

OBESITY, INACTIVITY, AND CHRONIC DISEASES: Researchers Fit the Pieces Together

By Johanna Van Hise Heart

For more than 40 years, School of Public Health faculty and alumni have been examining the relationships among weight, level of physical activity, and risk for chronic diseases. School researchers have considered the significance of social factors, environmental influences, and body composition. They have looked at women and men; compared risk factors for African Americans and Caucasians; and worked with research subjects at every stage of life, from infants to senior citizens, to shed light on the causes and consequences of obesity and chronic diseases.

Longitudinal Studies Provide Perspective

In the mid-1980s, as issues of women's health and health disparities were becoming a growing concern on a national scale, professor of public health nutrition **Zak Sabry, Ph.D.** and researcher **Patricia Crawford, Dr.P.H. '94, R.D.**, began the National Institutes of Health-funded National Heart, Lung, and Blood Institute Growth and Health Study (NGHS), a 10-year, three-site longitudinal study of 2,379 African American and Caucasian girls recruited from the Richmond, California, and Washington, D.C. areas and from Cincinnati, Ohio.

"A strong association between obesity and heart disease had been established, but there was a lack of understanding of how this process progresses in women," says Sabry. "Up to that time, most of the research on heart disease development had been on men." Additionally, the higher incidence of heart disease and mortality from heart disease among African American women prompted a study design that allowed comparison between Caucasian and African American girls.

Hoping to track the development of obesity and other biological, social, and psychological risk factors for cardiovascular disease, Sabry and Crawford chose to begin following their cohort from ages nine or ten. Earlier longitudinal studies at the School conducted by professors



emeritae **Ruth L. Huenemann, D.Sc.**, and **Leona R. Shapiro, M.S.**, had confirmed that an increase in body weight in early childhood did not necessarily translate into obesity in late adolescence or early adulthood. (See profile of Ruth Huenemann, page 12.)

"Probably the turning point is about age nine," says Sabry. "It makes sense biologically in terms of what hormonal profiles you might get circulating in the blood stream affecting metabolism. And it also makes a lot of sense, particularly in women, in terms of the body's deliberate effort to store additional energy in preparation for childbearing."

From 1987 to 1997, Sabry and Crawford and their team assembled an incredibly extensive database of information. Initially working with the Richmond Unified School District, the local study staff measured diet, physical activity, anthropometry, self-esteem and other psychological factors, blood pressure, lipids, glucose, insulin, health beliefs, attitudes, and family influences. Some initial

conclusions include recognition that while nutrient intake varies greatly from family to family, the main dietary factor associated with the development of obesity is the proportion of calories from dietary fat. Additionally, socioeconomic status bears a strong inverse relationship to the development of obesity for Caucasian girls, but not for African American girls.

Thanks to an amazing retention rate of approximately 90 percent among participants, the study provides the most extensive and most reliable physical profiles of Caucasian and African American girls and young women available anywhere. Crawford, now codirector of the UC Berkeley Center for Weight and Health, and **May Wang, Dr.P.H. '93, R.D.**, visiting assistant professor of health policy and management at the School of Public Health, continue to procure funding to delve deeper into the data. They are considering such issues as the influence of community characteristics on obesity risk; the effects of teen pregnancy, poor diet, and inactivity on the normal course of

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development of bones; and the etiology of the development of eating disorders, especially among young African American women, for whom little data previously existed. While of much scientific value on their own, these ancillary studies will also provide opportunities for contact with the NGHS cohort and help maintain a high retention rate. Sabry anticipates that as the women near menopause there will be great interest in gathering more data that examine the relationship between weight and the development of metabolic syndrome and chronic disease.

Discerning the Role of Physical Activity

In the first national-scale analysis of energy expenditure in this country, [Linda Dong, M.P.H. '02](#), and professor of epidemiology and public health nutrition [Gladys Block, Ph.D.](#), quantified the strikingly low levels of physical activity in which Americans engage. Using data from 7,515 adults who had given detailed reports on their physical activity in a 24-hour period, Dong and Block were able to calculate that, outside of sleeping, the most energy expenditure among the population was driving a car, office work, and watching TV. In fact, only about five percent of the population's total energy expenditure was spent in moderate to strenuous physical activity.

“This study provides a wake-up call for the nation, particularly in light of the rising obesity rates in this country,” says Dong. “A lot of people aren't fully aware of how sedentary their lives are.”

Yet physical activity alone can neither control weight gain nor preserve health, according to other studies at the School which focus on the issue of weight and physical activity at specific times of life. An eight-year study of 2,092 male and female senior citizens in Sonoma, California, conducted by professors of epidemiology [Ira Tager, M.D.](#), and [William Satariano, Ph.D.](#), has found that it is not just physical activity that helps maintain the physical functioning so essential to



Helen McKenna, a participant in Ira Tager and William Satariano's study of physical activity and fitness among elders in Sonoma, undergoes an examination to measure the length of her reach.

good health and independence among elders. “We were specifically interested in looking at the relationship between physical activity and body composition, the ratio of muscle to fat,” says Tager. At each home evaluation, researchers obtained detailed information on medical history, social factors such as marital status and engagement in their community, income level, and past and current participation in physical activity. During subjects' biannual visits to the laboratory, data were gathered on body and muscle mass and heart and lung function at rest and, if possible, while on a treadmill.

“A lot of people aren't fully aware of how sedentary their lives are.”

“It turned out that the preservation of a good balance between the amount of muscle you have and the amount of fat you have actually seemed to be more important than physical activity in preventing or protecting against functional limitations in the elderly,” says Tager.

The researchers took into account the effect that physical activity has on fat and muscle mass. “This wasn't just the result of the fact that people who exercised more

had less fat. In essence, we controlled for that,” says Tager. “So older people might go out and do strength training or take their brisk walks every day, but the implications of these data would be that, if they were still overweight, that was going to be potentially less useful to them in protecting them from future disability than it would be if they also had a more ideal amount of fat for their body size.”

Although data collection, with the exception of mortality information, has ceased, analysis continues. Because they have exercise capacity data on upwards of a thousand people who were monitored closely while on a treadmill, the researchers will be able to look at the how their body composition is related to their exercise capacity, and then in turn how their exercise capacity is ultimately related to their future risk of becoming disabled or dying from cardiovascular disease.

The Office of the U.S. Surgeon General has called for a broad approach to obesity prevention, comprising research and evaluation, communication, and action. By increasing our understanding of the roles of physical activity, nutrition, weight, and risk of chronic diseases, the School of Public Health is providing a much-needed foundation for successful interventions to improve our nation's health. [↻](#)