

## Supplementary file

### The clustering of risk behaviours in adolescence and health consequences in middle age

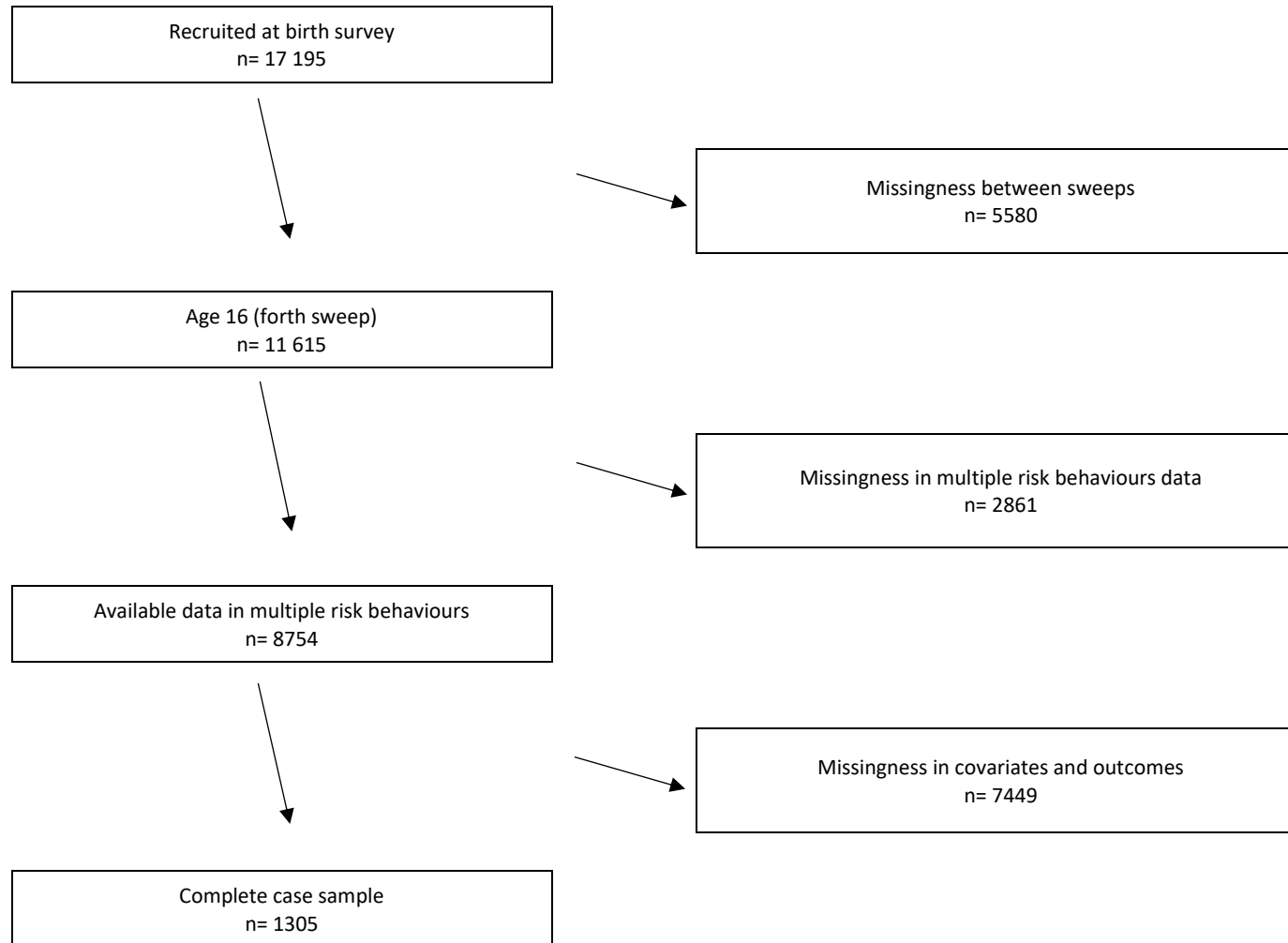
Akasaki M<sup>1</sup>, Ploubidis GB<sup>1</sup>, Dodgeon B<sup>1</sup>, Bonell CP<sup>2</sup>

1. UCL Centre for Longitudinal Studies, Institute of Education, University College London, 20 Bedford Way, London WC1H 0AL United Kingdom
2. Department of Public Health, Environments and Society, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, United Kingdom

Corresponding author: Mifuyu Akasaki

Email; [mifuyu.akasaki.15@ucl.ac.uk](mailto:mifuyu.akasaki.15@ucl.ac.uk)

**Appendix 1. Flow Chart of participants' recruitment**



### Appendix 3. Measurements of multiple risk behaviours at age 16 (fourth sweep)

Multiple risk behaviours	Questions	Coding of variable [original response scale]
<b>Smoking</b>		
Status	What kind of smoker?	<b>No</b> [never, haven't 3 months or more] <b>Yes</b> [less than one cigarette a wk, smoker]
Number of cigarettes	How many cigarettes do you smoke in a week?	<b>Non-smoker</b> [non-smoker], <b>1-5</b> [one/1-5], <b>5-20</b> [5-10/10-20], <b>20-40</b> [20-40], <b>40+</b> [40-70, 70-100, 100 and over]
<b>Alcohol</b>		
Drunkenness	Have you ever been really drunk?	<b>No/rarely</b> [no, rarely or never], <b>Once</b> [once], <b>more than once</b> [more than once, every few wks, almost ever wk]
Number of days drinking	If you have had any alcoholic drink since this time last wk, on how many days did you do so?	<b>Never, 1-2 days, 3+ days</b>
<b>Drugs</b>		
	Have you ever tried drugs in the last 12 months? (6 drugs; uppers, downers, cannabis, LSD, cocaine, heroin)	<b>No</b> [never, missing] <b>Yes</b> [not in the last 12 m, once, 2-9 times, 10+ times in at least one drug]
<b>Sexual intercourse</b>		
Debut before 16	How do you feel about sex?: I have never had sex	<b>Debut before 16</b> [no tick], <b>No debut before 16</b> [tick]
Unprotected sex	Your views about taking precautions against pregnancy: which ways do you use nowadays?	<b>Unprotected</b> [withdraw, trusting luck] <b>Protected</b> [rubber, safe period, pill, jelly/cream, another method, no sex]
<b>Physical inactivity</b>		
	Did you take any exercise last Saturday?	<b>Active</b> [yes], <b>inactive</b> [no]
<b>Involvement in fights</b>		
	Have you taken part in a fight? (5 occasions; at school, at football matches, outside pubs, on buses/trains, elsewhere)	<b>Yes</b> [at least one occasion] <b>No</b> [no, missing]
<b>Delinquency</b>		
	Have you been formally cautioned at a police station since you were 10 yrs of age?	<b>Delinquent</b> [yes], <b>no delinquent</b> [no]

#### Appendix 4. Measurements of outcomes at age 42 (ninth sweep)

Outcomes	Question/definition	Deprivation
<b>Risk behaviours</b>		
Smoking status	Which of the statements on this card applies to you?	Never smoked, used to smoke but not now, smoke occasionally, smoke every day
Number of cigarettes	How many cigarettes a day do you usually smoke? - <i>asked only to every day smokers</i>	Number of cigarettes <i>Respondents to "Never smoked", "used to smoke but not now" and "smoke occasionally" in smoking status above were included as 0 (zero)</i>
Number of alcohol units	Number of units of alcohol consumed in last 7 days	Number of units of alcohol
Physical inactivity	On how many days in a typical week do you do 30 minutes or more of exercise where you are working hard enough to raise your heart rate and break into a sweat?	None, once or more
<b>Health outcomes</b>		
Self-rated health	In general, would you say your health is...?	Excellent, very good, good, fair, poor
Body Mass Index	Self-report height and weight	Weight (kg)/height (m) <sup>2</sup>
Malaise inventory	Malaise inventory: 9 items <i>e.g., Do you often feel miserable or depressed?</i>	Low (0-3 scores), High (4-9 scores)

## Appendix 5. Measurements of other variables at age 10 (third sweep) and 16 (fourth sweep)

Variables	Measurements	What is measured of	Deprivation
Cognitive ability	Shortened Edinburgh Reading Test	A test of word recognition, which examined vocabulary, syntax, sequencing, comprehension and retention	Standardised score of the first principal component of total scores  Cronbach's alpha for the eight tests is 0.86 (unstandardised) and 0.89 (standardised)
	Friendly Math Test	A multiple choice test including arithmetic, number skills, fractions, algebra, geometry and statistics	
	Spelling dictation task	Dictation task, including both real and made-up words	
	Pictorial language comprehension test	Based on the English picture vocabulary test	
	British Ability Scale (BAS)	Two verbal subscales (Word Definitions and Word Similarities) and two non-verbal subscales (Recall of Digits and Matrices).	
Rutter scale	Rutter scale	Behaviours difficulties; 19 items e.g., Very restless. Often running or jumping up and down. Hardly ever still.	Standardised scores of the first two components of total scores; Externalising (the first component score) and Internalising (the second component score)  Cronbach's alpha among 19 items is 0.80 (unstandardised) and 0.82 (standardised)
Locus of control	CARALOC	Perceived achievement control; 15 items e.g., Do you feel that most of the time it's not worth trying hard because things never turn out right anyway?	0 (Low) to 15 (High)
Self-esteem	LAWSEQ	Self-esteem with reference to teachers, peers and parents; 12 items e.g., Do you think that your parents usually like to hear about your ideas?	0 (Low) to 12 (High)
Parental monitoring and family rules	<i>Statements related to home rules</i>	Rules expected to agree to do by parents; 23 items e.g., Tell them where I am going.	0 (Low) to 23 (High)

## Appendix 6. Characteristics by latent class of risk behaviours at age 16 (Imputed Data Analyses; n=8754)

	N <sup>a</sup>	Less-risky (n=6833)	High-risky (n=1921)
Sex (%)	8754		
Men		80.0	20.0
Women		76.4	23.6
<b>At birth</b>			
Birthweight (Mean, SD)	8059	3303.3 (535.0)	3314.9 (518.4)
Mother's age at delivery (Mean, SD)	8031	26.1 (5.3)	25.7 (5.5)
Mother's smoking during pregnancy (%)	8029		
Not smoked		80.0	20.0
Smoked		75.2	24.8
Fathers' or mothers' occupation (%)	8024		
I: Unskilled		75.3	24.7
II: Partly skilled		76.7	23.3
III-M: Skilled-manual		78.7	21.3
III-NM: Skilled-non manual		78.1	21.9
IV: Managerial and technical		79.1	20.9
V: Professional		77.4	22.6
<b>At age 10</b>			
BMI (Mean, SD)	7045	16.8 (2.1)	17.1 (2.1)
Abnormal health conditions (%)	7311		
None		77.7	22.3
One		78.5	21.5
Two and more		81.1	18.9
Cognitive ability (Mean, SD)	6317	0.1 (1.0)	0.1 (1.0)
Rutter scale (Mean, SD)			
Externalising	7382	-0.2 (1.9)	0.1 (2.1)
Internalising	7382	0.0 (1.5)	0.0 (1.6)
CARALOC scale (Mean, SD)	7071	7.4 (3.0)	7.3 (2.9)
Self-esteem scale (Mean, SD)	7097	7.4 (2.5)	7.1 (2.6)
Parental relationship with children (%)	7753		
Both natural parents		79.4	20.6
One natural and one non-natural parent		71.8	28.2
Single parent (either natural and non-natural)		71.4	28.6
Others		66.2	33.8
Parental smoking (%)	7620		
Non smokers		82.6	17.4
One parent smoker		77.1	22.9
Both smokers		73.2	26.8
Mother's malaise inventory score (Mean, SD)	7279	486.6 (268.9)	505.7 (270.7)
<b>At age 16</b>			
Parental monitoring and family rules (Mean, SD)	5374	13.8 (3.7)	12.4 (4.0)
<b>At age 42</b>			
Self-rated health (%)	6059		
Excellent		83.0	17.0
Very good		79.1	20.9
Good		76.4	23.6
Fair		71.5	28.5
Poor		70.3	29.7
Body Mass Index (Mean, SD)	5483	26.9 (5.3)	26.8 (5.3)
Malaise Inventory Scale (%)	5430		
Low score (0-3)		78.9	21.1
High score (4+)		74.6	25.4
Smoking (%)	6061		
Non-smokers		95.8	4.2
Ex-smokers		65.8	34.2
Occasional smokers		62.5	37.5
Every day smokers		54.8	45.2
Number of cigarettes among everyday smokers (Median, SD)	1050	12 (13.7)	15 (14.5)
Alcohol units (Median, SD)	4413	10 (15.5)	13.4 (19.7)
Physical activity a week (%)	5979		
None		78.7	21.3
Once and more		76.5	23.5

<sup>a</sup> Number of available observations

**Appendix 7. Estimated risks and 95% Confidence Intervals (CIs) of risk behaviours and health outcomes at age 42 by latent class of risk behaviours at age 16<sup>a</sup> (Complete Case Analysis; n=1,305)**

			Unadjusted	Adjusted <sup>b</sup>
<b>Smoking status (ref. non-smoker)</b>				
	Ex-smoker	RRR (95% CI)	17.69 (11.40-27.44)**	17.64 (11.24-27.69)**
	Occasional smoker	RRR (95% CI)	14.22 (7.34-27.55)**	13.64 (6.78-27.43)**
	Every day smoker	RRR (95% CI)	36.88 (22.10-61.54)**	35.14 (20.54-60.13)**
<b>Number of cigarettes</b>			IRR (95% CI)	0.90 (0.83-0.98)*
<b>Alcohol</b>				
	25th	b (95% CI)	0.20 (-1.00-1.40)	1.60 (0.41-2.79)*
	50th	b (95% CI)	1.50 (0.05-2.95)*	0.68 (-1.21-2.56)
	75th	b (95% CI)	3.00 (-1.29-7.29)	0.01 (-3.20-3.22)
<b>Physical activity (ref. none)</b>			OR (95% CI)	1.05 (0.78-1.43)
<b>Self-rated health (ref. excellent)</b>			OR (95% CI)	1.37 (1.08-1.73)*
<b>BMI</b>			b (95% CI)	-0.10 (-0.73-0.53)
<b>Malaise inventory score (ref. low)</b>			OR (95% CI)	0.96 (0.66-1.39)

\* <0.05, \*\* <0.001

RRR=relative risk ratio; OR=odds ratio; IRR=incidence rate ratio; b= unstandardised coefficient

<sup>a</sup> Less-risky behaviour class is reference group.

<sup>b</sup> Adjusted for sex, birth weight, mother's age at delivery, maternal smoking during pregnancy, BMI, abnormal health conditions, cognitive ability, locus of control, self-esteem, Rutter scale score, family structure, parental SES at birth, parental smoking, parental monitoring and family rules, and maternal malaise score.