Limited Access Datasets: Exam 1
Dictionary: Created Variables

All created analytic variables have the letter "C" appended to the variable name in order to indicate that it is a created variable, rather than a variable that is directly obtained as part of the MESA exam.

Personal Characteristics

Age (truncated to the nearest whole number)
AGE1C = trunc[(enrolldt1 – birthdt1)/365.25]

Ten-year age groups

AGECAT1C = 1	age = 45-54 years
AGECAT1C = 2	age = 55-64 years
AGECAT1C = 3	age = 65-74 years
AGECAT1C = 4	age = 75-84 years

Gender

GENDER1C = 0	female
GENDER1C = 1	male

Body mass index [BMI; weight(kg)/height(m)^2] by WHO categories; reference 1
BMI1C = (wtlb1*0.4536) / ((htcm1/100)^2)

Body mass index categories

BMI1C < 25	BMICAT1C =1	Normal
BMI1C >= 25 and BMI1C < 30	BMICAT1C =2	Grade 1 Overweight
BMI1C >= 30 and BMI1C < 40	BMICAT1C =3	Grade 2 Overweight
BMI1C >= 40	BMICAT1C =4	Grade 3 Overweight

Body surface area (BSA)
BSA1C = 0.20247*((htcm1/100)^(0.725))*((wtlb1*0.4536)^(0.425)).
(^ indicates the value of the exponent; e.g., the second term in the equation is height(m) to the 0.725 power):

Cigarette smoking status

CIG1C = 0	Never	if evsmk1 = 0
CIG1C = 1	Former	if evsmk1 = 1 AND cursmk1 = 0
CIG1C = 2	Current	if cursmk1 = 1

(ever is defined as >= 100 cigarettes in your lifetime; current is defined as smoking cigarettes within the past 30 days)

Pack-years of cigarette smoking (packs per day * years)

PKYRS1C = 0	if cig1c = 0
PKYRS1C = (agequit1 - agesmk1) * (cigsday1 / 20)	if cig1c = 1
PKYRS1C = (age - agesmk1) * (cigsday1 / 20)	if cig1c = 2

Cigar smoking status

CGR1C = 0	Never	if cigar1 = 0 or othtob1 = 0
CGR1C = 1	Former	if cigar1 = 1 AND cgrcur1 = 0
CGR1C = 2	Current	if cgrcur1 = 1

(ever is defined as >= 20 cigars in your lifetime; current is defined as smoking cigars within the past 30 days)

Cigar smoking amount (cigars per day * years)

CGRYRS1C = 0	if cgr1c = 0
CGRYRS1C = (cgrageq1 - cgrage1) * cgrday1	if cgr1c = 1
CGRYRS1C = (age1c - cgrage1) * cgrday1	if cgr1c = 2

Pipe smoking status

PIP1C = 0	Never	if pipe1 = 0 or othtob1=0
PIP1C = 1	Former	if pipe1 = 1 AND pipcur1 = 0
PIP1C = 2	Current	if pipcur1 = 1

(ever is defined as >= 20 pipefuls in your lifetime; current is defined as smoking a pipe within the past 30 days)

Pipe smoking amount (pipefuls per day * years)

PIPYRS1C = 0	if pip1c = 0
PIPYRS1C = (pipageq1 - pipage1) * pipday1	if pip1c = 1
PIPYRS1C = (age - pipage1) * pipday1	if pip1c = 2

Chewing tobacco use

CHEW1C = 0	Never	if chew1 = 0 or othtob1=0
CHEW1C = 1	Former	if chew1 = 1 AND chwcur1 = 0
CHEW1C = 2	Current	if chwcur1 = 1

(ever is defined as using chewing tobacco >= 20 times in your lifetime; current is defined as using chewing tobacco within the past 30 days)

Chewing tobacco amount (# of times chewing tobacco is used per day * years)

CHWYRS1C = 0	if chew1 = 0
CHWYRS1C = (chwageq1 - chwage1) * chwday1	if chew1 = 1
CHWYRS1C = (age - chwage1) * chwday1	if chew1 = 2

Snuff use

SNF1C = 0	Never	if snuff1 = 0 or othtob1=0
SNF1C = 1	Former	if snuff1 = 1 AND snfcur1 = 0
SNF1C = 2	Current	if snfcur1 = 1

(ever is defined as using snuff >= 20 times in your lifetime; current is defined as using snuff within the past 30 days)

Snuff amount (# of times snuff is used per day * years)

SNFYRS1C = 0	if snf1c = 0
SNFYRS1C = (snfageq1 - snfage1) / snfday1	if snf1c = 1
SNFYRS1C = (age - snfage1) / snfday1	if snf1c = 2

Alcohol use

ALC1C = 0	Never	if alcohol1 = 0
ALC1C = 1	Former	if alcohol1 = 1 AND curalc1 = 0
ALC1C = 2	Current	if curalc1 = 1

Years of alcohol use

YRSALC1C = yrsalcp1	if alc1c=1
YRSALC1C = yrsalcc1	if alc1c=2

Alcohol use, number of drinks per week when drinking

ALCWK1C = alcwkp1	if alc1c=1
ALCWK1C = alcwkc1	if alc1c=2

Family history of heart attack in parents, siblings, or children

FHHA1C = 0	pmi1 = 0 and shrtatt1 = (0 or 8) and chrtatt1 = (0 or 8)
FHHA1C = 1	pmi1 = 1 or shrtatt1 = 1 or chrtatt1 = 1

Current aspirin use (taking aspirin at least 3 days per week at baseline)

ASACAT1C = 0	Not taking aspirin
ASACAT1C = 1	If ASA1C = 1 and ASPDAYS1 >=3

Prevalent Disease Measures

Systolic blood pressure, average of 2nd and 3rd Dinamap measurements, in mm Hg
SBP1C = average (s2bp1, s3bp1)

Diastolic blood pressure, average of 2nd and 3rd Dinamap measurements, in mm Hg
DBP1C = average (d2bp1, d3bp1)

Hypertension stage by JNC VI (1997) criteria; reference 2
HTNSTG1C = 6 Stage 3 hypertension if sbp1c >= 180 or dbp1c >= 110
HTNSTG1C = 5 Stage 2 hypertension if (sbp1c = 160 - 179) or (dbp1c = 100 - 109)
HTNSTG1C = 4 Stage 1 hypertension if (sbp1c = 140 - 159) or (dbp1c = 90 - 99)
HTNSTG1C = 3 High-normal BP if (sbp1c = 130 - 139) or (dbp1c = 85 - 89)
HTNSTG1C = 2 Normal BP if (sbp1c = 120 - 129) or (dbp1c =80 - 84)
HTNSTG1C = 1 Optimal BP if sbp1c < 120 and dbp1c < 80
If sbp1c and dbp1c are in different categories, use the higher category.

Hypertension by JNC VI (1997) criteria (note: because of the way this vble is defined, there are people who are not classified as hypertensives because of their lack of self report (highbp=0) .)
HTN1C = 1 hypertension if dbp1c>=90 or sbp1c>=140 or (highbp1=1 and htnmed1c=1). (highbp1 is self reported history of hypertension and htnmed1c is an indicator of any hypertensive meds).
HTN1C = 0 no hypertension if dbp1c<90 and sbp1c<140 and HTN1C not equal to 1 (above).

Ankle-brachial index = minimum ratio of ankle BP to brachial (arm) BP. Ratios are calculated separately for the left and right side, and the minimum is then selected.

ABI1C = min (rtabi , ltabi)

where rtabi = (max (rdpedis1, rptib1)) / (avg (rbrach1,lbrach1))
ltabi = (max (ldpedis1, lptib1)) / (avg (rbrach1,lbrach1))

For rtabi and ltabi, if the two brachial (arm) BPs differ by 10 mmHg or more, use the higher arm pressure as the denominator.

Diabetes mellitus by 1997 ADA fasting criteria

DM971C	= 3	Treated diabetes defined as: (i) use of insulin or ohga on medication form, or (ii) self-report of insulin/ohga us on medical history form and on the phlebotomy form
DM971C	= 2	Untreated diabetes if fasting glucose >= 126 mg/dL and DM971C not equal to 3 (above).
DM971C	= 1	impaired fasting glucose if fasting glucose = 110-125 mg/dL and DM971C not equal to 3 (above).
DM971C	= 0	normal if fasting glucose is < 110 mg/dL and DM971C not equal to 3 (above).

Diabetes mellitus by 2003 ADA fasting criteria

DM031C	= 3	Treated diabetes defined as: (i) use of insulin or ohga on medication form, or (ii) self-report of insulin/ohga us on medical history form and on the phlebotomy form
DM031C	= 2	Untreated diabetes if fasting glucose >= 126 mg/dL and DM031C not equal to 3 (above).
DM031C	= 1	impaired fasting glucose if fasting glucose = 100-125 mg/dL and DM031C not equal to 3 (above).
DM031C	= 0	normal if fasting glucose is < 100 mg/dL and DM031C not equal to 3 (above).

Framingham risk, NCEP version

fr_totc

This variable measures the points for calculating 10-year risk of developing hard CHD (MI and CHD death). It is not included in the dataset; rather, it is used for calculating **frncep1c**. This measure relies upon age [**age1c**], total cholesterol [**chol1**], current smoking status [**cig1c**], hdl [**hdl1**], systolic blood pressure [**sbp1c**] and presence of hypertension medication [**htnmed1c**] for its calculations. Men and women [**gender1**] are scored separately. No adjustment has been made for participant use of lipid lowering medications at the time of blood draw. This measure should not be used in analysis; use the Framingham 10-year risk of CHD instead. To find the Framingham risk point score, sum the points from the tables below. For example, a male, age 66, cholesterol 232, HDL 54, smoker, and systolic blood pressure of 132 without hypertension treatments will have a point score of 11+1+0+1+1=14.

A missing value sets this entire variable to be missing, unless the missing value would have no effect on the total points. (missing htnmed1c when sbp1c is less than 120, for example) This scoring algorithm is oriented towards cholesterol treatment decisions. Since diabetes is considered a CHD risk-equivalent, diabetics are automatically recommended for treatment, and the risk scoring does not include diabetes as a factor. For this reason, the 10 year risk estimates do not apply to diabetics, and this variable is set to missing for anyone with **glucose1** >=126 mg/dl or on diabetes treatment. [**dm031c**=2 or 3] The algorithm is also only applicable for ages<80, however, for ages 80-85 we assigned them a risk as though they were age 79.
NOTE: Tables and methods taken directly from NCEP summary, reference #4.

Framingham Point Scores for Men

Age point distribution

[**age1c**]	Points
45-49	3
50-54	6
55-59	8
60-64	10
65-69	11
70-74	12
75-79	13
80+	undefined

Cholesterol point distribution, varies by age

	[**age1c**]			
[**chol1**]	40-49	50-59	60-69	70-79
<160	0	0	0	0
160-199	3	2	1	0
200-239	5	3	1	0
240-279	6	4	2	1
280+	8	5	3	1

HDL point distribution

[**hdl1**]	points
60+	-1
50-59	0
40-49	1
<40	2

Smoking point distribution, varies by age

	[**age1c**]			
[**cig1c**]	40-49	50-59	60-69	70-79
Nonsmoker [**cig1c=0,1**]	0	0	0	0
Current smoker [**cig1c=2**]	5	3	1	1

Systolic blood pressure point distribution, varies by hypertension status

	Hypertension status	
[**sbp1c**]	Untreated [**htnmed1c=0**]	Treated [**htnmed1c=1**]
<120	0	0
120-129	0	1
130-139	1	2
140-159	1	2
160+	2	3

Framingham Point Scores for Women

Age point distribution

[**age1c**]	Points
45-49	3
50-54	6
55-59	8
60-64	10
65-69	12
70-74	14
75-79	16
80+	undefined

Cholesterol point distribution, varies by age

	[**age1c**]			
[**chol1**]	40-49	50-59	60-69	70-79
<160	0	0	0	0
160-199	3	2	1	1
200-239	6	4	2	1
240-279	8	5	3	2
280+	10	7	4	2

HDL point distribution

[**hdl1**]	points
60+	-1
50-59	0
40-49	1
<40	2

Smoking point distribution, varies by age

	[**age1c**]			
[**cig1c**]	40-49	50-59	60-69	70-79
Nonsmoker [**cig1c=0,1**]	0	0	0	0
Current smoker [**cig1c=2**]	7	4	2	1

Systolic blood pressure point distribution, varies by hypertension status

	Hypertension status	
[**sbp1c**]	Untreated [**htnmed1c=0**]	Treated [**htnmed1c=1**]
<120	0	0
120-129	1	3
130-139	2	4
140-159	3	5
160+	4	6

Framingham 10-year risk of CHD, NCEP version

frncep1c Risk of developing hard CHD within 10 years, calculated from the NCEP Framingham risk point scores. Men and women use different tables to find their values:

Framingham 10-Year Risk Percentages for Men

Point Total	10-Year Risk, %	
<0	<1	*coded as 0
0	1	
1	1	
2	1	
3	1	
4	1	
5	2	
6	2	
7	3	
8	4	
9	5	
10	6	
11	8	
12	10	
13	12	
14	16	
15	20	
16	25	
17+	30+	*coded as 0.30

Framingham 10-Year Risk Percentages for Women

Point Total	10-Year Risk, %	
<9	<1	*coded as 0
9	1	
10	1	
11	1	
12	1	
13	2	
14	2	
15	3	
16	4	
17	5	
18	6	
19	8	
20	11	
21	14	
22	17	
23	22	
24	27	
25+	30+	*coded as 0.30

All values are coded as decimals; 12% is coded as 0.12

From the previous example, the man with a point score of 14 has an estimated probability of 16% with regards to experiencing a CHD in 10 years. The actual value of frncep1c would be 0.16
NOTE: Tables and methods taken directly from NCEP summary, reference #4.

Framingham risk, JAMA version
frjama1c
Risk of developing hard CHD within 10 years, calculated from the JAMA Framingham risk survival model. These scores were developed using Cox proportional hazards models, using a separate model for each gender. The models are not recalibrated to the MESA data; the average values of the Framingham covariates are used and the published Framingham average incidence rates are used. The variables used in calculating FR_JAMA1c are **age1c**, **htnstg1c**, **chol1**, **hdl1**, **dm031c**, **glucose1**, **cig1c** and **gender1**. The algorithm is only applicable for ages<75, however, however for older participants we assigned them a risk as though they were age 74. The survival model's means and coefficients are provided from the JAMA Framingham Cox regression.

Framingham risk, Circulation version
frcirc1c
Estimated 10 year risk of all CHD events by Framingham equation published in Circulation in 2001 [7]. This algorithm is very similar to that used in FR_JAMA1c above, only predicting all CHD (MI, CHD death, angina) instead of hard CHD. The same risk factors and modeling strategy are used for both. The algorithm is only applicable for ages<75, however, however for older participants we assigned them a risk as though they were age 74.

NECP Metabolic Syndrome
METSYN1C
Must have 3 or more of the following risk factors

1.) Increase waist size
Waistcm1 > 102 cm if gender1 = 1
Waistcm1 > 88 cm if gender1 = 0

2.) Elevated Triglycerides
trig1 >= 150mg/dl

3.) Low HDL cholesterol
hdl1 < 40 mg/dl if gender1 = 1
hdl1 < 50 mg/dl if gender1 = 0

4.) Hypertension
defined as dbp1c >= 85 or sbp1c >= 130 or htnmed1c = 1

5.) Impaired fasting glucose
glucose >= 110 mg/dl or diabet1 = 1

Physical activity

By category level – minutes per week

HSEMN1C = Household chores – Light effort + Moderate effort
YRDMN1C = Lawn/Yard/Garden/Farm work – Moderate effort + Heavy effort
CAREMN1C = Child & Adult care – Light effort + Moderate effort
TRNMN1C = Drive or ride in car or bus
WALKMN1C = Non-work walking – To get places + For exercise or pleasure
SPTNMN1C = Dancing + Three types of sport activities
CONDMN1C = Conditioning – Moderate effort + Heavy Effort
LEISMN1C = Leisure time activities – Sit or recline + Read, knit, sew, etc.

By category level – MET levels

HSEMT1C	Household chores min/wk – Light effort * 2.5 + Moderate effort * 4.0
YRDMT1C	Lawn/Yard/Garden/Farm work min/wk – Moderate effort * 4.0 + Heavy effort * 6.5
CAREMT1C	Child & Adult care min/wk – Light effort *2.5 + Moderate effort * 4.0
TRNMT1C	Drive or ride in car or bus min/wk * 1.5
WALKMT1C	Non-work walking min/wk – To get places *3.0 + For exercise or pleasure * 3.5
SPTNMT1C	Min/wk for Dancing *5.0 + Team sports * 7.0 + Dual sports * 7.0 + Individual activities * 3.5
CONDMT1C	Conditioning min/wk – Moderate effort *5.5 + Heavy Effort * 7.0
LEISMT1C	Leisure time activities min/wk – Sit or recline * 1.0 + Read, knit, sew, etc * 1.5

Occupational and volunteer activities – minutes per week

OCCMN1C	Occupation-paid work – Light effort, sitting + Light effort, standing + Moderate effort + Heavy effort
VOLMN1C	Volunteer activity – Light effort + Moderate effort + Heavy effort

Occupational and volunteer activities – MET levels

OCCMT1C	Occupation-paid work min/wk – Light effort, sitting * 1.5 + Light effort, standing * 2.5 + Moderate effort *3.0 + Heavy effort * 7.0
VOLMT1C	Volunteer activity min/wk – Light effort *1.5 + Moderate effort * 3.0 + Heavy effort * 6.5

Intensity level

MPTTMN1C	Total Light+Moderate+Vigorous activities min/wk
MPTTMT1C	Total of all Light+Moderate+Vigorous activities min/wk multiplied by their individual MET values
MPLTMN1C	Total Light activities min/wk
MPLTMT1C	Total of all Light activities min/wk multiplied by their individual MET values
MPMOMN1C	Total Moderate activities min/wk
MPMOMT1C	Total of all Moderate activities min/wk multiplied by their individual MET values
MPVGMN1C	Total Vigorous activities min/wk
MPVGMT1C	Total of all Vigorous activities min/wk multiplied by their individual MET values

Summary variables

PAHRDY1C	Reported total PA hours per day
WKHRWK1C	Reported total work hours per week. Equivalent to OCCMN1C/60
EXERCM1C	Total intentional exercise (Q9-15) MET-min/wk. =sum(PAq9mt, sptnmt, condmt). PAq9mt = MET-minute variables for Question 9 on the PA form.

Health and Life

Spielberger trait anger scale
SPLANG1C = sum of scores for 10 items (qktempr1, frtempr1, hothead1, angry1, annoyed1, flyoff1, nasty1, furious1, frushit1, infurat1)

Assign scores 1, 2, 3, 4 from "almost never" to "almost always".
If more than 2 items are missing, do not score.
If 1-2 items are missing, assign value of 1 to missing items.

Spielberger trait anxiety scale
SPLANX1C = sum of scores for 10 items (steady1, satisf1, nervous1, unhappy1, failure1, turmoil1, secure1, noconf1, inadeqt1, worry1)

Assign scores as follows:
For nervous1, unhappy1, failure1, turmoil1, noconf1, inadeqt1, and worry1:
Score 1,2,3,4 from "almost never to almost always".

For steady1, satisf1, and secure1:
Score 4,3,2,1 from "almost never to almost always".

If more than 2 items are missing, do not score.
If 1-2 items are missing, determine mean score across items completed, multiply by 10 and round to nearest whole number.

Chronic burden
CHRBUR1C = total number of items to which response is 1 =Yes for (hprb1pt1, hprb1ot1, job1prb1, mon1prb1, rel1prb1).

If any items are missing, do not code.

Chronic burden 6 months or more
CHRBU61C = total number of items to which response is 1 =Yes for (hprb2pt1, hprb2ot1, job2prb1, mon2prb1, rel2prb1).

If any items are missing, do not code.

CES-D (Center for Epidemiologic Studies – Depression) Scale
CESD1C = sum of scores for the 20 items of the CES-D Scale (bother1, noteat1, blue1, asgood1, concntr1, depress1, effort1, hopeful1, lffail1, fearful1, badslp1, happy1, lestalk1, lonely1, unfrnly1, enjlife1, cryspel1, sad1, dislikd1, getgoin1)

Assign scores as follows:
For asgood1, hopeful1, happy1, enjlife1:
Score 3, 2, 1, 0 (rarely to most)

For bother1, noteat1, blue1, concntr1, depress1, effort1, lffail1, fearful1, badslp1, lestalk1, lonely1, unfrnly1, cryspel1, sad1, dislikd1, getgoin1:
Score 0,1,2,3 (rarely to most).

If more than 5 items are missing, score is not calculated.
If 1-5 items are missing, sum scores for completed items, divide total by number answered and multiply by 20.

Emotional Social Support Index
EMOT1C = sum of scores for 6 items (talkto1, advice1, affectn1, hlpchr1, emospt1, confide1).

Assign scores 1,2,3,4,5 from “none of the time” to “all of the time”.
If any items are missing, do not score.

Perceived discrimination

Lifetime:
DISCRL1C = total number of items to which response is 1 = Yes for (uf1fire1, uf1hire1, uf1stop1, uf1educ1, uf1move1, uf1nghb1).

If any items are missing, do not code.

Past year:
DISCRY1C = total number of items to which response is 1 = Yes for (uf3fire1, uf3hire1, uf3stop1, uf3educ1, uf3move1, uf3nghb1).

If any items are missing, do not code.

Everyday hassles
HASSL1C = sum of scores for 9 items (curtesy1, respect1, service1, smart1, afraid1, dishon1, better1, insult1, threat1).

Assign scores 6,5,4,3,2,1 from “almost every day” to “never”.
If any items are missing, do not score.

Neighborhood

Neighborhood social cohesion
Assign scores as follows:
For asgood1, hopeful1, happy1, enjlife1:
Score 3, 2, 1, 0 (rarely to most)

NCOHES1C = sum of scores for the 5 items related to neighborhood social cohesion (nclose1, nhelp1, ndgalng1, ntrust1, nvalues1)

Assign scores as follows:
For nclose1, nhelp1, ntrust1:
Score 5, 4, 3, 2, 1 (

to the "strongly agree → strongly disagree" continuum as follows:
5 → 1 (decreasing order) for (nclose1, nhelp1, ntrust1)
1 → 5 (increasing order) for (ndgalng1, nvalues1)
The resulting score increases with increasing cohesion.
If any items are missing, do not score.

Neighborhood problems
NPROB1C = sum of scores for 7 items related to neighborhood problems (nnoise1, ntraf1, nlfshop1, nlparks1, ntrash1, nsdwlk1, nviolen1).
Assign scores 4,3,2,1 for "very serious problem" to "not really a problem".
If any items are missing, do not score.

Time lived in neighborhood
NHDTIM1C = combination of nhdmo1 (months in neighborhood) and nghyrs1 (years in neighborhood)

Blood Lab Measures

NOTE: All lipid categories determined by NCEP 2001 guidelines; reference 4

Total Cholesterol, NCEP Categories

CHLCAT1C = 3	High	Cholesterol ≥ 240 mg/dL
CHLCAT1C = 2	Borderline High	Cholesterol 200-239 mg/dL
CHLCAT1C = 1	Desirable	Cholesterol < 200 mg/dL

LDL Cholesterol, NCEP Categories

LDLCAT1C = 5	Very High	LDL cholesterol ≥ 190 mg/dL
LDLCAT1C = 4	High	LDL cholesterol 160-189 mg/dL
LDLCAT1C = 3	Borderline High	LDL cholesterol 130-159 mg/dL
LDLCAT1C = 2	Near Optimal	LDL cholesterol 100-129 mg/dL
LDLCAT1C = 1	Optimal	LDL cholesterol < 100 mg/dL

HDL Cholesterol, NCEP Categories

HDLCAT1C= 3	Low	HDL < 40 mg/dL
HDLCAT1C= 2		HDL 40-59 mg/dL
HDLCAT1C= 1	High	HDL ≥ 60 mg/dL

Triglycerides, NCEP Categories

TRGCAT1C = 4	Very High	Triglycerides ≥ 500 mg/dL
TRGCAT1C = 3	High	Triglycerides 200-499 mg/dL
TRGCAT1C = 2	Borderline High	Triglycerides 150-199 mg/dL
TRGCAT1C = 1	Normal	Triglycerides < 150 mg/dL

Urinary Measures

Urinary microalbuminuria from spot urine measurement, albumin(mg) / creatinine (g); reference 5

UABCAT1C = 3	Macroalbuminuria	alb(mg)/cre(g) > 300
UABCAT1C = 2	Microalbuminuria	alb(mg)/cre(g) 30-300
UABCAT1C = 1	Normal	alb(mg)/cre(g) < 30

ECG Measures

MAJOR ABNORMALITIES

Ventricular Conduction Defect
VCD1C = 1 If the first 3 characters of ncsp31 = "3.1" or "3.2" or "3.3" (If Novacode 3.1 or 3.2 or 3.3 is present)
VCD1C = 0 Otherwise

Major Q-Wave Abnormalities
QQS1C = 1 If ncsp51 = "5.1" or "5.2" or "5.3" (If Novacode 5.1 or 5.2 or 5.3 is present)
QQS1C = 0 Otherwise

Minor Q, QS waves with ST-T Abnormalities
QST1C = 1 If ncsp51 = "5.4" (If Novacode 5.4 is present)
QST1C = 0 Otherwise

Isolated ST-T Wave Abnormalities
STT1C = 1 If ncsp51 = "5.5" or "5.6" (If Novacode 5.5 or 5.6 is present)
STT1C = 0 Otherwise

Left Ventricular Hypertrophy
ECGLVH1C = 1 If ncsp61 = "6.1.1" (If Novacode 6.1.1 is present)
ECGLVH1C = 0 Otherwise

Atrial Fibrillation
AFIB1C = 1 If any of (ncvp1a1, ncvp1b1, ncvp1c1, ncvp1d1, ncvp1e1, ncvp1f1, ncvp1g1) = "1.5.1" or "1.5.2" or "1.5.3" (If Novacode 1.5.1 or 1.5.2 or 1.5.3 is present)
AFIB1C = 0 Otherwise

First Degree Atrio-Ventricular (AV) Block
AVB1C = 1 If ncsp21 = "2.1" (If Novacode 2.1 is present)
AVB1C = 0 Otherwise

Any Major ECG Abnormalities
MAJABN1C = 1 If any of the following are present: (vcd1c, qqs1c, qst1c, stt1c, ecglvh1c, afib1c, avb1c)
MAJABN1C = 0 Otherwise

MINOR ABNORMALITIES

Minor Q, QS Waves
MQS1C = 1 If ncsp51 = "5.7" (If Novacode 5.7 is present)
MQS1C = 0 Otherwise

High R Waves
HIR1C = 1 If ncsp61 = "6.1.0" (If Novacode 6.1.0 is present)
HIR1C = 0 Otherwise

Minor Isolated ST-T Abnormalities
MST1C = 1 If ncsp51 = "5.8" (If Novacode 5.8 is present)
MST1C = 0 Otherwise

ST Elevation
STE1C = 1 If any of (mcl921 , mcf921 mcv921) = 1 (If Minnesota Code 9-2 is present)
STE1C = 0 Otherwise
where
mcl921 = 1 if any of (mc92i1, mc92avl1, mc92v61) = "921"
mcf921 = 1 if any of (mc92ii1, mc92iii1, mc92avf1) = "921"
mcv921 = 1 if any of (mc92v11, mc92v21, mc92v31, mc92v41, mc92v51) = "921"

Incomplete RBBB
IRBBB1C = 1 If ncsp31 = "3.4.1" (If Novacode 3.4.1 is present)
IRBBB1C = 0 Otherwise

Long QT Interval
LQT1C = 1 If qti1 >=110, where qti1 = qtdur1* (hr + 100) / 656
LQT1C = 0 Otherwise

Short PR (milliseconds)
SPR1C = 1 If prdur1 < 120 ms and (mcr611 ne "6.1.1" and mcr641 ne "6.4.1" and mcr681 ne "6.8.1" and mcr821 ne "8.2.1" and mcr821 ne "8.2.2" and mcr831 ne "8.3.1" and mcr831 ne "8.3.2" and mcr841 ne "8.4.1")
SPR1C = 0 Otherwise

Left Axis Deviation
LAD1C = 1 If -90 <= qrsaxis1 <= -30
LAD1C = 0 Otherwise

Right Axis Deviation
RAD1C = 1 If 120 <= qrsaxis1 <= 210
RAD1C = 0 Otherwise

Any Minor ECG Abnormalities

MINABN1C = 1 If any of the following are present:(mqs1, hir1, mst1, ste1, irbbb1, lqt1, spr1, lad1, rad1)

MINABN1C = 0 Otherwise

Ultrasound: IMT

Carotid intimal-medial thickness (IMT), in millimeters
The computed variables of MAXCOM1C and MAXINT1C reflect the mean of all available maximum wall thicknesses across all scans, across both left and right sides, and across the near and far walls for the common and internal carotid variables, respectively.

MAXCOM1C = mean (rcfwmax1, rcnwmax1, lcfwmax1, lcnwmax1)

MAXINT1C = mean (rafwmax1, ranwmax1, rlfwmax1, rlnwmax1, rpfwmax1, rpnwmax1, lafwmax1, lanwmax1, llfwmax1, llnwmax1, lpfwmax1, lpnwmax1)

Maximum carotid stenosis, graded
MAXSTN1C = max (rsten1, lsten1) for values of rsten1 and lsten1 which indicate a stenosis.
When one side indicated "bad image", or "can't tell" and the other side had a valid value, the valid measure was taken as the maximum.

0 = No Lesion
1 = 1-24%
2 = 25-49%
3 = 50-74%
4 = 75-99%
5 = 100%

Maximum surface
MAXSUR1C = max (rsurf1, lsurf1) for values of rsurf1 and lsurf1 which indicate a lesion.
When one side indicated "can't tell" and the other side had a valid value, the valid measure was taken as the maximum.

0 = Smooth
1 = Mildly Irregular
2 = Markedly Irregular
3 = Ulcerated
6 = No Lesion

Maximum morphology
MAXMOR1C = max (rmorph1, lmorph1)
for values of rmorph1 and lmorph1 which indicate a lesion.
When one side indicated "can't tell" and the other side had a valid value, the valid measure was taken as the maximum.

0 = No Lesion
1 = Homogeneous
2 = Heterogeneous

Maximum density

MAXDEN1C = max (rdens1, ldens1) for values of rdens1 and ldens1 which indicate a lesion.
When one side indicated "can't tell" and the other side had a valid value, the valid measure was taken as the maximum.

0 = No Lesion
1 = Hypodense
2 = Isodense
3 = Hyperdense
4 = Calcified

MRI Measures

Aortic Distensibility
AODIS1C = [(oaormx1 – oaormn1) / oaormn1] / mripp1

where oaormx1 = maximum aortic cross-sectional area;
oaormn1 = minimum aortic cross-sectional area; and
mripp1 = the average of the pulse pressures from the brachial blood pressures measured before and after Series 7 in the MRI exam
= [(presys1 - predia1) + (postsys1 - postdia1)] / 2

Average Aortic Diameter
AAD1C = [2 * sqrt(oaormn1 / pi) + 2 * sqrt(oaormx1 / pi)] / 2,
where pi = 3.14159

CT Measures

PHOK1C Indicator specifying whether or not phantom data (and thus the phantom adjustment) were valid for a particular scan. Missing phantom data are by definition "invalid."

PHOK1C	=1	Phantom data/adjustment valid
	=0	Phantom /data adjustment not valid

Each of the measures below is the sum of the corresponding measures from the left anterior descending, circumflex, left and right coronary arteries.

1) Agatston calcium score

a) Unadjusted = slft1 + slad1 + scrc1 + srt1

AGATU1C Defined for each scan (CT RC data file)
AGATU11C Scan 1, defined for each participant (main data file)
AGATU21C Scan 2, defined for participants with 2 scans (main data file)
AGATUM1C mean(AGATU11C,AGATU21C), average of scans 1 and 2 (main data file)

b) Phantom-adjusted = pslft1 + pslad1 + pscrc1 + psrt1 if PHOK1C=1
= slft1 + slad1 + scrc1 + srt1 if PHOK1C=0

AGATP1C Defined for each scan (CT RC data file)
AGATP11C Scan 1, defined for each participant (main data file)
AGATP21C Scan 2, defined for participants with 2 scans (main data file)
AGATPM1C mean(AGATP11C,AGATP21C), average of scans 1 and 2 (main data file)

2) Total calcium volume

a) Unadjusted = vlft1+ vlad1 + vcrc1 + vrt1

VOLU1C Defined for each scan (CT RC data file)
VOLU11C Scan 1, defined for each participant (main data file)
VOLU21C Scan 2, defined for participant w/ 2 scans (main data file)
VOLUM1C mean(VOLU11C, VOLU21C), average of scans 1 and 2 (main data file)

b) Phantom-adjusted = pvlft1+pvlad1+pvcrc1+pvrt1 if PHOK1C=1
= vlft1+ vlad1 + vcrc1 + vrt1 if PHOK1C=0

VOLP1C Defined for each scan (CT RC data file)
VOLP11C Scan 1, defined for each participant (main data file)
VOLP21C Scan 2, defined for participants w/ 2 scans (main data file)
VOLPM1C mean(VOLP11C, VOLP21C), average of scans 1 and 2 (main data file)

3) Total isometric volume score

a) Unadjusted = vslft1 + vslad1 + vscrc1 + vsrt1

VOLSU1C Defined for each scan (CT RC data file)
VOLSU11C Scan 1, defined for each participant (main data file)
VOLSU21C Scan 2, defined for participant w/ 2 scans (main data file)
VOLSUM1C mean(VOLSU11C, VOLSU21C), average of scans 1 and 2 (main data file)

b) Phantom-adjusted = pvslft1 + pvslad1 + pvscrc1 + pvsrt1 if PHOK1C=1
= vslft1 + vslad1 + vscrc1 + vsrt1 if PHOK1C=0

VOLSP1C Defined for each scan (CT RC data file)
VOLSP11C Scan 1, defined for each participant (main data file)
VOLSP21C Scan 2, defined for participants w/ 2 scans (main data file)
VOLSPM1C mean(VOLSP11C, VOLSP21C), average of scans 1 and 2 (main data file)

Pulsewave Measures

Estimated Stroke Volume
stkvolp1 = -6.6 + 0.25*(cejectp1-35) – 0.62*pulsewp1 + 40.4 * bsap1 – 0.51 * Age (mL)

stkvol1c = (stkvolp1 - 40.4 * bsap1) + 40.4 * bsa1c

Estimated Stroke Volume Index
stkvx1c = stkvol1c / bsa1c

Estimated Cardiac Output
ecop1 = stkvolp1 * pulsewp1 / 1000 (Liters/minute)

eco1c = (ecop1 / stkvolp1) * stkvol1c

Estimated Cardiac Output Index
cardx1c = eco1c / bsa1c

Systemic Vascular Resistance
svrp1 = 80 * mnapwp1 / ecop1 (dyne-sec-cm^{-5})

svr1c = (svrp1 * ecop1) / eco1c

The following variables are related to parameters from a third order Windkessel model. The diastolic decay can be represented as the solution to the Windkessel model with six unknown parameters. The Windkessel model is:

$$P(t) = A_1 e^{-A_2 t} + A_3 e^{-A_4 t} \cos(A_5 t + A_6)$$

Large Artery Elasticity Index

$$laep1 = \frac{2A_4[(A_2 + A_4)^2 + A_5^2]}{svrp1 \times A_2 (2A_4 + A_2)(A_4^2 + A_5^2)}$$

lae1c = (laep1 * svrp1) / svr1c

Small Artery Elasticity Index

$$saep1 = \frac{1}{svrp1 \times (2A_4 + A_2)}$$

sae1c = (saep1 * svrp1) / svr1c

Total Vascular Impedance

$$totvip1 = \frac{1333.33\sqrt{(\frac{1}{L \times saep1} - w^2)^2 + (\frac{1333.33w}{svrp1 \times saep1})^2}}{laep1\sqrt{(\frac{1333.33}{L \times svrp1 \times saep1 \times laep1} - \frac{1333.33w^2}{svrp1 \times saep1})^2 + w^2(\frac{1}{L \times laep1} + \frac{1}{L \times saep1} - w^2)^2}}$$

$$L = \frac{svrp1(2A_4 + A_2)^2}{2A_4[(A_2 + A_4) + A_5^2]}$$

$$w = \frac{2\pi \times pulsewp1}{60}$$

References:

1. World Health Organization Expert Committee. Physical status: the use and interpretation of anthropometry. Geneva, Switzerland: World Health Organization, 1993 (Technical Report Series 854).
2. 1997 Joint National Committee. The sixth report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Arch Intern Med 1997;157(2446):2413-2446
3. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 1997;20(7):1183-1197.
4. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adutls. Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). JAMA 2001;285:2486-2497.
5. American Diabetes Association. Diabetic nephropathy. Diabetes Care 1997;20 (Suppl 1):S24-S27.
6. D'Agostino RB, Grundy S, Sullivan LM, Wilson P, Validation of the Framingham Coronary Heart Disease Prediction Scores Results of a Multiple Ethnic Groups Investigation, JAMA, 286: 180-187, 2001.
7. Wilson PF, D'Agostino RB, Levy D, Belanger AM, Silberhatz H, Kannel WB, Prediction of Coronary Heart Disease Using Risk Factor Categories, Circulation, 97: 1837-1847, 1998.