Research History

Dietary Pattern Research and Other Contributions from the Framingham Nutrition Studies

Heather Padilla, Boston University School of Medicine

In 1948 a study began in the town of Framingham, Massachusetts with the objective to learn more about cardiovascular disease (CVD). By employing a longitudinal study design, researchers were able to follow a large group of participants with no previous history of CVD over a great length of time to determine what factors lead to the development of CVD. Prior to the study, little was known about the disease but its increasing prevalence made the need for research urgent. The Framingham Heart Study, a joint endeavor of the National Heart, Lung, and Blood Institute (NHLBI) and Boston University, has since made important scientific contributions and published over 1,200 articles in leading medical journals. The study has gained an iconic status for the standards it has set as one of the longest running, epidemiological studies in medical history[1].

The first study cohort involved 5,209 men and women between the ages of 30 and 62. Baseline physical examinations and lifestyle interviews were conducted at the initial start of the investigation and subjects returned to the study continuously every two years for physical exams, medical histories, and laboratory tests. The second generation of cohorts was enrolled beginning in 1971 for similar exams. These subjects were made up of 5,124 of the original subjects' adult children and their spouses (Framingham Offspring/Spouse Study (FOS)). In 2002 the third generation of participants, grandchildren of the original cohort, was enrolled. The first exam of the third generation study was completed in July 2005 and made up of 4,095 participants. By procuring multiple generations of participants, the Framingham Study has been strengthened in its ability to understand CVD and the disease's affect on families. Research on heritable traits and social influences can help in the production of ways to prevent, diagnose, and treat CVD.

In 1984, Framingham added a nutrition component to its research, which became the Framingham Nutrition Studies (FNS). The primary aims of the FNS were to 1) form valid nutritional risk assessment methods, 2) evaluate food and nutrient intake trends in comparison to professional health and nutrition guidelines, 3) explore diet and disease relationships (controlling for genetic, biological, and behavioral factors), and 4) transform research into preventive nutrition interventions[2]. Data for the first studies was collected from the FOS cohort at Exam 3 (1984-1988). Multiple findings have come out of the FNS including techniques for estimating nutrient intake, dietary pattern analysis, research planning and questionnaire design, and dietary behavior and relationship to various diseases like heart disease, obesity, and metabolic syndrome.

One of the most important outcomes of the FNS, as mentioned above, has been the identification of unique, non-overlapping dietary patterns. With the ability to characterize food behavior and overall dietary quality, dietary patterns hold valuable implications for epidemiological research.

In order to characterize food intake patterns, the multivariate technique known as cluster analysis was applied to a 145-item food-frequency questionnaire (FFQ) administered to Framingham subjects. Five distinct patterns emerged from the analyses for each gender. The 5 patterns for women were 1) Lighter Eating (low daily consumption of sweets, other fats, and bread and margarine), 2) High Fat (higher mean daily consumption of diet beverages, vegetable fats, breads, and sweets and other fats), 3) Heart Healthy (higher consumption of vegetables, lower-fat foods, fruits, lower-fat dairy products, whole grains, and soups), 4) Empty Calories (highest intake of sweetened beverages (about 10 times as much as other women) and fats, oils, and sweets), and 5) Wine and Moderate Eating (higher consumption of high-fat dairy foods and snack items and more wine and cholesterol-rich foods like eggs and organ meats on a daily basis). The 5 patterns for men were 1) Lower Variety (lowest consumption of most food groups), 2) Empty Calories (highest intake of sweets, salty snacks, high-fat animal protein foods, and refined grains and the lowest intake of low-fat milk), 3) Transition to Heart Healthy (highest intake of vegetables, fruits, whole grains, oils, and lower-fat foods, soup, organ meats, various types of fish, and carbohydrates as well as lowest consumption of refined grains, desserts, saturated fat, and total fat), 4) Average Male (high intakes of diet and decaffeinated beverages and lowest consumption of leaner proteins), and 5) Higher Starch