

Supplementary table 1 Study information

Country	Study location	Stratification for sampling ^a	Recruitment	Dates	Age range (years)	Total sample ^e (n)	Compliance	Deprivation measure	Reference
England	Blackburn with Darwen (North West England)	Blackburn with Darwen Local Authority ^b	Study information letter sent to randomly selected households; households not opting out upon receipt of letter visited by researchers	2012 (Aug-Sep)	18-70 ^d	1500	70.4%	IMD 2010	1
England	National sample	English Administrative Regions (n=10) ^c		2013 (Apr-Jul)	18-69	4010	53.5%	IMD 2010	2
England	Luton, Hertfordshire Northamptonshire (South East England)	Luton, Hertfordshire Northamptonshire (n=3)		2015 (Jun-Sep)	18-69	5623	55.8%	IMD 2011	3
Wales	National sample	Welsh Health Regions (n=7)		2017 (Mar-Jun)	18-69	2497	58.5%	WIMD 2014	4
Wales	National sample	Welsh Health Regions (n=7)	Households in sampled areas randomly selected by researchers	2015 (Feb-May)	18-69	2028	49.1%	WIMD 2014	5

^aLower Super Output Area level stratification by deprivation quintile. ^bNo sub-regional stratification was undertaken in Blackburn with Darwen due to the relatively small size of the sample area. ^cLondon was split into Inner and Outer London for regional sampling. ^dIndividuals aged 70 years were excluded from the sample for consistency. ^eIndividuals not completing all questions on variables of interest were excluded. IMD, Index of Multiple Deprivation; WIMD, Welsh Index of Multiple Deprivation.

1. Bellis MA, Lowey H, Leckenby N, Hughes K, Harrison D. Adverse childhood experiences: retrospective study to determine their impact on adult health behaviours and health outcomes in a UK population. *J Public Health* 2014;36:81-91.
2. Bellis MA, Hughes K, Leckenby N, Hardcastle K, Perkins C, Lowey H. Measuring mortality and the burden of adult disease associated with Adverse Childhood Experiences in England: a national survey. *J Public Health* 2015;37:445-54.
3. Ford K, Butler N, Hughes K, Quigg Z, Bellis MA. Adverse childhood experiences in Hertfordshire, Luton and Northamptonshire. Liverpool: Centre for Public Health, Liverpool John Moores University, 2016. https://www.researchgate.net/publication/302589403_Adverse_Childhood_Experiences_ACEs_in_Hertfordshire_Luton_and_Northamptonshire (accessed 16 October 2019).
4. Hughes K, Ford K, Davies AR, Homolova L, Bellis MA. Sources of resilience and their moderating relationships with harms from adverse childhood experiences. Wrexham: Public Health Wales, 2018. https://www.researchgate.net/publication/322697404_Sources_of_resilience_and_their_moderating_relationships_with_harms_from_adverse_childhood_experiences_Report_1_Mental_Illness (accessed 16 October 2019).
5. Bellis MA, Ashton K, Hughes K, Ford K, Bishop J, Paranjothy S. Adverse childhood experiences and their impact on health-harming behaviours in the Welsh population. Cardiff: Public Health Wales, 2016. https://www.researchgate.net/publication/290433553_Adverse_Childhood_Experiences_and_their_impact_on_health-harming_behaviours_in_the_Welsh_adult_population (accessed 16 October 2019).

Supplementary Table 2 ACE and health outcome questions used

ACE questions. All ACE questions were preceded by the statement “While you were growing up, before the age of 18...”		
ACE	Question	Qualifying responses
<i>Physical abuse</i>	How often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way? This does not include gentle smacking for punishment?	Once; more than once
<i>Verbal abuse</i>	How often did a parent or adult in your home ever swear at you, insult you, or put you down?	More than once
<i>Sexual abuse</i>	How often did anyone at least 5 years older than you (including adults) ever... ...touch you sexually? ...try to make you touch them sexually? ...force you to have any type of sexual intercourse (oral, anal, or vaginal)?	Once or more than once to any of the questions
<i>Parental separation</i>	Were your parents ever separated or divorced?	Yes
<i>Domestic violence</i>	How often did your parents or adults in your home ever slap, hit, kick, punch, or beat each other up?	Once; more than once
<i>Mental illness</i>	Did you live with anyone who was depressed, mentally ill, or suicidal?	Yes
<i>Alcohol abuse</i>	Did you live with anyone who was a problem drinker or alcoholic?	Yes
<i>Drug abuse</i>	Did you live with anyone who used illegal street drugs or who abused prescription medications?	Yes
<i>Incarceration</i>	Did you live with anyone who served time or was sentenced to serve time in a prison or young offenders' institution?	Yes
Health outcome	Question	Qualifying responses
<i>Alcohol use</i>	How often do you have a drink containing alcohol? How many standard drinks containing alcohol do you have on a typical day when you drink? - responses used to estimate daily consumption	Consumption of 12g or more alcohol per day
<i>Smoking</i>	In terms of smoking tobacco, which of the following best describes you?	I smoke daily; I smoke occasionally but not daily
<i>Drug use</i>	How often, if ever, have you used heroin or crack cocaine?	Used but not in the last 12 months; Used in the past 12 months
<i>High BMI</i>	What is your height? (in feet/inches or metres/centimetres) What is your weight? (in stone/pound, kilograms or pounds) - Responses used to calculate BMI	BMI 25.0 or higher
<i>Depression</i>	Are you currently or have you ever been treated for... depression?	Yes, currently; Yes, in the past
<i>Anxiety</i>	Are you currently or have you ever been treated for... anxiety?	Yes, currently; Yes, in the past
<i>Other mental illness</i>	Are you currently or have you ever been treated for... another mental illness?	No, never; Yes, currently; Yes, in the past
<i>Victim of violence</i>	How many times have you been physically hit in the past 12 months? Or (in Wales, 2017): In the past 12 months, have you been physically hit by someone else?	Once; 2 or 3 times; More than 3 times Yes
<i>Cancer</i>	Has a doctor or nurse ever told you that you have... Cancer?	Yes
<i>Type 2 diabetes</i>	Has a doctor or nurse ever told you that you have... Type 2 diabetes?	Yes
<i>Heart disease</i>	Has a doctor or nurse ever told you that you have... Coronary heart disease or heart attack?	Yes
<i>Stroke</i>	Has a doctor or nurse ever told you that you have... Stroke?	Yes
<i>Respiratory disease</i>	Has a doctor or nurse ever told you that you have... Respiratory disease such as Chronic bronchitis/ Emphysema/ Chronic Obstructive Pulmonary Disease?	Yes

ACE, adverse childhood experience; BMI, body mass index.

Supplementary Table 3 Outcomes measured across studies

	All	England (national)	England (South East)	England (North West)	Wales 2015 (national)	Wales 2017 (national)
Total sample (n)	15285	3885	5454	1421	2028	2497
Alcohol use	n=12736					
Missing (n)	52	18	7	23	4	-
Yes (%)	13.6	16.3	10.0	15.3	17.1	-
Smoking	n=15281					
Missing (n)	4	0	0	4	0	0
Yes (%)	26.3	26.9	23.1	37.1	27.9	25.3
Drug use	n=15246					
Missing (n)	39	3	19	14	2	1
Yes (%)	2.4	2.2	2.0	3.1	4.4	1.6
High BMI	n=11527					
Missing (n)	1261	424	481	16	340	-
Yes (%)	49.8	50.9	49.0	45.7	53.2	-
Depression	n=2496					
Missing (n)	1	-	-	-	-	1
Yes (%)	29.2	-	-	-	-	29.2
Anxiety	n=2493					
Missing (n)	4	-	-	-	-	4
Yes (%)	25.0	-	-	-	-	25.0
Other mental illness	n=2491					
Missing (n)	6	-	-	-	-	6
Yes (%)	6.0	-	-	-	-	6.0
Victim of violence	n=15267					
Missing (n)	18	2	10	2	4	0
Yes (%)	5.1	5.3	3.7	6.3	9.1	4.1
Cancer	n=12765					
Missing (n)	23	4	12	7	0	-
Yes (%)	3.7	4.4	2.9	3.2	4.8	-
Type 2 Diabetes	n=12769					
Missing (n)	19	3	12	4	0	-
Yes (%)	5.1	4.8	4.7	7.3	5.3	-
Heart disease	n=12773					
Missing (n)	15	1	12	2	0	-
Yes (%)	2.7	3.2	2.3	4.2	1.5	-
Stroke	n=12773					
Missing (n)	19	1	13	5	0	-
Yes (%)	1.1	1.1	1.0	1.8	0.8	-
Respiratory disease	n=12766					
Missing (n)	22	0	15	7	0	-
Yes (%)	2.8	3.5	1.9	5.2	2.1	-

- outcome not measured in survey. BMI, body mass index

Supplementary Table 4: Study outcome and matched Global Burden of Disease (GBD) category

Outcome	GBD category matched (ID)
Risk factors	
Alcohol use	Alcohol use (102)
Smoking	Smoking (99)
Drug use	Drug use (103)
High BMI	High body-mass index (108)
Causes of ill health	
Depression	Major depressive disorder (586)
Anxiety	Anxiety disorders (571)
Other mental illness	Mental disorders (558), excluding major depressive disorder (586) and anxiety disorders (571)
Violence	Interpersonal violence (724)
Cancer	Neoplasms (410)
Type 2 diabetes	Diabetes mellitus type 2 (976)
Heart disease	Ischaemic heart disease (493), hypertensive heart disease (498)
Stroke	Stroke (494)
Respiratory disease	Chronic respiratory diseases (508), excluding asthma (515)

ID, identification; BMI, body mass index

Supplementary Table 5 Sample demographics and ACE count prevalence

	All	England (national)	England (South East)	England (North West)	Wales 2015 (national)	Wales 2017 (national)
Total sample (n)	15285	3885	5454	1421	2028	2497
Gender (%)						
Male	45.1	45.0	44.7	39.9	49.8	45.3
Female	54.9	55.0	55.3	60.1	50.2	54.7
Age group (%)						
18-29	21.9	21.0	20.6	24.6	30.4	17.9
30-39	19.9	19.9	22.5	21.5	14.2	18.4
40-49	20.3	20.5	20.6	22.2	17.8	20.1
50-59	17.7	18.0	17.0	14.6	17.5	20.6
60-69	20.2	20.7	19.3	17.0	20.2	23.1
Ethnicity (%)						
White	85.7	86.3	80.6	71.3	95.4	96.4
Other	14.3	13.7	19.4	28.7	4.6	3.6
Deprivation quintile (%)						
(least deprived) 1	21.7	20.1	28.5	5.5	21.7	18.7
2	19.1	19.5	20.2	10.2	19.4	20.9
3	19.9	19.7	20.8	8.1	19.4	25.1
4	19.2	19.9	20.0	14.5	18.7	19.3
(most deprived) 5	20.1	20.7	10.5	61.7	20.7	15.9
ACE count (%)						
0	55.3	53.6	58.4	54.4	54.4	52.1
1	19.7	22.7	18.2	20.0	19.0	18.9
2-3	15.3	15.4	15.3	15.8	13.0	17.1
≥4	9.6	8.3	8.1	9.8	13.6	11.9

ACE, Adverse childhood experience.

Supplementary Table 6 Unadjusted proportion reporting each outcome by ACE count category

	n	ACE count			
		0 ACEs	1 ACE	2-3 ACEs	≥4 ACEs
Alcohol use	12736	11.3	14.6	15.9	22.0
Smoking	15281	20.3	26.3	32.9	50.6
Drug use	15246	0.9	1.8	3.4	10.5
High BMI	11527	49.3	49.8	51.1	50.6
Depression	2496	18.4	29.4	41.3	59.1
Anxiety	2493	16.0	24.2	36.5	49.8
Other mental illness	2491	2.8	4.9	9.9	16.4
Violence	15267	2.5	3.8	8.3	18.2
Cancer	12765	3.5	3.5	3.7	5.1
Type 2 diabetes	12769	5.0	5.0	5.3	5.6
Heart disease	12773	2.5	2.5	3.2	3.1
Stroke	12769	0.9	1.1	1.3	1.8
Respiratory disease	12766	2.2	2.7	4.0	4.7

ACE, adverse childhood experience; BMI, body mass index