Improved Measures of Diet and Physical Activity for the Genes, Environment, and Health Initiative (GEI)

Risk Factor Monitoring and Methods Branch
APPLIED RESEARCH PROGRAM

Description

The Genes, Environment, and Health Initiative (GEI) is a NIH-wide project led by the National Institute of Environmental Health Sciences (NIEHS) and the National Human Genome Research Institute (NHGRI). The overarching goal of the GEI is to determine the etiology of common diseases by focusing on the interaction of genetic and environmental factors to better understand how these interactions contribute to health and disease.

The GEI is an investment in genetic studies and environmental monitoring technologies. The genetic component is focused on genome-wide association studies and data analytic methods. As genes alone do not tell the whole story, the other component examines exposure biology.

Exposure Biology

Recent increases in the incidence of chronic diseases such as diabetes, childhood asthma, obesity, or autism are not likely due to major shifts in the human genome. The increases are more likely due to changes in our environments, diets, and/or activity levels, which may lead to disease in genetically predisposed persons.

The Exposure Biology Program, one component of the GEI, released five RFAs aimed at stimulating the development of innovative wearable sensors to accurately measure diet, physical activity, environmental exposures, psychosocial stress, and addictive substances.

One of the RFAs focuses on improved measures of diet and physical activity. The goal is to create innovative, accurate technologies to use in large population studies that have both genetic and environmental components. The RFA is led by the National Cancer Institute (NCI) and the National Heart, Lung and Blood Institute (NHLBI), with $16 million in funding over 4 years for seven grants, beginning in August 2007.

Diet and physical activity are lifestyle and behavioral factors that play an important role in the etiology, prevention, and treatment of many chronic diseases, including heart disease, vascular disease, chronic lung disease, metabolic disorders, cancer, and psychiatric conditions. The focus of this RFA is on assessments of these two behaviors, and not on the determinants.

Accurate data on diet and physical activity are critical in understanding how these factors may impact health and functional status over the human lifespan. On an individual level, interactions between genetic factors and diet or physical activity may influence disease risk. An improved understanding of how these genes and environment interactions affect disease risk may lead to better prevention or treatment approaches.

The measurement of usual dietary intake (considered the long-run average intake over the past year) or physical activity over varying recent time periods or in the past has, by necessity, relied on self-report instruments. A variety of such instruments exist, but they can be cognitively difficult for respondents and prone to varying degrees of measurement error depending on the time period considered, the instrument's ease of use, and the ethnic and demographic characteristics of the respondents. To overcome some of these limitations, the GEI supports the development of improved measures and more objective methods to assess dietary intake and physical activity.

Funded Research Grants

Diet Assessment Grants

- Web-based, multimedia tool for reporting dietary intake among children in both Spanish and English (PI: Tom Baranowski, Baylor College of Medicine, Houston, TX).

- A mobile telephone food record coupled with image processing software to estimate nutrient intake (PI: Carol Boushey, Purdue University, West Lafayette, IN).

- Camera and voice descriptions of foods captured via cell phones used with adaptive modeling software and automated processing technologies to estimate dietary intake (PI: Rick Weiss, Princeton Multimedia Technologies Corporation, Princeton, NJ).

Physical Activity Assessment Grants

- A breathing rate sensor, an indoor/outdoor environmental sensor, and an accelerometer will be combined to assess physical activity (PI: Patty Freedson, University of Massachusetts, Amherst).

- Multiple wireless sensors will be combined with an accelerometer-enabled cellular phone to assess physical activity, with the potential to assess other behaviors (PI: Stephen Intille, Massachusetts Institute of Technology, Cambridge).

- Device to collect motion, heart rate, and location paired with software to integrate location data with GIS systems to measure physical activity within the geospatial context (PI: Kevin Patrick, University of California, San Diego).

Combined Diet and Physical Activity Assessment Grants

- A unified sensor device that captures video images, motion, swallowing, and respiration to create an electronic chronicle of indexed diet and physical activity occasions (PI: Mingui Sun, University of Pittsburgh, Pittsburgh, PA).

Program Contacts

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