ARIC Manuscript Proposal #2254

PC Reviewed: 11/12/13 **Status: A** **Priority: 2**
SC Reviewed: _____ **Status: _____** **Priority: ____**

1.a. Full Title: Relationship of Adiposity Trajectories to Later Life Physical Function and Strength

b. Abbreviated Title (Length 26 characters): Adipose Trajectories & Function

2. Writing Group:
B. Gwen Windham, Wanmei Wang, Ellen Demerath, Kenneth Butler, Gerardo Heiss, Lisa Pompeii, Kelly Gabriel, Anna Kucharska-Newton, Michael E. Griswold, Thomas H. Mosley

I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. bgw **[please confirm with your initials electronically or in writing]**

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3. Timeline: 5 months

4. Rationale:
Physical function is associated with adverse outcomes such as incident disability, falls, hospitalization, length of hospital stay, and mortality in older adults.[1-4] Obesity is an important, modifiable risk factor for functional impairments in older age.[5,6] Limited studies suggest that exposure to obesity at younger ages may also contribute to poorer function in midlife[7] and in older age.[8] The combination of increasing numbers of overweight and obese Americans and demographic aging trends is expected to result in dramatic increases in the number of older obese persons[9] with project increases in the number of disabled and functionally impaired older persons.[6] Most studies of the relationship between adiposity and physical function are in older adults only, lack assessments of muscle strength which is an important aspect of maintaining function, are limited by lack of comprehensive adiposity assessments that discern contributions from central versus overall adiposity, or have limited follow-up. In addition, longitudinal studies are particularly sparse and mostly limited to older, ethnically homogeneous participants.[5,7,8,10]

The aims of this study are to examine the association of weight, body mass index (BMI), waist circumference (WC), and waist-to-hip ratio (WHR) trajectories (visit 1-5) from midlife to older age with later life (visit 5, aged ≥65) physical function and strength among participants of the ARIC Study cohort.

5. Main Hypothesis/Study Questions:

Hypotheses:

1. Increases in adiposity over time, regardless of baseline, will be associated with poorer function and strength at Visit 5.
2. Maintenance of higher adiposity, (high baseline adiposity with little change over time), will be associated with poorer function and strength at Visit 5.
3. Weight trajectories may show stronger associations than individual adiposity marker trajectories (such as BMI or WC), particularly in older age (e.g. ≥70 years).
4. Low adiposity partnered with accelerated velocities of adiposity decline will be associated with poorer function and strength at visit 5, particularly in the oldest participants (such as ≥70 years), likely due to frailty and illness.

6. Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).

Study Design: Mixtures of Cross-Sectional and Longitudinal Data Analyses (LDA)
Exclusions: None
Outcomes: (PFX)

1. Physical Function (PF):
    a. SPPB (V5)
    b. gait speed (V5)
2. Strength: grip strength (V5)

Primary Predictors:

1. BMI (V1-V5)
2. Waist Circumference (V1-V5)
3. Weight (V1-V5)

Other Variables: age, sex, race-site, education, smoking status, alcohol status, comorbidity (hypertension, diabetes, coronary heart disease, (V1-V5), stroke (V2-V5)), blood pressure, BP meds, physical activity exercise (V1-V3,V5). Please see the included spreadsheet at end of proposal for a listing of specific variables.

Data Analysis (summary):
Our primary analytical architecture will employ General Linear Models (GLM), Generalized Linear Mixed Models (GLMM) and Non-Linear Mixed Models (NLMM) across a variety of approaches and definitions to address different specific questions and examine robustness of results across approach. Deaths, Dropouts and other missingness types will be handled through formal modeling approaches and sensitivity analyses. Proposed analyses include (but are not limited to):

1. Simplest Approach: Single timepoint BMI relationships with V5 PFX using a series of GLMs:
    a. Outcomes (Y_{5i}):
        i. SPPB: 0-12 scale, Semi-Continuous data
        ii. SPPB3cat: Three Category functional status outcome defined via clinical thresholds:
            3 = Ideal: $10 \leq$ SPPB
            2 = Intermediate: $6 \leq$ SPPB < 10
            1 = Poor: SPPB ≤ 5
        iii. SPPB4cat: Four Category functional status outcome defined via clinical thresholds and including Death as an outcome level
            3 = Ideal: $10 \leq$ SPPB
            2 = Intermediate: $6 \leq$ SPPB < 10
            1 = Poor: SPPB ≤ 5
            0 = Dead
        iv. Walking Speed (WS), Grip Strength (GS): Continuous data
    b. We will then use standard GLMs with adiposity measures from individual timepoints V1-V5 to estimate and compare cross-temporal relationships with V5 outcomes. Examples:
        i. $g(E(\mathbf{Y}_{5i}|b_i)) = \beta_0 + \beta_1\mathbf{BMI1}_i$ +adjustors/interactions
        ii. $g(E(\mathbf{Y}_{5i}|b_i)) = \beta_0 + \beta_1\mathbf{BMI2}_i$ +adjustors/interactions
        iii. $g(E(\mathbf{Y}_{5i}|b_i)) = \beta_0 + \beta_1\mathbf{BMI3}_i$ +adjustors/interactions
        iv. $g(E(\mathbf{Y}_{5i}|b_i)) = \beta_0 + \beta_1\mathbf{BMI4}_i$ +adjustors/interactions
        v. $g(E(\mathbf{Y}_{5i}|b_i)) = \beta_0 + \beta_1\mathbf{BMI5}_i$ +adjustors/interactions
    c. Expected GLM formulations include:
        i. Log-link, Negative Binomial Distributions: SPPB
        ii. Log/"logistic"-link, Multinomial Distributions: 4 Category SPPB
        iii. Log/"logistic"-link, ordinal (cumulative) Distributions (proportional odds (P.O.) models): 3 Category SPPB (if P.O. assumption hold)
        iv. identity-link, Gaussian distributions (GS)
    d. Sensitivity analyses will be conducted to examine potential effects of dropouts/missingness where appropriate, including inverse probability weighting approaches and selected value non-ignorable imputation approaches (best case\worst case, etc.).

2. Basic Trajectory Approach: Adiposity Trajectory relationships with V5 PFX using GLMMs\NLMMs:
    a. (*Predictor LDA submodel*) We will first define and examine adiposity trajectories (such as BMI) using GLMMs.
    Simple Example:
        i. $\mathbf{BMI}_{ij}|b_i = \gamma_0 + \gamma_1\text{time} + \mathbf{b}_{0i} + \mathbf{b}_{1i}\,\text{time}$ + adjustors/interactions+ e_{ij}
        ii. $\mathbf{b}_i \sim N(0, \boldsymbol{\tau}^2)$
        iii. $e_{ij}|b_i \sim N(0, \delta^2)$
        iv. Note: other terms includes adjustors, interactions, and other covariate terms

v. This formulation would imply each participant has his/her own estimated subject-specific adiposity intercept and slope defined by:
    1. $\mathbf{BMIint_i} = (\gamma_0 + \mathbf{b_{0i}})$
    2. $\mathbf{BMIslope_i} = (\gamma_1 + \mathbf{b_{1i}})$

b. (*Outcome GLM submodel*) We will then connect the estimated subject-specific BMI trajectories to PFX outcomes with similar GLMs as described in 1. above. Example:
    i. $g(\mathbf{Y}_{5i}|b_i) = \beta_0 + \beta_1\mathbf{BMIint_i} + \beta_2\mathbf{BMIslope_i}$ +adjustors/interactions

c. Initial exploratory analyses can proceed by fitting the predictor LDA submodel GLMM and estimating the corresponding subject-specific trajectory descriptors (such as intercepts and slopes or more sophisticated, nonlinear trajectories) in an initial model, and then including these subject-specific trajectory descriptors in a simple separate outcome submodel GLM (such as above). For final estimates however these two submodels will be estimated simultaneously (jointly) using NLMMs to obtain appropriate standard errors.

d. Sensitivity analyses will be conducted to examine potential effects of dropouts/missingness where appropriate, including a full likelihood shared-parameter model approach (see below) and selected value non-ignorable imputation approaches (best case\worst case, etc.).

3. <u>Non-Ignorable Dropout Trajectory Approach:</u> Adiposity Trajectory relationships with V5 PFX using Shared Parameter Models:
    a. The previous approaches take death and dropout effects into account by defining composite outcomes and conducting sensitivity analyses. Another approach, which has the benefit of additionally addressing potentially nonignorable missingness effects, is to include a Shared Parameter Model (joint LDA/Survival) approach by formally incorporating an additional survival submodel.
    b. (*Predictor LDA submodel*) We will first define and examine adiposity trajectories using GLMMs. Example:
        i. $\mathbf{BMI}_{ij}|b_i = \gamma_0 + \gamma_1\text{time} + \mathbf{b_{0i}} + \mathbf{b_{1i}}\,\text{time} + \text{other terms} + e_{ij}$
        ii. $\mathbf{b}_i \sim N(0, \boldsymbol{\tau}^2)$
        iii. $e_{ij}|b_i \sim N(0, \delta^2)$
        iv. This implies each participant will have their own estimated random intercept and slope defined by:
            1. $\mathbf{BMIint_i} = (\gamma_0 + \mathbf{b_{0i}})$
            2. $\mathbf{BMIslope_i} = (\gamma_1 + \mathbf{b_{1i}})$
    c. (*Survival submodel*) We will define additionally a parametric survival/dropout submodel with shared random effects. Accelerated Failure Time or Proportional Hazards Models (PHM) could be used. Example: (PHM)
        i. $\log\{H(T_i|b_i)\} = \log\{H_0(T_i)\} + \alpha_1\text{Educ} + \rho_0\mathbf{b_{0i}} + \rho_1\mathbf{b_{1i}}$
        Where H0(Ti) represents the hazard at time Ti for the ith individual to experience an event of interest (such as death); this can be parameterized to fit specific distributions (such as a constant term for exponential survival functions).

d. (*Outcome GLM submodel*) We will then connect the estimated subject-specific BMI trajectories to Functional Group status with similar multinomial/ordinal outcome models as described in 1. above. Example:
    i. $g(\mathbf{Y}_{5i}|b_i) = \beta_0 + \beta_1\mathbf{BMIint}_i + \beta_2\mathbf{BMIslope}_i$ +adjustors/interactions
e. Again, final results will be estimated using a joint model which simultaneously maximizes the full likelihood including all three submodels and their shared random effects.

We note that the subject-specific intercepts and slopes used above are only meant as example adiposity "trajectory" definitions. Alternative (nonlinear) trajectory definitions will be examined and may be formulated more generally from any appropriate function of the primary adiposity measures, $\text{Trajectory}_i = f(\text{BMI}_{i1},..,\text{BMI}_{i5})$, for inclusion in the outcome GLM submodels. Thus, one could include interactions of subject-specific intercepts with linear, quadratic, and/or spline-based adiposity changes in the outcome GLM model to examine whether participants who started at similar adiposity values but increased or decreased at different velocities were at heightened risk of Physical Function detriments. Additionally, trajectories can be defined using joint adiposity measures to examine whether adding information across measures contributes to physical function predictions; example: $\text{Trajectory}_i = f(\text{BMI}_{i1},..,\text{BMI}_{i5}; \text{Waist}_{i1},..,\text{Waist}_{i5})$. Separate race\site and sex effects will also be assessed using stratification and interaction terms. Finally, subhypotheses such as differential trajectory associations with PFX across subpopulations (i.e. effect modification by age group or other characteristics) can be examined using defined interaction terms in our proposed models.

Potential Tables & Figures:

- Table 1: Participant characteristics SPPB3cat (poor, intermediate, good SPPB)
- Table 2: Single time-point adiposity relationships with V5 Physical Function
    - From Approach 1 above
- Table 3: Adiposity Trajectory relationships with V5 Physical Function
    - From Approach 2 above (if nonignorable missingness does not play a large role)
    - From Approach 3 above (SPM: if nonignorable missingness does appear to affect estimates; otherwise Approach 3 estimates will appear as an appendix)
- Figure 1: Relationships between V5 PFX and Adiposity (V1-V5)
    - Likely for the most interesting adiposity marker with the others in appendices
- Figure 2: Relationships between Adiposity Trajectories and V5 PFX
- Appendix Figure 1: study flow diagram
- Other Appendix Tables as necessary

Limitations

Physical function assessments were only performed at visit 5

7.a. Will the data be used for non-CVD analysis in this manuscript?____ Yes _x_ No

b. If Yes, is the author aware that the file ICTDER03 must be used to exclude persons with a value RES_OTH = "CVD Research" for non-DNA analysis, and for DNA analysis RES_DNA = "CVD Research" would be used? ____ Yes ____ No

(This file ICTDER has been distributed to ARIC PIs, and contains
the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript? ____ Yes _x_ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER03 must be used to exclude those with value RES_DNA = "No use/storage DNA"? ____ Yes ____ No

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: http://www.cscc.unc.edu/ARIC/search.php
__x Yes _____ No

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?
MS #
1697 Functional Status and CVD
1798 Trajectory of Self-Rated health and Functional Status Before & After Cancer Dx
2077 Moderating Effects of Functional Status on BP-Mortality Relationship
830 Association between body composition and functional and self-rated health

11.a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data? ____ Yes _x_ No

11.b. If yes, is the proposal
___ A. primarily the result of an ancillary study (list number* _____)
___ B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)* _____ _____ _____)
*ancillary studies are listed by number at http://www.cscc.unc.edu/aric/forms/

12a. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

12b. The NIH instituted a Public Access Policy in April, 2008 which ensures that the public has access to the published results of NIH funded research. It is **your responsibility to upload manuscripts to PUBMED Central** whenever the journal does not and be in compliance with this policy. Four files about the public access policy from http://publicaccess.nih.gov/ are posted in http://www.cscc.unc.edu/aric/index.php, under Publications, Policies & Forms. http://publicaccess.nih.gov/submit_process_journals.htm shows you which journals automatically upload articles to Pubmed central.

References

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VARIABLE LIST

Measure	Visit	Dataset Name	Variable Name	Label	rena
ID	1	DERIVE13	ID	ARIC SUBJECT ID (CIR)	id
Date	1	DERIVE13	V1DATE01	Visit 1 date	vdate
Predictor	1	DERIVE13	BMI01	BODY MASS INDEX IN KG/(M*M)	bmi
Predictor	1	ANTA	ANTA07A	WAIST GIRTH TO NEAREST CM Q7A	waist
Predictor	1	ANTA	ANTA04	WEIGHT TO THE NEAREST LB Q4	weig
Predictor	1	ANTA	ANTA01	STANDING HEIGHT TO NEAREST CM Q1	heigh
Predictor	1	DERIVE13	WSTHPR01	WAIST-TO-HIP RATIO	waist
Demographics	1	DERIVE13	CENTER	ARIC FIELD CENTER (CIR)	cente
Demographics	1	DERIVE13	RACEGRP	RACE (from FTRA23)	race
Demographics	1	DERIVE13	GENDER	SEX (from FTRA22)	gend
Demographics	1	DERIVE13	V1AGE01	AGE AT VISIT 1	age
Demographics	1	DERIVE13	CIGT01	CIGARETTE SMOKING STATUS	smok
Demographics	1	DERIVE13	CURSMK01	Current cigarette smoker	currs
Demographics	1	DERIVE13	DRNKR01	DRINKER STATUS	drink
Demographics	1	DERIVE13	ELEVEL02	EDUCATION LEVEL, DEFINITION 2	educ
Comorbidity	1	DERIVE13	PREVHF01	Prevalent HF at Visit 1	HFse
Comorbidity	1	DERIVE13	PRVCHD05	PREVALENT CORONARY HEART DISEASE	CHDs
Comorbidity	1	DERIVE13	HYPERT04	HYPERTENSION, DEFINITION 4	htn
Comorbidity	1	DERIVE13	HYPTMDCODE01	Hypertension Lowering Medication within the Past 2 weeks (UC4688)	htnm
Comorbidity	1	DERIVE13	DIABTS02	DIABETES	diab
Comorbidity	1	DERIVE13	STATINCODE01	Statin use in the past 2 weeks based on 2004 medication codes	statir
Lipids	1	DERIVE13	TCHSIU01	TOTAL CHOLESTEROL in mmol/L	totch
Lipids	1	DERIVE13	TRGSIU01	TOTAL TRIGLYCERIDES in mmol/L	trigs
Lipids	1	DERIVE13	HDLSIU02	RE-CALIBRATED HDL CHOL. in mmol/L	hdl
Lipids	1	DERIVE13	LDLSIU02	RE-CALIBRATED LDL CHOL. in mmol/L	ldl
Acitvity	1	DERIVE13	WORK_I02	Physical activity at work, Definition 2	work
Acitvity	1	DERIVE13	LISR_I01	Physical activity during leisure time excluding sport	leisu
Acitvity	1	DERIVE13	SPRT_I02	Sport during leisure time	sport
Blood Pressure	1	SBPA	SBPA21	2ND AND 3RD SYSTOLIC BP AVERAGE Q21	sbp
Blood Pressure	1	SBPA	SBPA22	2ND AND 3RD DIASTOLIC BP AVERAGE Q22	dbp
Date	2	DERIVE13	V2DATE21	Visit 2 Date	vdate
Predictor	2	DERIVE13	BMI21	V2 body mass index in kg/m2	bmi
Predictor	2	ANTB	ANTB04A	WAIST GIRTH (NEAREST cm) Q4A	waist
Predictor	2	ANTB	ANTB01	WEIGHT TO NEAREST LB Q1	weig
Predictor	2	DERIVE13	WSTHPR21	V2 waist-hip ratio	waist
Demographics	2	DERIVE13	V2AGE22	Age at Visit 2	age
Demographics	2	DERIVE13	CIGT21	V2 cigarette smoking status	smok
Demographics	2	DERIVE13	CURSMK21	Current cigarette smoker	currs
Demographics	2	DERIVE13	DRNKR21	V2 drinking status	drink
Comorbidity	2	DERIVE13	PRVCHD21	V2 Prevalent Coronary Heart Disease	CHDs
Comorbidity	2	DERIVE13	PRVSTR21	Prevalence of Stroke at Visit 2	Strok
Comorbidity	2	DERIVE13	HYPERT24	V2 hypertension, definition 4	htn
Comorbidity	2	DERIVE13	HYPTMDCODE21	Hypertension Lowering Medication within past 2 weeks using updated medication codes	htnm
Comorbidity	2	DERIVE13	DIABTS22	V2 Diabetes	diab

Measure	Visit	Dataset Name	Variable Name	Label	rename

Comorbidity	2	DERIVE13	STATINCODE21	Statin use in the past 2 weeks based on 2004 medication codes	statin
Lipids	2	DERIVE13	TCHSIU21	V2 total cholesterol in mmol/L	totchol
Lipids	2	DERIVE13	TRGSIU21	V2 Total triglycerides in mmol/L	trigs
Lipids	2	DERIVE13	HDLSIU21	V2 HDL cholesterol in mmol/L	hdl
Lipids	2	DERIVE13	LDLSIU22	V2 LDL cholesterol in mmol/L	ldl
Blood Pressure	2	SBPB	SBPB21	2ND AND 3RD SYSTOLIC BP AVERAGE	sbp
Blood Pressure	2	SBPB	SBPB22	2ND AND 3RD DIASTOLIC BP AVERAGE	dbp
Date	3	DERIVE13	V3DATE31	VISIT 3 DATE	vdate
Predictor	3	DERIVE13	BMI32	Body Mass Index in kg/m**2	bmi
Predictor	3	ANTC04	ANTC3A	WAIST GIRTH (NEAREST cm) Q3A	waist
Predictor	3	ANTC04	ANTC2	WEIGHT TO NEAREST LB Q2	weight
Predictor	3	ANTC04	ANTC1	STANDING HEIGHT TO NEAREST CM Q1	height
Predictor	3	DERIVE13	WSTHPR31	Waist-to-hip ratio	waisthip
Demographics	3	DERIVE13	V3AGE31	Age at Visit 3	age
Demographics	3	DERIVE13	CIGT31	V3 CIGARETTE SMOKING STATUS	smoke
Demographics	3	DERIVE13	CURSMK31	Current cigarette smoker	currsmoke
Demographics	3	DERIVE13	DRNKR31	Drinker status	drink
Comorbidity	3	DERIVE13	PRVCHD31	V3 Prevalent Coronary Heart Disease	CHDself
Comorbidity	3	DERIVE13	PRVSTR31	Prevalent Stroke at Visit 3	Strokeself
Comorbidity	3	DERIVE13	HYPERT34	V3 HYPERTENSION, DEF. 4	htn
Comorbidity	3	DERIVE13	HYPTMDCODE31	(Hypertension Lowering Medication within past 2 weeks using updated medication codes	htnmed
Comorbidity	3	DERIVE13	DIABTS33	Diabetes Using Lower Cutpoint 140 mg/dL	diab
Comorbidity	3	DERIVE13	STATINCODE31	Statin use in the past 2 weeks based on 2004 medication codes	statin
Lipids	3	DERIVE13	TCHSIU31	Total Cholesterol in SI units	totchol
Lipids	3	DERIVE13	TRGSIU31	Triglycerides in SI units	trigs
Lipids	3	DERIVE13	HDLSIU31	Re-Calibrated HDL Cholesterol in mmol/L	hdl
Lipids	3	DERIVE13	LDLSIU32	Re-Calibrated LDL Cholesterol in mmol/L	ldl
Acitvity	3	DERIVE37	WORK_I32	Physical activity at work, Definition 2	workpa
Acitvity	3	DERIVE37	LISR_I31	Physical activity during leisure time excluding spor	leisurepa
Acitvity	3	DERIVE37	SPRT_I31	Sport during leisure time	sportpa
Blood Pressure	3	SBPC04	SBPC22	2ND AND 3RD SYSTOLIC BP AVERAGE	sbp
Blood Pressure	3	SBPC04	SBPC23	2ND AND 3RD DIASTOLIC BP AVERAGE	dbp
Date	4	DERIVE13	V4DATE41	Visit 4 Date	vdate
Predictor	4	DERIVE13	BMI41	Body Mass Index in kg/m**2	bmi
Predictor	4	ANTD04	ANTD3A	WAIST GIRTH (NEAREST cm) Q3A	waist
Predictor	4	ANTD04	ANTD2	WEIGHT TO NEAREST LB Q2	weight
Predictor	4	ANTD04	ANTD1	STANDING HEIGHT TO NEAREST CM Q1	height
Predictor	4	DERIVE13	WSTHPR41	Waist-to-hip Ratio	waisthip
Demographics	4	DERIVE13	V4AGE41	Age at Visit 4	age
Demographics	4	DERIVE13	CIGT41	Cigarette Smoking Status	smoke
Demographics	4	DERIVE13	CURSMK41	Current cigarette smoker	currsmoke
Demographics	4	DERIVE13	DRNKR41	Drinker status	drink
Comorbidity	4	DERIVE13	PRVCHD43	Prevalent CHD at V4, definition 3	CHDself
Comorbidity	4	DERIVE13	PRVSTR41	Prevalent Stroke at Visit 4	Strokeself
Comorbidity	4	DERIVE13	HYPERT44	Hypertension, Definition 4	htn
Comorbidity	4	DERIVE13	HYPTMDCODE41	Hypertension Lowering Meds w/in past 2 wks using 2004 med code	htnmed

Measure	Visit	Dataset Name	Variable Name	Label	rename
Comorbidity	4	DERIVE13	DIABTS41	Diabetes Using Lower Cutpoint 140 mg/dL	diab
Comorbidity	4	DERIVE13	STATINCODE41	Statin use in the past 2 weeks based on 2004 medication codes	statin
Lipids	4	DERIVE13	TCHSIU41	V4 Total Cholesterol in SI Units	totchol
Lipids	4	DERIVE13	TRGSIU41	TOTAL TRIGLYCERIDES in mmol/L	trigs
Lipids	4	DERIVE13	HDLSIU41	V4 HDL Cholesterol in SI Units	hdl
Lipids	4	DERIVE13	LDLSIU41	V4 LDL Cholesterol in SI Units	ldl
Blood Pressure	4	SBPD04	SBPD19	2ND AND 3RD SYSTOLIC BP AVERAGE	sbp
Blood Pressure	4	SBPD04	SBPD20	2ND AND 3RD DIASTOLIC BP AVERAGE	dbp
Date	5	DERIVE13	V5DATE51	Visit 5 Date, Stage 1	vdate
Predictor	5	DERIVE13	BMI51	V5 Body Mass Index (kg/m2)	bmi
Predictor	5	ANT	ANT10a	Waist Circumference	waist
Predictor	5	ANT	ANT4	Weight	weight
Predictor	5	ANT	ANT3	Standing Height	height
Predictor	5	DERIVE13	WSTHPR51	V5 Waist-to-Hip Ratio	waisthip
Demographics	5	DERIVE13		AGE AT VISIT 5	age
Demographics	5	DERIVE13	CURSMK52	V5 Current Cigarette Smoker	currsmoke
Demographics	5	DERIVE13	DRNKR51	V5 Drinker Status	drink
Comorbidity	5	DERIVE13		PREVALENT CORONARY HEART DISEASE	CHDself
Comorbidity	5	DERIVE13		Prevalent Stroke at Visit 5	Strokeself
Comorbidity	5	DERIVE13	HYPERT54	Hypertension, Definition 4	htn
Comorbidity	5	DERIVE13	HYPTMDCODE51	V5 Hypertension Lowering Medication in Past 4 weeks - Using 2004 med code	htnmed
Comorbidity	5	DERIVE13	DIABTS53	Diabetes - Lower Cutpoint 140 mg/dL	diab
Comorbidity	5	DERIVE13	STATINCODE51	V5 Statin Use in past 4 weeks - Using 2004 Med Cod	statin
Lipids	5	DERIVE13	TCHSIU51	V5 Total Cholesterol in SI Units	totchol
Lipids	5	DERIVE13	TRGSIU51	V5 Triglycerides in SI Units	trigs
Lipids	5	DERIVE13	HDLSIU51	V5 HDL Cholesterol in SI Units	hdl
Lipids	5	DERIVE13	LDLSIU51	V5 LDL Cholesterol in SI Units	ldl
Blood Pressure	5	SBP	SBP14	2ND AND 3RD SYSTOLIC BP AVERAGE	sbp
Blood Pressure	5	SBP	SBP15	2ND AND 3RD DIASTOLIC BP AVERAGE	dbp