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Statin use and lipid levels in older adults: NHANES 2001-2006

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Abstract

Background—Statins are the evidence-based drugs of choice for the prevention of cardiovascular disease (CVD).

Objective—Statin utilization has increased in those ≥ 65 years, but patterns of utilization in subgroups of elderly are unknown.

Methods—Weighted data from the 2001 through 2006 National Health and Nutrition Examination Surveys were combined for this analysis.

Results—Statin use increased in all sex, age, and risk categories between the 2001-2002 and 2005-2006 surveys, when the highest use was by men aged 65-74 years with CVD (80%), followed by women with CVD aged 65-79 (64-69%), women and men with diabetes aged 65-69 (56 and 94%, respectively); statins were used by $<42\%$ of individuals without CVD or diabetes. In adjusted logistic regression models, those with diabetes [odds ratio (OR) 2.1, 95% CI 1.8-2.6], CVD but no diabetes (OR 3.0, 95% CI 2.5-3.6), and CVD and diabetes (OR 5.2, 95% CI 3.9-7.1) were more likely to use statins than those without CVD or diabetes, $p < 0.001$. A significant interaction between age and gender was found, where 75-79 year old women were more likely to report statin use than men aged 65-69 (OR = 2.07, 95% CI = 1.29, 3.35). In general, those aged 65-69 were more likely to use a statin than those ≥ 70 (OR 0.57, 95% CI 0.39-1.08, $p = 0.08$). Non-white persons aged ≥ 70 reported less statin use than whites aged 65-69 (OR=0.17, 95% CI 0.10-0.30). Mexican Americans were less likely to report statin use than whites.

Conclusions—Although statin use has increased substantially over time, statins remain underutilized in both the primary and secondary prevention of CVD in the elderly, with some evidence of disparities by sex, advancing age, and race/ethnicity.

Keywords

Lipids; Statins; Elderly; Prevention; Population; Cardiovascular disease

Although remaining the leading cause of death in the US, cardiovascular disease (CVD) incidence and mortality has fallen by $>25\%$ over the past decade, including those >65 years.

¹ This decline has in large part been attributed to the use of evidence-based prevention medications, including statins.^{2, 3} Treatment of LDL-C with, has been shown to reduce the risk of both coronary heart disease (CHD) and stroke in secondary prevention populations

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aged 65 to 80 years. In a prospective meta-analysis of 14 statin trials those over age 65 (n=6446) experienced a 19% reduction in major cardiovascular events, a benefit similar to the 22% reduction in risk experienced by those ≤ 65 years (n=7902).⁴ The few data available from primary prevention populations without CVD or diabetes also suggest individuals >70 years benefit from statin therapy.^{5, 6}

A previous analyses of the National Health and Nutrition Examination Surveys (NHANES) found that between the 1999-2000 and 2003-2004 surveys, statin use increased from 32% to 44% in those aged 60-74, and 28% to 42% by those aged ≥ 75 years.⁷ Another analysis of the 2003-2004 survey found that the NCEP ATP III-defined LDL-C goal was achieved by 63% of those aged 60-69, and 55% of those aged 70-79.⁸ We undertook this analysis to further evaluate lipid levels and the use of statins and in older adults through the 2005-2006 survey, and to evaluate the influence of age, gender, race or ethnicity, and cardiovascular and diabetes status.

Methods

Data from the National Health and Nutrition Examination Survey (NHANES) collected during NHANES 1999-2000, 2001-2002, 2003-2004, 2005-2006 surveys were used in this analysis. NHANES are nationally representative cross-sectional surveys of the U.S. civilian noninstitutionalized population that utilize a stratified multistage probability sample. Procedures are similar for each survey and include a home interview followed by a physical examination in a mobile examination center using standardized techniques and equipment. Approximately half of respondents to the medical history component of the NHANES also had lipid panel, and approximately half of the lipid panels were fasting, further limiting the number of individuals available for analysis. Therefore, to evaluate the statin utilization and lipid levels by age, gender, race/ethnicity and disease status, the 2001-2006 surveys were combined due to the small number of NHANES participants in age, race, and gender subgroups in individual surveys. More specimens were available for non-HDL-C since fasting was not required.

Race-ethnic group based on self-reporting was categorized as non-Hispanic white, non-Hispanic black, Mexican American, other race including multi-racial and other Hispanics. The Mexican American groups were used for comparison in this analysis. Cardiovascular disease was defined as every having been told they had coronary heart disease, angina/angina pectoris, heart attack, or stroke. Diabetes was defined by a doctor having told them they had diabetes, use of diabetes pills or insulin, or fasting blood glucose >125 mg/dL.

Statistical analysis was performed using SAS 9.1 survey procedures. For each survey, weighted data were used to take into account the unequal probabilities of selection resulting from the sample design and from planned oversampling of certain subgroups to obtain a nationally representative sample of income data. Comparisons of prevalence were considered significant if the 95% confidence intervals were exclusive; a p-value of <0.05 considered significant for other comparisons. Chi-square testing and contrasts were used to compare proportions. Logistic regression was used to model predictors of statin use.

Results

In women >65 years, statin use increased from 23% in 2001-2002 to 37% in the 2005-2006 surveys (data not shown). In men >65 years, statin use increased from 25% to 44% over the same time period. In those without CVD or diabetes, statin use peaked at similar levels in the 70-74 age group in men and in the 75-79 age group in women (37-42%) [Table 1]. In women with CVD, statin use remained fairly stable (62-69%) in the 65-69 age group

between 2001-2002 and 2005-2006 surveys, but increased from 37-46% to 64-66% in the 70 and 79 age group; statin use also increased in the >80 age group, from 27 to 43%. In men with CVD, in the 2001-2002 survey 60-63% of those aged 65-74 reported statin use, which increased to 80% by the 2005-2006 survey. In men with CVD >75 years, statin use increased from about 33% to 55%. Insufficient numbers of individuals with diabetes without and with CVD were evaluated to permit comparison of the 2 surveys, with a greater number were available for subsequent analyses of the pooled surveys.

The following results are from models adjusted for age, gender, race/ethnicity, and CVD and diabetes status using data from the combined 2001-2006 surveys. Compared to those without CVD or diabetes, statin use was more likely in those with diabetes [odds ratio (OR) 2.1, 95% CI 1.8-2.6], CVD but no diabetes (OR 3.0, 95% CI 2.5-3.6), and CVD and diabetes (OR 5.2, 95% CI 3.9-7.1); $p < 0.001$. There was a trend for women to be somewhat less likely than men to report using a statin, although this did not achieve statistical significance (OR 0.7, 95% CI 0.5-1.1; $p = 0.09$). There was evidence of a trend for those 65-69 to be more likely than those ≥ 70 years to report taking a statin (OR 0.57, 95% CI 0.39-1.08, $p = 0.08$). This was largely due to non-white persons aged ≥ 70 reporting less statin use than whites aged 65-69 (OR=0.17, 95% CI 0.10-0.30). A significant interaction between age and gender was found, where 75-79 year old women were more likely to report statin use than men aged 65-69 (OR = 2.07, 95% CI = 1.29, 3.35). Mexican Americans were less likely to report statin use than whites; blacks, other Hispanics, and others reported similar rates as whites. The interaction term for gender and race was not significant ($p = 0.104$).

No CVD or diabetes

Overall 63% of women and 54% of men ≥ 65 years reported no clinical CVD or diabetes. In women without CVD or diabetes, use of statins alone or in combination increased from 20% of those aged 65-69 to 31% of those aged 75-79, with a drop-off to 16% in those aged 80 and older (Table 2). Men had more consistent use across the age groups, 24-27% in those age 65-74, then about 20% after age 75.

Among those without CVD or diabetes not reporting the use of cholesterol-lowering drugs (Table 3), half of women aged 65-69 had an LDL-C ≥ 139 mg/dL and a non-HDL-C ≥ 156 mg/dL. Median LDL-C and non-HDL levels declined with advancing age, such that by age ≥ 80 , half of women had an LDL-C ≥ 124 mg/dL and non-HDL-C ≥ 151 mg/dL. For most age-sex groups, median LDL-C and non-HDL-C levels similarly declined with age, although medians were slightly lower for men.

Among those without CVD or diabetes reporting cholesterol-lowering drug use (Table 4), women aged 65-69 had the lowest median LDL-C (89 mg/dL). Men aged 65-69 had a slightly higher median LDL-C of 105 mg/dL. Median LDL-C was 94-103 mg/dL and median non-HDL-C was 116-143 mg/dL in the other age-sex groups.

Diabetes but no CVD

Overall 13% of women and men ≥ 65 years reported diabetes but no CVD, with prevalence falling to about 10% in the ≥ 80 age group. In women, 40-43% of those aged 65-79 reported statin use, with somewhat lower use in those ≥ 80 years (32%) [Table 2]. Statin use was reported by 45% of men aged 64-69, with lower use in those in their 70's (31-38%), declining to 23% by men ≥ 80 years. More specimens were available for non-HDL-C since fasting was not required.

Among those with diabetes but no CVD not reporting cholesterol-lowering drug use (Table 3), median LDL-C levels were 113-130 mg/dL in women age 65-79, with a median of 143

in women ≥ 80 years. In men, median LDL-C levels were 132 mg/dL in men aged 65-69 years, but lower in those ≥ 70 years (117-119 mg/dL).

Among those with diabetes but no CVD who did report cholesterol-lowering drug use (Table 4), median LDL-C levels were 72-90 mg/dL in women. In men, median LDL-C was fell from 99 mg/dL in men 65-79 to 82 mg/dL in men aged 75-79. In women, median non-HDL-C levels were 111-123 mg/dL, and in men 110-124 mg/dL in those ≥ 70 years, and 143 mg/dL in those aged 65-69.

CVD no diabetes

Overall 17% of women and 24% of men ≥ 65 years had CVD without diabetes. The proportion of women reporting CVD but without diabetes increased with advancing age, from 9% in those aged 65-69 to 23% by age ≥ 80 (Table 2). In men, 18% reported CVD without diabetes in the 65-69 group, which increased to 37% by age ≥ 80 . Statin use in women peaked in the 70-74 age group at 52%, with a 40% reporting use in younger and older 5-year age groups, and fell to 29% in those ≥ 80 years. Men with CVD but without diabetes reported higher rates of statin use by every age group, with 61-63% reporting use in the 65-74 age group and 44% in those ≥ 75 years.

Among those with CVD but no diabetes who did not report statin use (Table 3), median LDL-C was 137 mg/dL in women aged 65-69 and fell to 119 mg/dL in those ≥ 80 years. In men, the median LDL-C ranged from 111 to 121 mg/dL. Median non-HDL-C was 152-160 mg/dL in women, and 138-150 mg/dL in men.

Among those with CVD but no diabetes who reported statin use (Table 4), median LDL-C was 95-103 mg/dL in women aged 65-79, and 88 mg/dL in those ≥ 80 years. In men, LDL-C was highest at 107 mg/dL in the 65-69 group, and 71-88 in those ≥ 70 years. Median non-HDL-C was 114-128 mg/dL in women, with the exception of age 70-74 with median non-HDL-C of 147 mg/dL. Men had median non-HDL-C levels of 112-125 mg/dL.

CVD and diabetes

Overall, 7% of women and 9% of men ≥ 65 years had both CVD and diabetes (Table 2). In men, 12% reported CVD and diabetes in the 65-69 age group, which fell to 7% by age ≥ 80 . Before age 80, 62-68% of women reported using statin, with a drop-off to 48% in the ≥ 80 age group. In men, before age 75, 64-71% reported using statins, with a drop-off to 41-49% in those ≥ 75 years.

In those with CVD and diabetes did not report using a statin, few data were available for LDL-C (Table 3). More data were available for non-HDL-C, which ranged from 139-188 in women and 125-148 in men.

In those with CVD and diabetes who reported using a statin (Table 4), median LDL-C was 121-136 mg/dL in women aged 65-74, and 81-90 in those ≥ 75 years. In men, median LDL-C was 64-78 mg/dL. Median non-HDL-C was highest in women aged 70-74 (153 mg/dL), and ranged from 106-122 mg/dL in women in other age groups. In men, median non-HDL-C ranged from 94-129 mg/dL.

LDL-C <100 mg/dL

In those without CVD or diabetes, age and gender did not influence achieving an LDL-C <100 mg/dL or non-HDL-C <130 mg/dL, while Hispanics were less likely to achieve this goal than other groups ($p < 0.001$). However, in those with CVD or diabetes, attainment of LDL-C <100 mg/dL was more likely in those ≥ 75 years ($p = 0.02$) and in non-whites

($p<0.001$), while gender did not influence goal attainment ($p=0.18$); non-whites had similar rates of non-HDL-C goal attainment as whites.

Discussion

Although statin use increased in persons ≥ 65 years in the period between 2001 and 2006, treatment rates still remained suboptimal during this time period. Underutilization of statins occurred in every risk category, although rates improved with increasing levels of risk. The greatest improvements in statin use occurred in men with CVD or diabetes, with statin use in women generally lagging behind men before age 75. Although diabetes is considered a CHD risk equivalent in the National Cholesterol Program Adult Treatment Panel (ATP) III guidelines,⁹ statins were used by fewer individuals ≥ 70 with diabetes without CVD than in those with CVD (with or without diabetes). In those with CVD, statin use declined after age 75 in men and 80 in women. Non-whites were generally less likely to receive statins than nonwhites.

In primary prevention population of individuals without clinically evident CVD or diabetes, the large majority of men 65-69 and all men aged 70-79 on the basis of age alone, have $\geq 10\%$ 10-year coronary heart disease (CHD) risk and statin therapy should be considered for LDL-C were ≥ 130 mg/dl and could be considered for LDL-C ≥ 100 mg/dL according to the 2004 ATP III update.^{9, 10} This population-based analysis revealed that $\leq 27\%$ of men in this age group were receiving statin therapy while about half of still had an LDL-C >100 mg/dL. Among those not receiving a statin, $>75\%$ would be eligible for a statin due to LDL-C >100 mg/dL. In the primary prevention population of women, relatively few have a 10-year CHD risk $\geq 10\%$ before age 75, although most women ≥ 75 will have $\geq 10\%$ risk on the basis of age and hypertension.¹¹ Despite the large difference between men and women in the proportion with ≥ 10 -year CHD before age 75, similar proportions reported statin therapy. Statin utilization rates were similar in white and on-white groups before age 70, but disparities in statin use became increasingly evident with advancing age. More data are needed for non-white groups.

Statin use consistently declined after age 80. Although statin therapy is recommended for individuals ≥ 80 years with CVD or diabetes as a CHD risk equivalent, risk stratification in those ≥ 80 years these conditions is not recommended according to current guidelines.¹⁰ Instead, individualized use of statins is recommended for the oldest patients. Lack of evidence from randomized trials of benefit in the face of competing causes of morbidity and mortality and concerns about safety no doubt contribute to the lower rates of statin utilization after age 80.⁵

Limitations

Despite merging 3 2-year NHANES surveys, insufficient numbers non-white persons were available for comparisons of various age-sex-disease status subgroups. Since this was a cross-sectional survey, data were not available on long-term adherence patterns.

Conclusion

Increasing rates of statin use by the elderly have no doubt contributed to the encouraging declines in CVD morbidity and mortality over the past decade. It appears that the 2001 and 2004 recommendations by NCEP ATP III for more aggressive for lipid treatment did translate into greater utilization in clinical practice. However, statin use remains suboptimal and efforts to increase statin utilization for both the primary and secondary prevention of CVD in the elderly should continue. Efforts to address disparities in statin use with advancing age, in women, and non-whites are also needed. Since the risks and benefits of

statins in individuals ≥ 80 years are unclear, a randomized trial is needed to guide statin treatment.

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Table 1

Trends in statin use

Age group (years)	No CVD and No Diabetes		No CVD and Diabetes		CVD	
	2001-2002 Statin use, % (95% CI)	2005-2006 Statin use, % (95% CI)	2001-2002 Statin use, % (95% CI)	2005-2006 Statin use, % (95% CI)	2001-2002 Statin use, % (95% CI)	2005-2006 Statin use, % (95% CI)
WOMEN						
65-69	18.3 (9.8, 26.9)	24.3 (16.7, 31.8)	29.5 (9.4, 49.6)	55.8 (43.8, 67.9)	61.5 (34.4, 88.6)	68.8 (44.7, 92.9)
70-74	16.1 (5.7, 26.4)	25.9 (12.8, 39.1)	36.2 (15.1, 57.3)	39.1 (17.5, 60.6)	36.9 (17.1, 56.7)	66.3 (43.6, 88.9)
75-79	25.2 (13.3, 37.0)	41.9 (33.6, 50.2)	16.6 (7.3, 26.0)	63.8 (.)	45.8 (26.5, 65.1)	64.3 (50.4, 78.2)
80+	10.7 (5.7, 15.8)	24.9 (14.7, 35.2)	20.5 (2.9, 38.0)	46.7 (34.3, 59.2)	26.6 (13.9, 39.4)	42.5 (30.8, 54.2)
MEN						
65-69	15.2 (6.7, 23.6)	27.3 (14.7, 39.9)	16.4 (0.0, 34.7)	93.5 (79.6, 100)	59.6 (43.5, 75.6)	79.5 (68.3, 90.8)
70-74	17.4 (8.6, 26.3)	37.4 (20.5, 54.2)	39.4 (4.0, 74.7)	37.5 (1.9, 73.1)	63.0 (47.8, 78.1)	80.2 (67.8, 92.6)
75-79	12.7 (1.7, 23.7)	29.9 (19.5, 40.3)	27.8 (0.0, 84.9)	40.3 (0.0, 92.7)	33.4 (22.1, 44.6)	55.4 (39.8, 71.0)
80+	14.0 (8.5, 19.5)	21.9 (16.4, 27.3)	21.9 (0.0, 45.5)	32.9 (0.0, 100)	32.3 (20.3, 44.2)	55.3 (44.3, 66.3)

CI = Confidence interval
CVD = Cardiovascular disease

Table 2
NHANES 2001-2006. Statin use alone or in combination by age group and gender

Age group (years)	No CVD and No Diabetes			No CVD and Diabetes			CVD and No diabetes			CVD and Diabetes		
	Population N (Weighted % of age/ race group)	Statin use, % (95% CI)	Population N (Weighted % of age/ race group)	Population N (Weighted % of age/ race group)	Statin use, %	Population N (Weighted % of age/ race group)	Population N (Weighted % of age/ race group)	Statin use, %	Population N (Weighted % of age/ race group)	Statin use, %	Population N (Weighted % of age/ race group)	Statin use, %
WOMEN												
65-69-all	3,998,061 (69.6)	20.2 (16.3, 24.2)	810,882 (14.1)	528,704 (9.2)	42.1 (33.7, 50.6)	408,188 (7.1)	528,704 (9.2)	40.4 (26.1, 54.6)	408,188 (7.1)	63.9 (32.7, 95.0)	408,188 (7.1)	63.9 (32.7, 95.0)
White	3,279,028 (71.4)	21.0 (17.8, 24.1)	574,420 (12.5)	405,653 (8.8)	41.2 (36.1, 46.2)	332,316 (7.2)	405,653 (8.8)	40.8 (36.3, 45.3)	332,316 (7.2)	71.8 (49.9, 93.7)	332,316 (7.2)	71.8 (49.9, 93.7)
Black	349,805 (67.5)	16.0 (10.4, 21.6)	72,250 (13.9)	68,508 (13.2)	50.8 (0.0, 100)	27,518 (4.3)	68,508 (13.2)	33.4 (.)	27,518 (4.3)	58.8 (.)	27,518 (4.3)	58.8 (.)
Mexican/American	99,191 (53.1)	9.0 (5.0, 13.0)	58,740 (31.4)	18,977 (10.1)	37.1 (17.6, 56.5)	9,983 (5.3)	18,977 (10.1)	55.0 (0.0, 100)	9,983 (5.3)	13.1 (.)	9,983 (5.3)	13.1 (.)
Other Hispanic	91,045 (41.0)	37.7	105,472 (47.5)	20,977 (9.4)	44.4	4,465 (2.0)	20,977 (9.4)	0	4,465 (2.0)	100	4,465 (2.0)	100
Other	178,992 (78.7)	12.6	-	14,590 (6.4)	-	33,906 (14.9)	14,590 (6.4)	-	33,906 (14.9)	-	33,906 (14.9)	-
70-74-all	3,346,779 (65.9)	24.3 (18.2, 30.3)	756,561 (14.9)	644,874 (12.7)	42.6 (33.2, 52.0)	327,188 (6.4)	644,874 (12.7)	51.5 (42.0, 61.1)	327,188 (6.4)	62.3 (43.0, 81.6)	327,188 (6.4)	62.3 (43.0, 81.6)
White	2,789,103 (67.7)	26.5 (19.8, 33.1)	615,274 (14.9)	526,295 (12.8)	45.7 (37.6, 53.7)	186,679 (4.5)	526,295 (12.8)	57.1 (43.1, 71.1)	186,679 (4.5)	72.6 (0.0, 100)	186,679 (4.5)	72.6 (0.0, 100)
Black	271,279 (61.6)	14.9 (4.1, 25.7)	53,381 (12.1)	46,419 (10.5)	12.8 (.)	69,275 (15.7)	46,419 (10.5)	13.8 (0.0, 28.6)	69,275 (15.7)	40.6 (.)	69,275 (15.7)	40.6 (.)
Mexican/American	90,693 (49.3)	14.7 (10.8, 18.6)	56,886 (30.9)	18,236 (9.9)	35.9 (30.3, 41.5)	17,981 (9.8)	56,886 (30.9)	21.2 (13.5, 28.9)	17,981 (9.8)	62.6 (0.0, 100)	17,981 (9.8)	62.6 (0.0, 100)
Other Hispanic	79,573 (71.1)	-	-	32,321 (28.9)	-	-	32,321 (28.9)	-	-	-	-	-
Other	116,131 (52.3)	18.1	31,021 (14.0)	21,602 (9.7)	45.8	53,252 (24.0)	21,602 (9.7)	-	53,252 (24.0)	54.4 (.)	53,252 (24.0)	54.4 (.)
75-79-all	2,422,678 (58.4)	30.8 (25.9, 35.7)	505,169 (12.2)	878,717 (21.2)	39.5 (26.4, 52.7)	341,457 (8.2)	505,169 (12.2)	40.1 (32.2, 47.9)	341,457 (8.2)	67.9 (16.3, 100)	341,457 (8.2)	67.9 (16.3, 100)
White	2,074,465 (59.6)	32.7 (27.5, 38.0)	347,448 (10.0)	761,281 (21.9)	34.3 (7.4, 61.2)	294,324 (8.5)	347,448 (10.0)	42.3 (33.2, 51.4)	294,324 (8.5)	72.3 (21.3, 100)	294,324 (8.5)	72.3 (21.3, 100)
Black	133,968 (37.3)	17.0 (0.0, 41.6)	106,770 (29.7)	72,475 (20.2)	40.9 (0.0, 100)	45,812 (12.7)	106,770 (29.7)	23.8 (.)	45,812 (12.7)	41.4 (.)	45,812 (12.7)	41.4 (.)
Mexican/American	55,984 (59.8)	14.0 (4.0, 24.1)	26,700 (28.5)	9,526 (10.2)	47.3 (0.0, 100)	1,321 (1.4)	26,700 (28.5)	56.6 (.)	1,321 (1.4)	-	1,321 (1.4)	-
Other Hispanic	61,394 (68.5)	-	-	28,227 (31.5)	-	-	28,227 (31.5)	-	-	-	-	-
Other	96,867 (75.5)	38.0	24,250 (18.9)	7,208 (5.6)	-	-	24,250 (18.9)	-	7,208 (5.6)	-	-	-
80+ - all	3,805,491 (58.8)	16.4 (12.3, 20.5)	673,176 (10.4)	1,506,713 (23.3)	31.6 (23.7, 39.5)	483,358 (7.5)	673,176 (10.4)	29.0 (21.9, 36.0)	483,358 (7.5)	48.1 (32.7, 63.6)	483,358 (7.5)	48.1 (32.7, 63.6)
White	3,263,485 (58.3)	16.8 (12.5, 21.1)	552,607 (9.9)	1,363,584 (24.4)	35.4 (25.0, 45.8)	412,847 (7.4)	552,607 (9.9)	31.2 (24.1, 38.4)	412,847 (7.4)	49.6 (32.7, 66.4)	412,847 (7.4)	49.6 (32.7, 66.4)
Black	271,260 (59.2)	12.2 (4.1, 20.3)	44,080 (9.6)	88,865 (19.4)	34.6 (.)	53,488 (11.7)	44,080 (9.6)	9.8 (.)	53,488 (11.7)	52.2 (.)	53,488 (11.7)	52.2 (.)
Mexican/American	70,187 (54.7)	11.8 (6.4, 17.1)	26,274 (20.5)	22,332 (17.4)	7.3 (.)	9,405 (7.3)	26,274 (20.5)	7.8 (.)	9,405 (7.3)	-	9,405 (7.3)	-
Other Hispanic	117,168 (81.1)	5.7	19,641 (12.6)	-	-	7,618 (5.3)	19,641 (12.6)	-	7,618 (5.3)	-	7,618 (5.3)	-
Other	83,391 (57.4)	32.9	30,574 (21.0)	31,392 (21.6)	-	-	30,574 (21.0)	-	31,392 (21.6)	-	-	-

Age group (years)	No CVD and No Diabetes			CVD and No Diabetes			CVD and Diabetes		
	Population N (Weighted % of age/ race group)	Statin use, % CI	Population N (Weighted % of age/race group)	Statin use, %	Population N (Weighted % of age/ race group)	Statin use, %	Population N (Weighted % of age/race group)	Statin use, %	Population N (Weighted % of age/race group)
MEN									
65-69-all	2,666,981 (55.1)	23.6 (16.7, 30.4)	736,235 (15.2)	44.7 (30.3, 59.1)	873,082 (18.0)	63.0 (50.2, 75.8)	566,962 (11.7)	64.2 (51.1, 77.3)	
White	2,131,629 (54.7)	23.6 (16.7, 30.6)	565,437 (14.5)	45.1 (26.0, 64.1)	752,722 (19.3)	65.2 (50.4, 79.9)	442,836 (11.4)	64.8 (46.7, 82.9)	
Black	277,194 (57.1)	23.7 (12.5, 34.9)	96,432 (19.9)	26.1 (0.0, 84.0)	44,971 (9.3)	32.9 (0.0, 100)	67,149 (13.8)	44.4 (15.9, 72.9)	
Mexican/American	96,559 (51.3)	14.7 (9.3, 20.1)	42,902 (22.8)	41.5 (24.1, 58.9)	26,396 (14.0)	42.4 (0.0, 100)	22,272 (11.8)	56.1 (.)	
Other Hispanic	91,470 (83.7)	37.3	17,777 (16.3)	-	-	-	-	-	
Other	70,129 (41.9)	14.6	13,688 (8.2)	-	48,994 (29.2)	68.4	34,704 (20.7)	-	
70-74-all	2,346,546 (58.3)	27.3 (19.7, 35.0)	582,976 (14.5)	30.6 (17.6, 43.7)	760,187 (18.9)	60.9 (52.4, 69.4)	332,492 (8.3)	71.2 (59.8, 82.6)	
White	1,980,087 (58.7)	31.2 (22.7, 39.7)	465,000 (13.8)	34.7 (19.4, 49.9)	652,046 (19.3)	60.8 (51.4, 70.3)	274,456 (8.1)	74.2 (54.4, 94.0)	
Black	141,141 (52.1)	8.0 (7.6, 8.5)	60,701 (22.4)	16.7 (0.0, 36.6)	34,059 (12.6)	55.1 (.)	34,748 (12.8)	34.8 (0.0, 100)	
Mexican/American	94,798 (64.4)	5.4 (0.0, 12.6)	29,361 (20.0)	25.1 (11.2, 39.1)	14,473 (9.8)	17.2 (.)	8,388 (5.7)	72.6 (.)	
Other Hispanic	112,814 (67.0)	2.7	27,915 (16.6)	0	27,687 (16.4)	87.0	0 (0)	0	
Other	17,706 (27.4)	21.2	0 (0)	0	31,921 (49.5)	66.4	14,901 (23.1)	100	
75-79-all	1,689,186 (54.1)	19.8 (14.5, 25.2)	358,268 (11.5)	37.6 (16.5, 58.7)	789,726 (25.3)	44.0 (34.5, 53.4)	284,249 (9.1)	41.1 (21.4, 60.9)	
White	1,429,912 (53.3)	21.5 (15.8, 27.3)	294,044 (10.9)	42.2 (15.2, 69.1)	726,239 (27.1)	44.1 (38.2, 50.1)	232,145 (8.7)	41.2 (18.7, 63.8)	
Black	153,006 (61.5)	15.9 (11.7, 20.0)	24,739 (9.9)	43.0 (.)	43,487 (17.5)	50.6 (17.0, 84.3)	27,461 (11.0)	69.8 (.)	
Mexican/American	38,620 (55.1)	6.9 (0.0, 14.8)	13,395 (19.1)	0 (.)	14,669 (20.9)	33.0 (0.0, 100)	3,410 (4.9)	58.7 (.)	
Other Hispanic	42,443 (88.9)	0.0	5,307 (11.1)	0	0 (0)	0	0 (0)	0	
Other	25,206 (34.7)	0.0	20,783 (28.6)	0	5,331 (7.3)	0	21,233 (29.3)	0	
80+ - all	1,656,199 (48.1)	18.5 (15.0, 22.1)	279,603 (8.1)	23.3 (15.4, 31.3)	1,261,380 (36.6)	43.5 (37.3, 49.8)	245,161 (7.1)	48.7 (39.6, 57.8)	
White	1,449,076 (47.2)	19.3 (15.3, 23.4)	231,716 (7.5)	26.6 (16.6, 36.6)	1,171,803 (38.2)	45.2 (38.8, 51.7)	216,474 (7.1)	50.9 (40.1, 61.6)	
Black	88,715 (56.9)	17.2 (7.7, 26.7)	15,182 (9.7)	17.8 (.)	31,996 (20.5)	19.6 (14.0, 25.2)	20,097 (12.9)	19.2 (.)	
Mexican/American	51,117 (58.9)	5.2 (0.0, 40.4)	16,190 (18.6)	5.6 (0.0, 14.1)	13,228 (15.2)	7.2 (.)	6,280 (7.2)	86.5 (.)	
Other Hispanic	41,155 (52.7)	-	13,830 (17.7)	-	20,732 (26.6)	15.0	2,310 (3.0)	-	
Other	26,136 (49.8)	33.8	2,685 (5.1)	-	23,621 (45.0)	36.7	-	-	

CI = Confidence interval
CVD = Cardiovascular disease

Table 3

NHANES 2001-2006 Median LDL-C (fasting) and non-HDL-C (fasting and non-fasting) in those reporting no use of statins or other cholesterol-lowering drugs

Age (years) Race/ethnicity	No CVD and No Diabetes		No CVD and Diabetes		CVD and No diabetes		CVD and Diabetes	
	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)
WOMEN								
65-69-all	139 (112-157)	156 (137-189)	113 (104-133)	164 (135-210)	137 (136-150)	156 (149-178)	113 (113-113)	139 (134-196)
White	139 (112-156)	154 (134-189)	106 (100-113)	172 (138-211)	143 (137-234)	156 (149-186)	.	139 (135-208)
Black	153 (119-168)	169 (143-197)	109 (104-127)	145 (140-152)	133 (117-142)	155 (155-184)	.	174 (174-174)
Mexican/American	119 (109-141)	161 (143-175)	129 (92-139)	173 (135-186)	164 (129-171)	148 (145-203)	121 (121-145)	151 (132-220)
70-74-all	136 (113-159)	165 (139-190)	115 (91-142)	158 (112-175)	126 (114-136)	152 (135-182)	72 (72-125)	188 (137-196)
White	142 (115-162)	166 (139-191)	115 (95-142)	159 (132-177)	126 (117-137)	152 (135-182)	.	196 (1188-206)
Black	122 (88-156)	152 (123-180)	121 (63-121)	154 (111-158)	114 (114-114)	140 (140-144)	72 (72-72)	131 (97-156)
Mexican/American	136 (112-136)	159 (137-168)	115 (83-139)	165 (129-174)	40 (40-136)	167 (54-175)	125 (104-125)	159 (104-159)
75-79-all	126 (91-148)	151 (126-175)	130 (91-190)	172 (134-196)	131 (125-146)	160 (138-180)	.	143 (128-177)
White	126 (98-148)	147 (126-175)	130 (126-190)	172 (153-202)	127 (125-157)	159 (138-184)	.	143 (128-189)
Black	142 (71-160)	140 (92-185)	72 (58-103)	131 (92-173)	131 (131-146)	161 (110-163)	.	123 (103-123)
Mexican/American	140 (113-151)	164 (143-194)	114 (114-114)	163 (163-168)	.	135 (126-135)	.	.
80+ - all	124 (95-143)	151 (125-176)	143 (115-145)	162 (127-185)	119 (94-144)	156 (133-175)	99 (86-143)	144 (130-196)
White	128 (104-144)	153 (127-178)	140 (115-144)	163 (127-183)	119 (94-144)	153 (131-175)	124 (86-143)	148 (132-196)
Black	95 (85-129)	135 (104-159)	.	130 (113-130)	109 (59-182)	150 (141-188)	82 (82-82)	98 (98-136)
Mexican/American	146 (102-148)	149 (112-174)	92 (92-136)	168 (110-270)	128 (124-142)	168 (152-193)	.	.
MEN								
65-69-all	136 (106-153)	162 (137-178)	132 (98-142)	154 (118-169)	111 (87-126)	150 (124-162)	124 (107-134)	148 (129-175)
White	133 (104-152)	163 (138-181)	134 (98-152)	154 (118-164)	87 (84-127)	153 (133-188)	124 (70-134)	147 (129-174)
Black	139 (76-173)	152 (119-168)	98 (63-159)	142 (124-187)	111 (94-115)	124 (112-141)	139 (139-155)	175 (162-216)
Mexican/American	144 (107-158)	172 (145-183)	118 (103-134)	157 (136-183)	169 (104-173)	147 (135-154)	177 (177-177)	146 (146-227)
70-74-all	122 (105-144)	150 (132-176)	117 (99-127)	141 (120-166)	121 (100-148)	149 (140-175)	90 (80-90)	125 (114-140)
White	121 (110-142)	150 (132-175)	117 (80-130)	144 (119-174)	121 (116-148)	149 (140-175)	90 (90-90)	123 (114-140)
Black	97 (79-118)	128 (115-154)	99 (99-139)	145 (112-164)	100 (100-132)	110 (110-158)	80 (78-80)	134 (98-134)

Age (years) Race/ethnicity	No CVD and No Diabetes		No CVD and Diabetes		CVD and No Diabetes		CVD and Diabetes	
	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)
Mexican/American	143 (131-160)	167 (141-188)	125 (87-137)	156 (139-170)	133 (133-147)	127 (116-163)	66 (66-66)	109 (109-236)
75-79-all	126 (98-145)	151 (123-174)	119 (97-166)	144 (117-191)	115 (95-134)	138 (114-178)	148 (119-148)	143 (128-177)
White	125 (103-154)	151 (125-174)	119 (97-166)	157 (117-191)	115 (95-134)	138 (117-178)	148 (148-148)	191 (134-224)
Black	128 (89-145)	151 (110-183)	.	134 (107-134)	96 (76-160)	155 (112-183)	.	102 (102-102)
Mexican/American	122 (97-126)	156 (122-192)	108 (104-148)	132 (111-140)	.	157 (136-179)	119 (119-119)	138 (138-138)
80+ - all	121 (100-138)	145 (120-168)	119 (95-121)	148 (127-166)	117 (98-143)	145 (113-170)	107 (81-117)	144 (130-196)
White	121 (100-138)	142 (120-166)	119 (106-121)	148 (138-165)	120 (99-143)	146 (113-172)	117 (117-145)	137 (135-186)
Black	122 (90-135)	136 (115-155)	95 (95-95)	166 (113-223)	55 (55-124)	103 (100-139)	85 (75-96)	123 (112-127)
Mexican/American	109 (84-116)	132 (106-161)	134 (134-154)	194 (167-196)	97 (97-151)	154 (143-163)	.	.

CI = Confidence interval

CVD = Cardiovascular disease

HDL-C = High density lipoprotein cholesterol

IQR = Interquartile range

LDL-C = Low density lipoprotein cholesterol

Table 4

NHANES 2001-2006 Median LDL-C (fasting) and non-HDL-C (fasting and non-fasting) in those reporting use of a statin as monotherapy

Age/race/ethnicity	No CVD and No Diabetes		No CVD and Diabetes		CVD and No diabetes		CVD and Diabetes	
	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)
WOMEN								
65-69-all								
White	89 (83-107)	132 (117-148)	88 (77-95)	111 (104-128)	96 (84-96)	114 (108-149)	121 (85-168)	118 (107-173)
Black	89 (83-107)	132 (115-148)	84 (77-88)	111 (104-128)	96 (96-96)	119 (108-162)	121 (85-168)	118 (107-173)
Mexican/American	111 (74-142)	120 (110-132)	89 (34-112)	111 (90-138)	116 (85-116)	122 (110-140)	114 (114-114)	106 (54-125)
70-74-all								
White	58 (58-65)	127 (87-161.5)	84 (56-127)	106 (100-115)	89 (63-89)	117 (102-149)	.	.
Black	100 (97-121)	137 (121-155)	79 (67-100)	123 (107-142)	103 (89-144)	147 (116-173)	136 (91-136)	153 (118-158)
Mexican/American	100 (97-123)	137 (121-157)	97 (67-100)	135 (107-142)	134 (89-144)	147 (116-173)	.	153 (84-158)
75-79-all								
White	94 (87-94)	109 (109-140)	.	133 (133-133)	.	106 (106-106)	136 (91-136)	169 (153-169)
Black	107 (101-153)	145 (129-178)	119 (108-127)	130 (113-152)	.	137 (137-164)	76 (76-76)	109 (107-125)
Mexican/American	103 (90-120)	143 (117-153)	90 (57-113)	106 (94-145)	95 (90-102)	127 (111-162)	90 (82-99)	122 (116-139)
80+ - all								
White	103 (90-120)	143 (115-151)	103 (59-113)	125 (83-160)	95 (90-102)	127 (111-153)	90 (82-99)	122 (116-139)
Black	114 (108-114)	133 (132-140)	90 (55-101)	106 (88-145)	60 (60-60)	107 (85-107)	.	127 (127-127)
Mexican/American	54 (54-124)	172 (166-175)	92 (44-107)	126 (107-177)	147 (147-147)	167 (167-196)	.	.
80+ - all								
White	99 (79-120)	127 (106-148)	72 (62-115)	121 (102-152)	88 (50-114)	128 (98-148)	81 (80-104)	106 (101-144)
Black	99 (79-121)	129 (109-148)	72 (62-98)	121 (102-149)	88 (50-114)	128 (98-148)	81 (81-104)	102 (101-121)
Mexican/American	120 (120-120)	136 (102-212)	118 (118-118)	152 (90-152)	.	.	77 (77-77)	144 (107-155)
MEN								
65-69-all								
White	113 (65-113)	150 (145-150)	.	.	.	166 (166-166)	.	.
Black	105 (86-124)	137 (115-151)	99 (91-118)	143 (112-158)	107 (73-120)	117 (108-140)	72 (47-110)	129 (100-149)
Mexican/American	98 (64-109)	130 (115-154)	93 (91-118)	143 (112-158)	102 (73-120)	115 (108-140)	99 (72-110)	145 (122-159)
70-74-all								
White	91 (78-108)	128 (111-146)	99 (99-150)	146 (129-150)	70 (70-70)	102 (102-158)	76 (57-78)	93 (92-137)
Black	83 (83-114)	179 (139-192)	92 (92-122)	133 (130-143)	69 (69-69)	126 (91-126)	33 (33-33)	125 (68-132)
Mexican/American	98 (87-109)	126 (110-138)	85 (62-92)	112 (90-123)	71 (67-98)	125 (106-144)	64 (55-118)	109 (88-140)
70-74-all								
White	98 (87-109)	125 (110-137)	85 (75-92)	112 (90-149)	71 (67-104)	125 (107-144)	64 (55-118)	109 (90-140)
Black	139 (139-139)	128 (102-128)	56 (56-56)	101 (66-123)	80 (80-127)	99 (90-120)	52 (52-108)	129 (80-148)
Mexican/American	119 (83-119)	138 (104-138)	62 (62-78)	106 (91-111)	81 (81-81)	122 (122-122)	.	172 (67-172)

Age/race/ethnicity	No CVD and No Diabetes		No CVD and Diabetes		CVD and No diabetes		CVD and Diabetes	
	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)	LDL-C (IQR)	Non-HDL-C (IQR)
75-79-all	102 (88-111)	130 (119-151)	82 (82-104)	124 (90-154)	79 (77-84)	115 (101-127)	68 (61-103)	94 (72-99)
White	102 (95-111)	130 (110-151)	82 (82-104)	124 (90-129)	79 (77-84)	115 (101-127)	61 (61-103)	94 (72-99)
Black	112 (112-112)	134 (122-159)	83 (83-83)	126 (111-154)	79 (79-79)	110 (97-115)	68 (68-96)	101 (87-117)
Mexican/American	83 (46-83)	129 (66-129)	.	.	67 (67-67)	129 (109-194)	68 (68-68)	106 (106-106)
80+ - all	94 (77-118)	116 (100-141)	104 (50-112)	110 (98-130)	88 (72-96)	112 (95-130)	78 (51-81)	111 (83-122)
White	94 (77-111)	116 (100-141)	104 (50-112)	110 (98-130)	88 (72-96)	112 (94-130)	78 (51-81)	111 (83-122)
Black	146 (55-146)	169 (66-169)	.	146 (146-146)	.	.	.	.
Mexican/American	.	109 (109-122)	.	105 (105-105)	99 (99-99)	128 (128-128)	75 (62-103)	118 (83-157)

CI = Confidence interval

CVD = Cardiovascular disease

HDL-C = High density lipoprotein cholesterol

IQR = Interquartile range

LDL-C = Low density lipoprotein cholesterol