Original Paper

Characteristics and Lipid Distribution of a Large, High-Risk, Hypertensive Population: The Lipid-Lowering Component of the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT)

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The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) consisted of 42,418 participants randomized to one of four antihypertensive treatment groups: chlorthalidone, amlodipine, lisinopril, or doxazosin. A subset of these participants with fasting low-density lipoprotein cholesterol levels 100–189 mg/dL were randomized into a lipid-lowering component: 5170 to receive pravastatin (40 mg daily) and 5185 to receive usual care. This report describes the characteristics and lipid distribution of these participants. There were no important differences between the randomized treatment groups. Women had higher total cholesterol, low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol than men. There was a similar finding for black participants compared with whites, except blacks had lower triglycerides. Diabetics had lower high-density lipoprotein cholesterol and higher triglycerides than nondiabetics, and patients with body mass index <25 kg/m^2 had higher high-density lipoprotein cholesterol but lower low-density lipoprotein cholesterol and triglycerides than patients with higher body mass index. The success of the randomization of this large, diverse population and the differences in the lipid distributions among its subgroups will allow further understanding of optimal lipid-lowering treatment. (J Clin Hypertens. 2003;5:377–385)

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Manuscript received July 30, 2003;
revised October 21, 2003;
accepted October 24, 2003

www.lejacq.com **ID: 3163**

Observational data have consistently demonstrated a strong continuous and graded relationship between total cholesterol or low-density lipoprotein cholesterol (LDL-C) and coronary heart disease (CHD) risk. This relationship extends to cholesterol levels that are considered normal or mildly elevated.[1–4] Over the last two decades, several large randomized trials demonstrated conclusively that effective lowering of LDL-C with 3-hydroxymethylglutaryl coenzyme A (HMG CoA) reductase inhibitors (statins) can substantially reduce the risk of myocardial infarction (MI) and CHD events[5–11] without significant adverse

effects. The five largest published trials before the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT)—the Scandinavian Simvastatin Survival Study (4S),[5] the West Of Scotland Coronary Prevention Study (WOSCOPS),[6] the Cholesterol and Recurrent Events (CARE) trial,[7] the Long-term Intervention with Pravastatin in Ischemic Heart Disease (LIPID) trial,[11] and the Air Force and Texas Coronary Atherosclerosis Prevention Study (AFCAPS/TexCAPS),[10] with sample sizes ranging from 4159 to 9017 patients—were each strongly positive and, in aggregate, showed significant reductions in mortality as well as CHD events. Post hoc analysis of most of these trials also demonstrated a substantial risk reduction for stroke with lowering of LDL-C, although epidemiological observations have not detected a relationship between the two.[12,13]

In a recent meta-analysis, LaRosa et al.[14] examined the data from these trials, with primary focus on risk reduction in women and elderly patients. Collectively, these trials included 30,817 participants, of whom 13% were women and 29% over the age of 65. The overall proportional risk reduction for major cardiovascular events was equally reduced in men and women and younger and older; however, the effect on coronary deaths remained unclear. Overall, only two of the studies (4S and LIPID) showed significant reduction in coronary deaths, whereas the subgroups of women and the elderly were too small for definite conclusions. More recently, the strongly positive results of the British Heart Protection Study (HPS),[15] which included 20,536 participants with known cardiovascular disease, hypertension, and/or diabetes, further reinforced these findings.

The ALLHAT Lipid-Lowering Trial (LLT) was designed to address the effects of LDL lowering in segments of the population in which definitive evidence was lacking. These included the very elderly, racial/ethnic minority groups, and (at least for pravastatin) hypertensives and patients with LDL-C <3.4 mmol/L (130 mg/dL). The cholesterol-lowering component of ALLHAT was a randomized, nonblinded study comparing pravastatin to a usual care control group and was the first trial to examine the effect of lipid lowering exclusively in patients with treated hypertension. The primary findings of the ALLHAT-LLT have been reported.[16] This paper describes the characteristics and lipid distribution in this large sample of high-risk, hypertensive participants.

METHODS

ALLHAT was a large, intervention trial sponsored by the National Heart, Lung, and Blood Institute in cooperation with the Department of Veterans' Affairs. The study included 42,418 participants, of whom 10,355 were also randomized into the LLT. The design of ALLHAT and baseline characteristics of its participants have been described previously.[17,18] In brief, ALLHAT was designed to determine whether the combined incidence of fatal CHD and nonfatal MI differed between persons randomized to diuretic (chlorthalidone) treatment and each of three alternative treatments—a calcium antagonist (amlodipine), an angiotensin-converting enzyme inhibitor (lisinopril), and an α-adrenergic blocker (doxazosin). The LLT was designed to determine whether lowering LDL-C with pravastatin in a moderately hypercholesterolemic subset of ALLHAT participants would reduce all-cause mortality compared with a control group receiving "usual care."

ALLHAT participants were high-risk patients with hypertension who were recruited from 623 clinical centers in the United States, Canada, Puerto Rico, and the US Virgin Islands. Recruitment for the hypertension component was completed between February 14, 1994, and January 31, 1998. Patients were eligible for the trial if they had hypertension, were over the age of 55, and had at least one additional cardiovascular risk factor. These risk factors included prior MI or stroke (>6 months or age indeterminate), history of revascularization procedure, other documented atherosclerotic cardiovascular disease, major ST depression or T-wave inversion on electrocardiogram within past two years, type 2 diabetes mellitus, left ventricular hypertrophy, current cigarette smoking, and low high-density lipoprotein cholesterol (HDL-C <0.9 mmol/L [35 mg/dL]). Blood pressure (BP) eligibility criteria were, for untreated patients, systolic BP 140–180 mm Hg, diastolic BP 90–110 mm Hg, or systolic BP <160 mm Hg, diastolic BP <100 mm Hg for patients on treatment with one or two antihypertensive drugs.

Eligible and consenting patients were randomized into one of the four antihypertensive treatment groups of the hypertension trial at their second clinic visit. Randomization was stratified by clinical center and blocked over time. A fasting blood sample was obtained from participants at visit two and shipped to the central laboratory for biochemistry analysis, including measurements of total cholesterol (TC), HDL-C, and triglycerides (TG). LDL-C was calculated according to the Friedewald formula: LDL-C = TC – HDL-C – 1/5 TG.[19] This value was used to determine eligibility for the LLT within 180 days of a participant's entry into the hypertension trial. After 180 days, a new, locally measured lipid profile was required to determine lipid eligibility. Consenting participants with fasting LDL-C levels

of 120–189 mg/dL (3.1–4.9 mmol/L or 100–129 mg/dL [2.6–3.3 mmol/L] for those with known CHD) and a TG level ≤350 mg/dL (4.0 mmol/L) were eligible for the lipid-lowering component. Initially, the upper limit of LDL-C for participants with known CHD was 159 mg/dL (4.1 mmol/L), but was lowered to 129 mg/dL (3.3 mmol/L) on April 5, 1995, in light of the 4S findings.[5]

All blood samples were allowed to clot for 30 to 45 minutes and centrifuged at 1000–3000 xg for 15 minutes, causing a double-gel separator to divide the serum from the clot. The blood collection tube was stored refrigerated for no more than 5 days and shipped with a frozen refrigerant pack to the ALLHAT Central Laboratory (Fairview-University Medical Center Clinical Laboratories, formerly the University of Minnesota Clinical Laboratories), a Centers for Disease Control (CDC) standardized laboratory, for analyses. Both internal quality control measures, used to assess assay precision and drift, and external quality control measures (i.e., proficiency testing) were routinely performed.

Participants were excluded from the LLT who were: 1) currently receiving lipid-lowering therapy; 2) taking large doses of non-prescription niacin (≥500 mg/d); 3) were known to be intolerant of statins or had contraindications for statin therapy; or 4) were known to have significant liver or kidney disease (serum alanine aminotrasnferase [ALT] >100 IU/L or serum creatinine >176.8 μmol/L [2.0 mg/dL]), previous organ transplantation, nephrotic syndrome, or hypothyroidism. At the time of visit two, eligible participants must have been off lipid-lowering drugs at least 2 months and off probucol for more than 1 year. Enrollment was discouraged for participants whose personal physicians recommended cholesterol-lowering medications.

ALLHAT participants who were eligible for the LLT and consented to participate in this component signed a separate informed consent form and were randomly assigned to either pravastatin (40 mg daily) or to "usual care." Allocation of participants to pravastatin or usual care was in the ratio 1:1. Recruitment for the LLT was completed on May 31, 1998.[20] All of the 513 ALLHAT clinical centers that enrolled participants in the LLT received institutional review board approval.

Lipid-lowering medications were taken in the evening. The study physician had the option to lower the dose of pravastatin if it was poorly tolerated. All participants, including those assigned to usual care, were advised to follow the National Cholesterol Education Program (NCEP) Step I diet.[21] A second fasting lipoprotein profile was taken at the time of enrollment into the LLT to serve as baseline measure.

A single schedule of clinic visits was followed for both the LLT and antihypertensive component. During follow-up, cholesterol levels were measured in the pravastatin group at the first ALLHAT follow-up visit after entry into the LLT and at annual ALLHAT visits thereafter. Full lipid profiles were taken in a randomly chosen 10% sample of the pravastatin group. In the usual care group, cholesterol levels were measured at the second, fourth, and sixth annual visits; full lipid profiles were obtained in a random 5% sample. Treatment with lipid-lowering medication for participants randomized to usual care was generally discouraged but left to the judgment of the primary care physician.

In February 2000, the doxazosin arm of the antihypertensive trial was discontinued[22]; however, doxazosin participants who were also in the LLT continued participating in this component. Study physicians had the option of treating their doxazosin participants with an open-label chlorthalidone provided by the study or using other antihypertensive therapy of their choice.

STATISTICAL ANALYSIS

The results are presented as frequency distributions for discrete variables and as means and standard deviations for continuous ones. For comparisons between the pravastatin and usual care groups, the *p* values reported are based on the standard normal test, comparing either two proportions or two independent sample means. For comparisons of the mean serum lipid values within subgroups, the reported *p* values, unless otherwise noted, are based on the standard normal test comparing two independent sample means, where the first category is always used when subgroups have more than two levels. Four linear regression models were used, respectively, to examine the effect of selected characteristics on the four mean lipid measures. For these models, the student test statistics were used to test hypotheses that the linear model parameter estimates do not defer from zero. An F-statistic was used to assess the overall significance of categorical variables with more than two levels. A two-sided, Type I error rate of 0.05 was used in tests of statistical significance. Generally, adjustments for multiple comparisons were not done in these analyses, and some statistically significant differences would be expected to occur by chance alone. However, in the regression analyses, a Scheffé multiple comparisons test[23] was used to assess the contribution to the F-statistic of the individual comparisons of categorical variables with more than two levels: race, smoking, and antihypertensive trial component treatment groups.

Table I. Distribution of Participants According to Lipid-Lowering Trial (LLT) Treatment Group and Pre-Existing Coronary Heart Disease (CHD) Status at Baseline

	Lipid-Lowering Trial				
Subgroup	Pravastatin (n [%])	Usual Care (n [%])	All (n [%])	Non-LLT (n [%])	All Randomized (n [%])
All	5170 (100.0)	5185 (100.0)	10,355 (100.0)	32,063 (100.0)	42,418 (100.0)
Pre-existing CHD					
Present*	695 (13.4)	780 (15.0)	1475 (14.2)	9300 (29.0)	10,775 (25.4)
Absent	4475 (86.6)	4405 (85.0)	8880 (85.8)	22,444 (70.0)	31,324 (73.8)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	319 (1.0)	319 (1.0)

*The pravastatin and usual care groups differed significantly with respect to the presence of pre-existing CHD (chi-square=5.43; p=0.02).

RESULTS

The distribution of ALLHAT participants, according to the assigned treatment groups for both trial components, is presented in Table I. Of the 42,418 ALLHAT participants, 10,355 were also randomized into the LLT, with 5185 randomly assigned to usual care and 5170 to pravastatin. A small percentage of LLT participants (14%) had pre-existing CHD, with a larger percentage in usual care (p=0.02). Table II shows selected baseline characteristics of LLT participants by randomized treatment group. The last column depicts, for comparison, the same characteristics for non-LLT ALLHAT participants. Baseline characteristics of the two treatment groups were almost identical with regard to sex, race, age group distribution, treated hypertension, and smoking status. The number of participants randomized to each of the antihypertensive treatment groups was also similar among the pravastatin and usual care groups. There were slightly more men than women participating in the LLT (51% vs. 49%), but the difference was less than that observed among non-LLT participants. The largest racial group in the LLT was the non-Hispanic whites, but black participants were well represented (38%). The largest age group was that of 60–69 years and represented 47% of the participants in the LLT and 46% in the non-LLT. Younger participants between the ages of 55–59 represented 21% of LLT participants and 19% of non-LLT participants. Approximately 27% of participants belonged to the 70–79 age group, and a small but scientifically important proportion of participants (6%) were octogenarians. Twenty-three percent of LLT participants were current smokers; the remaining participants were about equally distributed between past and never smokers. Non-LLT participants had a slightly lower proportion of current smokers and correspondingly higher proportion of past smokers. There were no differences between usual care and pravastatin treatment arms when subgroups were examined according to the presence or absence of pre-existing CHD (data on file).

A comparison of selected baseline continuous measures for the two treatment groups and the non-LLT participants is presented in Table III. Characteristics such as years of education, mean systolic BP, diastolic BP, serum creatinine, serum potassium, fasting plasma glucose, and the percentage of type 2 diabetic participants were similar between the three groups. However, participants in the LLT had higher mean TC and LDL-C, and lower TG compared with non-LLT participants. HDL-C was similar among all three groups.

Table IV shows the average lipid and lipoprotein fractions for subgroups of LLT participants. The following significant differences were observed: Women had higher TC, HDL-C, and LDL-C than men, and women on hormone replacement therapy had significantly higher HDL-C and lower LDL-C than those not on replacement therapy. Black participants had significantly higher TC, HDL-C, and LDL-C, and lower TG than white participants. Participants in the "other" category, mostly of Hispanic origin, also had higher HDL and slightly lower TG than whites. Participants with diabetes had lower HDL-C and higher TG compared with nondiabetic patients. Participants with atherosclerotic cardiovascular disease/CHD had lower total and LDL-C (due to their lower LDL inclusion criteria for the LLT) but similar HDL and TG compared with those without atherosclerotic cardiovascular disease/CHD, a feature related to differences in entry criteria for CHD and non-CHD participants. Past and current smokers had lower TC and HDL-C, and past

Table II. Distribution of Selected Baseline Characteristics by Treatment Group

	LIPID-LOWERING TRIAL		
BASELINE CHARACTERISTIC*	PRAVASTATIN (N [%])	USUAL CARE (N [%])	NON-LLT (N [%])
Sample size	5170 (100.0)	5185 (100.0)	32,063 (100.0)
Male	2659 (51.4)	2645 (51.0)	17,273 (53.9)
Female	2511 (48.6)	2540 (49.0)	14,790 (46.1)
Race**			
White	2116 (40.9)	2133 (41.1)	15,729 (49.1)
Black	1991 (38.5)	1920 (37.0)	11,173 (34.8)
Other	1063 (20.6)	1132 (21.8)	5161 (16.1)
Age (years)			
55–59	1069 (20.7)	1069 (20.6)	5949 (18.6)
60–69	2404 (46.5)	2432 (46.9)	14,605 (45.6)
70–79	1399 (27.1)	1401 (27.0)	9325 (29.1)
≥80	298 (5.8)	283 (5.5)	2184 (6.8)
BMI (kg/m^2)			
<25	973 (18.9)	997 (19.3)	6444 (20.2)
25–29	1949 (37.8)	1956 (37.8)	12,222 (38.3)
30–39	1952 (37.9)	1877 (36.3)	11,354 (35.6)
≥40	280 (5.4)	344 (6.6)†	1896 (5.9)
Cigarette smoking status			
Current	1193 (23.1)	1208 (23.3)	6868 (21.4)
Past	1922 (37.2)	1934 (37.3)	13,226 (41.3)
Never	2055 (39.7)	2043 (39.4)	11,967 (37.3)
Treatment group			
Chlorthalidone	1872 (36.2)	1883 (36.3)	11,500 (35.9)
Amlodipine	1122 (21.7)	1118 (21.6)	6808 (21.2)
Lisinopril	1094 (21.2)	1073 (20.7)	6887 (21.5)
Doxazosin	1082 (20.9)	1111 (21.4)	6868 (21.4)
On BP meds >2 mo	4454 (86.2)	4477 (86.3)	27,905 (87.0)
Aspirin use	1566 (30.6)	1637 (31.9)	12,020 (38.0)
History of diabetes††	1855 (35.9)	1783 (34.4)	11,645 (36.3)
LVH by ECG‡	992 (19.2)	1016 (19.6)	4944 (15.4)
Hard LVH (baseline ECG) ‡‡	241 (4.9)	258 (5.2)	1555 (5.3)

LLT=lipid-lowering trial; BMI=body mass index; BP=blood pressure; LVH=left ventricular hypertrophy; ECG=electrocardiogram; *ascertained at entry to antihypertensive trial component; **white includes non-Hispanic whites, black includes black Hispanics, other includes non-black Hispanics and a small percentage of Asians, American Indians, Alaskan natives, and Pacific Islanders; †denotes statistically significant difference between pravastatin and usual care groups, $p<0.05$; ††for trial eligibility, participants had to have at least one other risk factor in addition to hypertension. The indicated risk factors are not mutually exclusive or exhaustive and do not represent prevalence. ‡Clinically ascertained LVH on any ECG within the past two years; ‡‡hard LVH was ascertained from centrally coded baseline ECGs using the Minnesota Code criteria of tall R-wave in the presence of ST-segment depression or T-wave inversion. ECGs were missing for 8.2% of participants

smokers had lower LDL-C than non-smokers. HDL-C was higher in participants who had never smoked. Participants with body mass index <25 kg/m^2 had significantly higher HDL-C and lower LDL-C and TG than those with a higher body mass index.

Total LDL-C, HDL-C, and TG were virtually identical between participants randomized to usual care and pravastatin subgroups. This was true for all risk subgroups, including diabetics, patients with atherosclerotic cardiovascular disease/CHD, current smokers, men, and women. Compared with participants randomized to usual care or pravastatin, however, participants in the non-LLT had consistently lower TC and LDL-C and higher TG in all risk subgroups, whereas HDL-C was comparable. This might be due to many participants not randomized to the LLT being on lipid-lowering therapy at baseline evaluation. Linear regression analyses were done to examine the multivariable relationships of the characteristics from Table IV on the four mean lipid measures (data not shown). These analyses did not significantly change the results presented in Table IV.

Table III. Mean and Standard Deviation for Selected Baseline Characteristics by Treatment Group

	Lipid-Lowering Trial†		
Baseline Characteristic*	Pravastatin (n=5170) (Mean [SD])	Usual Care (n=5185) (Mean [SD])	Non-LLT (n=32,063) (Mean [SD])
Education (years)	10.7 (4.1)	10.7 (4.1)	11.0 (4.0)
SBP (mm Hg)	146.6 (15.6)	146.1 (15.6)	146.3 (15.7)
DBP (mm Hg)	84.7 (10.0)	84.7 (10.0)	83.8 (10.1)
Creatinine (mmol/L)	88.4 (26.5)	88.4 (26.5)	88.4 (26.5)
Fasting glucose (mmol/L)	6.78 (3.09)	6.77 (3.12)	6.85 (3.19)
Serum potassium (mmol/L)	4.3 (0.7)	4.3 (0.7)	4.4 (0.7)
Total cholesterol (mmol/L)	5.82 (0.71)	5.81 (0.71)	5.52 (1.22)
HDL-C (mean mmol/L)	1.24 (0.35)	1.23 (0.36)	1.21 (0.39)
LDL-C (mean mmol/L)	3.80 (0.56)	3.78 (0.56)	3.42 (1.05)
Triglycerides (mean mmol/L)	1.70 (0.81)	1.72 (0.93)	2.03 (1.68)

LLT=lipid-lowering trial; SBP=systolic blood pressure; DBP=diastolic blood pressure; HDL-C=high-density lipoprotein; LDL-C=low-density lipoprotein cholesterol; *ascertained at entry to antihypertensive trial component; †there were no statistically significant differences in these characteristics between the pravastatin and usual care groups; to convert from SI to metric units, divide by the following conversion factors: creatinine, 88.4; glucose, 0.0555; potassium, 1.0; total cholesterol, HDL-C, LDL-C, 0.0259; triglycerides, 0.0113. See Table IV footnote for participants missing biochemistry measures.

DISCUSSION

Randomization in ALLHAT worked well, and participants were equally distributed to the two treatment arms: pravastatin 40 mg daily or usual care. Baseline characteristics such as age, race and sex, smoking habits, demographics, blood pressure, electrolytes and renal function, distribution of cardiovascular risk factors, and baseline lipid profiles were almost identical between the two treatment groups. Some differences exist between the LLT and the non-LLT populations, primarily related to race distribution and lipid profiles, but these differences can be easily explained from the selection procedures and inclusion criteria.

A number of interesting observations resulted when the lipid profile of the various subgroups was compared. There were, as would be expected, differences between men and women: Men had significantly lower TC and LDL-C and substantially lower HDL-C than women. TG levels were similar between the two groups.

Black participants had slightly higher TC and LDL-C and substantially higher HDL-C than white participants. These findings are consistent with the findings of previous studies.[24,25] The Atherosclerosis Risk in Communities (ARIC)[24] study included 14,524 men and women of both black and white races between the ages of 25–64 years. Patients were screened for lipid profiles, and in this population it was also found that women had higher HDL-C and TC than men. As in ALLHAT, black participants had higher HDL-C than white participants.

The Veterans Administration Cooperative Study group[25] compared lipid profiles among black and white middle-aged men and found that white patients had significantly lower HDL-C than blacks (1.2 vs. 1.3 mmol/L [45 vs. 52 mg/dL]) and significantly higher TG (1.7 vs. 1.3 mmol/L [153 vs. 116 mg/dL]). TC and LDL-C did not differ significantly. The observations on the HDL-C and TG are similar to the findings in ALLHAT-LLT. These differences in the lipid profile may explain some of the observed differences in the prevalence of CHD in black and white patients.

In ALLHAT-LLT, diabetic participants had significantly lower HDL-C and higher TG than nondiabetic participants. This observation is in agreement with some, but not all, previous, generally smaller studies.

A variety of lipid measures have been compared in diabetics and nondiabetics.[26–30] Mean levels of TC and LDL-C often do not differ between diabetics and nondiabetics, but HDL-C is usually lower and TG is usually higher in diabetics. Representative values from the literature have been recently summarized by Wilson[31] in patients 20–74 years of age. In this summary it was found that diabetic women had substantially higher TC and LDL-C and higher TG and lower HDL-C than nondiabetic women. The differences between diabetic and nondiabetic men were limited to TG.

Analyses of the baseline data of ALLHAT-LLT participants indicate that randomization to pravastatin or usual care worked well. The pravastatin and usual care groups were remarkably similar, and the significant differences that were observed among various subgroups generally agreed with published observations. The ALLHAT-LLT was well positioned to provide answers and important insights not provided by previous lipid-lowering trials.

The main results of the LLT[16] demonstrated the following: At the end of the follow-up period, 83% of

Table IV. Baseline Mean Lipid and Lipoprotein Fractions by Risk Category Subgroups of Lipid-Lowering Trial Participants

Subgroup*	Sample Size (n [%])**	Age (Mean)	TC (Mean [SD])	HDL-C (Mean [SD])	LDL-C (Mean [SD])	TG (Mean [SD])
Men	5304 (51.2)	66.3	5.63 (0.69)	1.12 (0.31)	3.72 (0.56)	1.70 (0.92)
Women	5051 (48.8)	66.4	6.01 (0.68) †	1.35 (0.37)†	3.86 (0.56)†	1.72 (0.82)
On HRT	789 (15.6)	63.4	6.05 (0.68)	1.45 (0.38)	3.73 (0.56)	1.89 (0.80)
Not on HRT	4156 (82.3)	67.0	6.01 (0.68)	1.33 (0.36)†	3.89 (0.55)†	1.69 (0.82)†
Race‡						
White	4249 (41.0)	67.2	5.79 (0.74)	1.15 (0.33)	3.77 (0.58)	1.90 (0.96)
Black	3911 (37.8)	65.9	5.84 (0.68)†	1.34 (0.38)†	3.84 (0.58)†	1.40 (0.69)†
Other	2195 (20.8)	65.6	5.81 (0.70)	1.21 (0.32)†	3.74 (0.56)	1.82 (0.80)†
Age (years)						
55–59	2138 (20.6)	56.9	5.88 (0.72)	1.22 (0.34)	3.84 (0.57)	1.78 (1.08)
60–69	4836 (46.7)	64.4	5.82 (0.70)	1.22 (0.35)	3.80 (0.56)	1.72 (0.82)
70–79	2800 (27.0)	73.6	5.78 (0.71)	1.25 (0.37)	3.75 (0.56)	1.66 (0.78)
≥80	581 (5.6)	83.3	5.77 (0.71)	1.31 (0.40)	3.73 (0.57)	1.58 (0.81)
Diabetic status						
Diabetics	3638 (35.1)	66.3	5.82 (0.70)	1.19 (0.32)	3.79 (0.55)	1.80 (0.97)
Nondiabetics	6717 (64.9)	66.4	5.81 (0.71)	1.25 (0.37)†	3.79 (0.57)	1.66 (0.80)†
ASCVD/CHD status						
ASCVD/CHD	3888 (37.5)	68.0	5.68 (0.77)	1.23 (0.36)	3.66 (0.61)	1.70 (0.81)
Non-ASCVD/CHD	6467 (62.5)	65.4	5.89 (0.67)†	1.23 (0.35)	3.87 (0.52)†	1.71 (0.91)
Cigarette smoking status						
Current smoker	2401 (23.2)	63.7	5.82 (0.71)	1.23 (0.36)	3.81 (0.54)	1.70 (1.03)
Past smoker	3856 (37.2)	67.2	5.74 (0.71)†	1.18 (0.34)†	3.75 (0.58)†	1.72 (0.80)
Never smoked	4098 (39.6)	67.2	5.88 (0.70)†	1.28 (0.37)†	3.81 (0.56)	1.70 (0.84)
BMI (kg/m^2)						
<25	1970 (19.0)	68.9	5.82 (0.73)	1.35 (0.43)	3.75 (0.56)	1.56 (0.81)
25–29	3905 (37.7)	66.8	5.80 (0.71)	1.21 (0.34)†	3.79 (0.56)†	1.72 (0.80)†
30–39	3829 (37.0)	65.2	5.82 (0.70)	1.19 (0.32)†	3.80 (0.56)†	1.78 (0.97)†
≥40	624 (6.0)	63.2	5.86 (0.70)	1.24 (0.33)†	3.84 (0.59)†	1.68 (0.80)†
Antihypertensive Treatment group						
Chlorthalidone	3755 (36.3)	66.6	5.82 (0.69)	1.23 (0.35)	3.79 (0.56)	1.70 (0.78)
Amlodipine	2240 (21.6)	66.5	5.83 (0.74)	1.25 (0.36)	3.78 (0.57)	1.71 (1.07)
Lisinopril	2167 (20.9)	66.1	5.80 (0.72)	1.23 (0.36)	3.78 (0.57)	1.73 (0.81)
Doxazosin	2193 (21.2)	66.2	5.81 (0.71)	1.23 (0.36)	3.80 (0.56)	1.70 (0.84)

TC=total cholesterol (mmol/L); HDL-C=high-density lipoprotein cholesterol (mmol/L); LDL-C=low-density lipoprotein cholesterol (mmol/L); TG=triglycerides (mmol/L); HRT=hormone replacement therapy; ASCVD=atherosclerotic cardiovascular disease; CHD=coronary heart disease; BMI=body mass index; SD=standard deviation; *where a subgroup has more than two categories, statistical comparisons are made with the first category; **the sample size is based on participants in the lipid-lowering trial. Baseline biochemical data are missing for the following percentages of participants in the lipid-lowering trial: TC, 3%; HDL-C, 3%; LDL-C, 3.7%; TG, 22.0%. Conversion units for metric scale are given in Table III. † $p \leq 0.01$; there were no additional significant differences at the $p \leq 0.05$ level. ‡white category includes non-Hispanic whites; the black category includes black Hispanics; the other category includes non-black Hispanics and a small percentage of Asians, American Indians, Alaskan Natives, and Pacific Islanders.

participants assigned to the pravastatin group remained on statin therapy, but 26% of participants assigned to the usual care group also received statin therapy. As a result, TC and LDL-C were reduced by 20% and 30%, respectively, in the pravastatin group, and by 11% and 16%, respectively, in the usual care group. Total mortality was similar between the two groups and among all the subgroups examined. Nonfatal MI and CHD deaths were 9% lower in the pravastatin group compared with usual care, but this difference was not statistically significant. Small, non-significant differences were noted in most subgroups, except in blacks where nonfatal MI/CHD deaths were 27% lower in the pravastatin group compared with

usual care. Overall, the benefit from pravastatin therapy was small due to the small deferential reduction of LDL-C. The observed (nonsignificant) differences in events in ALLHAT-LLT, taking into account net cholesterol differences, were proportional to those shown for other major lipid-lowering trials.[16] Further analysis of the results in subgroups is currently underway.

**For a complete list of members of the ALLHAT Collaborative Research Group, see* JAMA. *2002;288:2981–2997.*

Acknowledgments: This research was supported by Health and Human Services contract number NO1-HC-35130 from the National Heart, Lung, and Blood Institute, National Institutes of Health, US Department of Health and Human Services, Bethesda, MD. The ALLHAT investigators acknowledge contributions of study medications supplied by Pfizer, Inc. (amlodipine and doxazosin), AstraZeneca (atenolol and lisinopril), and Bristol-Myers Squibb (pravastatin), and financial support provided by Pfizer to the National Heart, Lung, and Blood Institute.

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