

## **William B. Kannel, MD, MPH (1923–2011)**

William B. Kannel, MD, MPH, and other Framingham Heart Study colleagues contributed in a major way to research knowledge concerning cholesterol levels and heart disease risk in populations using observational data across several decades of follow up.

Some examples of topics that were investigated are the levels of cholesterol, triglycerides, and HDL cholesterol as biomarkers of cardiovascular disease risk in diabetic and obese participants, as well as cholesterol and HDL-C as key lipid determinants for the prediction of heart attack risk. Other research focused on the relation between diuretic use and lipid levels, effects of smoking on HDL-C levels, levels of cholesterol in participants who died of cancer, change in lipids, and other risk factors as potential underpinnings of the decline in cardiovascular disease mortality, lipid levels as predictors of recurrent coronary artery disease, and the association of lipid levels with various types of cardiovascular disease outcomes.

A major theme throughout this Framingham research related to lipids and heart disease was the emphasis on blood cholesterol and triglyceride levels that were measured at almost every Framingham Heart Study visit from the late 1940s onward. The measurement of lipids was not always done in the fasting state and Framingham investigators typically worked together with outside collaborators.

The first major collaboration was with John Gofman, MD, PhD, at the Lawrence Livermore National Laboratory in Berkeley, Calif. Framingham specimens were shipped to the California laboratory and Svedberg fraction lipids were quantified by the methods available in the 1950s. In the early 1970s, the Framingham Laboratory undertook ultracentrifugation of lipoprotein particles in the Heart Study laboratory under the leadership of William P. Castelli, MD, and utilized the Lipid Research Clinics Protocol that had been developed by Robert I. Levy, MD, Donald S. Frederickson, MD, and Robert S. Lees, MD, at the National Heart Institute in the 1960s.

This technique provided estimates of total cholesterol, triglycerides, VLDL cholesterol, LDL cholesterol using ultracentrifugation, and measurement of HDL-C after precipitation of apolipoprotein B containing particles. From the mid-1980s onward, the laboratory investigations included enzymatic determination of lipids and the evaluation of newer biomarkers such as glycosylated hemoglobin, leucocyte count, homocysteine, C-reactive protein, and other biomarkers and genetic markers.