Derived and adjusted variables

30 year follow-up (Q30)

2010-2012

A number of key variables were derived by BRHS researchers working with the BRHS data collected in 2010-2012 (Q30). These are variables that were computed by calculating or categorising existing variables in the BRHS dataset. These variables have been shared and widely used by other researchers working with the BRHS data.

Some of the physiological measurements were adjusted for observer error. The derived and adjusted variables that are available are listed below. A description/reference of the method used to derive/adjust each variable, is given in the sections that follow.

	Derived variables:	**section**
Behavioural	Smoking status categories Physical activity categories	1 2
Diet	Elderly Dietary Index (EDI) Healthy Diet Indicator (HDI) Macronutrient and micronutrient estimates Dietary patterns	3 4 5 6
Medications	Blood pressure medication Lipid lowering medications (including statins) Diabetes medication	7
Frailty	Frailty components 1) Exhaustion- no energy 2) Unintentional weight loss 3) Low physical activity 4) Slow walk 5) Low grip Frailty Score categories	8
Test your Memory (TYM) test	TYM total score TYM categories (Cognitive performance groups)	9
ECG	Left Ventricular Hypertrophy (LVH) Right Ventricular Hypertrophy (LVH) Conduction defects (CD) MI or Ischaemia grade (MISH) Atrial Fibrillation Atrial Flutter only Atrial Tachycardia only Atrial Fibrillation OR Flutter Atrial Fibrillation OR Flutter OR Tachycardia	10
Lung function	Fev1(height standardised)	11
BMI	Body Mass Index (BMI)	12
Height	Height (includes estimated height for non-attenders)	13

Adjusted variables:		**section**
Physiological (adjustment for observer and cuff size differences in BP measurements)	Mean sitting Systolic blood pressure Mean sitting Diastolic blood pressure	14

DERIVED VARIABLES

1. Smoking status

The participant responses to smoking related questions 20.0 -20.2 in the 30 year follow-up survey questionnaire[1] as well as the participant's previous smoking history (i.e. responses to smoking related questions from previous waves of questionnaires) were used to assign a smoking status category for each BRHS participant at the Q30(2010-2012) study time point as shown in the table below.

Derived variables Smoking	Value labels/categories	BRHS Variable name	Data access
Q30 Smoking status (8 categories)	1= Never Smoked 2= Gave up before Q1(1978-80) 3= Gave up between Q1 and Q5(1983) 4= Gave up between Q5(1983) and Q92(1992) 5= Gave up between Q92(1992) and Q96(1996) 6= Gave up between Q96(1996) and Q20(1998-2000) 7= Gave up between Q20(1998-2000) and Q30(2010-2012) 8= Current Smoker (2010-2012) 99= Missing - smoking status unavailable	q30smok8	Yes

[1] **BRHS 2010-12 30 year follow-up survey Qr Q30.pdf**

2. Physical activity

"A physical activity (exercise) score was derived for each man based on the frequency and type (intensity) of the physical activity. Scores were assigned for each type of activity and duration based on the intensity and energy demands of the activities reported. This was based on the recommendations of a National Heart, Lung and Blood Institute (NHLBI) workshop and the Minnesota intensity codes. Scores were heavily weighted on vigorous exercise. Physical activity at work was excluded from the score partly because few middle-aged men do physically demanding work and partly because such activity is not readily amenable to modification. Though the gradings were arbitrary we tried to ensure that any given score implied approximately equal intensity and energy demands for the various types of activity. The total score for each man was not a measure of total time spent in physical activity but was a relative measure of how much physical activity has been carried out or energy expended. Regular walking and cycling related to weekday journeys, including those to and from work. Recreational activity includes gardening, pleasure walking, and do-it-yourself jobs. Sporting (vigorous) activity includes running, golf, swimming, tennis, sailing, digging, etc. It was not possible to identify the type of vigorous activity for each man (copies of the questionnaire are available on request) but it was regarded as being vigorous."

1. *Shaper AG, Wannamethee G, Weatherall R. Physical activity and ischaemic heart disease in middle-aged British men. Br Heart J1991;66:384–94.*

Derived variables Physical activity	Value labels/categories	BRHS Variable name	Data access available
Q30 Physical Activity status	0= Inactive 1= Occasional 2= Light 3= Moderate 4= Moderate vigorous 5= Vigorous	q30pa	Yes

3. Elderly Dietary Index (EDI)

The EDI was developed by Kourlaba et al, specifically to address adherence to nutritional recommendations for older adults, based on the frequency of consumption of specific foods/food groups in the Modified MyPyramid for Older Adults.3, 4 The EDI consisted of nine components (meat; fish and seafood; vegetables; cereals; fruit; legumes; olive oil; dairy; bread), each assigned a four-point scoring system based on frequency of consumption, resulting in a total score range from 9-36. The frequency of olive oil consumption was not available so the scoring of this component was modified from the original score used (1 = <1 day/week; 2 = 1-2 days/week; 3 = 3-6 days/week; 4 = daily) to the quantity of weekly consumption (never/rarely consumed and tertiles of weekly consumption). The derived EDI components and total score are based on responses to the dietary questions, PART II of the 30 year follow up survey questionnaire[5].

References:

1. Atkins JL, Whincup PH, Morris RW, Lennon LT, Papacosta O, Wannamethee SG. High diet quality is associated with a lower risk of cardiovascular disease and all-cause mortality in older men. J Nutr. 2014 May;144(5):673-80. doi: 10.3945/jn.113.186486. Epub 2014 Feb 26.
2. Parsons TJ, Papachristou E , Atkins JL, Papacosta O, Ash S, Lennon L, Whincup PH, Ramsay SE, Wannamethee SG. Healthier diet quality and dietary patterns are associated with lower risk of mobility limitation in older men. European Journal of Nutrition 2018; Epub Jul 23
3. Kourlaba G, Polychronopoulos E, Zampelas A, Lionis C, Panagiotakos DB. Development of a diet index for older adults and its relation to cardiovascular disease risk factors: the Elderly Dietary Index. Journal of the American Dietetic Association. 2009;109:1022-30.
4. Lichtenstein AH, Rasmussen H, Yu WW, Epstein SR, Russell RM. Modified MyPyramid for Older Adults. The Journal of nutrition. 2008;138:5-11.
5. **BRHS 2010-12 30 year follow-up survey Qr Q30.pdf**

Elderly Dietary Index (EDI) components and scoring criteria:

Elderly Dietary Index Scoring (EDI)				
Component	**Score = 1**	**Score = 2**	**Score = 3**	**Score = 4**
Meat	≥3 days/week	Never/rarely	<1 day/week	1-2 days/week
Fish/Seafood	Never/rarely	<1 day/week	≥3 days/week	1-2 days/week
Legumes	Never/rarely	<1 day/week	≥3 days/week	1-2 days/week
Fruit	<1 day/week	1-2 days/week	3-6 days/week	Daily
Vegetables	<1 day/week	1-2 days/week	3-6 days/week	Daily
Cereals	<1 day/week	1-2 days/week	3-6 days/week	Daily
Bread	None	White	White & whole grain	Whole grain
Olive oil	Never/Rarely	Tertile 1 of intake	Tertile 2 of intake	Tertile 3 of intake
Dairy	Full-fat milk and full-fat cheese	Semi-skimmed milk and full-fat cheese / full-fat milk and low-fat cheese	Skimmed milk and full-fat cheese	Skimmed/Semi-skimmed milk and low-fat cheese
Alcohol	> 4 glasses wine/day	3-4 glasses wine/day	No consumption	> 0-2 glasses wine/day

Derived variables **EDI component score**	**Value labels/categories**	**BRHS Variable name**	**Data access**
Bread	1-4 as above	q30EDI_bread	yes
Vegetables	1-4 as above	q30EDI_veg	Yes
Fruit	1-4 as above	q30EDI_fruit	Yes
Legumes	1-4 as above	q30EDI_legume	Yes
Meat	1-4 as above	q30EDI_meat	Yes
Cereals	1-4 as above	q30EDI_cereal	Yes
Olive oil	1-4 as above	q30EDI_olive_oil	Yes
Fish/Seafood	1-4 as above	q30EDI_fish	Yes
Dairy	1-4 as above	q30EDI_dairy	Yes
Alcohol	1-4 as above	q30EDI_alcohol	Yes
EDI Total score (sum of all components excluding alcohol)	11-33	q30EDI_total_9_woALC	Yes
EDI Total score (sum of all components including alcohol)	16-37	q30EDI_total_10_withALC	Yes

4. Healthy Diet Indicator (HDI)

The HDI was constructed using WHO dietary guidelines for the intake of nutrients and food components, as initially used by Huijbregts et al.1, 2 The HDI consisted of eight components (SFA; PUFA; protein; carbohydrates; sugar; fibre; fruit and vegetables; cholesterol), each scoring one if the dietary guideline was met and zero otherwise, resulting in a total score range from 0-8. Dietary data for pulses, nuts and seed were unavailable so this component could not be included in the HDI. The cut-off points for PUFA and fibre intake were modified for use in a British population as performed previously.3, 4 The weight of fruit and vegetables consumed was not available, so this component was modified from the original scoring used (1 = ≥400g/day; 0 = < 400g/day) to the consumption of both fruit and vegetables daily. The derived HDI components and total score are based on responses to the dietary questions, PART II of the 30 year follow up survey questionnaire[6].

References:

1. Atkins JL, Whincup PH, Morris RW, Lennon LT, Papacosta O, Wannamethee SG. High diet quality is associated with a lower risk of cardiovascular disease and all-cause mortality in older men. J Nutr. 2014 May;144(5):673-80. doi: 10.3945/jn.113.186486. Epub 2014 Feb 26.
2. World Health Organization. Diet, nutrition and the prevention of chronic disease. Joint WHO/FAO expert consultation. WHO Technical Report Series, No 916. Geneva: WHO; 2003.
3. Huijbregts P, Feskens E, Rasanen L, Fidanza F, Nissinen A, Menotti A, Kromhout D. Dietary pattern and 20 year mortality in elderly men in Finland, Italy, and The Netherlands: longitudinal cohort study. BMJ. 1997;315:13-7.
4. Maynard M, Ness AR, Abraham L, Blane D, Bates C, Gunnell DJ. Selecting a healthy diet score: lessons from a study of diet and health in early old age (the Boyd Orr cohort). Public health nutrition. 2005;8:321-6.
5. McNaughton SA, Bates CJ, Mishra GD. Diet quality is associated with all-cause mortality in adults aged 65 years and older. The Journal of nutrition. 2012;142:320-5.
6. **BRHS 2010-12 30 year follow-up survey Qr Q30.pdf**

Healthy Diet Indicator (HDI) components and scoring criteria:

Healthy Diet Indicator Scoring (HDI)		
Component	**Score = 0**	**Score = 1**
SFA (% energy)	>10	0-10
PUFA (% energy)	<6 and >10	6 - 10
Protein (% energy)	<10 and >15	10 - 15
Total carbohydrates (% energy)	<50 and >70	50-70
Sugar (% energy)	>10	0-10
Dietary Fibre (g/day)	<18 and >32	18-32
Cholesterol (mg/d)	>300	0-300
Fruits and Vegetables	Less frequent than daily consumption of both	Daily consumption of both

Derived variables **Healthy Diet Indicator (HDI)**	**Value** **labels/categories**	**BRHS** **variable name**	**Data** **access**
Healthy Diet Indicator (HDI) Total score (sum of HDI components)	0-6	q30HDI_total	Yes

5. Macronutrient and micronutrient estimates

A validated computer programme was used to calculate the total macronutrient and micronutrient intakes of all foods reported as consumed by the BRHS participants in the FFQ of PART II of the 30 year follow up survey questionnaire[3]. and hence the total energy intake (Ref 1). This computer programme multiplied food frequency by standard portion sizes for each food and by the nutrient composition of the food obtained from the UK food composition tables (Ref 2). The distribution of total energy intakes was checked for any extreme values. A list of the macronutrient and micronutrient with estimated intakes are shown in the table below.

1: Wannamethee, SG, Lowe, GD, Rumley, A, et al. (2006) Associations of vitamin C status, fruit and vegetable intakes, and markers of inflammation and hemostasis. *Am J Clin Nutr* 83, 567–574.
2: Holland, B, Welch, AA, Unwin, ID, et al. (1991) McCance and Widdowson's the Composition of Foods, 5th ed. London: Royal Society of Chemistry and Ministry of Agriculture, Fisheries and Food.
3. **BRHS 2010-12 30 year follow-up survey Qr Q30.pdf**

Derived variables Macronutrients and micronutrients	Units	BRHS Variable name	Data Access
Fat	mg/d	q30_FAT	yes
Saturated fat	mg/d	q30_SAT	yes
Polyunsaturated fat	mg/d	q30_POLY	yes
Protein	mg/d	q30_PROT	yes
Carbohydrate	mg/d	q30_CHO	yes
Starch	mg/d	q30_STCH	yes
Sugar	mg/d	q30_SUG	yes
Alcohol	mg/d	q30_ALC	yes
Cereal fibre	mg/d	q30_CF	yes
Vegetable fibre	mg/d	q30_VF	yes
Vitamin C	mg/d	q30_VITC	yes
Total daily k calories	kcal	q30_KCAL	yes
Cholesterol	mg/d	q30_CHOLEST	yes
Retinol (ie dietary vitamin A)	mg/d	q30_RETINEL	yes
Beta carotene	mg/d	q30_B_CAROT	yes
Alpha tocopherol (ie dietary vitamin E)	mg/d	q30_A_TOCOP	yes
Dietary intake linoleic acid	mg/d	q30_LINOLEIC	yes
Iron	mg/d	q30_IRON	yes

6. Dietary patterns

Responses to the FFQ, PART II of the 30 year follow up survey questionnaire[3], were used to generate 34 food groups. Principal component analysis identified dietary patterns that were categorised into quartiles, with higher quartiles representing higher adherence to the dietary pattern. Three interpretable dietary patterns were identified: **'high fat/low fibre'** (high in red meat, meat products, white bread, fried potato, eggs), **'prudent'** (high in poultry, fish, fruits, vegetables, legumes, pasta, rice, wholemeal bread, eggs, olive oil) and **'high sugar'** (high in biscuits, puddings, chocolates, sweets, sweet spreads, breakfast cereals)[1]

Derived Dietary patterns		BRHS Variable name	Data access
High fat/low fibre diet	PCA factor scores	q30pc1_highfat_lowfibre	yes
High fat/low fibre diet quartiles	PCA factor score quartiles	q30pc1_quart_highfat_lowfibre	yes
Prudent diet	PCA factor scores	q30pc2_prudent	yes
Prudent diet quartiles	PCA factor score quartiles	q30pc2_quart_prudent	yes
High sugar	PCA factor scores	q30pc3_high_sugar	yes
High sugar quintiles	PCA factor score quartiles	q30pc3_quart_high_sugar	yes

1. Parsons TJ, Papachristou E , Atkins JL, Papacosta O, Ash S, Lennon L, Whincup PH, Ramsay SE, Wannamethee SG. Healthier diet quality and dietary patterns are associated with lower risk of mobility limitation in older men. European Journal of Nutrition 2018; Epub Jul 23
2. Janice L. Atkins et al. Dietary patterns and the risk of CVD and all-cause mortality in older British men. British Journal of Nutrition (2016), 116, 1246–1255
3. **BRHS 2010-12 30 year follow-up survey Qr Q30.pdf**

7. Medications – derived variables

Responders to the 30 year follow-up survey questionnaire[1] were asked to list the names of regular medications taken, the reason they were taken, the year started and whether the listed medication was prescribed. Using this information, (question 45.0) the medications were coded according to the British National Formulary (BNF) classification codes. Variables indicating whether BRHS participants were taking certain types of medications were derived based on defined BNF codes.

1. **BRHS 2010-12 30 year follow-up survey Qr Q30.pdf**

The derived medication variables are listed below.

Derived variables **Medications**	**Value, labels/categories**	**BRHS Variable name**	Data access
Blood Pressure lowering medication			
BNF codes : 2.2.1, 2.2.3, 2.2.4, 2.2.8, 2.4, 2.5.1 to 2.5.5, 2.6.2	0= not on BP lowering medication 1= taking BP lowering drugs (reason: ICD codes 401 429 459) 2= taking BP lowering drugs (reason: not for hypertension (ICD other than those above)) 9= taking BP lowering drugs (reason: not specified) [usually grouped with code 1 – assume taken for BP] .= missing data on drug taking	q30bpmed_icd	Yes
Lipid lowering medication:			
1) on Lipid lowering medication [BNF codes 2.12 (derived from medications listed in Question 45.0)]	0= not on lipid lowering meds 1= on lipid lowering meds	q30bnf212_lipidlowering	Yes
2) on Statins [Codes 20-29 from Question 44.3: Atorvastatin, Fluvastatin, Pravastatin, Simvastatin, Rosuvastatin, Simvastatin with Ezetimibe, statin (medicine name not given)]	0=not on Statins 1=on Statins	q30onStatins	Yes
Diabetes medication:			
Diabetic med Insulin BNF codes 6.1.1	0=not on insulin(BNF6.1.1) 1=on insulin(BNF6.1.1)	q30bnf611_insulin	Yes
Diabetic medication BNF codes 6.1.2	0=not on diabetic medication 1=on diabetic medication	q30bnf612_diabMed	Yes

8. FRAILTY

Assessment of frailty was based on the 'Fried frailty phenotype'[2] using both questionnaire and objective data. This included unintentional weight loss (assessed as ≥5% decrease in self-reported weight that was reported to be unintentional); exhaustion (if response to the question 'Do you feel full of energy?' was 'no'); weakness (assessed as lowest fifth of grip strength distribution – grip strength was assessed during the physical examination. See section 3.2.12 of the 30 year follow-up physical examination protocol[3] for method ; and slow walking speed (lowest fifth of walking speed – assessed during the physical examination see 3.2.2 for method[3]. If walking speed was unavailable, self-report of slow walking pace (being unable to walk more than a few steps or <200 yards or difficulty walking across a room) or low physical activity (self-report of being less/much less active than an average man). Presence of three or more of these components was defined as frailty, and presence of one or two as pre-frailty.

1. Ramsay SE, Arianayagam DS, Whincup PH, et al. Cardiovascular risk profile and frailty in a population-based study of older British men. Heart 2015;101:616–22.
2. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype.J Gerontol A Biol Sci Med Sci 2001;56:M146–57.
3. **BRHS 2010-12 30 year follow-up survey Qr Q30.pdf**

Frailty components	Value, labels/categories	BRHS Variable name	Data access
1) Exhaustion- no energy	0=no, 1=yes	q30exh	yes
2) Unintentional weight loss	0=no, 1=yes	q30uwtloss	Yes
3) Low physical activity	0=no, 1=yes	q30lowact	Yes
4) Slow walk	0=no, 1=yes	q30slow_walk	Yes
5) Low grip strength	0=no, 1=yes	q30low_grip	Yes
Frailty Score (categories)	0= Not frail	q30frailscore	yes
	1=pre-frail (total score 1 or 2)		
	2=frail (total score 3,4 or 5)		

9. Test Your Memory (TYM)

At the 30 year BRHS follow-up examination participant's cognitive skills were assessed using the Test Your Memory questionnaire(TYM) developed by Brown et al[1,4]. The TYM questionnaire is a 10-task self assessment test that covers a broad range of cognitive domains including orientation, copying, semantic knowledge, calculation, fluency, similarities, naming, visuospatial abilities, anterograde memory and executive functioning[1].

1.Testing

The TYM questionnaire was completed by the BRHS participants while waiting for their physical examination. The TYM's testing instructions[4] were followed.

2.Scoring

Scoring of the test was done using the TYM's scoring instructions[4]. The last item is scored according to whether the TYM was completed with help from others or not (major = 1 to none = 5). Because the BRHS participants completed the TYM in a controlled setting without assistance, the maximum score of 5 was given to all participants for this item. Total TYM scores range between 0 and 50 with higher scores indicating superior cognitive performance. Upon calculating the total TYM scores, participants were divided into three categories: a normal cognitive ageing group, a group with MCI and one with SCI. Cut-offs for the respective categories were based on the original TYM scores[1,3] Specifically, scores below 33 were considered consistent with Severe Cognitive impairment(SCI), while scores between 33 and 45 (if older than 80 years of age) or 46 (if younger than 80 years of age) were considered to be indicative of Mild Cognitive Impairment(MCI)[2].

Derived Cognitive performance group	TYM Score range
0 = Severe Cognitive Impairments (SCI)	Total TYM score below 33
1 = Mild Cognitive Impairments (MCI)	Total TYM score between 33 and 45 (if 80+ years of age) or 33 and 46 (if younger than 80 years of age)
2 = Normal Cognitive Ageing	Total TYM score above 45 (if 80+ years of age) or 46 (if younger than 80 years of age)

1. Brown J, Pengas G, Dawson K, et al. 2009. Self administered cognitive screening test (TYM) for detection of Alzheimer's disease: cross sectional study. BMJ 338: b2030

2. Papachristou E, Ramsay SE, Papacosta O, Lennon LT, Iliffe S, Whincup PH, et al. The Test Your Memory cognitive screening tool: sociodemographic and cardiometabolic risk correlates in a population-based study of older British men. International journal of geriatric psychiatry. 2015. Epub 2015/10/23.

3. Royal College of Psychiatrists (Rpsych). 2013. Interpreting the TYM [Online]. Available :http://www.rcpsych.ac.uk/pdf/TYM_Interpreting.pdf Accessed 26 July 2015; http://www.tymtest.com/

4. **BRHS 2010-12 (Q30) 30yr follow-up TYM Cognitive assessment Documentation.docx**

Derived variable Description	value labels/categories	BRHS Variable name	Data access
Total TYM Score	0-50	Q30total_tym_score	yes
TYM score categories (Cognitive performance groups)	0=Severe Cognitive Impairments(SCI) 1=Mild Cognitive Impairments(MCI) 2=Normal Cognitive Ageing	Q30tym_score_3categ	yes

10.Derived variables using ECG Minnesota codes

Minnesota codes were used in algorithms to obtain Left Ventricular Hypertrophy (LVH), Right Ventricular Hypertrophy (LVH), Conduction defects (CD), MI or Ischaemia grade (MISH), Atrial fibrillation(AF), Atrial Flutter together, Atrial Tachycardia

Derived variables Description	Value label	BRHS Variable name	Reference algorithm:	Data access
MI or Ischaemia grade Classified using Minnesota codes from ECG	1='definite MI - acute' 2='definite MI' 3='probable MI' 4='definite ischaemia' 5='probable ischaemia' 6='possible ischaemia'	q30ecg_mish	SAS code[1]	yes
Left Ventricular Hypertrophy Classified using Minnesota codes from ECG	1 = definite LVH 2 = probable LVH 3 = possible LVH	q30ecg_lvh	SAS code[1]	yes
Right Ventricular Hypertrophy Classified using Minnesota codes from ECG	1 = definite RVH 2 = probable RVH 3 = possible RVH	q30ecg_rvh	SAS code[1]	yes
Conduction defects based in Minnesota codes LBBB = Left Bundle Branch Block RBBB = Right Bundle Branch Block CHB = Complete Heart Block WPW= Wolff Parkinson White syndrome	1 = LBBB 2 = RBBB 3 = CHB 4 = WPW 5 = LBBB and WPW 6 = RBBB and CHB	q30ecg_cd	SAS code[1]	yes

Classified using Minnesota codes from ECG				
Atrial Fibrillation only	1=yes, 0=no	Q30atrial_fibr	NOTE 1	yes
Atrial Flutter only	1=yes, 0=no	Q30atrial_flutter	NOTE 1	yes
Atrial Tachycardia only	1=yes, 0=no	Q30tachycardia	NOTE 1	yes
Atrial Fibrillation OR Fluter	1=yes, 0=no	Q30atrial_fib_flu	NOTE 1	yes
Atrial Fibrillation OR Flutter OR Tachycardia	1=yes, 0=no	Q30atrial_fib_flu_tac	NOTE 1	yes

SAS code[1] deriving:-

Left Ventricular Hypertrophy (LVH)
Right Ventricular Hypertrophy (LVH)
Conduction defects (CD)
MI or Ischaemia grade (MISH)

```
ecg=1;
if p_axis lt -327 then p_axis = .;
if qrs_axis lt -327 then qrs_axis= .;
if t_axis lt -327 then t_axis= .;
/*   to remove certain LBBBs        */
if ((mg1_l ge 110 and mg1_l le 119) or  (mg1_p ge 110 and mg1_p le 119)  or  (mg1_a ge 110 and mg1_a le 119)) or ((mg1_l ge
121 and mg1_l le 126)  or  (mg1_p ge 121 and mg1_p le 126)  or  (mg1_a ge 121 and mg1_a le 126)) and  mg7_1=711 then
mg7_1=740;
```

*** CREATE Left Ventricular Hypertrophy using Minnesota codes * (LVH) ;**

```
if ecg=1 then lvh=0;
if (mg3 = 310 or mg3 = 330) and (mg4_l = 412 or mg4_l = 420 or mg4_p = 412   or mg4_p = 420 or mg4_a = 412
or mg4_a = 420 or mg4_a=411   or mg5_l = 510 or mg5_l = 520 or mg5_p = 510   or mg5_p = 520 or mg5_a = 510
or mg5_a = 520) then lvh=1;
if mg3 = 310 and lvh ne 1 then lvh = 2;
if mg3 = 330 and lvh ne 1 then lvh = 3;
```

*** CREATE Conduction defects using Minnesota codes * (CD);**

```
cd=.;
if mg7_1 = 711 then cd=1;
if mg7_1 = 721 then cd=2;
if mg6 = 610 then cd=3;
if mg6 = 641 then cd=4;
if mg7_1 = 711 and mg6 = 641 then cd=5;
if mg7_1 = 721 and mg6 = 610 then cd=6;
```

*** CREATE MI or Ischaemia grade using Minnsesota codes * (MISH);**

```
if ecg = 1 then mish=0;
if (mg4_l ge 430 and mg4_l le 439) or  (mg4_p ge 430 and mg4_p le 439) or  (mg4_a ge 430 and mg4_a le 439)
or (mg5_l ge 530 and mg5_l le 549) or  (mg5_p ge 530 and mg5_p le 549) or  (mg5_a ge 530 and mg5_a le 549)
then mish=6;
if (mg4_l ge 420 and mg4_l le 429) or  (mg4_p ge 420 and mg4_p le 429) or  (mg4_a ge 420 and mg4_a le 429)
or (mg5_l ge 520 and mg5_l le 529) or  (mg5_p ge 520 and mg5_p le 529) or  (mg5_a ge 520 and mg5_a le 529)
then mish=5;
if (mg4_l ge 410 and mg4_l le 419) or  (mg4_p ge 410 and mg4_p le 419) or  (mg4_a ge 410 and mg4_a le 419)
or (mg5_l ge 510 and mg5_l le 519) or  (mg5_p ge 510 and mg5_p le 519) or  (mg5_a ge 510 and mg5_a le 519)
then mish=4;
if (mg1_l ge 121 and mg1_l le 127) or  (mg1_p ge 121 and mg1_p le 127) or  (mg1_a ge 121 and mg1_a le 127)
then mish=3;
if ((mg1_l ge 110 and mg1_l le 119) or  (mg1_p ge 110 and mg1_p le 119)  or  (mg1_a ge 110 and mg1_a le 119))
or ((mg1_l ge 121 and mg1_l le 127)  or (mg1_p ge 121 and mg1_p le 127)   or (mg1_a ge 121 and mg1_a le 127)) and ((mg5_l
ge 510 and mg5_l le 539) or (mg5_p ge 510 and mg5_p le 539)  or (mg5_a ge 510 and mg5_a le 539)) then mish=2;
if ((mg1_l ge 110 and mg1_l le 119) or  (mg1_p ge 110 and mg1_p le 119)  or  (mg1_a ge 110 and mg1_a le 119))
or ((mg1_l ge 121 and mg1_l le 127)  or (mg1_p ge 121 and mg1_p le 127)   or (mg1_a ge 121 and mg1_a le 127)) and ((mg9_l
ge 920 and mg9_l le 929) or (mg9_p ge 920 and mg9_p le 929)  or (mg9_a ge 920 and mg9_a le 929)) then mish=2;
if ((mg9_l ge 920 and mg9_l le 929) or (mg9_p ge 920 and mg9_p le 929)  or (mg9_a ge 920 and mg9_a le 929)) and mish=2
then mish=1;
if ecg ne 1 then mish = .;
```

```
* CREATE Right Ventricular Hypertrophy using Minnesota codes * (RVH);
if ecg=1 then rvh=0;
if mg3=320 then rvh=3;
if mg3=320 and (mg4_l = 420 or mg4_p = 420 or mg4_a = 420  or mg5_l = 520 or mg5_p = 520 or mg5_a = 520)
then rvh = 2;
if mg3=320 and (mg4_l = 412 or mg4_p = 412 or mg4_a = 412 or mg4_a = 411 or mg5_l = 510 or mg5_p = 510 or mg5_a = 510)
then rvh = 1;

* DERIVED ECG VARIABLES FOR Q20: *;
q20ecg_mish=mish;
q20ecg_lvh=lvh;
q20ecg_rvh=rvh;
q20ecg_cd=cd;
*END*;
```

NOTE1:

Deriving Atrial Fibrillation (AF), Atrial Flutter together, Atrial Tachycardia

Atrial fibrillation (AF) was defined as Minnesota codes 8.3.1 and 8.3.3.
Atrial flutter was defined as Minnesota codes 8.3.2 and 8.3.4
Atrial tachycardia was defined as Minnesota codes 8.4.1 and 8.4.2
Atrial Fibrillation OR Fluter was defined as Minnesota codes 8.3.1 to 8.3.4
Atrial Fibrillation OR Flutter OR Tachycardia was defined as Minnesota codes 8.3.1 to 8.3.4 and 8.4.1, 8.4.2

11. FEV1

Derived variable of height standardised FEV1.
FEV1 is standardised for the mean height of the population at Q30(2010-12) (mean height=1.712672m) using the equation:
*Q30afev1=q30fev1x((**1.713**/q20ht)^2)* where q30fev1 and q30ht are the participant's Fev1 and height as measured during the physical examination. (see **BRHS 2010-12 (Q30) 30yr follow-up Physical examination protocol.pdf**)

Derived variables	units	BRHS Variable name	Data access
standardised FEV1	L	q30fev1_adj	Yes

12. Body Mass Index (BMI)

Body mass Index was calculated/derived using the measured height and weight from the 30 year follow-up physical examination(Q30).

BMI = Weight (kg)/ Height (m)^2

Derived variables	units	BRHS Variable name	Data access
Body Mass Index (BMI)	kg/m^2	q30bmi	Yes

13.Height estimates

At the 30 year follow-up in 2010-12(Q30) height is available for 1713 out of the 1722 participants who attended the physical examination. Approximately 400 participants who only responded to the 30 year follow-up questionnaire but did not attend the physical examination do not have a height measurement. An estimated height for those who did not attend the physical examination but completed a questionnaire was calculated using the participant's last available measured height (in 1978(Q1) or 1998(Q20)) and applied the average change in height in BRHS participants for the period from when height was last measured and the 30 year follow-up in 2010-12(Q30).

Therefore

Estimate 1 **Variable: q30ht_est2_usingQ1Q20**

(i) for those participants with no height measurement at the 30 year follow-up in 2010-12(Q30) but with measured height at the 20 year follow-up in 1998-2000(Q20) height was estimated by applying the observed mean change in measured height in BRHS participants between the 20 year and 30 year follow-up examinations to their measured height at the 20 year follow-up examination(1998-2000)Q20.

(ii) those who did not attend the 20 or 30 year follow-up, the observed mean change in height from baseline in 1998-80(Q1) to the 30 year follow-up was applied to their measured height at baseline(1978-80)Q1 to estimate height in 2010-12(Q30).

Estimate 2 **Variable: q30ht_est_usingQ1**

(i) for those participants with no height measurement at the 30 year follow-up, the mean change in height from baseline in 1998-80(Q1) to the 30year follow-up(Q30) found in BRHS participants was applied to their measured height at baseline(1978-80)Q1 to estimate height in 2010-12(Q30).

	Time point/year	BRHS Variable	N	Mean	StdDev
Height at Baseline (Q1)	Q1 (1978-80)	q1height	7735	1.73464	0.148537
Height at 20yr follow-up (Q20)	Q20 (1998-2000)	q20ht	4235	1.723061	0.065218
Height at 30yr follow-up (Q30)	Q30 (2010-2012)	q30ht	1713	1.712672	0.064815
Height difference (m)	Q1 to Q30	q1q30height_diff	1713	0.031743	0.021752
Height difference (m)	Q20 to Q30	q20q30height_diff	1584	0.01908	0.017331

Derived variables	**units**	**BRHS Variable name**	**Data access**
Height (estimated Q30 height using only Q1 measured height and mean change Q1 to Q30)	m	q30ht_est_usingQ1	
Height (estimated Q30 height using mean change from Q1 and Q20 to Q30 measured height)	m	q30ht_est2_usingQ1Q20	Yes

14. Adjusted measurements

Adjusted physiological measurements

Sitting Systolic and Diastolic blood pressure (SBP, DBP)

i) Differences in sitting SBP and DBP between cuff sizes and observers were detected. To correct for cuff size differences in sitting SBP and DBP the values of 4.6 and 1.7 were added to each participant's mean sitting SBP and DBP respectively with cuff size >3.2cm. The mean sitting SBP and DBP for each participant was the average of their two BP readings.

ii) For the adjustment of observer differences the method by Bruce et al[1] was used.

1. Bruce NG, Shaper AG, Walker M, Wannamethee G. Observer bias in blood pressure studies. Journal of Hypertension 1988; 6(5):375-380.

Adjusted variables **Blood Pressure**	**units**	**BRHS** **Variable name**	**Data access**
Sitting SBP (mean)	mmHG	q30sbpsit12_adj	yes
Sitting DBP (mean)	mmHG	q30dbpsit12_adj	yes