

Supplementary Materials for:

Associations between adolescent mental health and health-related behaviours in 2005 and 2015: A population cross-cohort study

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Table S1. Descriptions of measures in both ALSPAC and MCS and the harmonised measure used in this study.

Outcome	ALSPAC (2005)	MCS (2015)	Harmonised variable
Depressive symptoms	^a 13-item Short Moods and Feelings Questionnaire	^b 13-item Short Moods and Feelings Questionnaire	Total depressive symptoms score (continuous)
Antisocial behaviours	^b How often in the last year have you done any of the following? (categorical) - Not at all - Just once - 3-5 times - 6+ times Hit kicked or punched someone on purpose Been rowdy or rude in a public place so that people complained or you got in to trouble Written things or sprayed paint on a property that did not belong to you Deliberately damaged or destroyed property that did not belong to you Taken something from a shop without paying for it Other items included skipping school, breaking and stealing from various different places, carrying a knife or weapon for protection, setting fire, stealing a vehicle, not paying correct fare on public transport, using force to steal.	^b In the last 12 months have you: (yes/no) Pushed or shoved /hit/slapped/punched someone? Been noisy or rude in a public place so that people complained or got you into trouble? Written things or spray painted on a building, fence or train or anywhere else where you shouldn't have? On purpose damaged anything in a public place that didn't belong to you, for example by burning, smashing or breaking things like cars, bus shelters and rubbish bins? Taken something from a shop without paying for it? Other items included using a weapon on someone, stealing from someone, hacking into computers, sending computer viruses.	Binary yes/no variable based on clinical threshold ≥ 12 0 No 1 Yes Assault Rowdy behaviour Graffiti Vandalism Shoplifting Antisocial behaviour index score based on sum of these five harmonised binary variables.

Alcohol use	^a Have you ever tried alcohol with/without your parents' permission? (yes/no)	^b Have you ever had an alcoholic drink? That is more than a few sips. (yes/no)	Harmonised variable: 0 Never drank a whole drink 1 Nothing in last 12 months/never drank 5 or more
	What is the most alcoholic drinks you've had in a single evening? (continuous variable)	How many times have you had an alcoholic drink in the last 12 months? (7 response options from never to over 40)	2 1-2 times drank 5 or more alcoholic drinks in one evening 3 3 or more times drank 5 or more alcoholic drinks in one evening
	How many times have you done this in the last year? (continuous variable)	Have you ever had five or more alcoholic drinks at a time? A drink is half a pint of lager, beer or cider, one alcopop, a small glass of wine, or a measure of spirits. (yes/no)	Ever drank alcohol variable (yes/no) based on recoding never drank =0 and all others =1
Smoking frequency		How many times have you had five or more alcoholic drinks at a time in the last 12 months? - Never - 1-2 times - 3-5 times - 6-9 times - 10 or more time	Heavy alcohol (yes/no) variable based on 3 or more times drank 5 or ore alcohol drinks in one evening.
	^a Frequency teenager has smoked cigarettes in the past 6 months: - 1-3 times; - >4 times; - once per week; - never.	^b Please read the following statements carefully and decide which one best describes you. Do not include electronic cigarettes (e-cigarettes). - I have never smoked cigarettes; - I have only ever tried smoking cigarettes once; - I used to smoke sometimes but I never smoke a cigarette now; - I sometimes smoke cigarettes now but I don't smoke as many as one a week; - I usually smoke between one and six cigarettes a week;	Harmonised variable: 0 Non smoker 1 Occasional smoker, not weekly 2 Smokes 1-6 cigarettes a week 3 Smokes more than 6 cigarettes a week
	Number of cigarettes smoked per week in the last 6 months for weekly users (continuous variable)		Ever smoke variable (yes/no) based on recoding non smoker =0 and all others =1 Heavy smoker (yes/no) variable based on smoking more than 6 cigarettes a week.

Cannabis	^a Have you ever used cannabis? (yes/no)	- I usually smoke more than six cigarettes a week. ^b Have you ever tried any of the following things? Cannabis (also known as weed, marijuana, dope, hash or skunk)? (yes/no)	0 Never used cannabis 1 Have tried cannabis
Other drugs	^a Teenager has been offered drugs? (yes/no) <if yes to above> Teenager has used drugs other than cannabis to feel good/get high? (yes/no)	^b Have you ever tried any of the following things? Any other illegal drug (such as ecstasy, cocaine, speed)? (yes/no)	0 Never used other drugs 1 Have tried other drugs
BMI	^a Height and weight measured by interviewer	^a Height and weight measured by interviewer	BMI derived from height and weight Obese (0=no, 1=yes) derived using IOTF threshold
Weight perception	^b How do you describe your weight? - Very underweight - Slightly underweight - About the right weight - Slightly overweight - Very overweight	^b Which of these do you think you are? - Underweight - About the right weight - Slightly overweight - Very overweight	Perceive themselves: 1 Underweight 2 About the right weight 3 Slightly overweight 4 Very overweight
Sexual intercourse	^b Series of questions regarding intimate contact with someone else leading to: Have you had sexual intercourse with another person in the past year?	^b Series of questions regarding intimate contact with someone else leading to: In the last 12 months have you had sexual intercourse with another young person?	0 have not had sex 1 had sex

^a Measured via interview; ^b Measured via self completion;

Table S2. Correlations between all outcomes in ALSPAC (bottom left of the table) and MCS (top right of the table)

ALSPAC\MCS	Depressive symptoms	Antisocial-rowdy	Antisocial-shoplifting	Antisocial-vandalism	Antisocial-graffiti	Antisocial-assault	Alcohol	Smoking	Cannabis	Other drugs	BMI	Weight perception	Sexual Intercourse
Depressive symptoms	-	0.16	0.12	0.09	0.09	0.15	0.22	0.16	0.15	0.07	0.12	0.21	0.11
Antisocial-rowdy	0.16	-	0.24	0.31	0.25	0.26	0.32	0.18	0.24	0.13	0.00	0.02	0.13
Antisocial-shoplifting	0.16	0.34	-	0.26	0.27	0.16	0.23	0.22	0.30	0.16	0.00	0.03	0.16
Antisocial-vandalism	0.12	0.37	0.33	-	0.36	0.18	0.24	0.24	0.29	0.16	-0.01	0.00	0.15
Antisocial-graffiti	0.16	0.35	0.33	0.39	-	0.15	0.20	0.22	0.24	0.13	0.00	0.02	0.11
Antisocial-assault	0.14	0.25	0.22	0.26	0.25	-	0.22	0.11	0.16	0.06	0.00	0.00	0.09
Alcohol use	0.15	0.28	0.24	0.21	0.24	0.20	-	0.31	0.37	0.17	0.07	0.08	0.24
Smoking	0.15	0.27	0.27	0.19	0.24	0.16	0.37	-	0.49	0.27	0.03	0.05	0.30
Cannabis	0.11	0.19	0.27	0.19	0.20	0.14	0.34	0.44	-	0.33	0.03	0.03	0.32
Other drugs	0.02	0.03	0.08	0.02	0.04	0.02	0.13	0.23	0.26	-	0.00	0.01	0.18
BMI	0.08	0.02	0.03	0.03	0.01	0.04	0.09	0.05	0.03	0.01	-	0.65	0.02
Weight Perception	0.11	0.04	0.05	0.03	0.05	0.06	0.08	0.07	0.02	0.01	0.63	-	0.02
Sexual intercourse	0.06	0.14	0.17	0.14	0.12	0.10	0.23	0.32	0.26	0.13	0.04	0.02	-

Table S3. Fully adjusted regression model with all predictors investigating sex and cohort and sex interactions

	Depressive symptoms	Antisocial behaviours	Substance use
	<i>Coef (95% CI)</i>	<i>Coef (95% CI)</i>	<i>Coef (95% CI)</i>
Cohort (MCS, 2015)	-0.56 (-0.96 - -0.15)	-0.06 (-0.16 - 0.03)	-0.14 (-0.20 - -0.08)
Sex (female)	0.94 (0.55 - 1.33)	-0.20 (-0.30 - -0.11)	0.00 (-0.07 - 0.06)
Depressive symptoms	-	0.05 (0.03 - 0.06)	0.01 (0.00 - 0.02)
Antisocial behaviours	0.77 (0.36 - 1.18)	-	0.22 (0.18 - 0.25)
Substance use	0.31 (0.07 - 0.55)	0.47 (0.39 - 0.55)	-
BMI	-0.02 (-0.09 - 0.04)	-0.02 (-0.03 - 0.00)	0.02 (0.01 - 0.03)
Weight perception (overweight)	0.56 (0.02 - 1.11)	0.15 (0.01 - 0.30)	-0.09 (-0.18 - 0.01)
Sexual intercourse (yes)	0.50 (-0.74 - 1.73)	0.70 (0.20 - 1.19)	0.97 (0.69 - 1.24)
Sex x cohort	0.04 (-0.16 - 0.96)	0.03 (-0.08 - 0.15)	-0.06 (-0.14 - 0.02)
Depressive symptoms x cohort	-	-0.01 (-0.03 - 0.00)	0.00 (-0.01 - 0.01)
Antisocial behaviours x cohort	1.04 (0.44 - 1.64)	-	0.08 (0.03 - 0.13)
Substance use x cohort	0.29 (-0.10 - 0.69)	0.06 (-0.04 - 0.16)	-
BMI x cohort	0.04 (-0.05 - 0.13)	0.01 (-0.01 - 0.03)	-0.01 (-0.02 - 0.00)
Weight perception x cohort	0.61 (-0.13 - 1.36)	-0.19 (-0.35 - -0.02)	0.08 (-0.03 - 0.19)
Sexual intercourse x cohort	-0.63 (-2.42 - 1.17)	-0.06 (-0.67 - 0.54)	0.08 (-0.34 - 0.50)
Depressive symptoms x sex	-	-0.01 (-0.02 - 0.01)	0.00 (-0.01 - 0.01)
Antisocial behaviours x sex	0.79 (0.13 - 1.44)	-	0.01 (-0.03 - 0.06)
Substance use x sex	0.34 (-0.03 - 0.71)	-0.01 (-0.11 - 0.09)	-
BMI x sex	0.04 (-0.05 - 0.13)	0.01 (-0.01 - 0.03)	-0.01 (-0.03 - 0.00)
Weight perception x sex	0.58 (-0.14 - 1.29)	0.04 (-0.13 - 0.22)	0.08 (-0.03 - 0.20)
Sexual intercourse x sex	-0.43 (-2.29 - 1.44)	0.01 (-0.65 - 0.66)	0.03 (-0.33 - 0.38)
Depressive symptoms x cohort x sex	-	-0.01 (-0.02 - 0.01)	0.01 (0.00 - 0.02)
Antisocial behaviours x cohort x sex	0.33 (-0.67 - 1.34)	-	-0.03 (-0.10 - 0.05)
Substance use x cohort x sex	1.26 (0.66 - 1.87)	-0.17 (-0.30 - -0.03)	-
BMI x cohort x sex	-0.11 (-0.24 - 0.01)	-0.01 (-0.04 - 0.01)	0.01 (-0.01 - 0.02)
Weight perception x cohort x sex	1.27 (0.25 - 2.30)	0.03 (-0.17 - 0.19)	-0.04 (-0.19 - 0.11)
Sexual intercourse x cohort x sex	3.39 (0.80 - 6.59)	-0.47 (-1.27 - 0.34)	0.04 (-0.49 - 0.56)

Table S4. Sensitivity analysis. Descriptives in the Millennium Cohort Study while accounting for geographical strata and clustering.

Outcome	Variable	MCS (accounting for stratified and clustered sampling design- sensitivity check)	MCS (weighted but not accounting for strata and clusters-main analysis)
		Mean or % [95% CI]	Mean or % [95% CI]
Depressive symptoms	Mean symptoms score	5.72 [5.55, 5.89]	5.72 [5.57,5.86]
	% above clinical cutoff	16.2 [15.2, 17.1]	16.4 [15.5,17.3]
Antisocial behaviours	% Assault	31.6 [30.4, 32.7]	31.6 [30.4, 32.7]
	% Rowdy behaviour	14.1 [13.2,14.9]	14.1 [13.2,14.9]
	% Graffiti	2.8 [2.5,3.2]	2.8 [2.5,3.2]
	% Vandalism	3.6 [3.1,4.1]	3.6 [3.1,4.1]
	% Shoplifting	3.6 [3.1,4.1]	3.6 [3.1,4.1]
	Mean antisocial behaviour index score	0.56 [0.53,0.58]	0.56 [0.54,0.58]
Substance use	Alcohol % ever drank	48.2 [46.3, 50.0]	48.2 [47.0, 49.4]
	Alcohol % heavy drinking	3.7 [3.2, 4.2]	3.7 [3.2, 4.2]
	Tobacco % ever smoked	4.7 [4.1,5.4]	4.7 [4.1, 5.3]
	Tobacco % weekly smoking	1.8 [1.4, 2.1]	1.8 [1.4, 2.1]
	Cannabis:% ever tried	5.5 [4.9, 6.1]	5.5 [4.9, 6.1]
	Other drugs % ever tried	0.8 [0.6, 1.0]	0.8 [0.6, 1.0]
	Mean substance use index score	0.59 [0.57, 0.62]	0.59 [0.57, 0.61]
Weight	Mean BMI	21.58 [21.48, 21.69]	21.58 [21.47,21.69]
	% obese	7.8 [7.1, 8.5]	7.8 [7.1,8.5]
Weight Perception	% perceive overweight or very overweight	33.6 [32.5, 34.6]	33.6 [32.5, 34.7]
Sexual intercourse	% yes	2.0 [1.6,2.4]	2.0 [1.7,2.4]

Figure S1: Associations between predictor and outcome variables, including mutual adjustment for other predictors in 2005 and 2015. Each row of the figure corresponds to a different outcome variable (1A-E: depressive symptom score; 2A-E: number of antisocial behaviours endorsed; 3A-E: number of substances tried).

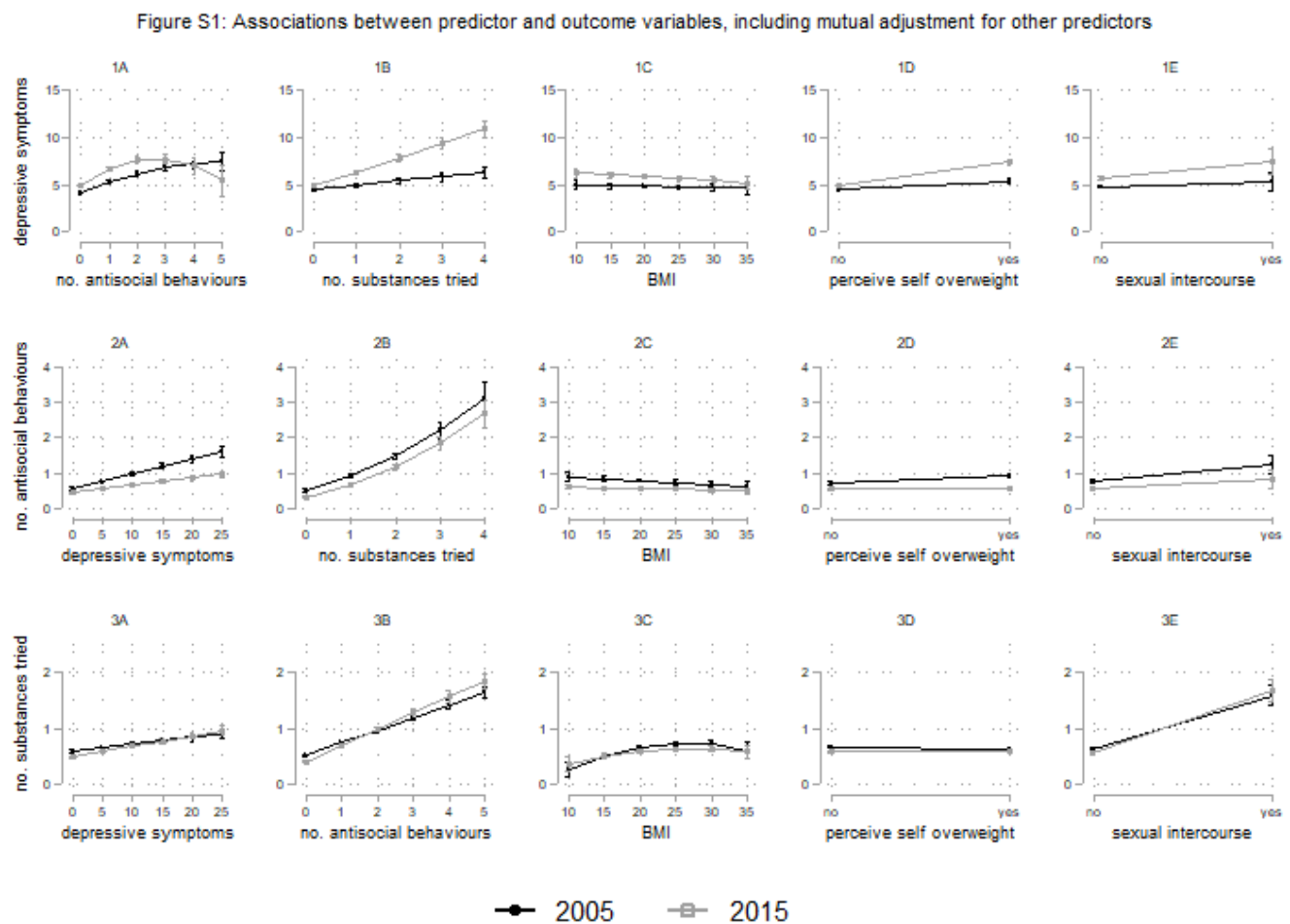


Figure S2a: Sex x cohort interaction for the association between number of substances used and depressive symptoms

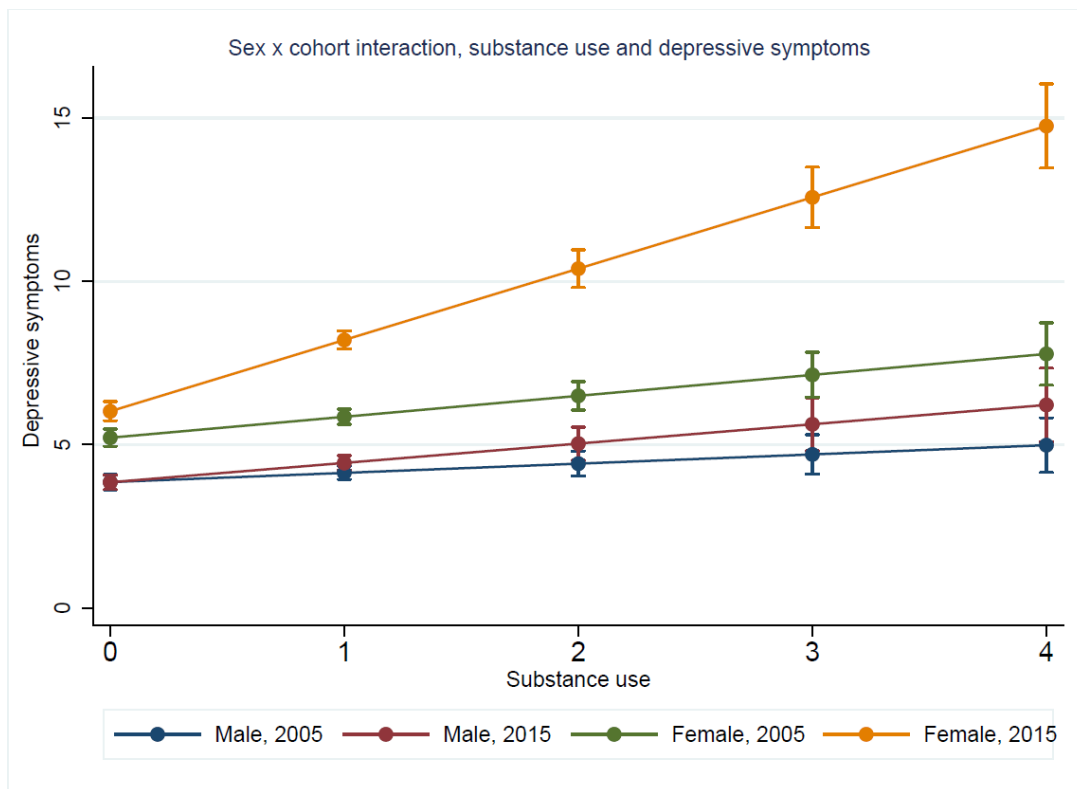


Figure S2b: Sex x cohort interaction for the association between sexual intercourse and depressive symptoms

