NHLBI Evidence Table: RF5-OB

PMID	First Author	Title	Year	Study Type	Prospect./ Restrospect.	Study	CVD	RF by CQ	Country	Setting	Main Study Objective	N at Baseline (N at Follow-up)	Target Population	Eligibility Criteria	Patient Characteristics	Study Groups	n at Baseline (n at Follow-up)	Total Follow-up Duration	Outcomes Measured	Results	Main Reported Findings by Critical Question
1579553	Kikuchi DA	Relation of serum lipoprotein lipids and apolipoproteins to obesity in children: the Bogalusa Heart Study	1992	CrS	Retrospective	Bogalusa	None	Q5 (RF5, RF8) Q6 (RF5, RF8)	USA	Community (other)	Correlate serum lipid/ lipoprotein levels with obesity measures in children	2,816	Pediatric/ Young adults	Age: 5-17 yr All children screened as part of the Bogalusa study in 1981-82 with fasting lipid profile results.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B.	49% M 36% B	N/A	N/A	TC TG HDL VLDL LDL Apo B Apo A1 Skinfolds (SFs) Ponderal index (PI) Glucose Insulin	Overall, Fs had higher levels of TC,TG,VLDL & LDL, and lower levels of HDL than Ms. Ms were thinner than Fs and BMs were thinner than WMs. In all race & sex grps: TG & VLDL correlated postively with glucose & insulin. HDL & apoA1 correlated negatively with insulin. LDL & apoB correlated postively with insulin. TG & VLDL correlated negatively with HDL, more than with apoA1. LDL related strongly to apoB; HDL related moderately to apoA1. Spearman correlations of lipid variables & obesity measures: Subscapular SFs correlated postively with insulin(r=0.29),TGs (0.26), LDL (0.18) & apoB (0.19)(all,p=S**) & negatively with HDL (-0.13,p=S**) & apoA1(-0.05;p=S). After adjustment for insulin & TGs, correlations are much less strong but still significant. When analyzed by quintiles of SFs, major positive effects noted in TGs & negative effects for HDL, for top 2 quintiles, greatest after 10 yr of age. LDL & apoB increased with increasing obesity but not nearly as strong a difference. With MRA, strongest correlation consistently seen between SFs and insulin & TGs, rather than LDL, HDL, apoB & apoA1.	Obesity measures correlated strongly with insulin and TGs, strikingly for top 2 quintiles on central obesity measures. LDL-C and apoB related positively but less well to obesity measures but positive statistical association persisted after adjustment for insulin & TGs. Inverse association between HDL & apoA, and obesity only before adjustment for insulin and TGs. VLDL levels related directly to obesity. Inverse association of HDL with obesity mediated by TGs and VLDL.
1766940	Srinivasan SR	Race and gender differences in serum lipoproteins of children, adolescents, and young adults--emergence of an adverse lipoprotein pattern in white males: the Bogalusa Heart Study	1991	CrS	Retrospective	Bogalusa	None	Q6 (RF2, RF3, RF5, RF8, RF10)	USA	Community (other)	Describe race- and gender-specific changes from adolescence into young adulthood in serum lipoprotein profiles	4,231	Pediatric/ Young adults	Age: 5-26 yr Two CrS surveys from Bogalusa in 1984-86, one in 5-17 yr olds and one in 18-26 yr olds.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B.	5-14 yr: 2,886 18-26 yr: 1,345 Combined sample = 32% WMs, 33% WFs, 17% BMs & 18% BFs	4,231	N/A	TC TG HDL LDL Subscapular skin folds (SSFs) Tanner stage Cigarette smoking Alcohol consumption OC use	W children & adolescents of both genders showed higher TGs and VLDL-C and lower TC and HDL-C compared with age-matched B subjects with differences becoming significant in young adults. LDL and VLDL increased with increasing age in all race/sex groups but significantly for WMs. HDL decreased with puberty in all race /sex grps, most for WMs. In young adults, there was no race difference in TC but young adult white males had significantly higher LDL (p=S-S*) and lower HDL(p=S-S**), even after adjustment for age, Tanner stage, SSFs, OC use, smoking & alcohol use. A consistent gender-related pattern developed only in young adults with W males showing higher TGs ,VLDL-C & LDL-C and lower HDL-C. Of young adult W males, 22.6% were classified as having borderline high and 9.1% high LDL-C. Adiposity was the major contributor to the adverse lipid pattern in W males. With MVR, adiposity was the major factor contributing to explained variance of lipoproteins, greatest among WMs; second largest independent variable is increased Tanner stage followed by increasing age. Because of the divergent direction of changes in TC & HDL with increasing age in WMs, TC/HDL ratio increased dramatically from adolescence to young adulthood compared with only a moderate increase in other race-sex grps.	Evolution of serum lipids & lipoproteins from childhood to adolescence varies markedly with race & gender. Ws begin to demonstrate an adverse lipid profile beginning in their 20's. By ages 19-26, LDL exceeds 160 mg/dl in 9% of WMs and 8% of WFs vs. 2% of BMs & 6% of BFs. A consistent gender-related pattern developed only in young adult W males who showed higher TGs, VLDL-C & LDL-C and lower HDL-C compared with WFs, after controlling for adiposity. Because of the divergent direction of changes in TC & HDL with increasing age in WMs, TC/HDL ratio increased dramatically from adolescence to young adulthood compared with only a moderate increase in other race-sex grps. Major contributing factor to adverse lipid profile changes is obesity followed by sexual maturation & age, especially in WMs.
1829398	Srinivasan SR	Racial (black-white) differences in serum lipoprotein (a) distribution and its relation to parental myocardial infarction in children. Bogalusa Heart Study	1991	Cohort	Prospective	Bogalusa	None	Q5 (RF1,RF5) Q6 (RF1,RF5)	USA	Community (other)	Correlate Lp (a) levels in children with parental hx of MI	2,438	Pediatric/ Young adults	All children in grades 3-12 evaluated in the Bogalusa study between 1984-85 with fasting lipid profile and Lp(a) levels.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, sample included all children in grades 3-12 rades evaluated between 1984-85 with fasting lipid profile and Lp(a) levels.	Sample included all children in grades 3-12 evaluated between 1984-85 with fasting lipid profile and Lp(a) levels.	N/A	N/A	Lp(a) Subscapular skin folds (SSFs) Tanner stage Parental hx of MI Cigarette smoking Alcohol consumption OC use	Overall, Lp(a) levels were 1.7X higher in blacks than in whites. Females had significantly higher Lp (a) levels than males in both Bs & Ws. Lp(a) increased with age but this was only significant in older WFs. (p=S**) By MVA, race was the only independent variable that contributed significantly to variability of Lp(a). White children with parental MI had significantly higher Lp(a) levels than those with (-) fam hx.[22.4+/-18.0 vs 17.1 mg/dl +/-17.8, p=S*] Among whites, prevalence of Lp(a) > 25mg/dl was significantly greater among those with (+) hx of MI. [9.5% vs 5.4%,p=S*] There was no association btwn Lp (a) levels and parental hx of MI in blacks.	Study provides race,sex & age-specific levels of Lp(a) in B & W children. Lp (a) levels were markedly higher in blacks than in whites. Females had significantly higher Lp(a) levels than males. Race was the only independent variable that contributed significantly to variability of Lp(a). White children with parental MI had significantly higher Lp (a) levels than those with (-) fam hx.[22.4 vs 17.1 mg/dl, p=S*] Among whites, prevalence of Lp (a) > 25mg/dl was significantly greater among those with positive hx of MI. [9.5% vs 5.4%,p=S*] There was no association btwn Lp (a) levels and parental hx of MI in blacks.
1919885	Stuhldreher WL	Cholesterol screening in childhood: sixteen-year Beaver County Lipid Study experience	1991	Cohort	Prospective	Beaver	None	Q8(RF5)	USA	Community (schools)	Evaluate prediction of adult cholesterol levels from pediatric results.	2448/ 295	Pediatric/ Young adults	Of 2448 7th grade subjects who underwent cholesterol screening in 1972-73, 295 of a possible 384 eligible subjects were re-tested in 1988-89.	Population-based study of a county-wide cohort of all 7th graders in Beaver City in 1981-82, aged 11-14 y at entry. For this study, mean age = 28 y, all had participated as children at 11 -14 y in cholesterol screening. 49% male. Lab methods changed between the 2 sample times so results for gender-specific cholesterol distributions were compared.	n=298 subjects, 49% male.	N/A	15 y	TC quintile at baseline and follow-up	38% of males & 42% of females who were in the top quintile at F/U (TC=223-316 for M, 210-301 for F) were in the top quintile at first evaluation (TC=189-362 in M, 194-275 in F). 37% of males & 45% of females in the top quintile as children were still in the top quintile and 65% in the top 2 quintiles at F/U. Using NCEP cutpoints, sensitivity of screening at age 12 y to predict elevated TC as an adult was 63%, specificity was 67% and PP(+) was 47%. Males with false positive results smoked significantly less than those with false negative results (p=S) and had a greater improvement in diet assessed by nutrition score change. Females with false positive results smoked significantly less than those with false negative results, were less overweight (both, p=S) and had lower prevalence of OC use (p=S*).	Overall correlation between baseline and follow-up TC was moderate but significant (r=.44; p=S**). Women had a higher correlation than men (r=.51 vs r=.38).
2028978	Webber LS	Tracking of serum lipids and lipoproteins from childhood to adulthood. The Bogalusa Heart Study	1991	Cohort	Prospective	Bogalusa	None	Q6 (RF5) Q7 (RF5) Q8 (RF5)	USA	Community (other)	Describe serial lipid levels in a bi-racial cohort from childhood to late adolescence/ early adulthood.	2 179/1 586	Pediatric/ Young adults	All members of the community of Bogalusa. LA are potentially eligible for study. In 1973-74, 3 524 children aged 5-14 y were studied + 714 pre-school children. Repeat evaluations occurred annually with roughly half to 2/3's of group returning. Results represent a series of cross sectional surveys from the same community group but results are not subject-specific. Evaluation of those not present at baseline but present at F/U, and of those present at baseline but not at F/U showed no difference so study group is felt to be representative of both the baseline & late F/U population.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study: 36% B, 64% W. Age at initial evaluation: 2-14 y Age at final evaluation:14-26 y	Age at initial evaluation: 2-14 y Age at final evaluation:14-26 y 36% B, 64% W.	2 179/1 586	12 yrs	TC TG HDL LDL VLDL Race/ Age/ Sex Wt/ Ht cubed = Rorher's Index (RI)	TC was stable from 2-10 y, then decreased until 18 y, followed by a steady increase until final study values at 26y - in BMs, increase began at 17y and in BFs, decrease with puberty was less striking. LDL pattern was similar to TC but change was less; magnitude of increase over time greater for WMs & all Fs than in BMs. TGs and VLDL increased progressively with age in WMs & WFs but this was much less apparent in BMs & BFs. In Ws, HDL was stable until mid-puberty with progressive subsequent decline, greater in WMs (20 mg/dl drop from 14-16 y to 25-26 y, than in WFs (10 mg/dl decline). In Bs, HDL levels were higher throughout and decline over time was much less apparent. With tracking by quartile, ~ 50% of those with TC & ~ 55% of those with LDL >age/race/sex-specific 75th%ile at baseline had TC or LDL > 75%ile 12 y later, 2X as many as would be expected by chance. Persistence of elevated levels was greater in 9-14y olds than in the 2-8y olds. Tracking was less good for TGs & VLDL.	TC and LDL-C levels decrease during adolescence, more in boys than in girls. and in Ws than Bs. After adolescence, TC and LDL-C levels rise continuously until 26 yrs. After adolescence, HDL-C levels continue to drop, most in W males. Tracking was evident for all lipids & lipoproteins: 12 yr correlation coefficients were greatest for LDL-C. Tracking for HDL was better after age 9, especially in W males. 50% of children who had TC or LDL-C levels > 75th%ile at baseline remained elevated 12 yrs later. For HDL, a trend with age was noted for W boys: 42% of those with HDL in the lowest quartile at 9-14 yrs remained in this quartile 12 yrs later. (7) The best predictor of F/U lipid level was baseline level.

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2028978	Webber LS	Tracking of serum lipids and lipoproteins from childhood to adulthood. The Bogalusa Heart Study	1991																	For HDL, 42% of WMs in the lowest quartile at baseline at 9-14 y remained in this quartile 12 y later. No tracking for HDLs measured at earlier ages. Best predictor of year 12 TC was baseline TC with R squared ranging from 18-48% for TC & 26-57% for LDL. For HDL, there was a strong inverse correlation with increase in obesity over time. Using NCEP cutpoints, of 35 subjects with TC > 240 mg/dl as adults, 23 were > 75th%ile as children & 4 more were obese.	
2243431	Lauer RM	Use of cholesterol measurements in childhood for the prediction of adult hypercholesterolemia. The Muscatine Study	1990	Cohort	Prospective	Muscatine	None	Q8 (RF5)	USA	Community (other)	Evaluate the validity & utility of screening tests for TC in school-age children to predict adult TC levels above the NCEP cut-points for intervention.	2,367	Pediatric/ Young adults	A group of 2 367 subjects who underwent multiple TC screenings in childhood and had F/U evaluation at 20-30 y of age.	Longitudinal cohort study based in Muscatine, IA of children aged 8-18 y at enrollment between 1971 & 1981, followed with biennial school surveys. into adult life. A total of 14,066 children have undergone 32,636 evaluations. For this study, age at baseline: 8 - 18 y; serial lipid evaluation + F/U at 20-30 yrs. 1234 F/ 1133M.	N/A	N/A	12- 22 y	TC TC %ile for age/ sex	If 2 childhood TCs >75th%ile, sensitivity=45% and specificity=90% for adult TC > 200 mg/dl in both Ms & Fs. For Ms, PP(+) = 45% & PP(-) = 89%. For Fs, PP(+)=57% & PP(-) = 86%. If 2 childhood TCs> 90th%ile, sensitivity = 16% for Fs & 21% for Ms for adult TC > 200 mg/dl. PP(+)=75% for Ms & Fs. PP(-)=81`% for Fs & 87% for Ms. With two consecutive childhood TC levels >/= 75th%ile, 57% of Fs & 45% of Ms would be correctly labeled as future high TC. With 2 consecutive TC > 90th%ile, 75% of both girls & boys were correctly identified as high adult TC & 25% were incorrectly labeled. In young adults, prevalence of smoking, obesity, low HDL, DM & HTN increased as adult TC level increased especially among Ms: ~ 88 % of Ms with TC > 240 mg/dl had >/= 2 other RFs vs. 26.9% of Fs. Results for LDL paralleled those with TC.	While in general, TC levels track from childhood to adult life, screening for TC in children misidentifies many children as being high risk for requiring treatment for high LDL as adults. Of children with TC > 75th%ile on 2 occasions, 75% of girls & 56% of boys would not qualify for intervention as adults. Of children with TC > 90th %ile on 2 occasions, 57% of girls & 30% of boys would not qualify for intervention as adults.
2314959	Dennison BA	Serum total cholesterol screening for the detection of elevated low-density lipoprotein in children and adolescents: the Bogalusa Heart Study	1990	CrS	Retrospective	Bogalusa	None	Q5 (RF5)	USA	Community (other)	Evaluate measurement of TC as a predictor of elevated LDL-C in children	2 857	Pediatric/ Young adults	All children with fasting lipid profile data from the Bogalusa study in 1981-82.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. This study included all children aged 5-17 y who underwent fasting lipid profile evaluation in 1981-82.	Age: 5-17 y 49% M 36% B	N/A	N/A	TC TG HDL LDL	Overall, LDL correlated well with TC (r=0.80 in WMs & WFs, 0.77 for BMs & 0.78 for BFs) No consistent age trend was noted for LDL. There were race & sex differences in sensitivities & specificities for TC prediction of LDL. In general, sensitivities were higher & specificities lower for Bs than Ws in both Ms & Fs. For TC levels in the range of 150-210 mg/dl, sensitivities were higher for Bs than Ws and higher for females than males. Using age-, race- and sex-specific 95th%iles as cut points, only 44 - 55% of subjects with LDL-C >/= 95th%ile were identified. Using the 75th%ile cutpoints, sensitivities were 92-95% of females and 100% for males and specificities were 78-79% but false positive results increased to 81-84%.	Poor test characteristics make TC an inefficient measurement for detection of elevated LDL in children & adolescents.
3300617	Freedman DS	Correlates of high density lipoprotein cholesterol and apolipoprotein A-I levels in children. The Bogalusa Heart Study	1987	CrS	Retrospective	Bogalusa	None	Q5 (RF5) Q6 (RF5)	USA	Community (other)	Correlate levels of HDL-C and apo A1 with other C-V RFs.	2 849	Pediatric/ Young adults	Data collected from 3312 5- to 17-year-olds in the fourth (1981 -1982) examination are used in the current analyses. The overall participation rate was 80.2%. 28 yielding a final sample size of 2849 children and adolescents.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, there were 2 849 subjects aged: 5-17 yrs examined in 1981-82; a subset of 515 adolescent males underwent endogenous sex hormone assessment.	2 849 subjects aged 5-17 y, 49% M; 36% B.	N/A	N/A	TC TG HDL VLDL LDL Apo B Apo A1 Skinfolds (SFs) Ponderal index (PI) Glucose Insulin Tanner stage OC use Thiocyanate levels/ cigarette smoking status Alcohol use Se hormone levels: testosterone, estrogen, progesterone	Bs had higher levels of HDL & apoA1 than Ws, significant only in Ms Ponderal index, SFs & insulin levels were strongly inversely related to HDL & apoA1 (p=S**). There was no relationship with serum glucose. Controlling for TGs eliminated the association between HDL & obesity measures and decreased the relationship with apoA1. By linear regression, HDL & apoA1 were negatively related to smoking and postively related to alcohol use. The number of Fs reporting OC use was small but the relationships of OCs with HDL & apoA1 were dependent on the estrogen content in the pills & were independent of smoking, alcohol & obesity. By MVR, Tanner stage was inversely related to HDL & apoA1 in 10-17 y old Ms but postively in Fs. After controlling for TGs, obesity, insulin, glucose, smoking & alcohol consumption, testosterone levels remained strongly asst'd with HDL & apoA1 levels in WMs but there was no association in BMs.	Increases in obesity correlated with decreases in HDL-C and apo A-1. Controlling for TGs eliminated the association between HDL & obesity measures and decreased the relationship with apoA1 HDL-C and apo A-1 were similarly related to sexual maturation, inversely in males. By linear regression, HDL & apoA1 were negatively related to smoking and positively related to alcohol use.
3478647	Freedman DS	Cardiovascular risk factors from birth to 7 years of age: the Bogalusa Heart Study. Serum lipids and lipoproteins	1987	Cohort	Prospective	Bogalusa	None	Q5 (RF5) Q6 (RF5) Q7 (RF5) Q8 (RF5)	USA	Community (other)	Evaluate tracking of serum lipid levels from birth to 7 yrs of age.	134/440	Pediatric/ Young adults	From a birth cohort of 440 infants, serial lipid results were evaluated at 6 mos, and 1, 2, 3, 4 & 7 y of age. Of the original cohort, 134 /440 had all samples available for evaluation.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, lipid findings for a birth cohort followed to 7 y of age were evaluated.	From a birth cohort of 440 infants, serial lipid reults were evaluated at 6 mos, and 1, 2, 3, 4 & 7 y of age. Of the oroginal cohort, 134 /440 had all samples available for evaluation.	440/137	7 yrs	TC TG VLDL HDL LDL Roher's index(wt/ht cubed) (RI) Skinfolds Diet by questionnaire	Mean levels of all serum lipids and lipoproteins increased greatly in the first 6 months of life and by 2 years, approached those of adolescents. W children had higher levels of TC, LDL & HDL at birth than B children; these differences were not present after age 1 y and by age 7y , B children had higher HDL than W children. W children had consistently higher TG levels from birth to 7y. Throughout early life, Fs had higher TC & LDL than Ms. There were no consistent associations between adiposity & lipids in the first 4 y of life. At age 7, ponderosity was (+)ly asst'd with TG & VLDL and (-)ly with HDL. Infants consuming cow's milk had significnatly higher TC (p=S) & LDL (p=S*) at 6 mos of age than those fed formula. There was no statistically significant difference after that time. Lipids measured at birth correlated statistically with later results with r=0.46 0.63(p=S**) for TC and 0.36-0.71 for LDL(p=S**).	Mean levels of all serum lipids and lipoproteins increased greatly in the first 6 months of life and by 2 years, approached those of adolescents. Infants consuming cow's milk had higher 6 month levels of TC & LDL-C than did formula-fed infants but there was no difference at 7 yrs. Serum lipids & lipoproteins at 7 yrs were significantly associated with levels measured as early as 6 mos. with unfavorable levels tracking over time. Increases in obesity over time were asst'd with increases in TGs and decreases in HDL. Correlations between lipid levels measured at 1-2 y of age and 7 y of age are as strong as those measured in older children.
7503349	Simon JA	Correlates of high-density lipoprotein cholesterol in black girls and white girls: the NHLBI Growth and Health Study	1995	CrS	Retrospective	Growth	None	Q5 (RF5) Q6 (RF5)	USA	Community (other)	Determine the correlates of HDL in 9-10 y old B & W girls.	1397	Pediatric/ Young adults	Post-menarchal Fs and those who had not fasted were excluded.	624 B girls & 773 W girls evaluated at baseline for longitudinal cohort study.	624 B girls & 773 W girls	N/A	N/A	HDL Sum of Skinfolds (SSFs) Tanner stage Activity Diet Parental education Income	B girls were heavier, were more likely to be pubertal, had a greater energy intake and a higher HDL, averaging 3.6 mg/dl higher than in W girls(all, p=S). B girls also watched more TV/wk & came from lower income families (both, p=S**) By linear regression, ht, wt, BMI, SSFs, sexual maturation & PU fat intake all correlated with HDL (p=S) Each 10-mm increase in sum of skin folds was associated with a 1.4 mg/dl decrease in HDL; each unit increase in tricep/suprailiac skinfold ratio was associated with an increase of 2 mg/dl in HDL; each 10% increase in polyunsaturated fat intake was associated with a 3.4 mg/dl increase in HDL. By MVA, associations of activity & sexual maturation with HDL were mediated by differences in adiposity.	Race, sexual maturation, adiposity & body fat distribution are the most important correlates of HDL in B & W girls.

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7998592	Porkka KV	Tracking and predictiveness of serum lipid and lipoprotein measurements in childhood: a 12 year follow-up. The Cardiovascular Risk in Young Finns study	1994	Cohort	Prospective	Young Finns	None	Q6 (RF5) Q8 (RF5)	Finland	Clinical	Evaluate tracking of serum lipoproteins in childhood over a 12y period	883	Pediatric/ Young adults	The Cardiovascular Risk in Young Finns Study is a collaborative effort of all university departments of pediatrics + several other Finnish institutions to study C-V RFs and their determinants in children and adolescents. The main cross-sectional study carried out in 1980 included 3596 3-18-year-old subjects with F/U studies in 1983, '86,'89 and '92, the last when the subjects were 15-30 years old.	Finnish cohort enrolled at 3-18 yr of age in 1980 and followed with serial lipid evaluation over time. 47% male.	All 883 subjects who had complete data on serum lipids in 1980 & 1992	883/ 883 by design	12 yr	TC TG HDL (incl HDL2 & HDL3) LDL VLDL Apo A1 ApoB BP SFs Diet Smoking status Alcohol use	Significant tracking was present for each lipid variable. 12 yr correlation coefficients: TC = 0.48-0.58; LDL = 0.53-0.58; HDL = 0.57-0.59; LDL/HDL = 0.57-0.59; TG = 0.33-0.37. Longterm tracking was better in Ms than Fs, especially for TC. Best correlation achieved for TC & LDL in 18 y old Ms. Apo A-1 and B showed similar tracking to LDL and HDL. 50% of extreme quintile TC, LDL and HDL subjects were still in that quintile 12 yrs later. In MVA, addition of BMI, exercise, diet and smoking did not change lipid correlations. Initial childhood or adolescent lipid value was the most significant predictor of the adult value. Tables for 95% CIs for adult lipid values based on single childhood value provided.	Significant tracking was present for each lipid variable with 12 yr correlation coefficients: TC = 0.48-0.58; LDL = 0.53-0.58; HDL = 0.57-0.59; LDL/HDL = 0.57-0.59; TG = 0.33-0.37. HDL tracking is considerably better than in other studies.
8326345	Bao W	Tracking of serum apolipoproteins A-I and B in children and young adults: the Bogalusa Heart Study	1993	Cohort	Prospective	Bogalusa	None	Q8 (RF5)	USA	Community (other)	Assess tracking of apoB and apoA1 in children and young adults examined 4 yrs apart.	1 728	Pediatric/ Young adults	All 1,728 children and young adults aged 7-22 y at F/U who had fasting lipid profiles evaluated 4 yrs apart were included.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, 1,728 children and young adults aged 7-22 y at F/U who had fasting lipid profiles evaluated 4 yrs apart were included.	1728 subjects; aged 7 - 22 y at F/U; 38% B; 53% F.	1728/1728 (by definition)	4 yrs	TC TG HDL LDL Apo B Apo 1 Ponderal index (PI) Smoking & drinking habits by questionnaire Parental hx of MI by self-report.	In general, Bs had higher apo A1 than Ws. Over time, apo A1 decreased except for the youngest age grp. Over time, apo B increased with age in all race-sex grps. Yr 1 vs yr 4 correlation coefficients ranged from .24-.45 for apoA1 and .57-.59 for apoB among different race and sex grps. (p=S** for all race-sex grps). Corresponding values for HDL & LDL were .39-.46 and .64-.67 respectively. Highest yr 1 vs yr 4 correlations were for TC(0.61-0.68) & LDL(0.64-0.67). No change after adjustment for age, height or PI. 31% of those with apoA1 in the highest quintile in yr 1 remained there in yr 4. For apoB, 50% of those in the highest quintile in yr 1 remained there in yr 4. For those in the lowest quintile in yr 1, 36% for apoA1 and 53% for apoB remained in this rank at F/U.	Yr 1 vs yr 4 correlation coefficients ranged from .24-.45 for apoA1 and .57-.59 for apoB among different race and sex grps. Corresponding values for HDL & LDL were .39-.46 and .64-.67 respectively. 31% of those with apoA1 in the highest quintile in yr 1 remained there in yr 4. For apoB, 50% of those in the highest quintile in yr 1 remained there in yr 4. For those in the lowest quintile in yr 1, 36% for apoA1 and 53% for apoB remained in this rank at F/U. Tracking of apolipoproteins offers no advantage over standard lipoprotein cholesterol measurements.
8651840	Bao W	Usefulness of childhood low-density lipoprotein cholesterol level in predicting adult dyslipidemia and other cardiovascular risks. The Bogalusa Heart Study	1996	Cohort	Prospective	Bogalusa	None	Q6 (RF4,5,8) Q7 (RF4,5,8) Q8 (RF 5)	USA	Community (other)	Examine the usefulness of childhood LDL-C for predicting dyslipidemia in adulthood and the association of dyslipidemia with other C-V RFs.	1 169 (by definition)	Pediatric/ Young adults	All 1169 individuals who underwent baseline fasting lipid profile assessment in 1973-74 and then again in 1988-91 were identified from 2 CrS surveys and defined as a longitudinal cohort.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, age at initial evaluation = 5-14y & at F/U evaluation =20-29y; 34% B	N/A	N/A	15 yrs	TC TG VLDL HDL-C LDL-C BMI BP	In general, lipid/ liporotein results tracked from childhood into adult life: LDL-C - r =.4-.6, p=S**TGs/ HDL - r = .1-.4, p=S** When subjects were ranked by quintile, among those with TC or LDL-C > 80th %ile as children, 40% had similar elevation 15 y later, more than 2X the expected rate. In stepwise MRA, incremental increases in childhood TC & BMI independently predicted incremental increases in adult values. Best predictor of adult lipoprotein level was childhood level, better for TC & LDL-C than TGs and HDL; next most predictive was change in BMI. If adult subjects were classified as having dyslipidemia by NCEP criteria,childhood LDL-C was most predictive of adult dyslipidemia:a 29 mg/dl higher childhood LDL= 2.5X greater risk by stepwise regression. Based on childhood LDL-C, children were classified as acceptable (AC:<110 mg/dl; = 977/ 84% of subjects), borderline (BO:110-129 mg/dl; =121/ 10%) or HR (>/= 130 mg/dl; = 71/ 6%). In adult subjects who were HR vs AC, obesity was 1.6X (38%) as prevalent (p=S); HTN was 2.4X as prevalent(p=S*); adult dyslipidemia was 8.3X as prevalent: 24% (8.3X) had high TC, 28% (5.4X) & 13% (2.4X) had low HDL. In 883 subjects with repeated childhood measurements, prevalence of adult dyslipidemia was highest(>50%) in those with 2 LDL-C>90th %ile in childhood; if child had no LDL-C > 90th%ile, chance of adult dyslipidemia was < 10%.	In general, lipid/ lipoprotein results tracked from childhood into adult life: LDL-C - r =.4-.6, p=S**TGs/ HDL - r = .1-.4, p=S** In MRA, childhood level was most predictive followed by change in BMI. Adult dyslipidemia was best predicted by childhood LDL-C. Compared with subjects with childhood LDL<110 mg/dl, those with childhood LDL > 130 mg/dl had significantly higher prevalence of elevated TC, TGs and reduced HDL level + higher prevalence of obesity and HTN. If elevated LDL persisted > 90th%ile in childhood, presence of adult dyslipidemia was markedly increased (p<.001).
8769686	Uiterwaal CS	Lipoproteins and apolipoproteins in the young and familial risk of coronary atherosclerosis	1996	CC	Retrospective	Other	Atherosclerosis	Q8 (RF1, RF5)	The Netherlands	Community (other)	Compare lipid profiles in men with early coronary artery disease (CAD) and their offspring to those of age-matched controls without CAD and their offspring	288 subjects,177 controls	Pediatric/ Young adults	Male patients with severe coronary atherosclerosis at angiography Reference group of male controls with no coronary atherosclerosis at angiography	90 male subjects with angiographically proven CAD had 115 sons & 73 daughters. 62 male controls with normal angiograms had 68 sons and 47 daughters.	Sons and daughters of men with CAD Control: Sons and daughters of men without CAD	115 sons and 73 daughters 68 sons and 47 daughters	N/A	HDL-C HDL2-C HDL3-C LDL-C TG Apo A-1 Apo B	In sons of patients, lower levels of HDL3 cholesterol (-0.07 mmol/1, standard error of the mean (SEM) 0.03, P < 0.05) and apolipoprotein A2 (-5.1 mg/dl (SEM, 1.4), P < 0.0001) were found compared to sons of controls. Similar differences were observed in daughters of such patients without, however, achieving statistical significance. No significant differences between the groups of offspring were found for total cholesterol, LDL cholesterol, HDL and HDL2 cholesterol, triglycerides and apolipoproteins A-I and B.	Q8: Reduced levels of HDL3 cholesterol and apolipoprotein A2 may be early risk indicators for coronary atherosclerosis later in life.
8782835	Srinivasan SR	The relation of apolipoprotein E polymorphism to multiple cardiovascular risk in children: the Bogalusa Heart Study	1996	CrS	Retrospective	Bogalusa	None	Q6 (RF5) Q7 (RF5)	USA	Community (other)	Evaluate C-V RFs by apoE phenotype in a sub-set of 8-17 y old children from the Bogalusa study	892/746	Pediatric/ Young adults	A subsample of 892 children from the 2559 subjects who underwent evaluation were randomly selected to undergo apoE phenotyping.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, a subsample of 892 children of a possible 2559 subjects underwent apoE phenotyping.	ApoE2 grp = 58 subjects with E2/2 & E3/2 phenotypes ApoE3 grp = 476 subjects with E3/3 phenotype ApoE4 grp = 212 subjects with E4/3 & E4/4 phenotypes	N/A	N/A	ApoE phenotype Fasting lipid profile Parental hx of MI BMI Glucose Insulin SBP Age/ race/ sex	e3 allele was the most common in all 4 race-sex grps. Bs had a lower frequency of e3 allele & higher frequencies of e2 & e4 than Ws. ApoE2 grp had lower mean BMI, % body fat, fasting insulin and LDL-C & higher HDL-C than the apoE3 grp.(p=S - S*) ApoE4 grp had higher TC and LDL-C levels vs. apoE3 grp (p=S*). BMI correlated (+)ly with TC & VLDL only in the apoE3 & 4 grps, and with TGs, LDL, TC/HDL ratio, SBP & DBP in all 3 phenotype grps.(p=S-S**) Marked increase in the prevalence of multiple RF clustering seen in apoE3 & apoE4 sub-grps but not with apoE2. ApoE2 grp vs apoE3 grp had lower prevalence of parental MI (8.8% vs 1.9%,p=.08) & DM (10.4% vs 2.0%,p=S).	ApoE2 grp had lower mean BMI, % body fat, fasting insulin and LDL-C & higher HDL-C than the apoE3 grp. ApoE4 grp had higher TC and LDL-C levels (p<.01). Insulin and BMI were asst'd with TGs and SBP in all 3 phenotype grps (p<.01). BMI was (+)ly correlated with TC, LDL-C, TC/HDL, SBP and DBP in all 3 phenotype grps (p=S - S**) Clustering of adverse RF levels occurred with apoE3 and apoE4 grps but not with apoE2. Family hx of heart attack and DM paralleled this trend.
9006807	Srinivasan SR	Influence of apolipoprotein E polymorphism on the serum lipids and lipoprotein changes from childhood to adulthood. The Bogalusa Heart Study	1999	Cohort	Prospective	Bogalusa	None	Q8 (RF5)	USA	Community (other)	Evaluate the influence of apoE polymorphism on the tracking of serum lipoproteins.	1520	Pediatric/ Young adults	All 1520 subjects from the Bogalusa study who had lipid & lipoprotein testing in 1973-74 as children aged 5 -14y, and who underwent repeat testing 16 yrs later as adults aged 21-30y	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. This study evaluated a subset of the cohort with defined apoE polymorphism and serial lipid results over a 16 yr F/U period.	ApoE2 grp: n=176 subjects with E2/2 or E3/2 phenotypes ApoE3 grp: n=874 subjects with E3/3 ApoE4 grp: n=427subjects with E4/3 or E4/4.	N/A - data obtained retrospectively	16 yrs	ApoE phenotype Fasting lipid profile Ponderal index (PI) Glucose Insulin SBP Cigarette & alcohol use by questionnaire OC use Age/ race/ sex	E3 allele was the most common in all 4 race-sex grps. Bs had a lower frequency of E3 allele & higher frequencies of E2 & E4 than Ws. At both evaluations, E2 vs. E3 allele grp had lower TC (p=S**), lower LDL (p=S*) & higher HDL (p=S*-S**). At both evaluations, E4 vs. E3 allele grp had higher TC (p=S**) and LDL (p=S**). For LDL tracking, persistence in the lowest quartile was significantly greater for E2 vs E3 or E4 phenotype grps (68 vs 44% & 68 vs 45%, p=S**) Overall, an increase in PI raised TC, TGs, VLDL, LDL & lowered HDL (all, p=S**); in E2 grp vs. E4 grp, HDL lowering was significantly greater (p=S). There were no significant interactions due to race, sex &/or age.	Correlations of baseline vs F/U levels of TC and LDL-C varied with apoE phenotype, highest for the apoE2 grp and lowest for the apoE4 grp. ApoE allele specific differences in TC & LDL were maintained from childhood to adulthood. Average effect of E2 phenotype is to lower LDL & increase HDL in childhood & adulthood. ApoE phenotype modulates the effects of excess adiposity on lipid variables.

NHLBI Evidence Table: RF5-OB

PMID	First Author	Title	Year	Study Type	Prospect./ Restrospect.	Study	CVD	RF by CQ	Country	Setting	Main Study Objective	N at Baseline (N at Follow-up)	Target Population	Eligibility Criteria	Patient Characteristics	Study Groups	n at Baseline (n at Follow-up)	Total Follow-up Duration	Outcomes Measured	Results	Main Reported Findings by Critical Question
9008838	Mohler B	Cholesterol screening in childhood: results of a 9-year follow-up study in Swiss and Italian children in Switzerland	1996	Cohort	Prospective	Other	None	Q5 (RF5) Q6 (RF5) Q* (RF5)	Switzerland	Community (schools)	Correlate lipid measures early in childhood and during adolescence in a population of children of Swiss and Italian descent, living in Basel, Switzerland	375/(+147) (-126)=249	Pediatric/ Young adults	10% random sample of 5 y old children attending kindergarten in Basel in 1976-78. Study group at baseline = 375 . 126 children lost to F/U at 10 y visit so additional 147 children added at that time -->net group of 359 subjects	Children evaluated by CrS at 5,10 & 14 yrs of age. N= 271 Swiss children,120 F N= 51 Italian children,30 F *N.B.: All lipid testing done from finger stick specimens, non-fasting.	322 children at 14 y old evaluation: 271 children = Swiss, 120 F 51 children = Italian, 30 F	Study group at baseline = 375 . 126 children lost to F/U at 10 y visit so additional 147 added at that time -->net group of 359 subjects	5-9 yrs	TC TG HDL LDL	Age-specific LDL-C levels were slightly higher and HDL-C levels slightly lower than in Bogalusa. TC increased between 5 & 10 y but decreased by 14 y. Italian Ms had significantly lower TCs at 5 & 10 y. No difference between grps for TC by age 14 y. HDL increased slightly over F/U. Italian girls showed the best tracking for HDL (r=.56 at 9 yrs.) No change in LDL over F/U. No strong correlation for any lipid results over time. BMI tracked fairly well with r=0.62-0.78 over 14 y F/U (p=S*) SBP tracked significantly but weakly with r = 0.26-0.33, p=S*.	For TC, no significant tracking was found. No strong correlation for any lipid results over time. Tracking of LDL & HDL differed btwn nationalities and sexes with slightly better tracking for TC/HDL ratio. *N.B.: All lipid testing done from finger stick specimens, non-fasting.
9048513	Donker GA	Low birth weight and serum lipid concentrations at age 7-11 years in a biracial sample	1997	Cohort	Retrospective	Bogalusa	None	Q5(RF5) Q6(RF5)	USA	Community (other)	Examine the relationship btwn birth weight and lipid profile findings at 7-11 yrs of age.	1,411	Pediatric/ Young adults	Pooled sample of all newborn Bogalusa cohort participants (n=225) from 1973-74 who were re-examined at 7-11 y of age; + subjects aged 7 - 11 y in 1987-88 (n=1 186) who were examined as part of a CrS survey; birth weights obtained from New Orleans Office of Vital Statistics	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, subjects from the cohort with known birth weight and lipid determinations at 7 11 yrs of age were evaluated. LBW = < 2500 gms	730 M - 464 W, 266 B 681 F - 396 W, 285 B All aged 7 - 11 y	N/A	7-11 yrs	Birth weight TC TG HDL LDL Quetelet index (QI) Elevated values reported as top decile for age-, race- and sex-specific distributions	Average BW was highest in WMs and lowest in BFs (p=S) TG & VLDL were higher in Ws than Bs (p=S*) No significant correlations found between lipids & BWs among 10 y olds by race-sex grp. Only WMs with low BW had a significantly greater # of subjects in the highest decile of TGs: OR=2.42(CI=1.19-4,91). When corrected for FT pregnancies only, prevalence ratio for WMs =1 & only WFs with low BW at term showed a significantly greater than expected %age of subjects in the top decile; OR=3.23 (CI=1.16-9.00). Overall, children with low BW had higher TGs than those with BW > 2 500 g (p=S); this was especially true for BMs(p=S*) By MVA, BW was only trivially related to LDL/HDL ratio after correction for sex,race,age & height. WMs showed a significant inverse correlation between BW & TGs after adjustment for age and QI. (p=S)	When only full term pregnancies are considered, only WFs had a higher %age of LBW subjects in the top decile for TGs (OR=3.23;CI=1.16-9.00). Regardless of BW, those in the highest tertile of QI had higher LDL/HDL ratios & higher TGs than those in the lower & middle tertiles except for WMs from the low BW grp.
9386145	Dwyer T	Differences in HDL cholesterol concentrations in Japanese, American, and Australian children	1997	CrS	Retrospective	Other	None	Q5 (RF5) Q6 (RF5) Q7 (RF5)	Japan Australia USA	Community (schools)	To compare TC and HDL-C levels in Japanese, American and Australian children	4 126	Pediatric/ Young adults	Data from 3 different surveys of schoolchildren, from Australia (n=1919, age 9,12 & 15 y); USA (n=284;10.6 y);& Japan (n=1 923, 11-2 y) were combined. Ht, wt & BMI were also measured. Activity & diet assessed by questionnaire.	Representative populations of schoolchildren from each of the 3 countries	AUS (n=1919,age 9,12,15y) USA (n=284;10.6 y); JAP (n=1 923, 11-2 y)	N/A	N/A	TC HDL C BMI Diet Activity	TC was higher for younger children but with no difference between country grps. HDL was higher in JAP vs AUS & USA (p=S**); difference was greater for Ms than Fs & increased with increasing age. Change in HDL with puberty was much greater for Australian (M:15.2%;F:2.6%) & American children(M:9.1%;F:2.7%) than for Japanese children(M:4.2%;F:1.9%). Within the USA grp, HDL was greater for Bs than Ws. BMI was very similar for AUS & JAP children and consistently higher in USA children, B & W. JAP grp consumed less fat vs AUS & USA but more kcal. JAP grp were more active than AUS; no data on US sample.	HDL-C was significantly higher for Japanese children than for Australian or American children); there was no difference in TC. Change in HDL with puberty was much greater for Australian & American children than for Japanese children. Potential explanatory factors = higher activity levels in Japanese children & major dietary differences but no difference in BMI.
9467707	Chen W	Sibling aggregation of low- and high-density lipoprotein cholesterol and apolipoproteins B and A-I levels in black and white children: the Bogalusa Heart Study	1997	CrS from community based cohort	Retrospective	Bogalusa	None	Q5 (RF 5) Q6 (RF5)	USA	Community (other)	Examine sibling aggregation of LDL-C, HDL-C, apoB and apoA1 in W vs B school-aged children; and to compare sibling correlation for LDL & HDL with apoB and apoA1.	790 sibships = 1305 sib-pairs	Pediatric/ Young adults	All siblings who participated in 2 cross-sectional survey in Bogalusa, LA . From a total of 6096 children, 790 full sibships with at least 2 children and 1305 sib pairs were studied.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, sib pairs were evaluated.	W Ms, 28.9%;Mean age=12.4 y W Fs, 31.8%;Mean age=12.6 y B Ms,19.1%;Mean age=13.5 y B Fs,20.2%; Mean age=13.3y.	N/A	N/A	LDL-C HDL-C ApoB ApoA1 Ponderal index Smoking/ alcohol/ OC use	Mean levels of LDL & apoB were similar regardless of sex or race There were no significant differences in the correlations between LDL & apoB and HDL & apoA1. ApoA1 was higher in WFs than in WMs. Bs had higher HDL levels than Ws for both Ms & Fs. Among siblings, LDL, apoB, HDL & apoA1 correlated significantly(p<S** for all) but all correlation coefficients were low, ranging from 0.10 to 0.33. Correlation coefficients for LDL-C & apoB were lower in Bs than Ws.(0.17 & 0.11 vs 0.32 & 0.33) By MVA, differences in PI significantly affected the lipid/lipoprotein correlations, more in Bs than Ws, but coefficients were low, 0.08-0.15.	Correlation coefficients for LDL-C and HDL-C were similar to those for apoB and apoA1. Sibpair differences in LDL-C & HDL-C were correlated with those for apoB & apoA1. Obesity exerted a greater but still small effect on lipid sibpair differences in B children than in W children.
10073983	Rainwater DL	Lipid and apolipoprotein predictors of atherosclerosis in youth: apolipoprotein concentrations do not materially improve prediction of arterial lesions in PDAY subjects. The PDAY Research Group	1999	CrS	Retrospective	PDAY	Atherosclerosis	Q1 (RF5) Q2 (RF5) Q4 (RF5) Q5 (RF5) Q9 (RF5)	USA	Don't know/NR	Compare serum lipid and apolipoprotein levels as predictors of post mortem atherosclerosis in adolescents and young adults.	715	Pediatric/ Young adults	15-34 yr olds who died accidentally in 15 different cities in the U.S.; lipid, apolipoprotein & Lp(a) data available	15-34 yr olds who died accidentally in 15 different cities in the U.S.; information on age/ gender/lipids/smoking/HBP/obesity/ hyperglycemia available	715 15-34 yr olds who died accidentally in 15 different cities in the U.S.; information on age/ gender/lipids/smoking/HBP/obesity/ hyperglycemia available	N/A	N/a	Extent of atherosclerosis by grade in thoracic aorta(TA), abdominal aorta(AA) & RCA correlated with lipid & apolipoprotein levels grouped by thirds. Correlation with age & race	Non-HDL-C was (+)ly associated with fatty streaks in all 3 arteries (p=S**) & with extent of raised lesions in the AA(p=S) and RCA (p=S*). ApoB was significantly although not as strongly asst'd with fatty streaks in all 3 locations but not with raised lesions. HDL-C was inversely asst'd with fatty streaks in all 3 arteries (p=S* for TA & AA,p=S for RCA) & with raised lesions in TA (p=S) & RCA (p=S). ApoA1 was inversely asst'd with fatty streaks in the TA (p=S) & AA (p=S) & with raised lesions only in the TA(p=S*). Lp(a) analyzed separately for Bs & Ws. Lp(a) correlated with fatty streaks in RCA of Ws (p=S**) but there were no other correlations. There was no interaction of Lp(a) & non-HDL,apoB or non HDL-C/HDL-C in effects on lesions. Analysis of fraction of lesion involvement explained by basic model (sex/age/race/smoking/ HTN) and basic model + lipids, + apolipoproteins, and + lipids & apolipoproteins demonstrated significant increase in fraction of variation explained with addition of lipids but no major further increase with addition of apolipoprotein data. Addition of Lp(a) data added little to basic model + lipids.	Neither apoA1 or apoB measures were as strongly correlated with extent of lesions as the corresponding lipid measurement. Neither Lp(a) or apo(a) size correlated consistently with extent of lesions when evaluated separately in Ws & Bs. Beyond the basic model which includes age/sex/race/smoking status/ HBP/ lipids, apoA1 and apoB added little to explain variability of results.

NHLBI Evidence Table: RF5-OB

PMID	First Author	Title	Year	Study Type	Prospect./ Restrospect.	Study	CVD	RF by CQ	Country	Setting	Main Study Objective	N at Baseline (N at Follow-up)	Target Population	Eligibility Criteria	Patient Characteristics	Study Groups	n at Baseline (n at Follow-up)	Total Follow-up Duration	Outcomes Measured	Results	Main Reported Findings by Critical Question
11730816	Chen W	Influence of lipoprotein lipase serine 447 stop polymorphism on tracking of triglycerides and HDL cholesterol from childhood to adulthood and familial risk of coronary artery disease: the Bogalusa heart study	2001	Cohort	Prospective	Bogalusa	Atherosclerosis	Q5 (RF5) Q8 (RF5)	USA	Community (other)	Track TG and HDL from childhood to adulthood in individuals with and without the lipoprotein lipase Serine 447 Stop (S447X) polymorphism + correlation with fam hx of C-VD.	829	Pediatric/ Young adults	All those young adults aged 18-38 y residing in Bogalusa LA who had LPL genotype data obtained in 1988-91 or 1995-6 and had participated as 5-17 y old children in earlier surveys in 1973-4 &/or 1976-77. Parental hx of CAD obtained by questionnaire.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. This study included only young adults tested for LPL S447X genotype & who had also participated in an earlier survey = 829 subjects, 28% B.	S447 Group: 543 W, 222 B X447 Group: 52W, 10 B	N/A	18.8 yrs	S447 genotype TC TG HDL LDL Fam hx of CAD	X447 allele is more frequent in Ws than Bs.(p=S*) Mean age at childhood(11.7 v. 11.9 y) and adult evaluation (30.5 v.30.8 y) was similar for carriers v. non-carriers. Mean levels of HDL & TG did not differ btwn S447 & X447 grps in childhood but carriers had higher HDL(p=S) & lower TGs(p=S**) as adults. When separated by race, differences were only significant in Ws. For the lowest quartile of HDL, carriers had less tracking than non-carriers.(23.1% v. 46.1%, p=S) For HDL-C, carriers of the X447 allele showed a higher %age of tracking in the highest quartile of HDL than did non-carriers (57.1% v.37.5%,p=S) TGs tended to track in the bottom quartile for carriers & the top quartile for non-carriers but the difference was not significant. HDLC tracling was independent of baseline BMI, baseline age, race & sex. Prevalence of (+) parental hx of CAD was lower in X447 carriers than non-carriers (6.9% v. 14.1%,p=S). By logistic regression with race, sex, age, BMI, BP, HDL & TGs in the model, OR for carriers vs non-carriers was 0.4 (CI: 0.17-0.97,p=S).	X447 allele is more common in Ws than Bs and is asst'd with increases in HDLC and decreases in TGs. X447 allele beneficially affects tracking of HDLC from childhood into young adult life.(Q8) Prevalence of parental CAD is lower among X447 carriers than non-carriers.
11735090	Youssef AA	Trends of lipoprotein variables from childhood to adulthood in offspring of parents with coronary heart disease: the Bogalusa Heart Study	2001	Cohort	Prospective	Bogalusa	None	Q6 (RF1,5)	USA	Community (other)	Evaluate association of (+)FamHx with development of adverse lipid profile in children and young adults.	1,076	Pediatric/ Young adults	Data from 6 cross-sectional surveys in children and 4 in young adults pooled for analysis of lipoprotein variables over time in subjects with & without (+) fam hx of CAD.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, 271 children with (+) famHx for CAD/ 805 without.	Fam hx(+) = 271 Fam hx(-) = 805	N/A - data pooled on fam hx(+) & fam hx (-) subjects assessed at each time interval	18 y	LDL TG VLDL HDL Correlated with age, sex, BMI, insulin & glucose in MVA	In (+) fam hx group, LDL was higher in early childhood from 4-15 y and then after age 20 y v. (-) fam hx group. LDL increased steeply in both groups during adolescence. VLDL & TG curves were similar in shape to LDL curves but differences btwn groups less impressive. For HDL, inverse association with age noted btwn ages 4 & 20 in both groups with trend for lower HDL in (+) fam hx group. With MVA, (+) fam hx was consistently correlated with higher VLDL with no interaction with age. Differences in LDL & TG btwn groups were significant after age 20. (+) fam hx correlated inversely with HDL and with age(p=.08) When BMI, insulin or glucose added to model, adverse association with VLDL & TGs was no longer significant. With LDL, adverse relationship disappeared only when glucose added to model. For all analyses, interactions were independent of race & sex.	With MVA, (+) fam hx was consistently correlated with higher VLDL with no interaction with age. In MVA adjusted for race and sex, parental CAD was (+)ly asst'd with LDL and TGs at young adult age and with VLDL during early childhood and young adulthood. Addition of obesity mediated measures alters relationship between (+) fam hx & lipids: (+) association between LDL and parental CAD persists with BMI and insulin in the model but disappears when FG is included; for TGs and VLDL, inclusion of BMI, insulin or FG eliminates the association with parental CAD.
11884296	Rask-Nissila L	Impact of dietary intervention, sex, and apolipoprotein E phenotype on tracking of serum lipids and apolipoproteins in 1- to 5-year-old children: the Special Turku Coronary Risk Factor Intervention Project (STRIP)	2002	Cohort	Prospective	STRIP	None	Q8 (RF5) Q10 (RF5) Q11 (RF5) Q13 (RF5)	Finland	Community (other)	Evaluate the effects of diet intervention, sex & apoE phenotype on tracking of lipids in children from 7 mos to 5 yrs of age.	1062/ 764	Pediatric/ Young adults	Cohort of children who had been followed as part of an RCT to lower dietary fat content from 7 mos - 5 y of age.	RCT of individualized counseling focusing on healthy low fat & low saturated fat diet & good exercise behaviors 2 X/ y beginning in infancy. At age 7 mos, 540 children randomized to intervention, 522 to control. Serum lipids checked annually beginning at 13 mos of age.	n=254 - Control group; 131 M n=265 - Diet group, 143 M	Control:522/ 254 Diet: 540/ 265	5 yrs	TC TG HDL VLDL LDL Non-HDL ApoB Apo A1 ApoE phenotype - Apo E4(+)=E3/4 or E4/4 n=174, M&F ApoE4(-)E2/3 or E3/3 n=174, M&F (E2/2 & E2/4 excluded because of small #s)	TC levels were lower throughout for the intervention vs diet group (p=S) Fs had higher non-HDL and lower apoA1/apoB ratios than Ms. ApoE phenotype influenced all lipid measures except HDL: ApoE4 (+) children had higher TC, non-HDL-C & apoB and lower apoA1 HDL/TC & apoA1/apoB ratios were lower for apoE4(+) children than apoE4(-) children Tracking was of the same magnitude throughout for intervention & control grps. Only gender effect was tracking of HDL, stronger for Ms than Fs (p=S*) WRT apoE phenotype, tracking was stronger in apoE(-) than in apoE(-) children for non-HDL (p=S) and apoB (p=S) In all children, tracking was strongest for the HDL/TC ratio; if lowest quartile at 13 mos, OR for remaining in that quartile = 39 (95% CI 23.1-66). Tracking of non-HDL-C & apo B was affected by apoE phenotype, with apoE4(-) children showing significantly stronger tracking in the lowest quartiles.; in the highest quartiles, non-HDL & apoB tracling was strongest in the apoE4(+) grp.	TC levels were lower throughout for the intervention vs diet group Dietary intervention did not affect tracking. Only gender effect was tracking of HDL, stronger for Ms than Fs Tracking of non-HDL-C & apo B was affected by apoE phenotype, with apoE4(-) children showing significantly stronger tracking in the lowest quartiles.; in the highest quartiles, non-HDL & apoB tracking was strongest in the apoE4(+) grp.
12205279	Srinivasan SR	Distribution and correlates of non high-density lipoprotein cholesterol in children: the Bogalusa Heart Study	2002	CrS	Retrospective	Bogalusa	None	Q5 (RF5) Q6 (RF5)	USA	Community (other)	Provide population-based data on the distribution and correlates of non-HDL-C in B & W children.	2,843	Pediatric/ Young adults	All 2,843 W or B children who underwent lipid profile testing at ages 5-17 y between 10/92 & 6/94 and who were not on oral contraceptives were eligible.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, subjects were age: 5-17 yrs, 57% W, 50% F.	N/A	N/A	N/A	Non-HDL-C by age/sex/race.	Non-HDL-C levels were similar in B & W children and higher in girls than in boys especially in 5-11 yr olds. Age was inversely related to both non-HDL-C and LDL-C. BMI and waist circumference were (+)ly asstd with non-HDL-C. Non-HDL-C correlated better with TGs than did LDL. Non-HDL was inversely related to HDL. In MVA, BMI, age, sex, waist circ and smoking accounted for 7.7% of the variance in non-HDL-C. Non-HDL-C cutpoints equivalent to currently recommended LDL-C levels (110,130,160 & 190 mg/dl) were 123,144,176 & 207 mg/dl.	Study provides distribution & correlates of non HDL-C in B and W, M and F children aged 5 -17 y. Non-HDL correlated better with TGs than LDL and was inversely associated with HDL. Non-HDL correlates with designated LDL cutpoints identified.
12324284	Tershakovec AM	Persistent hypercholesterolemia is associated with the development of obesity among girls: the Bogalusa Heart Study	2002	CrS	Retrospective	Bogalusa	None	Q5 (RF5,RF8) Q6 (RF4,5,8) Q7 (RF4,5,8)	USA	Community (other)	Assess age-related changes in relative weight & CV RFs in hypercholesterolemic and non-hypercholesterolemic children who were non-obese at baseline	273	Pediatric/ Young adults	All 5-6 y old children from Bogalusa cohort who underwent lipid evaluation in 1973 and who had TC either >75th%ile(HTC) or < 60th%ile (LTC) on this & 2 subsequent evaluations, 3 & 6 years later, at ages 8-9 y and 11-12 y.	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, baseline at 5-6 y; HC:n = 58, Non-HC =215; 41% black, 52% F. Evaluation at baseline plus 3 and 6 y later.	Group 1:HTC:TC > 75th%ile X 3 Group 2:LTC: TC< 60th%ile X 3	Group 1: 215 (215) Group 2: 58(58)	6 yrs	Lipid profile BMI BP Glucose/Insulin	At baseline, in HTC group LDL = 3.28+/-.40 in M, 3.60 +/-.60 in F vs. in LTC group, LDL=1.92+/-.34 in M & 2.00+/-.34 in F (p=S in M). Baseline TGs higher in HC M & F but only significant in M (p=S). HTC F had greater increase in BMI over 6 y F/U than did LTC F : at 11-12 y, 45.2% of HTC Fs had BMI > 85th%ile v .21.6% of LTC Fs. There was no difference in BMI between Ms in this time period. In Fs, BMI was significantly related to SBP, DBP, HDL-C & TGs and this increased over time. Relationships between BMI & SBP, and BMI & TGs were stronger in HTC than LTC Fs. In Ms, BMI was significantly related to insulin & SBP.	BMI increased significantly more in HTC Fs over 6 y F/U, but did not differ significantly btwn HTC and LTC Ms. Associations btwn BMI, BP, insulin and lipids were stronger with increasing age especially in HTC Fs.

NHLBI Evidence Table: RF5-OB

PMID	First Author	Title	Year	Study Type	Prospect./ Restrospect.	Study	CVD	RF by CQ	Country	Setting	Main Study Objective	N at Baseline (N at Follow-up)	Target Population	Eligibility Criteria	Patient Characteristics	Study Groups	n at Baseline (n at Follow-up)	Total Follow-up Duration	Outcomes Measured	Results	Main Reported Findings by Critical Question
12912790	Cook S	Prevalence of a metabolic syndrome phenotype in adolescents: findings from the third National Health and Nutrition Examination Survey, 1988-1994	2003	CrS		NHANES	None	Q6 (RF2, RF6, RF14)	USA	Community (other)	Estimate the prevalence and distribution of a metabolic syndrome among adolescents in the United States	2,430	Pediatric/ Young adults	12-19 yr Exclusions: (1) had not fasted for 6 hours, (2) was currently pregnant, or (3) was taking medication classified as a blood glucose regulator, such as insulin, androgens or anabolic steroids, or adrenal corticosteroids.	Male: 1,150 Female: 1,280 White: 646 Black: 824 Mexican American: 846 Age 12-14 yr: 969 Age 15-19 yr: 1,462 Below poverty level: 804 At or above poverty level: 1,394 Has parental history of MI: 410	N/A	N/A	N/A	Prevalence and distribution of a metabolic syndrome using the NCEP (Adult Treatment Panel III) definition modified for age	The overall prevalence of the metabolic syndrome among adolescents was 4.2%; 6.1% of males and 2.1% of females were affected (P=0.01). The syndrome was present in 28.7% of overweight adolescents (BMI, ≥95th percentile) compared with 6.8% of at-risk adolescents (BMI, 85th to <95th percentile) and 0.1% of those with a BMI below the 85th percentile (P<0.001). Based on population-weighted estimates, approximately 910,000 US adolescents have metabolic syndrome. Metabolic syndrome was more frequent in Mexican Americans (5.6%) and whites (4.8%) than black subjects (2.0%). By region of the country, the rate was highest in the West and Midwest and lowest in the Northeast. Findings for age (12-14 years vs 15-19 years), Tanner stage by pubic hair, poverty level, and parental history of diabetes and myocardial infarction were not significant.	Q6: 4% of adolescents and nearly 30% of overweight adolescents in the United States meet these criteria for a metabolic syndrome
15451913	Duncan GE	Prevalence and trends of a metabolic syndrome phenotype among U.S. Adolescents, 1999-2000	2004	CrS	Retrospective	NHANES III, NHANES 1999-2002	None	Q6 (RF2, RF6, RF8, RF14)	USA	Clinical	Determine the prevalence of a metabolic syndrome phenotype among U.S. adolescents.	991	Pediatric/ Young adults	12-19 yr	Patient characteristics from NHANES 1999-2000	Number of metabolic syndrome risk factors	NR	NR	BMI status <85th BMI status 85th to <95th BMI status >95th Number of risk factors for metabolic syndrome	The overall prevalence of a metabolic syndrome phenotype among U.S. adolescents increased from 4.2% in NHANES III (1988-1992) to 6.4% in NHANES 1999-2000 (P < 0.001). The syndrome was more prevalent (P < 0.01) in male than female adolescents (9.1 vs. 3.7%) and was found in 32.1% of overweight adolescents (BMI > or = 95th percentile for age and sex), compared with 7.1% of adolescents at risk for overweight (BMI between 85th and 95th percentiles) (P < 0.001). Based on population-weighted estimates, > 2 million U.S. adolescents currently have a metabolic syndrome phenotype.	Q6: The overall prevalence of a metabolic syndrome phenotype among U.S. adolescents increased from 4.2% in NHANES III (1988-1992) to 6.4% in NHANES 1999-2000 (P < 0.001). Metabolic syndrome was more prevalent in male than female adolescents and was found in 32.1% of overweight adolescents (BMI > or = 95th percentile for age and sex), compared with 7.1% of adolescents at risk for overweight (BMI between 85th and 95th percentiles).
16678832	Chen W	A genome scan for loci influencing levels and trends of lipoprotein lipid-related traits since childhood: The Bogalusa Heart Study	2007	Cohort	Retrospective	Bogalusa	None	Q5 (RF5)	USA	Don't know/NR	Identify loci influencing the long-term levels and trends of HDL-C and LDL-C and TG in a longitudinal cohort	NR (1,223)	Pediatric/ Young Adult	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. Serial cross-sectional studies performed from 1970 to present. For this study, siblings from Bogalusa study who had participated 2–13 times during the period of 1973–2004, with at least one measurement in childhood and at least one in adulthood were included.	14-43 yr White: 779 Black: 444	N/A	N/A	22 yr	LDL-C HDL-C TG For lipid levels, total and incremental area under the growth curves was used as the measure for long term levels and trends. Genotyping of microsatellite polymorphic markers was performed using standard electrophoresis methods.	After adjusting for age, sex and BMI, heritability estimates of total area values for all lipid variables were higher than those of a single measurement in either childhood or adulthood. In blacks, significant linkage to LDL-C incremental area (peak LOD=3.6 at 50 cM) was observed on chromosome 1; and suggestive linkage for total area of LDL-C (LOD=2.9 at 21 cM) on chromosome 19. Only 1 suggestive linkage (LOD=2.2 at 161 cM) on chromosome 2 was identified in whites for LDL-C incremental area. Other suggestive linkage (LOD≥2.0) was noted for LDL-C and HDL-C in terms of either total or incremental area on chromosomes 2, 5, 7 and 15 for blacks and whites. Several lipid-related candidate genes such as low-density lipoprotein receptor (LDLR), LDL receptor-related proteins 3 and 8, Apo E, Apo AII and Apo CII are located in these regions. Findings suggest that regions on these chromosomes harbor genetic loci that affect the propensity to develop dyslipidemia from childhood	Q5: There are racial differences in genotyping for dyslipidemias. In blacks, significant linkage to LDL-C incremental area was observed on chromosome 1; and suggestive linkage for total area of LDL-C on chromosome 19. Only one suggestive linkage on chromosome 2 was identified in whites for LDL-C incremental area. Other suggestive linkage was noted for LDL-C and HDL-C in terms of either total or incremental area on chromosomes 2, 5, 7 and 15 for blacks and whites.
16818562	Friedman LA	Sensitivity and specificity of pediatric lipid determinants for adult lipid status: Findings from the Princeton Lipid Research Clinics Prevalence Program follow-up study	2006	Cohort	Prospective	Princeton	None	Q8 (RF1,5)	USA	Community (other)	Determine the diagnostic utility of lipid levels in childhood assessed by the NCEP guidelines for determining adult lipid status 30 years later.	1 741	Pediatric/ Young adults	Subjects who underwent lipid testing in grades 1-12 in Cincinnati in the Princeton school district between 1972-78 and who participated in the Princeton F/U study between 1999-2004.	Students in grades 1-12 in Cincinnati Princeton school district between 1972-78. 73% W/ 27% B.; 52.3% M/ 47.7% F.	73% W/ 27% B.; 52.3% M/ 47.7% F Childhood group: 5-19 y of age Adult group: 28-48 y of age	1 741/1 741 by definition	30 y	TC LDL (+) Fam hx of parental HC (TC > 240 mg/dl) (+) fam hx of CVD at </= 55 y	Overall, sensitivities were: LDL 43.1% (CI:34.8-51.6%) TC 44.2% (CI:35.1-53.5%) Overall, specificities were: LDL 86.1%(CI:83.4-88.6%) TC 84.8& (CI:82.1-87.3%) For LDL:(+) predictive value = 39%;(-) predictive value = 88%. For TC: (+) predictive value = 31%;(-) predictive value = 91% Sensitivities varied considerably with age, with lowest at 14-16 y and highest at 5-10 y and 17-19 y. Lowest mean cholesterol levels occurred consistently at 14-16 y of age, regardless of adult lipid status W subjects tended to follow the same trends in sensitivity as the whole population but this was not true for B subjects. Number of adult CVD events was small - only 19 for LDL & 20 for TC. Sensitivity of childhood LDL for prediction of adult CVD was 10.5% (CI:1.3-33.1%); specificity was 81% (CI: 78.1-83.6%). Sensitivity of childhood TC to predict adult CVD was 20% (CI: 5.7-43.7%) and specificity 81% (CI: 78.2-93.5%). Results improved slightly when (+) family hx of HC or CVD included, to sensitivity of 11.1% for LDL (CI: 0.3048.3%) and 30% for TC (CI: 6.7 - 65.2%). Specificities for both decreased to 77% (CI:73-82%).	Sensitivity and specificity for evaluating TC or LDL levels in childhood that are elevated in adulthood are not improved by selecting children with a (+) family hx for high cholesterol or C-V disease. Differences in overall sensitivity between the selected screening approach and universal screening were only 3% for LDL and 1% for TC. In evaluating TC levels throughout childhood, maturational changes with puberty result in marked variation in sensitivities with lowest mean cholesterol levels occurring consistently at 14-16 y of age, regardless of adult lipid status. Number of adult CVD events was small - only 19 for LDL & 20 for TC. Sensitivity of childhood LDL for prediction of adult CVD was 10.5% (CI:1.3-33.1%); specificity was 81% (CI: 78.1-83.6%). Sensitivity of childhood TC to predict adult CVD was 20% (CI: 5.7-43.7%) and specificity 81% (CI: 78.2-93.5%). Results improved slightly when (+) family hx of HC or CVD included, to sensitivity of 11.1% for LDL (CI: 0.3048.3%) and 30% for TC (CI: 6.7 - 65.2%). Specificities for both decreased to 77% (CI:73-82%).
16818566	Srinivasan SR	Utility of childhood non-high-density lipoprotein cholesterol levels in predicting adult dyslipidemia and other cardiovascular risks: the Bogalusa Heart Study	2006	Cohort	Prospective	Bogalusa	None	Q8 (RF5)	USA	Community (other)	Evaluate usefulness of non-HDL-C measured in childhood for prediction of future dyslipidemia in adult life.	1163	Pediatric/ Young adults	All subjects from 2 cross sectional surveys, one performed in 1973-4(n=3446) & one in 2001-2 (n=1163) for whom fasting blood samples were obtained at both assessments	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F), 48% male (M); 44% B. For this study, 1,163 subjects who had fasting lipid profiles at 5-14 yrs & as adults 27 yrs later. 30% B, 55% F.	N/A	N/A	27 yrs	TC TG HDL LDL Non-HDL Defined RFs: BMI>/= 30 LDL>/= 160 mg/dl TG >/= 150 mg/dl HDL< 40 mg/dl Glucose>/=126 mg/dl Insulin >/= 18 uU/ml SBP >/= 140 DBP >/= 90 mmHg	Best predictor for adult LDL was childhood LDL(r=0.58,p=S**); next best predictor was change in BMI from childhood to adulthood. High risk childhood LDL predicts high adult prevalence of obesity, high LDL and High TGs. 38.5% of those in the top quintile as children remained in the top quintile as adults; 66.2% were in the top 2 quintiles as adults. Best predictor for adult non-HDL was childhood non-HDL(r=0.52,p=S**); next best predictor was change in BMI from childhood to adulthood High risk childhood non-HDL predicts high adult prevalence of obesity, high LDL, high TGs, low HDL, hyperinsulinemia & hyperglycemia. By logistic regression, compared to those in the lowest quartile, those in the age-,race- & gender-specific top quartile for non-HDL-C and LDL-C in childhood were 4.5 X (CI:2.51-8.04,p=S**) and 3.5 X (CI:2.02-6.07,p=S**) more likely to develop adult dyslipidemia (adverse levels of LDL, non-HDL,TGs or HDL), indepenent of baseline BMI and BMI change 27 yrs later.	Non-HDL tracked almost as well as LDL from childhood to young adult life. Childhood non-HDL-C was the best predictor of adult non-HDL-C.. High childhood non-HDL-C predicts adult dyslipidemia and other non-lipid RFs, including obesity, high LDL, high TGs, low HDL-C, hyperinsulinemia and borderline hyperglycemia. Adverse non-HDL-C in childhood is the best lipid predictor of adult dyslipidemia.
16940191	Jolliffe CJ	Distribution of lipoproteins by age and gender in adolescents	2006	CrS	Retrospective	NHANES III, NHANES 1999-2000, NHANES 2001-2002	None	Q6 (RF2, RF3, RF5)	U.S.A	Clinical	Develop age-and gender- specific lipoprotein threshold concentrations for adolescents.	6,067	Pediatric/ Young adults	12-20 yr	Patient characteristics from NHANES III, NHANES 1999-2000, NHANES 2001-2002	Groups stratified by age and gender	NA	NA	Mean TC [mmol/L (SD)] Mean LDL-C [mmol/L (SD)] Mean HDL-C [mmol/L (SD)] Mean TG [mmol/L (SD)]	Normal distributions described by age and gender from NHANES 1999-2002. TC concentrations for males and females declined during early adolescence and rose thereafter, approaching adult concentrations. Male LDL-C risk curves decreased during early adolescence before increasing at approximately 15.5 yr of age, whereas those for females steadily increase from 12-20 yr of age. HDL-C curve for males declined slightly until 16 yr, after which no change occurred. Female curve for HDL-C did not change with age.	Q6: Normal distributions for lipoproteins described by age and gender from NHANES 1999-2002. TC concentrations for males and females declined during early adolescence and rose thereafter, approaching adult concentrations.

NHLBI Evidence Table: RF5-OB

PMID	First Author	Title	Year	Study Type	Prospect./ Restrospect.	Study	CVD	RF by CQ	Country	Setting	Main Study Objective	N at Baseline (N at Follow-up)	Target Population	Eligibility Criteria	Patient Characteristics	Study Groups	n at Baseline (n at Follow-up)	Total Follow-up Duration	Outcomes Measured	Results	Main Reported Findings by Critical Question
17484618	Gronroos P	Influence of apolipoprotein E polymorphism on serum lipid and lipoprotein changes: a 21-year follow-up study from childhood to adulthood. The Cardiovascular Risk in Young Finns Study	2007	Cohort	Retrospective	Young Finns	None	Q8 (RF5)	Finland	Don't know/NR	Examine the influence of apolipoprotein E (Apo E) polymorphism on longitudinal changes in serum lipids	NR (1,233)	Pediatric/ Young Adult	Young Finns subjects who participated in the 21 yr follow-up study Subjects with lipid values and apo E phenotype measurements available for all study years	24-39 yr at 21 yr follow-up	Apo E phenotype: E2/2 Apo E phenotype: E3/2 Apo E phenotype: E4/2 Apo E phenotype: E3/3 Apo E phenotype: E4/3 Apo E phenotype: E4/4	N/A	21 yr	TC LDL-C HDL-C Apo B Apo A-1 Apo E phenotype	Apo E phenotype-related differences in serum TC and LDL-C were maintained throughout the 21-year follow-up from childhood to adulthood; the Apo E epsilon2 allele was consistently associated with lower and the epsilon4 allele with higher TC and LDL-C (p<0.001 for all). In adulthood, there was also a significant Apo E phenotype-related difference in HDL-C (p=0.007), and the epsilon2 allele was associated with higher and the epsilon4 allele with lower Apo A-I and HDL-C. In addition, Apo B increased in the phenotype order E3/2<E3/3<E4 (E4/3+E4/4) (p<0.001). The LDL-lowering effect of the epsilon2 allele was greater in adulthood than in childhood, i.e., there was a significant Apo E phenotype by time interaction (p=0.039) with longitudinal change in LDL-C	Q8: Apo E phenotype-related differences in serum TC and LDL-C were maintained throughout the 21-year follow-up from childhood to adulthood
17599442	Frontini MG	Utility of non-high-density lipoprotein cholesterol versus other lipoprotein measures in detecting subclinical atherosclerosis in young adults (The Bogalusa Heart Study)	2007	CrS	Retrospective	Bogalusa	IMT	Q3 (RF5)	USA	Community (other)	Compare the utility of non-HDL cholesterol with the utility of LDL-C, HDL-C, TG, Apo B, Apo A-I, ratio of TC to HDL-C, and ratio of Apo B to Apo A-I in detecting increased carotid IMT in asymptomatic younger adults	1,203 (NR)	Pediatric/ Young Adult	Bogalusa subjects who had an ultrasound measurement of carotid IMT Exclusions: Subjects who lacked bilateral far wall carotic IMT measurements on any arterial segment Subjects who were nonfasting	Community-based cohort of black(B) and white (W) children and young adults - originally examined at 5-17 yrs; 52% female(F). 48% male (M); 44% B. Serial cross-sectional studies made from 1970 to present.. For this study: 24-43 yr White: 71% Men: 43%		N/A	N/A	Non-HDL-C LDL-C HDL-C TG Apo B Apo A-I Ratio of Apo B to Apo A-I Ratio of TC to HDL-C Carotid IMT	In multivariate logistic regression analysis for detecting increased carotid IMT only non-HDL-C,TC/HDL-C, and Apo B emerged as significant correlates with respective OR of 1.75 (95% CI 1.10 to 2.78), 2.02 (95% CI 1.27 to 3.19), and 2.13 (95% CI 1.38 3.29) after adjusting for body mass index, systolic blood pressure, and other lipoprotein measurements Regarding discriminating values of different lipoprotein measurements in detecting increased carotid IMT, area (c-value) under the receiver operating characteristic curve analysis for each lipoprotein measurement adjusted for age, race, gender, body mass index, and systolic blood pressure indicated that the c-value for non-HDL-C (0.73) was similar to those for LDL-C (0.76), TC/HDL-C (0.72), Apo B/Apo A-I (0.71), and HDL-C (0.70), but significantly (p <0.001) higher than that for Apo A-I (0.69), TG (0.64), and Apo B (0.64) Non-HDL cholesterol is as good as or better than other widely recommended lipoprotein measurements in the identification of subclinical atherosclerosis in young adults	Q3: Only non-HDL-C,TC/HDL-C, and Apo B emerged as significant correlates of increased carotid IMT
18071074	Magnussen CG	Utility of currently recommended pediatric dyslipidemia classifications in predicting dyslipidemia in adulthood: Evidence from Childhood determinants of adult health (CDAH) study, Cardiovascular risk in young Finns study, and Bogalusa heart study.	2008	CrS	Prospective	Bogalusa, Young Finns, CDAH	None	Q8 (RF5)	USA + Finland + Australia	Community (schools)	Apply current definitions for pediatric dyslipidemia to adolescent lipid results to assess strength as predictors of adult dyslipidemia.	NR	Pediatric/ Young adults	3 cohorts: CDAH: Australian study of CV RFs from childhood into adult life. Baseline data on 8498 subjects, 7 - 15 y of age; 2410 subjects evaluated again at 26-36 y. Bogalusa: Community-based cohort of B & W children and young adults - original group examined at 5-17 yrs; 52% F, 35% B. In 1982; serial cross-sectional studies performed from 1970 to present. This study, included 273 subjects who had baseline lipids done at 12 -17 y and who returned for repeat testing as young adults. Young Finns: Collaborative effort of all university departments of pediatrics + several other Finnish institutions to study C-V RFs and their determinants in children and adolescents. The main cross-sectional study carried out in 1980 included 3596 3-18-year-old subjects with F/U studies in 1983, '86,'89 and '92, the last when the subjects were 15-30 years old. For this study, there were 1185 subjects who had adolescent and young adult lipid data.	CDAH: Mean age at baseline testing: 13.5+/-1.5y Mean age at adult testing: 33.4+/-1.6 y 178 M/ 185 F Bogalusa: Mean age at baseline testing: 15.3 +/- 1.6y Mean age at adult testing: 32.4+/- 1.4 117 M/ 149 F Young Finns: Mean age at baseline testing: 14.9+/-2.4 y Mean age at adult testing: 35.9+/-2.4 y 523 M/ 657 F	CDAH: Mean age at baseline testing: 13.5+/-1.5y Mean age at adult testing: 33.4+/-1.6 y 178 M/ 185 F Bogalusa: Mean age at baseline testing: 15.3 +/- 1.6y Mean age at adult testing: 32.4+/- 1.4 117 M/ 149 F Young Finns: Mean age at baseline testing: 14.9+/-2.4 y Mean age at adult testing: 35.9+/-2.4 y 523 M/ 657 F	N/A	N/A	TC TG HDL-C LDL-C % high TC % high TG % low HDL % high LDL	Pooled calculation of adjusted RR for abnormal lipids as an adult based on adolescent results was significantly higher for adolescents with borderline high/high-risk levels compared to those with nl lipids. Stratified by study group, results were similar for TC, LDL & TG but differed for HDL-C, with RR significantly lower for Bogalusa subjects. Pooled data calculation of sensitivity & specificity of high-risk cut points indicated: - For TC, borderline- and high risk NCEP cutpoints were considerably moresensitive than were NHANES: of adults with elevated TC, 32.3% would not be identified from adolescent results with NCEP cutpoint vs 60.6% with NHANES cutpoints. - For LDL, the NCEP borderline- and high-risk cutpoints were more sensitive and less specific than NHANES. 55.4% of adults with elevated LDL were not identified by NHANES cutpoints vs 35% with NCEP. - For HDL, the NHANES borderline- and high-risk cutpoints were better than the NCEP cutpoints, but both were poor predictors with 83.3% of adults with low HDL missed with NHANES and 93.3% with NCEP. - For TG, both classification performed poorly with NCEP better than NHANES; 86% of adults with elevated TGs were not identified using NCEP cutpoints and 97.7% using NHANES.	Q 8. Using data from 3 prospective cohort studies, findings confirmed that the more abnormal the lipid results were in adolescence, the more likely they were to accurately predict abnormal lipids in adult life. Comparing the predictive capacity of NCEP and NHANES cutpoints, the NCEP cutpoints were more accurate predictors for TC , LDL and TGs but the NHANES cutpoints were more accurate for HDL. The study indicated limitations with all screening approaches for clinical use in adolescents. Universal screening identified 75% of those with high LDL but false positives were high at 66.2% Current screening approaches based on cutpoints in adolescents were all poor in identifying adults with low HDL.
18071074	Magnussen CG	Utility of currently recommended pediatric dyslipidemia classifications in predicting dyslipidemia in adulthood: Evidence from Childhood determinants of adult health (CDAH) study, Cardiovascular risk in young Finns study, and Bogalusa heart study.	2008																	Using the Young Finns cohort and the best-performing cutpoints from the previous analyses, 3 different screening strategies were used: UNIVERSAL; positive FAM HX + cutpoints; OV/OB+ cutpoints; and positive FAM HX + OV/OB + cutpoints --> Universal screening identified 75% of those with high LDL but false positives were high at 66.2%. Results were similar for positive FAM HX, OV/OB and positive FAM HX + OV/OB. 20% with high LDL as adults were not identified by any screening strategy. Regardless of cutpoints used, 71% of adults with low HDL: were not identified from adolescent results.	
18206683	Cook S	Metabolic syndrome rates in United States adolescents, from the National Health and Nutrition Examination Survey, 1999-2002	2008	CrS	Retrospective	NHANES 1999-2002	None	Q5 (RF2, RF3, RF8, RF14) Q6 (RF2, RF3, RF8, RF14)	U.S.A	Clinical	Report the prevalence rates of the metabolic syndrome in a nationally representative sample of adolescents in the U.S. using 4 previously reported definitions of the syndrome.	4,902	Pediatric/ Young adults	12-19 yr Exclusions: Pregnancy Inadequate fasting Taking medications that could interfere with test results for the components of the metabolic syndrome	Patient characteristics from NHANES 1999-2002	Groups were studied by sex, race/ethnicity, and BMI status, as well as the 4 following definitions for metabolic syndrome: Cook/Ford Cruz Caprio Adult	NR	NR	Abdominal obesity BP TG LDL-C Glucose	In NHANES 99-02, the prevalence of the metabolic syndrome varied from 2.0% to 9.4% of teens in the United States, depending on the definition used. In obese teens, these prevalence rates varied from 12.4% to 44.2%. In obese teens, application of the metabolic syndrome definition by Cruz produced a prevalence rate of 12.4%; that of Caprio produced a rate of 14.1%. However, none of the normal weight or overweight teens met either definition. Application of the definition by Cook produced a prevalence rate of 7.8% in overweight teens and 44% in obese teens. The adult definition of metabolic syndrome produced a prevalence rate of 16% in overweight teens and 26% in obese teens.	Q6: Prevalence rates for metabolic syndrome vary widely depending on the definition used. In obese teens, metabolic syndrome prevalence varied from 12.4% to 44.2%.
18309111	Juonala M	Associations of dyslipidemias from childhood to adulthood with carotid intima-media thickness, elasticity, and brachial flow-mediated dilatation in adulthood: the Cardiovascular Risk in Young Finns Study	2008	Cohort	Prospective	Young Finns	Multiple	Q3 (RF5)	Finland	Don't know/NR	Examine in detail the effects of dyslipidemia phenotypes, including combined dyslipidemia, on risk of subclinical atherosclerosis in young adults.	3596 (2265)	Pediatric/ Young adults	Patients in the Cardiovascular Risk in Young Finns Study who completed the 21-year follow-up. Men and women between 3 and 18 at study onset.	Men and women between 3 and 18 yr at study onset	NA	NA	21 yr	**Arterial function:** cIMT; Elasticity; FMD. **CV RFs**: Serum Lipids, BP, BMI, smoking hx, fam hx of prem CAD, FG,Insulin or dx of DM, CRP Clinical characteristics.	(1) Adult cIMT was increased in subjects with childhood type IIb dyslipidemia after adjustment for sex/age/BP/BMI/CRP/ Ins/FG/DM/fam hx of CAD/smoking(p=S*). (2) Carotid compliance was decreased in type IIb but only in univariate analysis. (3) In type IIb subjects, increasing number of non-lipid RFs was significantly correlated with increased cIMT.(p=S**). cIMT increased with increasing number of non-lipid RFs but this was not significant in normolipidemic subjects. (4) Increased cIMT correlated significantly with presence of the metabolic syndrome only in type IIb subjects. (p=S) (5) In adulthood, subjects with type IIb or IV dyslipidemia had higher BP, BMI, insulin, and CRP levels, increased prevalence of metabolic syndrome and DM, and increased prevalence of positive family history of CAD compared to nondyslipidemic subjects. (6) HypoHDL-cholesterolemia was associated with increased prevalence of the metabolic syndrome. (7) In childhood, type IIb had increased BMI and type IV subjects had increased BMI and BP.	Q3: Type IIb dyslipidemia has deleterious effects on arterial vasculature beginning in childhood. Subjects with type IIb dyslipidemia were more vulnerable to the effects of cardiovascular risk factors and metabolic syndrome. The synergistic effect of the CV RFs begins in childhood.

NHLBI Evidence Table: RF5-OB

PMID	First Author	Title	Year	Study Type	Prospect./ Restrospect.	Study	CVD	RF by CQ	Country	Setting	Main Study Objective	N at Baseline (N at Follow-up)	Target Population	Eligibility Criteria	Patient Characteristics	Study Groups	n at Baseline (n at Follow-up)	Total Follow-up Duration	Outcomes Measured	Results	Main Reported Findings by Critical Question
18450895	Frontini MG	Usefulness of Childhood Non–High Density Lipoprotein Cholesterol Levels Versus Other Lipoprotein Measures in Predicting Adult Subclinical Atherosclerosis: The Bogalusa Heart Study	2008	Cohort	Retrospective	Bogalusa	Multiple	Q1,3 (RF5)	USA	Community (other)	Examine the usefulness of childhood non-high-density lipoprotein cholesterol level versus low-density lipoprotein cholesterol level, high-density lipoprotein cholesterol level, triglyceride level, apolipoprotein B level, apolipoprotein A-I level, total cholesterol/high-density lipoprotein cholesterol ratio, and apolipoprotein B/apolipoprotein A-I ratio in predicting adult excess carotid intimamedia thickness, an indicator of subclinical atherosclerosis.	437	Pediatric/ Young adults	Participants in the Bogalusa Heart Study as children 5-17 years of age and as adults 16-19 years later	White: 70% Male: 40% Mean age at F/U: 31.9 y(24-43 y)	NA	NA	16-19 yr	Non-HDL-C LDL-C HDL-C TG Apolipoprotein B Apolipoprotein A-I CIMT	By MVA, after adjustment for childhood BMI, SBP, other lipoprotein measures and F/U yrs, childhood non-HDL-C (OR=2.60), LDL-C (OR=2.95), TC/HDL-C ratio (1.78), apoB(OR=1.44) and apoB/apoA1 ratio (OR=1.69) were independent predictors of excess CIMT in young adulthood. HDL-C, TG and apoA! were not significant predictors. When evaluated by ROC analysis, childhood non-HDL was as effective as any other childhood lipid measure (c=0.62-0.66).	Childhood lipoprotein findings (non-HDL-C,LDL-C,TC/HDL-C,apoB and apoB/apoA1 ratio) were significant predictors of adult sub-clinical atherosclerosis assessed by CIMT. Childhood non-HDL was as effective a predictor as any other childhood lipid measure.
18634985	Juonala M	Childhood Levels of Serum Apolipoproteins B and A-I Predict Carotid Intima-Media Thickness and Brachial Endothelial Function in Adulthood	2008	Cohort	Prospective	Young Finns	Multiple	Q3,4 (RF4,5,8,10,14)	Finland	Clinical	Determine whether CV RFs including apolipoproteins (apo) B and A-I measured in childhood and adolescence predict subclinical evidence of atherosclerosis in adulthood	1341 (879)	Pediatric/ Young adults	Participants in the Cardiovascular Risk in Young Finns Study aged 3,6,9,12,15, and 18 years old at the onset of the study in 1980.	Male: 45.7% Mean age (SD) at F/U: 31.9 yr (5.0;)	NA	NA	21 yr	**Baseline and F/U:** Apo B levels; Apo A-I levels; TC,LDL-C,HDL-C,TG BP Smoking status BMI Insulin CRP **Follow-up:** CIMT Brachial FMD	In bivariate analysis, baseline Apo B(p=S**) and ApoB/Apo A-I ratio(p=S**) were directly related and Apo A-I was inversely related(p=S*) with adulthood IMT in subjects aged 12-18 y at baseline. These associations were not significant for baseline measures at 3-9 y. LDL(p=S) and LDL/HDL ratio(p=S*) also correlated significantly with adulthood CIMT but the correlation was roughly half as strong. In MVA using age-and gender-specific z-scores at 12-18 y, the direct association with apoB(p=S**) and the apoB/A1 ratio and the inverse association with apoA1(p=S*) were independent of other RFs. The associations between adolescent apolipoproteins and adult CIMT remained significant when adult apolipprotein results were included (p=S). The c-value for the MV model predicting CIMT > 90th%ile or carotid plaque with lipid and non-lipid RFs included was higher for adolescent apoB/apoA1 compared with LDL/HDL and with non-HDL/HDL(p=S for both). In bivariate analysis, baseline Apo B(p=S) and ApoB/Apo A-I ratio(p=S**) were indirectly related and Apo A-I was directly related(p=S**) with adulthood FMD in subjects aged 3-18 y at baseline. LDL and LDL/HDL ratio were not related to adulthood FMD. The associations between childhood apolipoproteins and adult FMD remained significant when adult apolipprotein results were included (p=S).	Q3: Apo B and A-I measured in children and adolescents better predicted adult sub-clinical atherosclerosis than did conventional lipid measures. High levels of apoB and low levels of apoA1 measure in adolescence reflect a lipoprotein profile predisposing to the development of subclinical atherosclerosis in adult life.