Smoking, Cholesterol and Heart disease in the Framingham study

Study the association between Smoking, Cholesterol and Heart disease in the Framingham study. A description of the data is attached.

Background on Lipids

Lipids *are a group of molecules that includes fats and oils, waxes, phospholipids, steroids (like cholesterol), and some other related compounds.* ***Fats*** *and* ***oils*** *are made from two kinds of molecules:* ***glycerol*** *(a type of alcohol with a hydroxyl group on each of its three carbons) and three* ***fatty acids*** *joined by dehydration synthesis. Since there are three fatty acids attached, these are known as* ***triglycerides****. "Bread" and pastries from a "bread factory" often contain mono- and diglycerides as "dough conditioners." The main distinction between fats and oils is whether they're solid or liquid at room temperature.*
High density lipoproteins (hdl) and low density lipoproteins(ldl) are proteins that attach to the lipids (fats and oils) and determine how the body will make use of the lipids. Hdl is generally beneficial whereas ldl generally is not.

Background on Statins

"Statins" are a class of drugs that lowers the level of cholesterol in the blood by reducing the production of cholesterol by the liver. Statins block the enzyme in the liver that is responsible for making cholesterol. This enzyme is called hydroxy-methylglutaryl-coenzyme A reductase (HMG-CoA reductase for short). Scientifically, statins are called HMG-CoA reductase inhibitors.

Cholesterol is critical to the normal function of every cell in the body. However, it also contributes to the development of atherosclerosis, a condition in which cholesterol-containing plaques form within the arteries. These plaques block the arteries and reduce the flow of blood to the tissues the arteries supply. When plaques rupture, a blood clot forms on the plaque, thereby further blocking the artery and reducing the flow of blood. When blood flow is reduced sufficiently in the arteries that supply blood to the heart, the result is ***angina*** *(chest pain) or a* ***heart attack****. If the clot occurs on plaques in the brain, the result is a* ***stroke****. Clots occurring on plaques in the leg cause intermittent* ***claudication*** *(pain in the legs while walking). By reducing the production of cholesterol, statins are able to reduce the formation of new plaques and occasionally can reduce the size of plaques that already exist. In addition, through mechanisms that are not well understood, statins also stabilize plaques and make them less prone to rupturing and forming clots.*

Although the important role of cholesterol in atherosclerosis is widely accepted by scientists, research also shows that atherosclerosis is a complex process that involves more than just cholesterol. For example, scientists have discovered that inflammation in the walls of the arteries may be an important factor in atherosclerosis. New research shows that statins reduce inflammation, which could be another mechanism by which statins beneficially affect atherosclerosis. This reduction of inflammation does not depend on statins' ability to reduce cholesterol. Further, these anti-inflammatory effects can be seen as early as two weeks after starting statins.

Statins are used for preventing and treating atherosclerosis that causes chest pain, heart attacks, strokes, and intermittent claudication in individuals who have or are at risk for atherosclerosis. Risk factors for atherosclerosis include abnormally elevated cholesterol levels, a family history of heart attacks (particularly at a young age), increasing age, and diabetes. Most individuals are placed on statins because of high levels of cholesterol. Though cholesterol reduction is important, heart disease is complex and, as discussed previously, other factors such as inflammation may play a role. Thirty-five percent of individuals who develop heart attacks do not have high blood cholesterol levels, yet most of them have atherosclerosis. This means that high levels of cholesterol are not always necessary for atherosclerotic plaques to form.

Background on Non-Statins
Many medications such as those that thin the blood remain in use to treat hypertension and heart disease. Statins are merely the most recent category of medications.