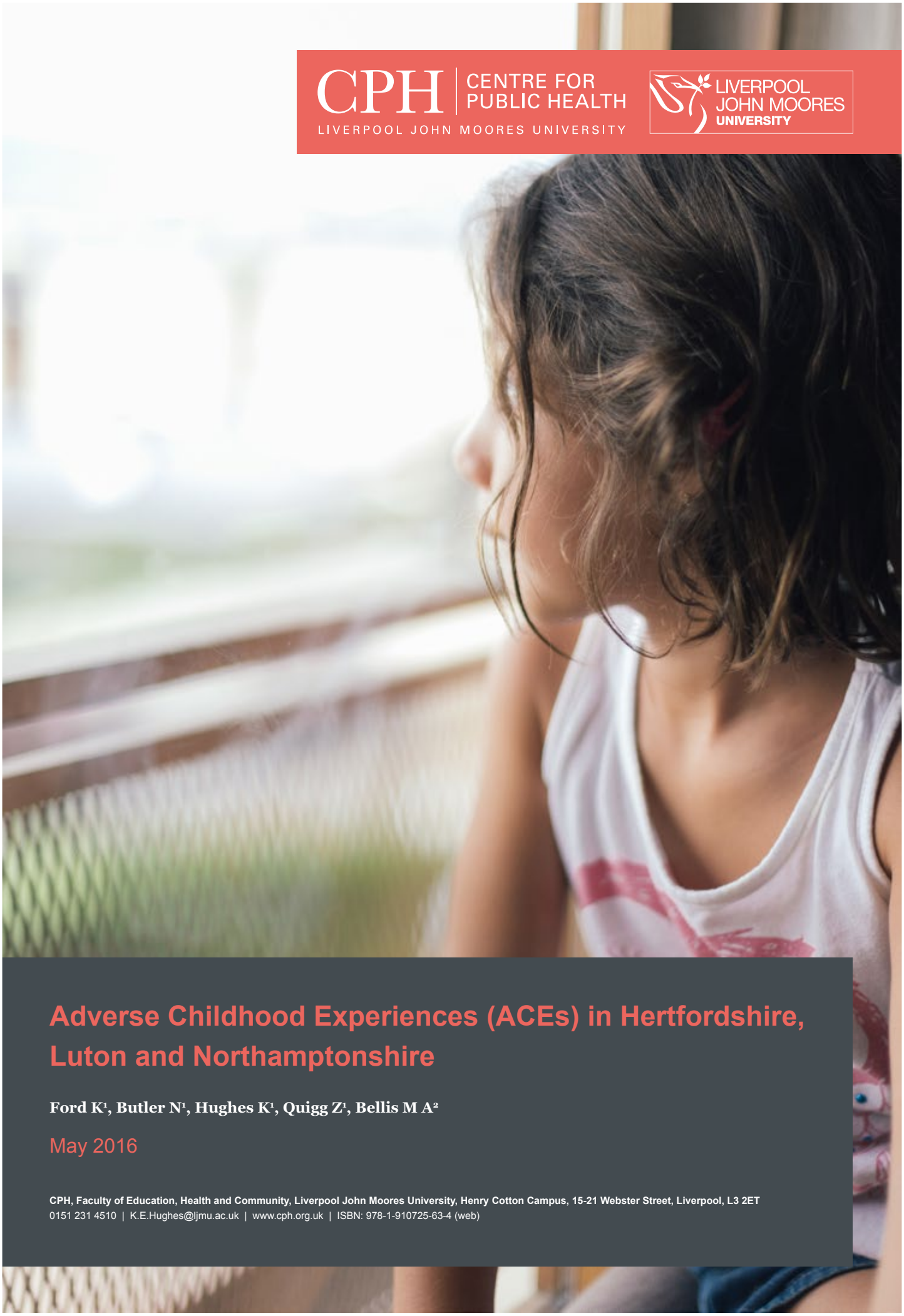
CPH | CENTRE FOR PUBLIC HEALTH
LIVERPOOL JOHN MOORES UNIVERSITY

LIVERPOOL JOHN MOORES UNIVERSITY



Adverse Childhood Experiences (ACEs) in Hertfordshire, Luton and Northamptonshire

Ford K[1], Butler N[1], Hughes K[1], Quigg Z[1], Bellis M A[2]

May 2016

CPH, Faculty of Education, Health and Community, Liverpool John Moores University, Henry Cotton Campus, 15-21 Webster Street, Liverpool, L3 2ET
0151 231 4510 | K.E.Hughes@ljmu.ac.uk | www.cph.org.uk | ISBN: 978-1-910725-63-4 (web)

Adverse Childhood Experiences (ACEs) in Hertfordshire, Luton and Northamptonshire

Katharine Ford[1], Nadia Butler[1], Karen Hughes[1], Zara Quigg[1], Mark A Bellis[2]

[1]Centre for Public Health
Faculty of Education, Health and Community
Liverpool John Moores University
Henry Cotton Building
15-21 Webster Street
Liverpool L3 2ET
www.cph.org.uk

[2]Public Health Wales
Hadyn Ellis Building
Maindy Road
Cathays
Cardiff CF24 4HQ

Contributorship

Peter Barker[3], David Conrad[4], Kelly O'Neill[5], Chandraa Bhattacharya[6], Barbara Paterson[6].

[3]Northamptonshire County Council
County Hall
Northampton
NN1 1ED

[4]Hertfordshire County Council
County Hall
Pegs Lane
Hertford
SG13 8DQ

[5]Luton Borough Council
Public Health
3rd Floor Town Hall Extension
Upper George Street
Luton LU1 2BQ

[6]Public Health England (PHE)
East of England
West Wing Victoria House
Capital Park
Fulbourn
Cambridge
CB21 5XB

Acknowledgements

We are very grateful to the residents of Hertfordshire, Luton and Northamptonshire who kindly participated in the survey. We would like to thank BMG research for collecting the data. We would like to thank Ann Robins (UNICEF), Tammy Coles, Sian Evans and Stephen Yeung (PHE) for their contributions to the study and Staff at the Centre for Public Health including Ryan Paden, Charlotte Bigland and Ciara McGee for assistance with report proofing, and Laura Heeks for producing the report cover and infographics.

Table of contents

Executive summary 1

1. Introduction 3

2. Methodology 6

3. Findings 9

3.1. Prevalence of ACEs in the study area 9

3.2. Relationship between ACEs and socio-demographics 11

3.3. Health-harming behaviours 13

- Tobacco smoking 14
- Using e-cigarettes (vaping) 15
- Smoking tobacco or using e-cigarettes 15
- Alcohol use – binge drinking 16
- Alcohol use – high-risk drinking 17
- Cannabis use 18
- Heroin or crack cocaine use 19
- Violence victimisation 20
- Violence perpetration 21
- Incarceration 22
- Poor diet 23
- Unintended teenage pregnancy 24
- Early sexual initiation 25
- Low physical exercise 26

3.4. Health service utilisation 27

- Regularly visiting a General Practitioner (GP) 27
- Visited an Accident and Emergency Department (ED) in the last 12 months 28
- Stayed a night in hospital in the last 12 months 28
- Having not attended the dentist in the last 12 months 29

3.5. Health outcomes 30

- Overweight and obese (BMI 25 or more) 30
- Mental wellbeing 31
- Life satisfaction 31
- More than ten teeth removed 32
- More than ten fillings 32
- Diagnosed with a sexually transmitted infection (STI) 33

3.6. Associations between ACEs and chronic disease 34

Any disease 34
Individual diseases 36
3.7. Associations between ACEs and premature mortality 38
4. Summary 39
Implications for practice 42
References 47
Glossary 49
Appendix 1 – Methodology 51
Appendix 2 – Data tables 57
Appendix 3 – Local authority infographics 99

Executive summary

Adverse childhood experiences (ACEs) include a range of stressful events that children can be exposed to while growing up, including: physical, sexual or emotional childhood abuse; family breakdown; exposure to domestic violence; or living in a household affected by substance misuse, mental illness or where someone is incarcerated. A growing body of research has identified that individuals' childhood experiences are fundamental in determining their future health and social prospects, with ACEs being one of the strongest predictors of poor health and social outcomes in adults.

The impact of ACEs can vary across population groups which may make comparisons between different areas not applicable. Thus, identifying the ACE profile of different communities is a critical element in understanding and addressing the underlying causes of ill health. Tackling ACEs in Hertfordshire, Luton and Northamptonshire relies on identifying the size and scale of the problem, and ascertaining which part of the population are most at risk. Consequently, the Centre for Public Health at Liverpool John Moores University was commissioned by Hertfordshire County Council, Luton Borough Council and Northamptonshire County Council in collaboration with Public Health England, to undertake a study of ACEs and their impacts in the adult population. This consisted of a cross-sectional survey of 5,454 adults, aged 18-69 years resident in Hertfordshire, Luton and Northamptonshire. Participants were asked about their current health behaviours and their exposure to ACEs using an internationally validated ACE questionnaire.

This study identified that a substantial proportion of the adult population in Hertfordshire, Luton and Northamptonshire suffered abuse, neglect or other household dysfunction during their childhood. Adjusting findings to population demographics, at least four in ten (44.4%) adults have experienced one or more ACEs and almost one in ten (9.1%) have suffered four or more (see infographic). The adjusted prevalence of individual ACEs ranges from 3.1% of residents reporting living with someone who was incarcerated, to 22.9% experiencing verbal abuse by a parent or adult in their home during their childhood. Further, exposure to ACEs has had a major impact on the development of health-harming behaviours (e.g. smoking and binge drinking), health service use (e.g. staying a night in hospital), health outcomes (such as being diagnosed with a sexually transmitted infection [STI] or chronic disease), and low mental wellbeing and life satisfaction.

This study reveals that ACEs in Hertfordshire, Luton and Northamptonshire are associated with chronic ill health in later life such as the development of cancer, liver and digestive disease and ultimately premature death. Preventing ACEs would not only lessen the prevalence of health-harming behaviours and prevent unintended teenage pregnancy, but also prevent violent behaviour, thus helping to break the cycle of adversity that families can become trapped into. Findings indicate that appropriate policies and programmes need to be implemented both to prevent ACEs and to recognise and moderate their impacts in affected populations, consequently improving health across the whole life course for residents in Hertfordshire, Luton and Northamptonshire.

How many adults have suffered each ACE?

CHILD MALTREATMENT

Verbal abuse
23%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED

Parental separation
18%

Domestic violence
16%

Mental illness
11%

Alcohol abuse
11%

Drug use
4%

Incarceration
3%

For every 100 adults 44 have suffered at least one ACE during their childhood and 9 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years

Compared with people with no ACEs, those with 4+ ACEs are:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

Preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

Unintended teen pregnancy
by 44%

Smoking
(current)
by 25%

Binge drinking
(current)
by 22%

Cannabis use
(lifetime)
by 45%

Heroin/crack use (lifetime) 54%

Incarceration (lifetime) 50%

Violence perpetration (past year) 61%

Violence victimisation (past year) 56%

Poor diet (current; <2 fruit & veg portions daily) 14%

1. Introduction

A growing body of research is identifying the heavy burden that adverse childhood experiences (ACEs; see Box 1) place on individuals' health and social prospects across the life course. Children who are maltreated or who grow up in homes with problems such as domestic violence, substance misuse or criminal behaviour have poorer educational and employment prospects and suffer more behavioural and health problems than those who are not exposed to such adversities. Thus, studies consistently link ACEs to health-harming behaviours such as smoking, alcohol and drug use, risky sexual activity and violence[1-3]; and to conditions such as mental illness, sexually transmitted infections, obesity, heart disease, cancers and, ultimately, premature mortality[1, 2, 4]. Importantly, the more ACEs children suffer the greater their risks of poor outcomes in later life[4-6]. These relationships also mean that individuals that have suffered ACEs can be vulnerable to exposing their own children to ACEs, leading to cycles of adversity, social disadvantage and poor health that affect families across generations[7, 8].

As understanding of the influence of childhood experience throughout the life course has grown, so has recognition of the need to prevent and address ACEs in order to improve population wellbeing, reduce social problems and tackle inequalities. However, developing appropriate responses to ACEs requires an understanding of their extent and impact in local populations. Thus in 2015 an ACE study was undertaken in Hertfordshire, Luton and Northamptonshire with a sample of adults aged 18-69 (N=5,454). This report presents the findings from the study, identifying the prevalence of ACEs in the general population, their impact on health and the estimated gains that could be made if ACEs were prevented.

Box 1: Adverse childhood experiences

The term adverse childhood experiences (ACEs) incorporates a wide range of stressful events that children can be exposed to whilst growing up. These include harms that affect the child directly, such as neglect and physical, verbal and sexual abuse; and harms that affect the environment in which the child lives, including exposure to domestic violence, family breakdown, parental loss, and living in a home affected by substance abuse, mental illness or criminal behaviour. The ACEs measured in this study are provided in Table 1.

How ACEs affect health and wellbeing

The underlying theory linking ACEs to poor adult outcomes is that chronic traumatic stress in childhood alters brain development and the development of hormonal, nervous and immunological systems[1, 9-11]. Children that are abused or exposed to other types of chronic stress can 'adapt' to function under these harsh conditions, developing heightened emotional and physiological stress response systems focused on short term survival at the expense of long term wellbeing. Children that are exposed to ACEs can have difficulty controlling their emotions and can suffer from problems such as attachment difficulties, low trust and low self-esteem[11, 12]. These characteristics can affect their school performance and lead to communication problems, difficulties forming healthy relationships and vulnerability to harmful behaviours such as substance use, risky sexual activity and overeating. Such behaviours can also emerge as coping mechanisms, and contribute to the development of diseases such as cancer and heart disease[1, 4, 9, 13]. Importantly, the heightened physiological stress responses that develop through chronic childhood stress can increase allostatic load –

the wear and tear that stress causes to the body – which further increases vulnerability to disease [1, 4, 11].

Previous research on ACEs and health

The ACE framework for examining the impact of childhood adversity on health was developed in the USA by Felitti et al[4]. Using a sample of over 17,000 adults, the US ACE study identified strong, cumulative relationships between the number of ACEs people had suffered and their risks of a wide range of health-harming behaviours and health conditions[4-6]. By following participants longitudinally, it also identified a relationship between ACEs and premature mortality.

Based on this work, a pilot ACE study was undertaken in the English local authority of Blackburn with Darwen in 2012[14], followed by a national study across England in 2013[9]. Using a representative sample of 3,885 adults, almost half (46.4%) of the English adult population had suffered at least one ACE and 8.3% had suffered four or more (i.e. 4+). As in the USA, strong relationships were identified between the number of ACEs individuals had and their risks of poor health outcomes. For example, compared with adults with no ACEs, those that reported 4+ ACEs were three times more likely to smoke, six times more likely to have had (or caused) an unintended teenage pregnancy, seven times more likely to have been involved in violence in the past year and eleven times more likely to have ever been incarcerated[2]. They were also found to have a significantly higher rate of having developed a chronic disease (including cancer, diabetes, stroke, respiratory disease, liver/digestive disease and cardiovascular disease) by the age of 70. By using sibling mortality as a proxy measure, (see Section 3.6) ACEs were also strongly linked to mortality[9].

Importantly, the English national ACE study also estimated that large reductions in health-harming behaviours could be achieved by preventing ACEs. Thus, modelling estimated that 12% of binge drinking, 14% of poor diet, 23% of smoking, 52% of violence perpetration, 59% of heroin/crack cocaine use, and 38% of unintended teenage pregnancy prevalence nationally could be attributed to ACEs[9].

The need for local data

The English national ACE study provided critical knowledge to support the development of programmes to prevent and address ACEs in England. However, the extent and impact of ACEs can vary across population groups meaning that comparisons between studies may not be applicable. Understanding how different communities are affected by ACEs is therefore an essential step in developing appropriate local responses to poor health and inequality, including early years interventions to prevent ACEs and promote nurturing and supportive parenting practices; programmes to build resiliency in young people; and appropriate support for individuals who have suffered ACEs, ensuring sympathetic and relevant care pathways that recognise and address the root causes of health and social problems.

The ACE study for Hertfordshire, Luton and Northamptonshire aimed to understand the independent impact of ACEs on behavioural, health, criminal justice and other outcomes, and understand the potential impact the prevention of ACEs could have on health. Findings will enable appropriate policies and programmes to be implemented to prevent ACEs and identify and intervene where children are already experiencing stressors.

ACE survey for Hertfordshire, Luton and Northamptonshire

In 2015, The Centre for Public Health, Liverpool John Moores University, was commissioned to conduct a study into ACES for Hertfordshire, Luton and Northamptonshire.

Survey objectives

The key objectives of the study were:

1. To measure the prevalence of ACEs across local authorities and wards in Hertfordshire, Luton and Northamptonshire;
2. To measure associations between ACEs and socioeconomic markers;
3. To measure the increased risks of harmful behaviours, morbidity and mortality in adulthood from experiencing ACEs; and,
4. To measure the burden of harmful behaviours that would be prevented if ACEs were reduced.

Report structure

Section 2 of this report briefly outlines the methodology used in the study and defines the ACE and outcome measurements used in the report, with full methodological details provided in Appendix 1. Section 3 presents the study findings, including the prevalence of individual ACEs and ACE counts (the number of ACEs individuals have suffered) in the study area (Section 3.1) the relationship between ACE counts and socio-demographics (Section 3.2), health-harming behaviours (Section 3.3), health service use (Section 3.4), health outcomes (Section 3.5), chronic disease (Section 3.6) and premature mortality (Section 3.7). Section 4 discusses the findings in relation using an ACE informed approach in the delivery of services (e.g. strengthening early years services). Tables providing full data are included in Appendix 2 and infographics highlighting the prevalence of ACEs for each local authority in the study are presented in Appendix 3.

2. Methodology

Using a method of stratified random probability sampling, a survey of adults (aged 18-69) resident in Hertfordshire, Luton and Northamptonshire (from here on referred to as the study area) was undertaken between June and September 2015 (details of the full methodology used to undertake the study are outlined in Appendix 1). The study used a validated questionnaire as used in previous ACE studies within the UK[2, 3, 14], which asks retrospective questions about participants' experiences of a range of adverse experiences before the age of 18 (see Table 1). The questionnaire also recorded basic demographics, such as age, gender, ethnicity and marital status, and past and current health and social behaviours and outcomes. The individual outcomes used in the report and how they were derived are outlined in Table 2.

Overall, 5,621 residents participated in the study (Hertfordshire, 2,587; Luton, 1,423; Northamptonshire, 1,611).Cases where full demographic information and ACE count was not provided were removed, thus the final sample size for analysis was 5,454 (Hertfordshire, 2,511; Luton, 1,390; Northamptonshire, 1,553). Where individuals did not answer all questions, adjusted sample sizes are presented.

Ethical approval for the research was obtained from Liverpool John Moores University Research Ethics Committee.

Table 1: ACEs included in the study

ACE	Question asked Questions were preceded by the statement 'While you were growing up, before the age of 18…'	Qualifying response
Sexual abuse 	How often did anyone at least 5 years older than you (including adults) try to make you touch them sexually? How often did anyone at least 5 years older than you (including adults) force you to have any type of sexual intercourse (oral, anal or vaginal)? How often did anyone at least 5 years older than you (including adults) ever touch you sexually?	Once or more than once to any of the three questions
Physical abuse 	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 or more than once
Verbal abuse 	How often did a parent or adult in your home ever swear at you, insult you, or put you down?	More than once
Domestic violence 	How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?	Once or more than once
Parental separation 	Were your parents ever separated or divorced?	Yes
Mental illness 	Did you live with anyone who was depressed, mentally ill or suicidal?	Yes
Alcohol abuse 	Did you live with anyone who was a problem drinker or alcoholic?	Yes
Drug abuse 	Did you live with anyone who used illegal street drugs or who abused prescription medications?	Yes
Incarceration 	Did you live with anyone who served time or was sentenced to serve time in a prison or young offender's institution?	Yes

Table 2: Outcomes covered

Outcome	Question *(text in brackets is the response indicating behaviour)*
Health-harming behaviours	
Smoking tobacco	In terms of smoking tobacco, which of the following best describes you? *(I smoke daily)*
Using e-cigarettes	Do you smoke e-cigarettes? *(yes)*
Binge drinker	Derived outcome: how often do you have 6 or more standard drinks on one occasion? *(weekly or daily or almost daily)*
High-risk drinking	Derived outcome: includes all individuals who had an AUDIT-C score of 5 or more. Questions on alcohol consumption were drawn from the AUDIT-C tool, and participants were provided with information on what constitutes a standard drink (UK = 10mg of alcohol; see Appendix 1)
Cannabis use	How often, if ever, have you taken the following illegal drugs...cannabis? *(any level of use)*
Heroin/crack cocaine use	How often, if ever, have you taken the following illegal drugs...heroin/crack cocaine? *(any level of use)*
Violence victimisation	How many times have you been physically hit in the past 12 months? *(any frequency)*
Violence perpetration	How many times have you physically hit someone in the past 12 months? *(any frequency)*
Incarceration	How many nights have you ever spent in prison, in jail or in a police station? *(any number of nights)*
Poor diet	On a normal day, how many portions of fruit and vegetables (excluding potatoes) would you usually eat (one portion is roughly one handful or a full piece of fruit such as an apple)? *(<2 portions)*
Unintended teenage pregnancy	Did you ever accidentally get pregnant or accidentally get someone else pregnant before you were aged 18 years? *(yes)*
Early sexual initiation	How old were you the first time you had sexual intercourse? *(<16 years)*
Low physical exercise	Usually, how many days each week do you take part in at least 30 minutes of physical activity that makes you breathe quicker, like walking quickly, cycling, sports or exercise*? (<3 days a week)*
Health service utilisation	
Regularly visiting a GP	In the last 12 months excluding for reasons relating to pregnancy, how many times have you visited your GP? *(>3 times)*
Visiting an accident and emergency department in last 12 months	In the last 12 months excluding for reasons relating to pregnancy, how many times have you been to A&E? *(once or more)*
One or more night in hospital in last year	In the last 12 months excluding for reasons relating to pregnancy, how many nights have you spent in hospital? (*one or more)*
Dentist utilisation	In the last 12 months excluding for reasons relating to pregnancy, how many times have you visited the dentist? *(never visited)*
Health outcomes	
Overweight and obese	What is your height? (feet and inches or metres and centimetres) and What is your weight? (stone and pounds, or kilograms or pounds). Participants' body mass index (BMI) was calculated (BMI; weight [kg] divided by height [metres] squared) and categorised into four weight groups, with scores of >25 classified as overweight or obese (see Appendix 1) *(Scores of >25)*
More than 10 teeth removed	Roughly how many adult teeth have you lost or had taken out due to decay or damage? *(>10)*
More than 10 fillings	Roughly how many of your (remaining) teeth have fillings or crowns/caps? (this does not include veneers) *(>10)*
Mental wellbeing	You are now going to see some statements about feelings and thoughts. For each statement, please select the box that best describes your experience over the last 2 weeks. *(SWEMWBS score; see Appendix 1)*
Life satisfaction	All things considered, how satisfied are you with your life on a scale of 1 to 10, where 1 is not at all satisfied and 10 is very satisfied? *(scores <6; see Appendix 1)*
Sexually Transmitted Infection (STI)	Has a doctor or nurse ever told you that you have a sexually transmitted infection e.g. Chlamydia, HIV/AIDS, syphilis, gonorrhoea? *(yes)*

3. Findings

This section presents key findings on the prevalence of ACEs in the study area (Section 3.1), and their relationship with socio-demographics, including associations between ACE counts and education (Section 3.2). The relationship between ACE counts and health-harming behaviours (e.g. smoking, drug use, violence) are presented in Section 3.3 along with estimates of the proportion of these behaviours that could be prevented if ACEs did not occur. Section 3.4 then focuses on relationships between ACE counts and health service utilisation (e.g. GP visits, hospitalisation); Section 3.5 on relationships between ACE counts and health outcomes (e.g. sexually transmitted infections, low mental wellbeing, chronic disease); and Section 3.6 on the impact of ACEs on premature mortality. Full data tables, including data at local authority and ward level, are provided in Appendix 2.

3.1. Prevalence of ACEs in the study area

ACE count

Across the whole sample, 43.1% of individuals surveyed reported having experienced at least one ACE before the age of 18 years. The number of ACEs individuals reported was summed to provide an ACE count, with respondents then categorised into four groups: 56.9% of the sample had no ACEs, 18.0% had one ACE, 16.2% had 2-3 ACEs and 9.0% had four or more (i.e. 4+) ACEs.

Data was then adjusted to account for population demographics (age, gender, ethnicity, deprivation and urban/rural categorisation). The adjusted prevalence of ACEs across the whole study area was: 55.6% 0 ACEs, 18.3% 1 ACE, 17.0% 2-3 ACEs and 9.1% 4+ ACEs. Table 3 shows the adjusted prevalence of ACEs across the three study areas. The proportion having experienced one or more ACE was 47.5% in Northamptonshire, 43.9% in Hertfordshire and 36.4% in Luton. Estimates for ACE prevalence at a local authority and ward level can be found in Appendix 2, Tables A3 and A4 respectively.

Some caution should be taken when interpreting the lower levels of ACEs identified in Luton. Previous studies have found a strong correlation between ACE prevalence and deprivation, thus Luton may be expected to have a higher prevalence of ACEs than found here. However, the population in Luton is much more ethnically diverse than that in Northamptonshire and Hertfordshire, with almost a third of residents being of Asian ethnicity (Appendix 1, Table A2). Individuals of Asian ethnicity reported a lower prevalence of ACEs than those of other ethnicities (section 3.2, and Appendix 2, Table A8), and this is consistent with findings from previous UK ACE studies[3, 9, 14]. While this may reflect cultural differences in parenting practices and behaviours, there may also be cultural variation in reporting practices that affect results.

Individual ACEs

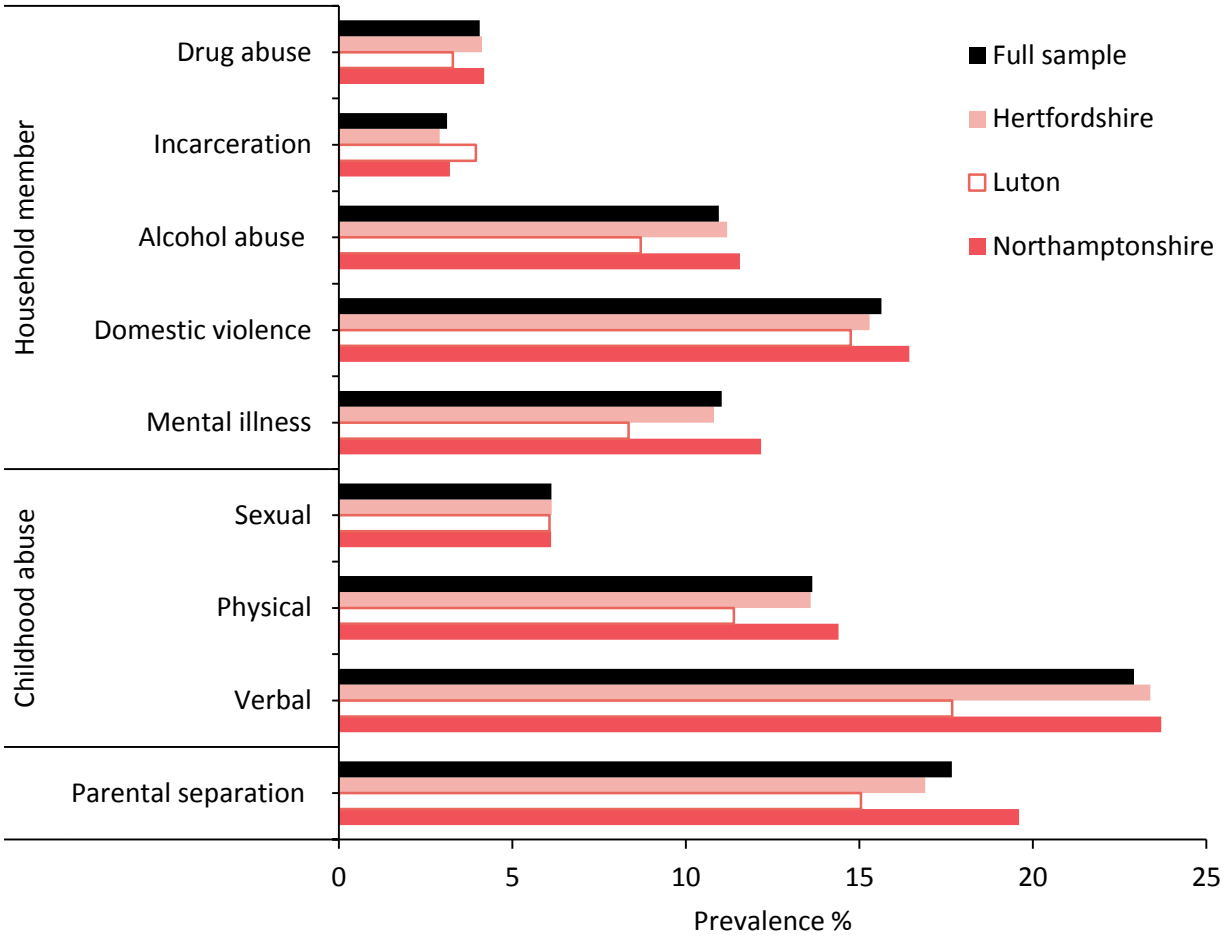
The adjusted prevalence of individual ACEs across the three study areas ranged from 3.1% of respondents reporting living with someone incarcerated during their childhood, to 22.9% experiencing verbal abuse (Appendix 2, Table A5). The prevalence of individual ACEs varied across the study area. For example, exposure to mental illness ranged from 8.3% in Luton, to 10.8% in Hertfordshire and 12.2% in Northamptonshire (see Figure 1). The

prevalence of parental separation differed across the study area (Hertfordshire, 16.9%; Luton, 15.0%; Northamptonshire, 19.6%). The prevalence of respondents reporting sexual abuse was however consistent across the three study areas, with over one in twenty (6.1%) reporting childhood sexual abuse. There were variations in individual ACE prevalence across the 18 local authorities included in this study (Appendix 2, Table A6) and at ward level (Appendix 2, Table A7).

Table 3: ACE count comparisons across study areas

	Sample data (%)			Population adjusted (%)		
Ace count	Hertfordshire	Luton	Northamptonshire	Hertfordshire	Luton	Northamptonshire
None	53.4	69.4	51.3	56.1	63.6	52.5
1	19.0	13.0	20.6	18.3	15.0	19.3
2-3	18.0	11.1	17.6	17.0	13.4	17.9
4+	9.5	6.5	10.4	8.6	8.0	10.4

Figure 1: Adjusted prevalence of the individual ACEs experienced, across the whole sample and three study areas*



*Prevalence rates adjusted to account for population demographics (see Appendix 1).

3.2. Relationship between ACEs and socio-demographics

ACE count

The unadjusted prevalence of ACEs by socio-demographics is shown in Table A8 (Appendix 2). The proportion reporting at least one ACE reduced with age from 48.8% of 18-29 year olds to 37.3% of 60-69 year olds, with the proportion reporting 4+ ACEs ranging from 11.9% of 18-29 year olds to 4.8% of 60-69 year olds. While the proportions of males (42.3%) and females (43.8%) reporting at least one ACE were similar, more females (10.3%) reported 4+ ACEs (males 7.4%). Asian respondents were less likely to report an ACE (22.6%) than individuals of White (46.4%) or Other (43.5%) ethnicity. There was also variation in ACE count by deprivation, with a slightly higher prevalence of 4+ ACEs in the most deprived quintile (11.7%; least deprived, 9.1%).

Each of these individual relationships remained after controlling for all other socio-demographics (using multinomial logistic regression). Compared with those with no ACEs, individuals with more than one ACE were more likely to be aged less than 60 years and females were more likely to report 4+ ACEs than males ($p<0.01$). Asian respondents were significantly less likely to have any number of ACEs. There were few independent relationships between ACE count and deprivation, although individuals resident in the most deprived quintile were 1.4 times more likely to have 4+ ACEs than those resident in the least deprived quintile ($p<0.05$; Appendix 2, Table A9).

In bivariate analysis there was also variation in ACE prevalence by urban/rural classification with respondents in rural town and fringe reporting the highest ACE prevalence ($p<0.001$; Appendix 2, Table A8).

Individual ACEs

The unadjusted prevalence of all ACE types except physical abuse, sexual abuse and exposure to domestic violence varied significantly by age, with prevalence generally highest in the youngest age group and lowest in the oldest age group. For example, the proportion reporting parental separation during their childhood reduced from 26.6% of 18-29 year olds to 7.6% of 60-69 year olds, and the proportion living with a drug abuser reduced from 6.8% of 18-29 year olds to 1.0% of 60-69 year olds.

Females were more likely than males to report parental separation (18.0% v 15.6% males), sexual abuse (8.1% v 4.1% males) and living in a household with mental illness (12.8% v 8.1% males) or alcohol abuse (11.7% v 9.0% males), while males were more likely to report physical abuse (14.3% v 12.2% females). There were no gender differences for verbal abuse, exposure to domestic violence and living in a household with someone who was incarcerated or a drug abuser.

The prevalence of having a household member incarcerated increased with deprivation (least deprived, 2.7%; most deprived, 5.1%; $p<0.01$; Appendix 2, Table A8), but there were no significant relationships between deprivation and other ACE types. (Appendix 2, Table A8).

Respondents of Asian ethnicity had the lowest prevalence of all ACEs, whilst those of White ethnicity had the highest prevalence for all except parental separation, physical abuse, exposure to domestic abuse and having a household member who used drugs, for which Other ethnicity had the highest prevalence (Appendix 2, Table A8).

The prevalence of verbal and physical abuse, exposure to domestic abuse and living in a house with mental illness varied significantly

by urban/rural classification and was highest for respondents residing in a rural town and fringe (Appendix 2, Table A8).

Relationship between ACE Count and low education

Nearly one in twenty (17.3%) respondents reported having no qualifications. The prevalence of having no qualifications varied by ACE count but showed no clear relationship (0 ACEs, 18.5%; 1 ACE 15.3%; 2-3 ACEs 14.6%; 4+ ACEs 18.8%; Appendix 2, Table A10). However there were strong relationships between having no qualifications and socio-demographic factors, particularly age (18-29 years 7.0%, 60-69 years 39.4%, $p<0.001$) and deprivation (least deprived 10.3%, most deprived 33.6%, $p<0.001$).

Once demographic factors were controlled for, having no qualifications was found to be associated with having 4+ ACEs; those with 4+ ACEs were 1.5 times more likely to have no qualifications than those with no ACEs. Having no qualifications was also associated with older age (e.g. 18-29, 7.0%; 60-69, 39.4%; $p<0.001$), Asian ethnicity and greater deprivation (Appendix 2, Tables A10 and A11).

3.3. Health-harming behaviours

This section presents data on the relationship between ACE count and a range of health harming behaviours: smoking (tobacco smoking and e-cigarette use); alcohol consumption (binge drinking and high-risk drinking); drug use (cannabis use and heroin or crack cocaine use); violence (victimisation and perpetration); incarceration; poor diet; unintended teenage pregnancy; early sexual initiation; and low physical exercise.

For each outcome, the unadjusted prevalence and relationship with ACE count and participant demographics is shown, along with results from logistic regression analysis which adjusts for the effects of age, gender, ethnicity and deprivation (from this point forward phrased controlling for socio-demographics). The overall prevalence and adjusted odds ratios for each outcome measure by ACE count is presented in a figure in each section.

For pertinent outcomes, an estimate of the reduction in the prevalence of health-harming behaviours in the study area that could be achieved if ACEs were prevented is provided. These figures have been adjusted to population socio-demographics and are summarised in Table 4. This shows that preventing ACEs in Hertfordshire, Luton and Northamptonshire could have a substantial impact on the prevalence of health-harming behaviours, with reductions (percentage change in prevalence) ranging from 13.9% for poor diet to 60.6% for perpetration of violence. In terms of numbers, these range from 15,289 individuals not using heroin or crack cocaine in their lifetime to 104,231 not using cannabis.

Methodological information along with tables providing full data for the findings in this section are included in Appendix 1 and 2.

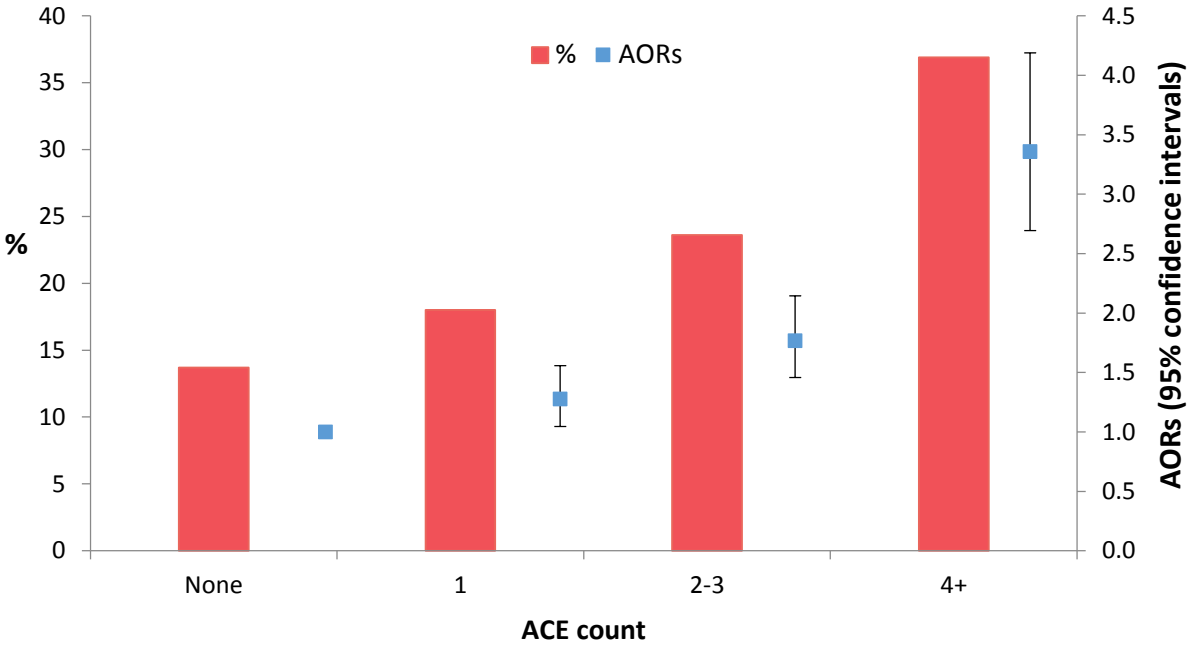
Table 4: Modelled impact of preventing ACEs at sample and national population levels on health-harming behaviours

	Current prevalence		Estimates with 0 ACEs			
Outcome	**%**	**n**	**%**	**n**	**% change**	**Number saved**
Smoking tobacco (*current*)	18.4	246698	13.8	185800	24.7	60898
Binge drinking	7.6	101820	5.9	79771	21.7	22048
Cannabis use (*lifetime*)	17.1	230423	9.4	126192	45.2	104231
Heroin or crack cocaine use (*lifetime*)	2.1	28482	1.0	13193	53.7	15289
Violence victimisation (*last 12 months*)	4.0	53769	1.8	23625	56.1	30144
Violence perpetration (*last 12 months*)	3.7	49421	1.5	19476	60.6	29944
Incarceration (*lifetime*)	6.3	85202	3.6	42294	50.4	42908
Poor diet (*current*)	10.4	139632	9.0	120272	13.9	19361
Unintended teenage pregnancy (*<18 years*)	6.0	80144	3.3	44871	44.0	35273
Early sexual initiation (*<16 years*)	13.0	174368	8.3	111401	36.1	62967

Tobacco smoking

Smoking tobacco was defined as currently smoking tobacco on a daily basis.

Figure 2: Current tobacco smoking: percentage and adjusted odds ratio (AOR) by ACE count



Just under a fifth (18.2%) of individuals who participated in the ACE study currently smoked tobacco. The prevalence of current smoking increased with the number of ACEs reported, rising from 13.7% among respondents with no ACEs to 36.9% among those with 4+ ACEs ($p<0.001$, Figure 2).

Prevalence of smoking tobacco was higher for males (22.0%; females, 15.1%; $p<0.001$), respondents in younger age groups (18-29 years, 23.6%; 60-69 years, 10.0%; $p<0.001$), and those of White ethnicity (20.4%; Asian, 8.5%; Other, 9.7%; $p<0.001$). The prevalence of smoking was also higher in more deprived areas with 13.2% of those in the least deprived quintile smoking compared with 29.9% in the most deprived quintile ($p<0.001$; Appendix 2, Table A12).

The relationship between smoking and ACE count remained after controlling for socio-demographics. The odds of being a current smoker were 3.4 times higher for those with 4+ ACEs compared to those with none (Figure 2; Appendix 2, Table A13).

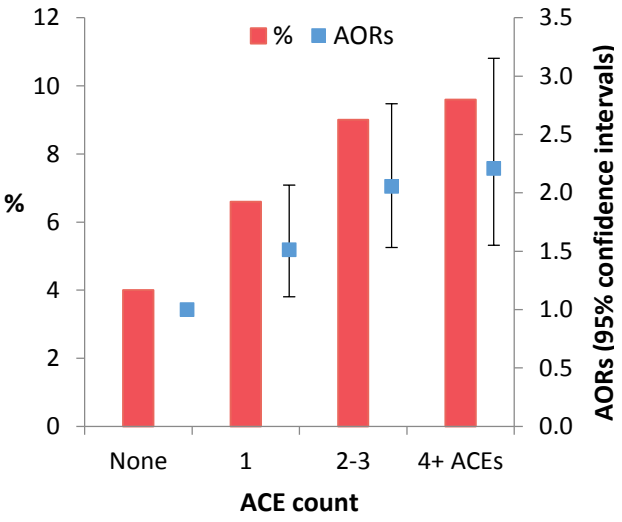
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of smoking could be 24.7% lower**.

This would be equivalent to having approximately **60,898 fewer smokers** across the study area (Table 4).

Using e-cigarettes (vaping)

Defined as individuals who were currently using e-cigarettes (vaping).

Figure 3: Currently using e-cigarettes: percentage and adjusted odds ratio (AOR) by ACE count



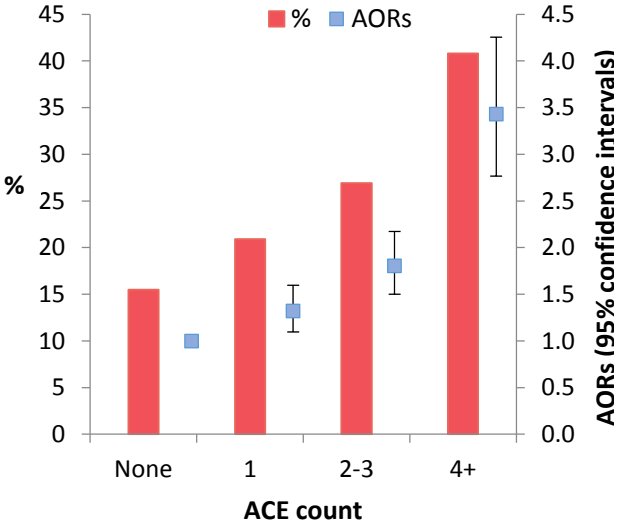
One in twenty (5.8%) participants currently used e-cigarettes. Prevalence of e-cigarette use increased with ACE count, rising from 4.0% of those with no ACEs to 9.6% of those with 4+ ACEs (p<0.001; Figure 3). E-cigarette use was higher in males (6.6%; females, 5.2%; p<0.05), younger age groups (e.g. 18-29 years, 7.0%; 60-69 years, 3.7%; p<0.01), and those of White ethnicity (6.7%; Asian, 1.4%; Other, 2.8%; p<0.001; Appendix 2, Table A12).

After controlling for socio-demographics the odds of being an e-cigarette user were 2.2 times higher for those with 4+ ACEs compared to those with none (Figure 3; Appendix 2, Table A13).

Smoking tobacco or using e-cigarettes

Smoking tobacco or using e-cigarettes was defined as current use of either.

Figure 4: Smoking tobacco or using e-cigarettes: prevalence and adjusted odds ratio (AOR) by ACE count



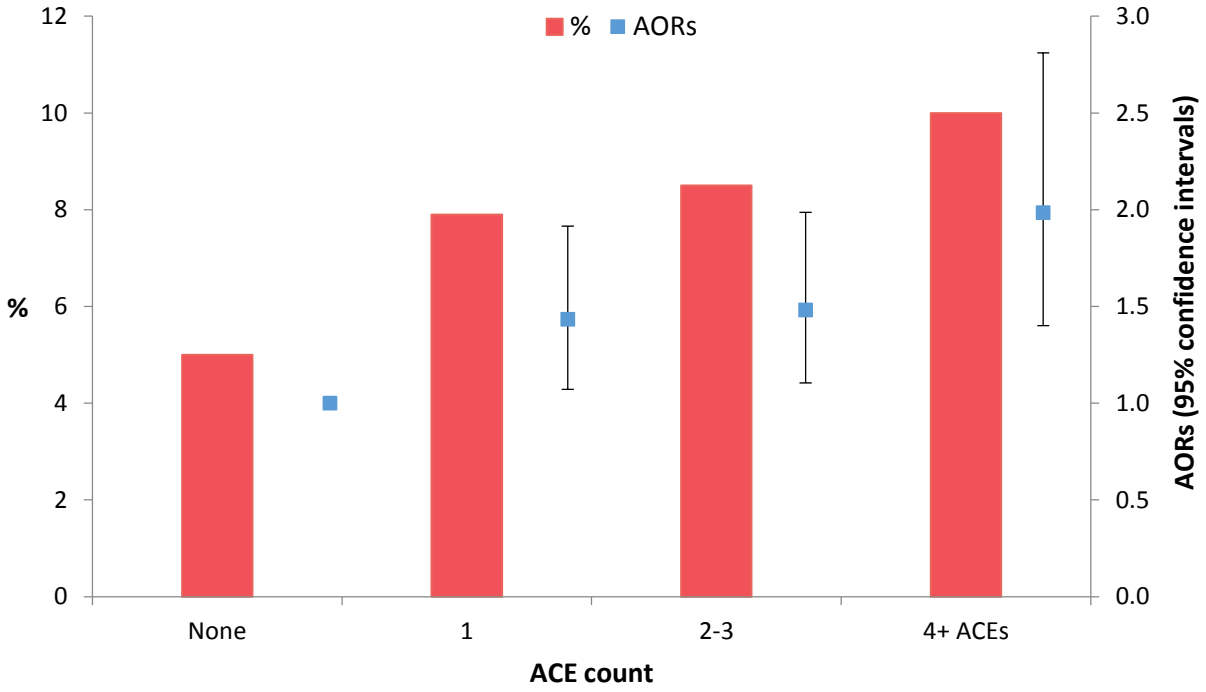
Combining tobacco and e-cigarette use, one fifth (20.6%) of respondents reported current use of either. Prevalence increased with the number of ACEs reported (no ACEs, 15.5%; 4+ ACEs 40.8%; p<0.001; Figure 4). Prevalence was also higher for males (25.2%; females, 16.9%; p<0.001), respondents in younger age groups (e.g. 18-29 years, 27.0%; 60-69 years, 11.4%; p<0.001), those of White ethnicity (23.3%; Asian, 9.2%; Other, 10.5%; p<0.001), and individuals living in the most deprived quintile (31.5%; least deprived, 15.8%; p<0.001; Appendix 2, Table A12).

After controlling for socio-demographics the odds of being a smoker or e-cigarette user were 3.4 times higher for those with 4+ ACEs compared to those with none (Figure 4; Appendix 2, Table A13).

Alcohol use – binge drinking

Binge drinking was defined as drinking six or more standard alcoholic drinks[a] in one occasion, at least once a week.

Figure 5: Binge drinking: percentage and adjusted odds ratio (AOR) by ACE count



Over one in twenty (6.6%) respondents reported binge drinking. The prevalence of binge drinking was higher for individuals who had 4+ ACEs compared to individuals who had experienced none, (4+ ACEs, 10.0%; no ACEs, 5.0%; p<0.001; Figure 5).

The prevalence of binge drinking was significantly higher amongst males (10.4%; females, 3.5%; p<0.001), respondents from younger age groups (e.g.18-29 year olds, 8.5%; 60-69 year olds, 4.4%; p<0.01) and individuals of a White ethnicity (7.9%; Asian, 0.4%; Other 2.3%; p<0.001; Appendix 2, Table A12).

After controlling for socio-demographics the relationship between binge-drinking and ACE count remained. Individuals with 4+ ACEs being twice as likely to binge drink than individuals with no ACEs (Figure 5; Appendix 2, Table A13).

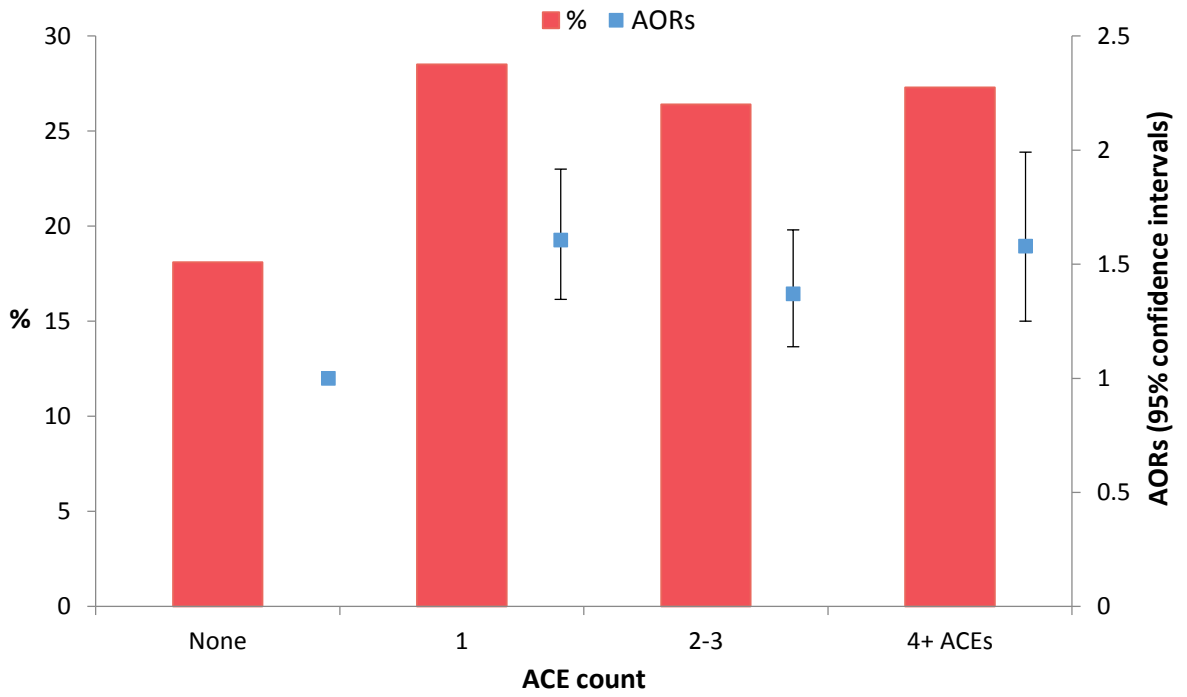
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of binge drinking by adults could be 21.7% lower**.

This would be equivalent to approximately **22,048 fewer binge drinkers** across the study area (Table 4).

Alcohol use – high-risk drinking

High-risk drinking was calculated using the Alcohol Use Disorder Identification Test (AUDIT-C)[b]. Individuals with a score of five or over were classified as high-risk drinkers.

Figure 6: High-risk drinking: percentage and adjusted odds ratio (AOR) by ACE count



Almost one quarter (22.1%) of respondents were classified as high-risk drinkers. The prevalence of high-risk drinking was higher for individuals reporting one ACE compared to individuals who had experienced no ACEs (no ACEs, 18.1%; 1 ACE, 28.5%; 4+ ACEs, 27.3%; p<0.001; Figure 6).

The prevalence of high-risk drinking was significantly higher amongst males (31.3%; females, 14.7% <0.001), respondents in younger-age groups (e.g. 18-29 year olds, 26.0%; 60-69, 16.3%; p<0.001), those from the two least deprived quintiles (e.g. least deprived, 28.2%; most deprived, 18.2%; p<0.001) and those of a White ethnicity (26.0%; Asian, 2.7%; Other, 12.5%; p<0.001; Appendix 2, Table A12).

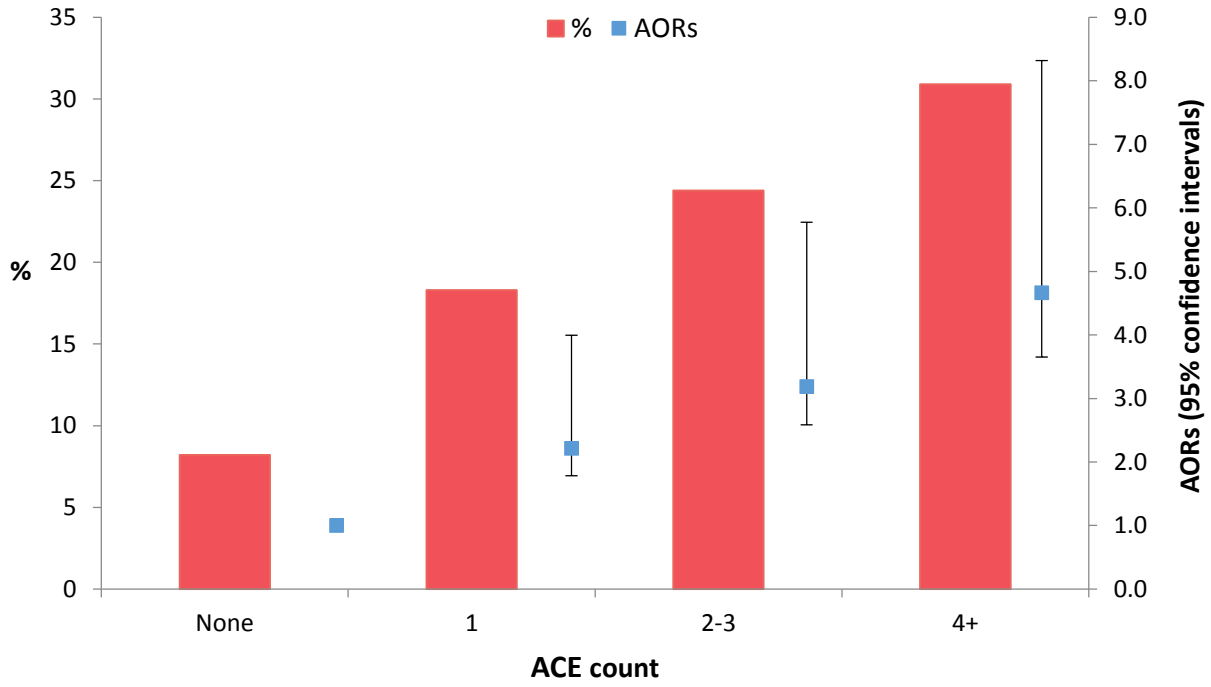
After controlling for socio-demographics the relationship between high-risk drinking and ACE count remained. The odds of high-risk drinking being 1.6 times higher for individuals with 4+ ACEs than those with none (Figure 6; Appendix 2, Table A13).

[b] AUDIT-C is the Alcohol Use Disorder Identification Test Consumption which creates an overall measure of risk associated with alcohol consumption by combining measures of drinking levels, dependence and harms. More information on AUDIT-C can be found at:
http://www.alcohollearningcentre.org.uk/Topics/Browse/BriefAdvice/?parent=4444&child=4898

Cannabis use

A respondent was defined as having used cannabis if they reported having used this drug at any point during their lifetime.

Figure 7: Cannabis use: percentage and adjusted odds ratio (AOR) by ACE count



Overall, 14.6% of respondents reported that they had used cannabis at some point in their lives. The prevalence of cannabis use increased with ACE count rising from 8.2% of those reporting no ACEs to 30.9% of individuals with 4+ACEs ($p<0.001$; Figure 7).

A significantly higher prevalence of cannabis use was recorded among males (19.7%; females, 10.5%; $p<0.001$), those of White ethnicity (16.9%; Asian, 3.1%; Other, 10.3%; $p<0.001$), and individuals from younger age groups (e.g. 18-29, 22.7%; 60-69, 5.7%; $p<0.001$; Appendix 2, Table A12).

The relationship between cannabis use and ACE count remained significant after controlling for socio-demographics. Odds of cannabis use was 4.7 times higher for individuals reporting 4+ ACEs compared to none (Figure 7; Appendix 2, Table A13).

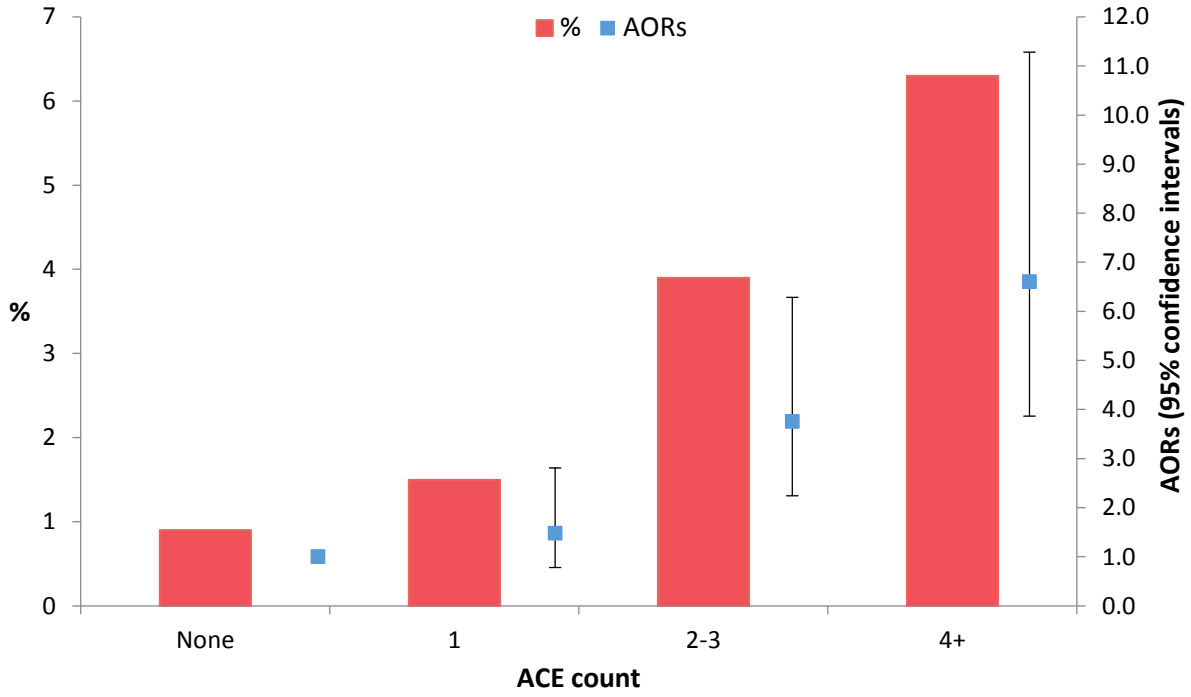
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of adults who have ever smoked cannabis could be 45.2% lower.**

This would be equivalent to approximately **104,231 fewer adults having ever smoked cannabis** across the study area (Table 4).

Heroin or crack cocaine use

A respondent was defined as having used heroin or crack cocaine if they reported having used this drug at any point during their lifetime.

Figure 8: Heroin or crack cocaine use: percentage and adjusted odds ratio (AOR) by ACE count



In total, 2.0% (n=107) of respondents reported having used heroin or crack cocaine at any point during their lifetime. The prevalence increased with ACE count, from 0.9% of those with no ACEs to 6.3% of those with 4+ ACEs (p<0.001; Figure 8).

There was a significantly higher prevalence of crack cocaine or heroin use among males (2.8%; female, 1.3%; p<0.001), individuals of White ethnicity (2.3%; Asian, 0.3%; p<0.01), and in younger age groups (e.g. 18-29, 3.0%; 60-69, 0.5%; p<0.001; Appendix 2, Table A12).

These relationships remained after controlling for socio-demographics, with the odds of ever having used crack cocaine or heroin being 6.6 times higher amongst those who had 4+ ACEs than those who had experienced no ACEs (Figure 8; Appendix 2, Table A13).

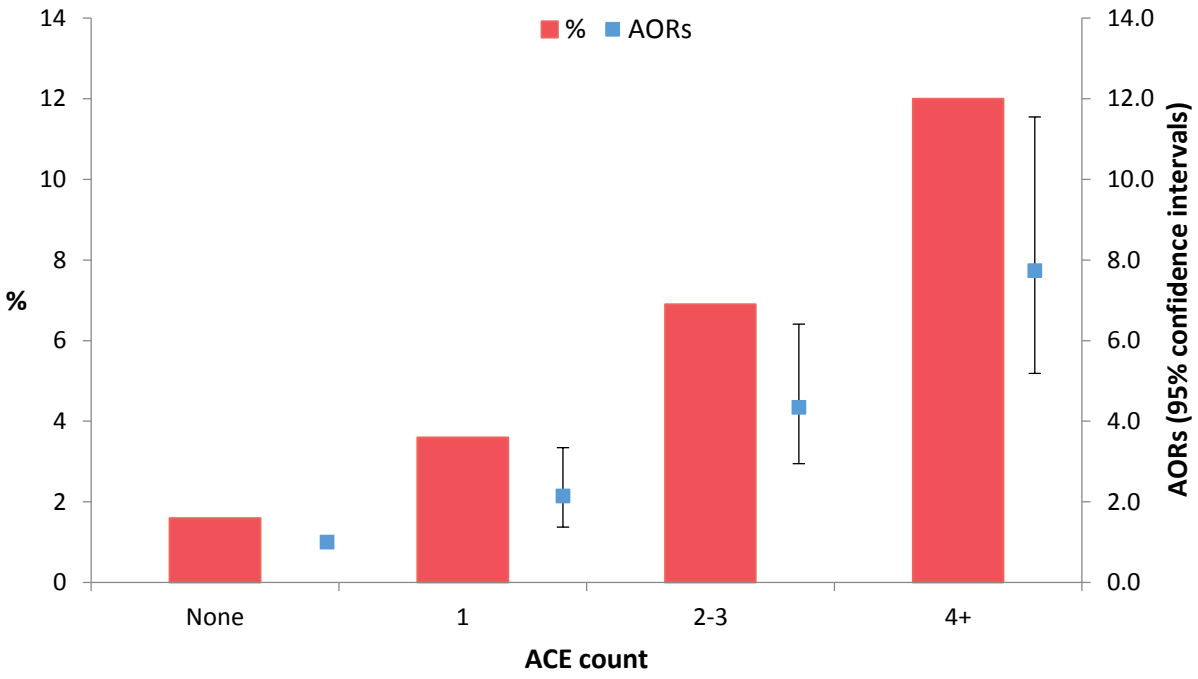
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of adults who have ever used crack cocaine or heroin could be 53.7% lower**.

This would be equivalent to approximately **15,289 fewer individuals ever having used heroin or crack cocaine** across the study area (Table 4).

Violence victimisation

Violence victimisation was defined as anyone who reported they had been physically hit by anyone in the last 12 months.

Figure 9: Violence victimisation: percentage and adjusted odds ratio (AOR) by ACE count



Less than one in twenty (3.7%) respondents reported being a victim of violence in the last 12 months. The prevalence of being a victim of violence increased with ACE count (4+ ACEs, 12.0%; no ACEs, 1.6%; p<0.001; Figure 9).

The prevalence of violence victimisation was significantly higher for males (4.7%; females, 3.0%; p<0.01), and significantly decreased with older age, with individuals in the youngest age group, 18-19 year olds over nine times more likely to have been victims of violence in the past year than individuals aged 60-69 years (e.g. 18-29, 8.7%; 60-69, 0.9%; p<0.001, Appendix 2, Table A12b).

After controlling for socio-demographics, the relationship between violence victimisation and ACE count remained. Individuals exposed to 4+ ACEs were 7.7 times more likely to have been victims of violence in the last 12 months compared to those exposed to no ACEs (Figure 9, Appendix 2, Table A13).

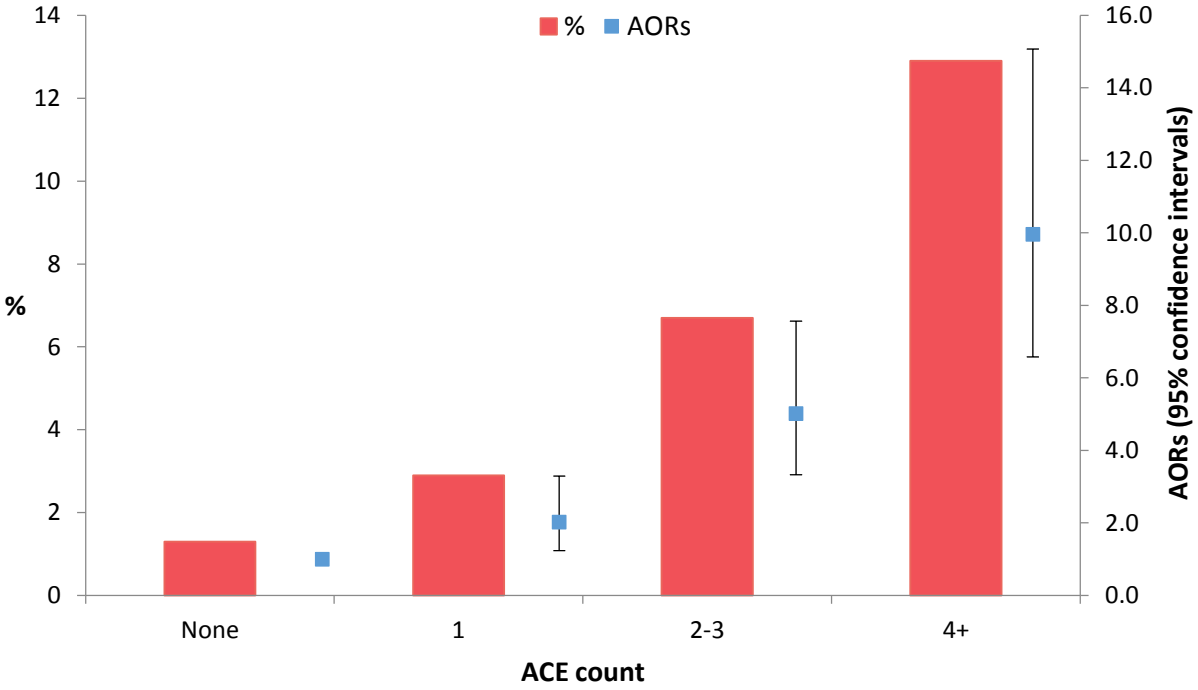
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of adults experiencing violence victimisation could be 56.1% lower.**

This would be equivalent to approximately **30,144 fewer individuals across the study area being a victim of violence in the previous 12 months** (Table 4).

Violence perpetration

Violence perpetration was defined as anyone who stated that they had physically hit another person in the last 12 months.

Figure 10: Violence perpetration: percentage and adjusted odds ratio (AOR) by ACE count



In total, 3.5% of respondents disclosed that they had perpetrated violence in the last 12 months. The prevalence of perpetration increased with ACE count, with 12.9% of adults exposed to 4+ ACEs reporting violence perpetration compared to 1.3% of those who reported no ACEs (p<0.001; Figure 10).

Significantly higher levels of violence perpetration were recorded for males (4.2%; females, 3.0%; p<0.01), and respondents in younger age groups: (e.g. 18-29, 8.3%; 60-69, 0.8%; p<0.001; Appendix 2, Table A12b).

The relationship between ACE count and violence perpetration remained after controlling for socio-demographics. The odds of perpetrating violence were almost 10.0 times higher in those with 4+ ACEs compared to individuals with none (Figure 10, Appendix 2, Table A13).

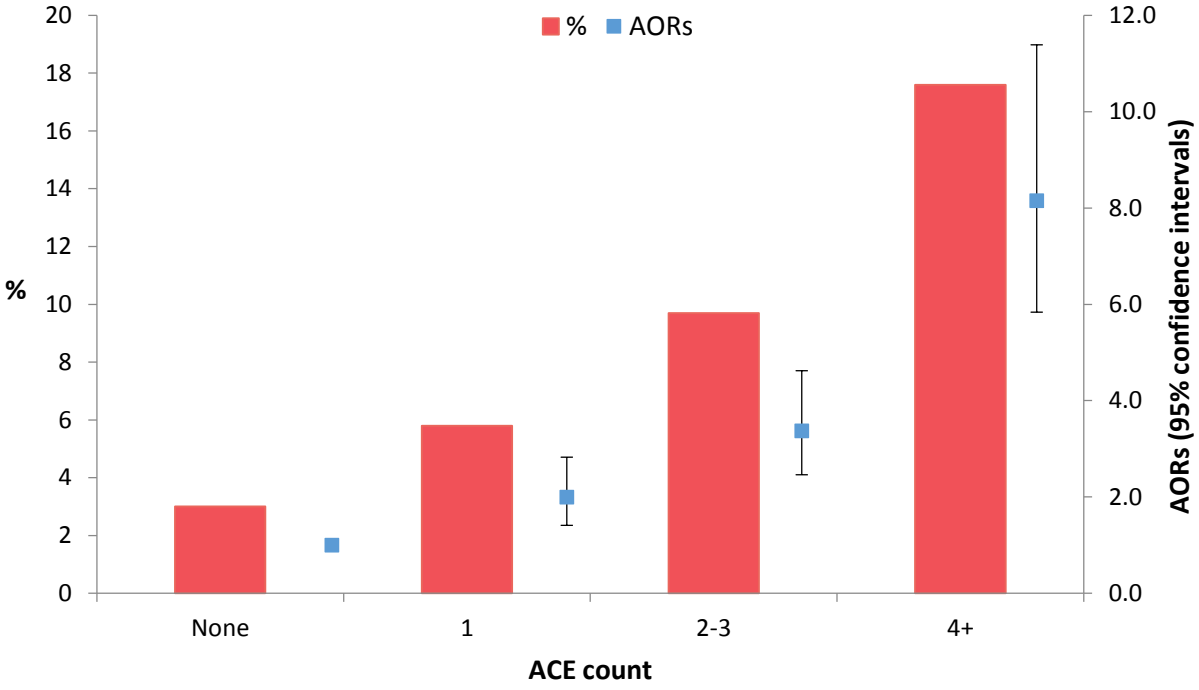
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of violence perpetration could be 60.6% lower**.

This would be equivalent to **29,944 fewer individuals across the study area perpetrating violence in the previous 12 months** (Table 4).

Incarceration

Incarceration was defined as anyone who has spent one or more night(s) in prison, jail or in a police station at any point in their lives.

Figure 11: Incarceration: percentage and adjusted odds ratio (AOR) by ACE count



One in twenty (5.9%) respondents stated they had been incarcerated at some point in their lives. The prevalence of incarceration increased with ACE count, with 17.6% of individuals exposed to 4+ ACEs reporting having previously been incarcerated compared to 3.0% of those with no ACEs (<0.001; Figure 11).

Incarceration was most prevalent among males (10.4%; females, 2.3%; p<0.001), respondents in younger age groups (e.g. 18-29, 7.2%; 60-69, 3.6%; p<0.01), individuals of White ethnicity (6.4%; Asian, 3.6%; Other, 4.5%; p<0.01), and individuals living in the most deprived quintile (9.6%; least deprived, 4.4%; p<0.001; Appendix 2, Table A12b).

After controlling for socio-demographics the relationship between incarceration and ACE count remained. The odds of having been previously incarcerated were 8.2 times higher for individuals who reported 4+ ACEs than those who had experienced none (Figure 11, Appendix 2, Table A13).

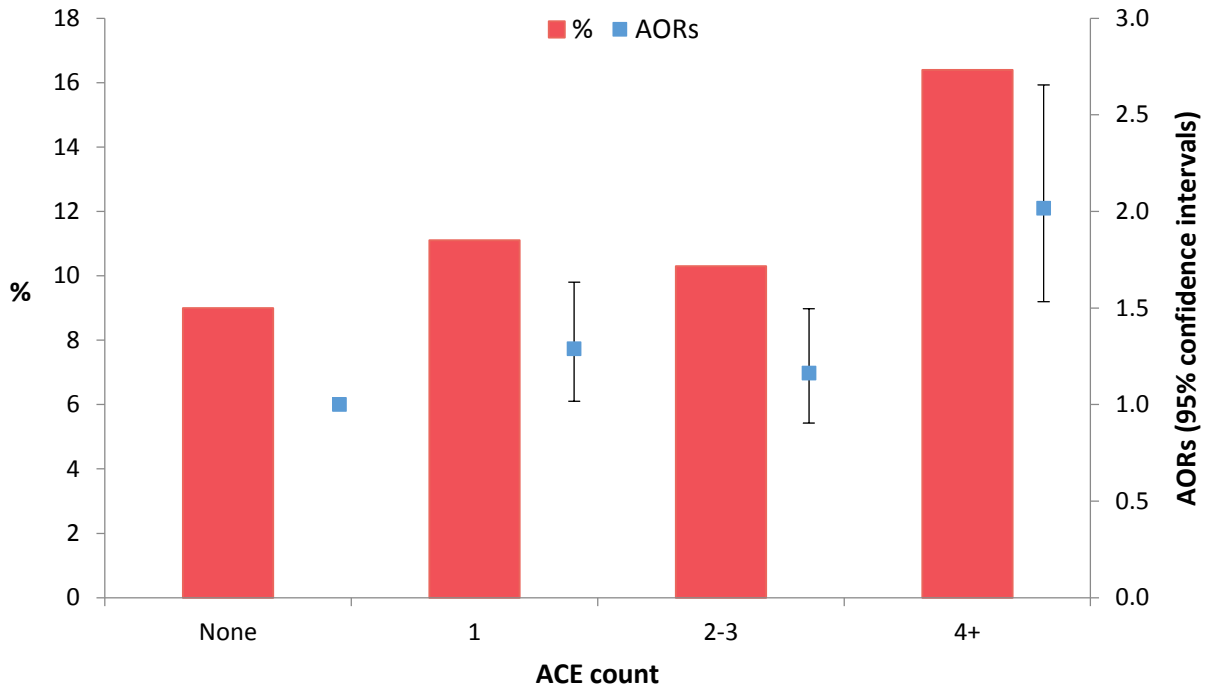
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of adults experiencing violence victimisation could be 50.4% lower**.

This would be equivalent to **42,908 fewer individuals across the study area having ever been incarcerated** (Table 4).

Poor diet

Poor diet was defined as eating less than two portions of fruit and vegetables (excluding potatoes) a day.

Figure 12: Poor diet: percentage and adjusted odds ratio (AOR) by ACE count



One in ten (10.2%) study participants reported having a poor diet. Prevalence of poor diet increased with ACE count, rising from 9.0% of respondents with no ACEs to 16.4% of those with 4+ ACEs (p<0.001; Figure 12).

Prevalence of a poor diet was significantly higher for males (13.1%; females, 7.9%; p<0.001), individuals from the youngest age group (e.g. 18-29 year olds, 14.5%; 60-69 year olds, 8.5%; p<0.001) and those resident in the poorest deprivation quintile (12.1%; compared to 7.5% in the least deprived; p<0.001; Appendix 2, Table A12b).

The relationship between ACE count and poor diet remained after controlling for socio-demographics, with the odds of having a poor diet twice as high for individuals who had experienced 4+ ACEs compared to those with none (Figure 12, Appendix 2, Table A13).

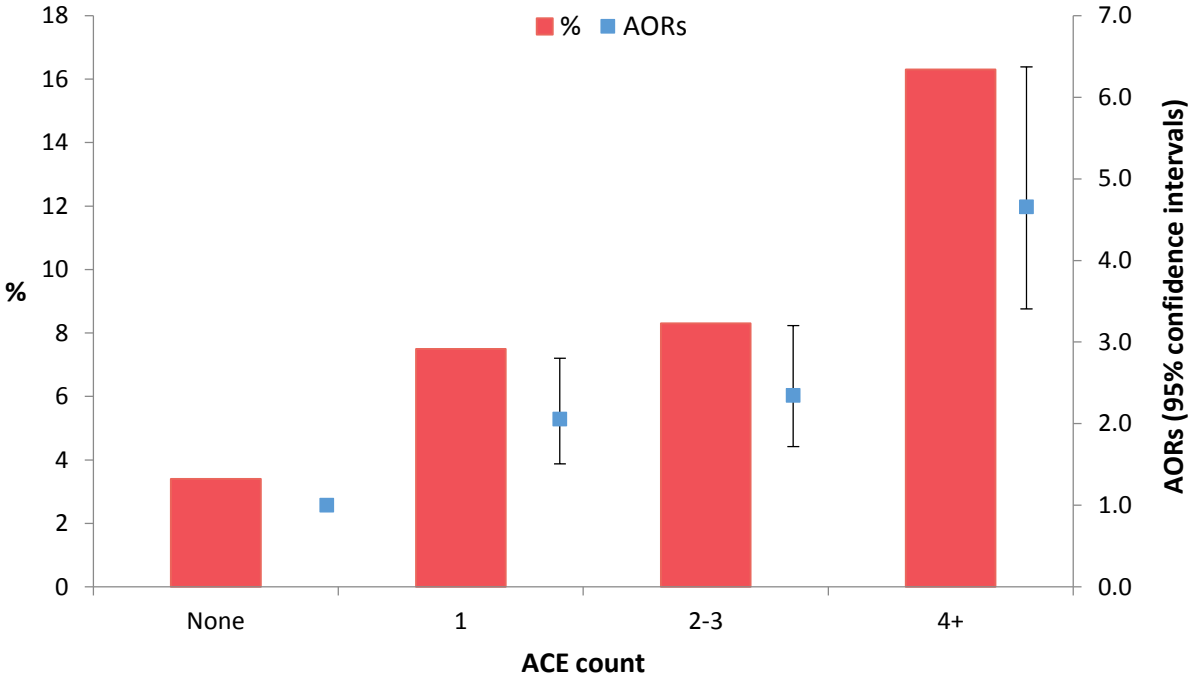
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of poor diet could be 13.9% lower.**

This would be equivalent to **19,361 fewer individuals having a poor diet** across the study area (Table 4).

Unintended teenage pregnancy

Unintended teenage pregnancy was defined as incidents where an individual accidently got pregnant or accidently got someone else pregnant before the age of 18 years.

Figure 13: Unintended teenage pregnancy: percentage and adjusted odds ratio (AOR) by ACE count



Overall, 6.1% of respondents reported that they accidently got pregnant, or accidently got someone else pregnant before the age of 18. The prevalence of accidental teenage pregnancy increased with ACE count (no ACEs, 3.4%; 4+ ACEs, 16.3%; p<0.001; Figure 13).

The prevalence of unintended teenage pregnancy was significantly higher for females (8.2%; males, 3.5%; p<0.001), lowest amongst individuals of Asian ethnicity (1.0%; Other, 7.7; White, 6.8%; p<0.001; Appendix 2, Table A12b).

After controlling for socio-demographics the relationship between unintended teenage pregnancy with ACE count remained. Individuals exposed to 4+ ACEs were 4.7 times more likely to have had an unintended teenage pregnancy than those with no ACEs (Figure 13, Appendix 2, Table A13).

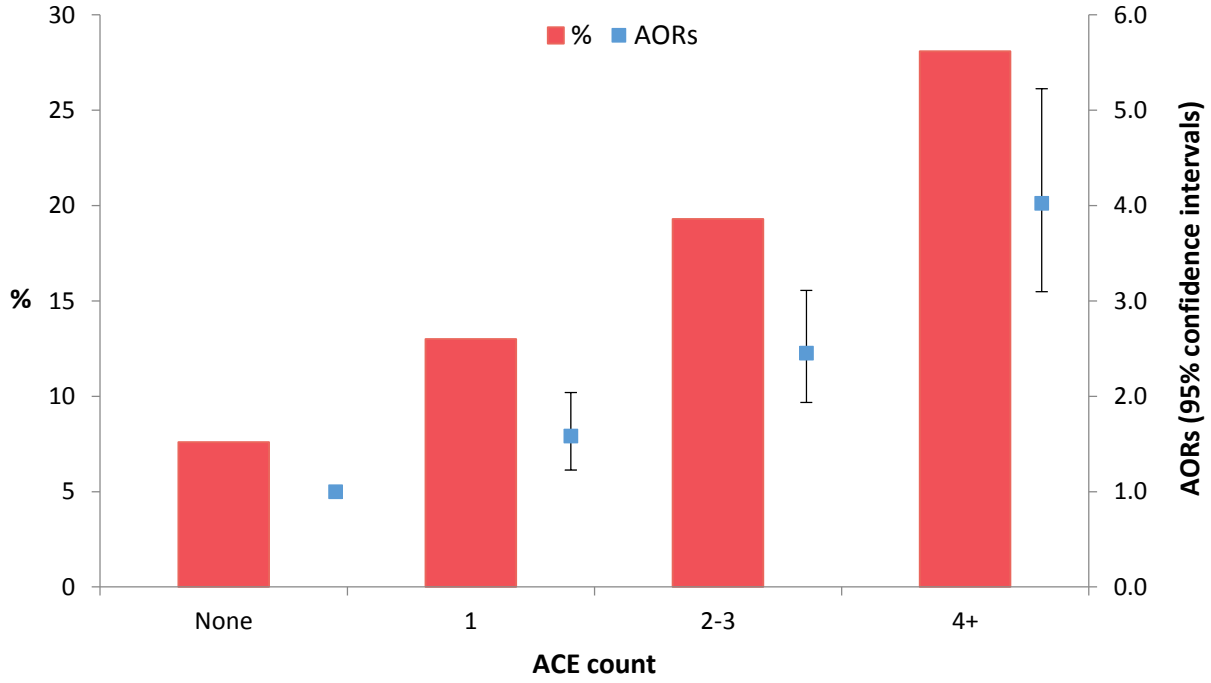
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of unintended teenage pregnancy could be 44.0% lower**.

This would be equivalent to **35,273 fewer individuals across the study area having unintended teenage pregnancies** (Table 4).

Early sexual initiation

Early sexual initiation was defined as someone who has had sexual intercourse before the age of 16 years.

Figure 14: Early sexual initiation: percentage and adjusted odds ratio (AOR) by ACE count



Over one in ten (12.7%) respondents disclosed having sexual intercourse before the age of 16. The prevalence increased with ACE count, with 28.1% of individuals who had experienced 4+ ACEs reporting early sexual initiation, compared to 7.6% of those who reported no ACEs ($p<0.001$; Figure 14).

Males were significantly more likely to have engaged in early sexual initiation (males, 14.2%; females, 11.5%; $p<0.01$). The prevalence was higher amongst the youngest age groups (e.g. 18-29, 20.1%; 60-69, 4.4%; $p<0.001$), and lowest amongst individuals of Asian ethnicity (2.1%; White, 14.0%; Other, 14.1%; $p<0.001$; Appendix 2, Table A12b).

After controlling for socio-demographics, the relationship with early sexual initiation and ACE count remained. The odds of early sexual initiation were 4.0 times higher amongst individuals who had experienced 4+ ACEs compared to those who had experienced none (Figure 14, Appendix 2, Table A13).

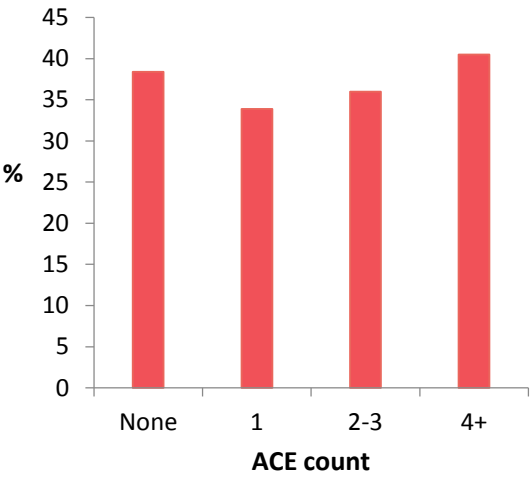
After adjusting figures to match population socio-demographics, results suggest that if no individuals in the population were exposed to ACEs, **the prevalence of early sexual initiation could be 36.1% lower.**

This would be equivalent to **62,967 fewer individuals across the study area having sexual intercourse under the age of 16** (Table 4).

Low physical exercise

Low physical exercise was defined as taking part in at least 30 minutes of physical activity (e.g. walking quickly, cycling, sports or exercise) less than three days a week

Figure 15: Low physical exercise: percentage by ACE count



Nearly four in ten (37.4%) respondents reported low physical exercise. The prevalence of low physical exercise was significantly higher for individuals who had experienced 4+ ACEs than other individuals (no ACEs, 38.4%; 1 ACE, 33.9%, 2-3 ACEs, 36.0%; 4+ ACEs, 40.5%; $p<0.05$; Figure 15). The prevalence of low physical exercise was higher amongst older age groups (e.g. 18-29 year olds, 31.7%; 60-69 year olds, 44.7%; $p<0.001$), individuals from the two most deprived quintiles (e.g. least deprived, 34.8%; most deprived, 39.8%; $p<0.01$) and individuals of Asian ethnicity (46.2%; White, 36.3; Other, 33.2%; $p<0.001$; Appendix 2, Table A12b).

After controlling for socio-demographics, rates of low physical exercise did not significantly relate to ACE counts, but relationships with age, ethnicity and deprivation remained (Appendix 2, Table A13).

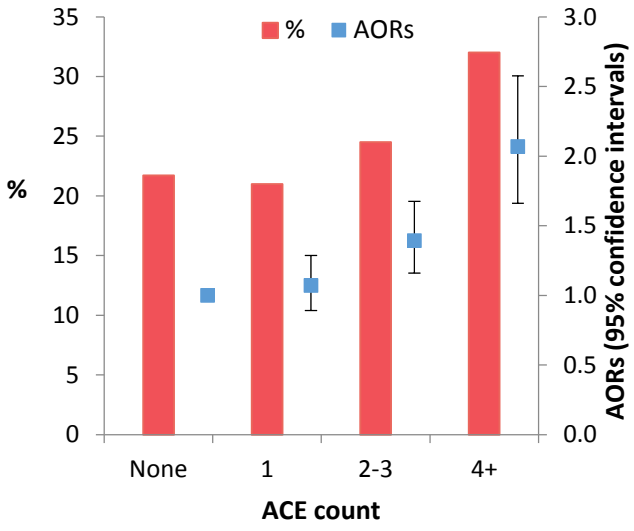
3.4. Health service utilisation

Study participants were asked a series of questions on their frequency of health service use in the last year (see Table 2). Health services examined included visits to a GP or accident and emergency department, overnight stays in hospital, and visits to the dentist. For each health service type, the following sections highlight the prevalence of service use, the relationship to ACE count, and the relationship with demographics at an unadjusted sample level. This is followed by results from logistic regression analysis showing adjusted odds ratios by ACE count after controlling for socio-demographics. Full data are provided in Appendix 2 Tables A14 and A15.

Regularly visiting a General Practitioner (GP)

Defined as having visited a GP >3 times in the last 12 months (excluding for reasons relating to pregnancy).

Figure 16: Regularly visiting a GP: percentage and adjusted odds ratio (AOR) by ACE count



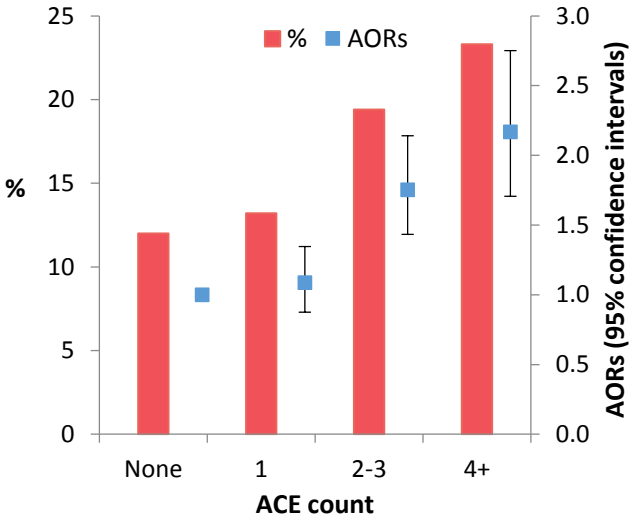
Over one fifth (23.0%) of respondents reported having visited their GP regularly (i.e. more than three times in the last 12 months). The proportion who had regularly visited their GP increased with ACE count (no ACEs, 21.7%; 4+ ACEs, 32.0%; p<0.001; Figure 16). Individuals who had reported visiting the GP regularly were more likely to be older (e.g. 18-29, 15.7%; 60-69, 36.3%; p<0.001), female (27.1%; male, 17.8%; p<0.001), live in the most deprived quintile (least deprived, 19.0%; most deprived, 31.5%; p<0.001), and be of Asian ethnicity (28.5%; White, 22.4%; Other 18.5%; p<0.001; Appendix 2, Tables A14).

After controlling for socio-demographics, individuals with 4+ ACEs were 2.1 times more likely than those with 0 ACEs to have visited a GP regularly (Figure 16; Appendix 2, Table A15).

Visited an Accident and Emergency Department (ED) in the last 12 months

Defined as having visited an ED once or more in the last 12 months (excluding for reasons relating to pregnancy).

Figure 17: Visiting an ED: percentage and adjusted odds ratio (AOR) by ACE count



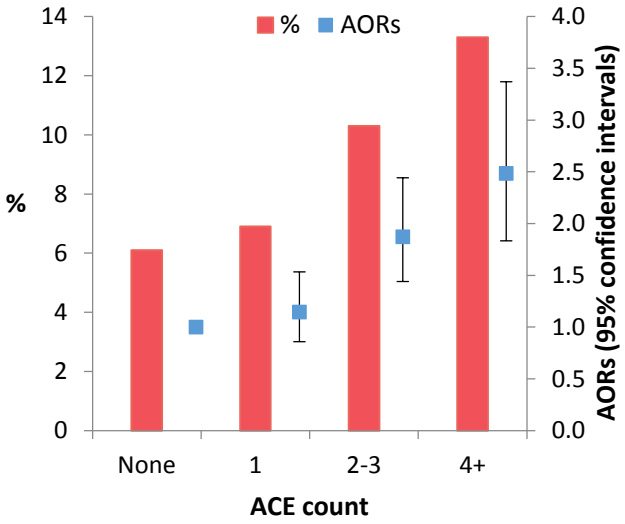
Over one in ten (14.4%) survey participants reported having visited an ED in the last 12 months. Increasing ACE counts were associated with having visited an ED, with 12.0% of people with no ACEs visiting EDs compared to 23.3% of those with 4+ ACEs (Figure 17). Individuals who reported having visited an ED were more likely to be younger (e.g. 18-29 years, 20.0%; 60-69 years, 14.4%; p<0.001; Appendix 2, Table A14).

After controlling for socio-demographics, the odds of having visited an ED in the last 12 months were 2.2 times higher for individuals with 4+ ACEs than individuals with no ACEs (Figure 17, Appendix 2, Table A15).

Stayed a night in hospital in the last 12 months

Defined as having stayed overnight in hospital once or more in the last 12 months (excluding for reasons relating to pregnancy).

Figure 18: Staying a night in hospital: percentage and adjusted odds ratio (AOR) by ACE count



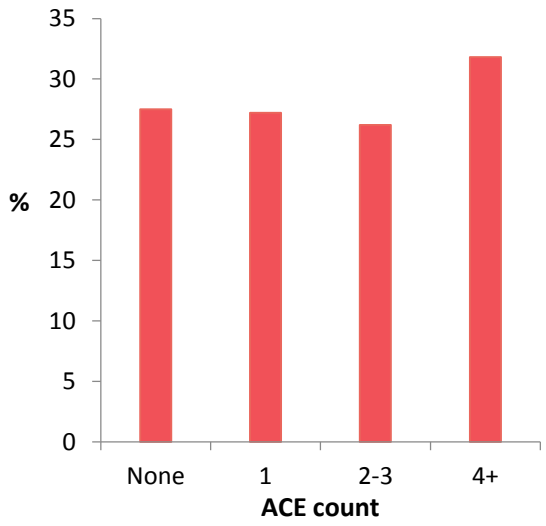
Over one in twenty (7.6%) respondents reported having stayed one night or more in hospital over the last year, with prevalence increasing with ACE count (no ACEs, 6.1%; 4+ ACEs, 13.3%; p<0.001; Figure 18). The prevalence of having stayed a night in hospital was significantly higher for females (8.5%; males, 6.4%; p<0.01), respondents in older age groups (e.g. 18-29 years, 6.9%; 60-69 years, 10.7%; p<0.01), and individuals living in the most deprived quintile (9.6%; least deprived, 6.2%; p<0.05; Appendix 2, Table A14).

After controlling for socio-demographics, the odds of having stayed a night in hospital were 2.5 times higher for those with 4+ ACEs compared to those with none (Figure 18, Appendix 2, Table A15).

Having not attended the dentist in the last 12 months

Having not visited the dentist was defined as having not been in the last 12 months (excluding for reasons relating to pregnancy)

Figure 19: Not visiting the dentist (%) by ACE count



Nearly three in ten (27.6%) respondents reported having not visited the dentist in the last 12 months. The prevalence did not significantly differ with ACE count (Figure 19). Males (32.5%; females, 23.6%; p<0.001), respondents in younger age groups (e.g. 18-29 years, 37.0%; 60-69 years, 24.5%; p<0.001), respondents with an Asian ethnicity (38.8%; White, 25.1%; Other, 36.5%; p<0.001) and individuals living in the most deprived quintile (20.2%; least deprived, 40.9%; p<0.001) had a significantly higher prevalence of not attending the dentist (Appendix 2, Table A14).

After controlling for socio-demographics, there was no relationship between ACE count and not visiting the dentist (Appendix 2, Table A15).

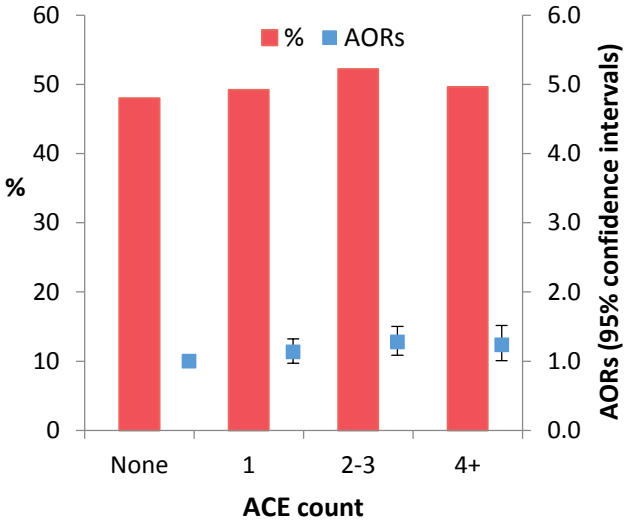
3.5. Health outcomes

This section examines the relationship between ACEs and health outcomes including: being overweight and obese; mental wellbeing; life satisfaction; dental health: more than ten teeth removed and more than ten fillings; and a diagnosis of sexually transmitted infections (STI). The following sections highlight the prevalence of the health outcome, their relationship to ACE count and demographics at an unadjusted sample level, and results from logistic regression analysis showing adjusted odds after controlling for socio-demographics. Full data are provided in Appendix 2 Table A16 and A17.

Overweight and obese (BMI 25 or more)

Respondents' BMI was calculated using self-reported height and weight, individuals with a score of 25 or more were classed as overweight or obese (see Appendix 1).

Figure 20: Overweight and obese: percentage and adjusted odds ratio (AOR) by ACE count



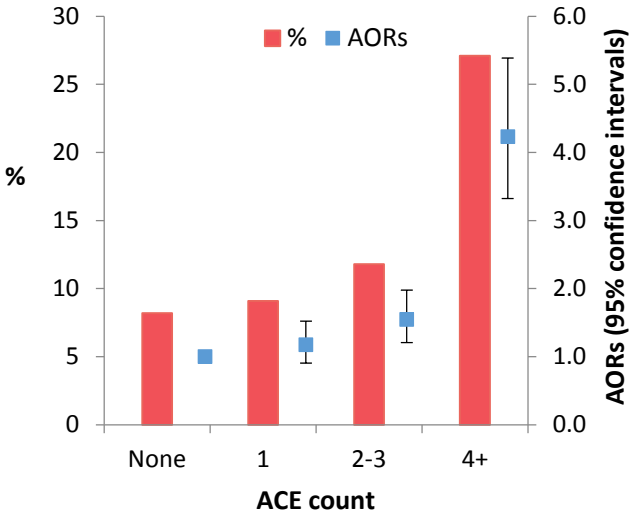
Almost half of all respondents (49.0%) were classified as being overweight or obese. The prevalence of being classed as overweight and obese did not significantly differ with ACE count (Figure 20). The prevalence of being overweight or obese was significantly higher for males (52.9%; females, 45.8%; p<0.001), respondents in older age groups (e.g. 18-29 year olds, 30.7%; 60-69 year olds, 56.9%; p<0.001) and for individuals of Other ethnicity (56.3%; White, 48.7%; Asian, 47.5%; p<0.05; Appendix 2, Table A16).

After controlling for socio-demographics, the relationships between overweight and obese; gender, age and ethnicity remained the same. However, the odds of being overweight and obese were 1.3 times higher for those with 2-3 ACEs, and 1.2 times higher for those with 4+ ACEs compared to those with none (Figure 20, Appendix 2, Table A17).

Mental wellbeing

Low mental wellbeing was defined as SWEMWBS Scores of <22 (see Appendix 1).

Figure 21: Low metal wellbeing: percentage and adjusted odds ratio (AOR) by ACE count



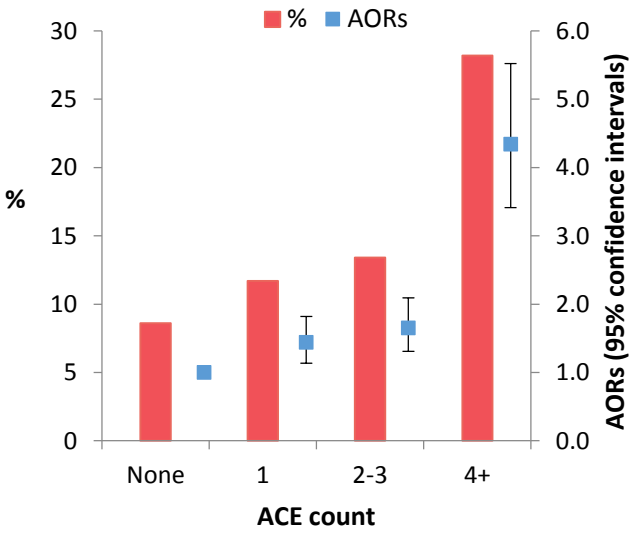
One in ten (10.6%) respondents reported a low mental wellbeing score. The prevalence of low mental wellbeing increased as ACE count increased, (no ACEs, 8.2%; 4+ ACEs, 27.1%; p<0.001; Figure 21). Having a low mental wellbeing score was significantly higher for individuals living in the most deprived quintile (15.3%; least deprived, 7.7%; p<0.001; Appendix 2, Table A16).

After controlling for socio-demographics the odds of having low mental wellbeing were 4.2 times higher for those with 4+ ACEs compared to those with none (Figure 21, Appendix 2, Table A17).

Life satisfaction

Low life satisfaction was defined as scores of <6 (See Appendix 1).

Figure 22: Low life satisfaction: percentage and adjusted odds ratio (AOR) by ACE count



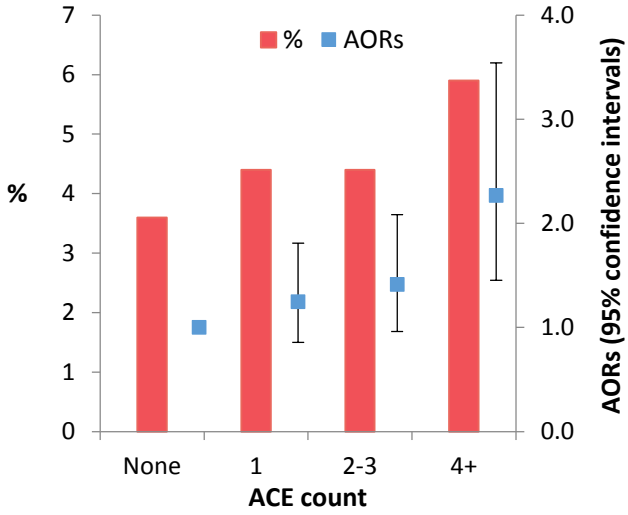
One in ten (11.7%) respondents reported a low life satisfaction. The prevalence increased with ACE count (no ACEs, 8.6%; 4+ ACEs, 28.2%; p<0.001; Figure 22). Having low life satisfaction was significantly higher for respondents in older age groups (e.g. 18-29 years, 10.7%; 50-59 years, 14.9%; p<0.05), those with White ethnicity (12.3%; Asian, 9.2%; Other, 9.1%; p<0.05) and individuals living in the most deprived quintile (14.7%; least deprived, 9.7%; p<0.001; Appendix 2 Table A16).

After controlling for socio-demographics, low life satisfaction was also significantly higher for males (p<0.01). The odds of having low life satisfaction being 4.3 times higher for those with 4+ ACEs compared to those with none (Figure 22, Appendix 2, Table A17).

More than ten teeth removed

Defined as more than ten adult teeth lost or had removed due to decay or damage.

Figure 23: More than 10 teeth removed: percentage and adjusted odds ratio (AOR) by ACE count



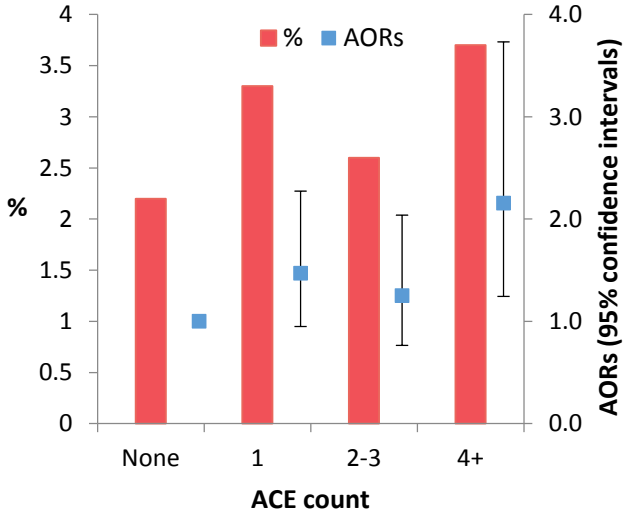
Less than one in twenty (4.1%) respondents reported having had more than ten teeth removed. The prevalence did not significantly relate to ACE count (Figure 23). Having more than ten teeth removed was significantly higher among respondents in older age groups (e.g. 18-29 years, 2.1%; 60-69 years, 12.8%; p<0.001), those with White ethnicity (4.6%; Asian, 1.6%; Other, 2.9%; p<0.001) and individuals living in the most deprived quintile (6.7%; least deprived, 3.4%; p<0.05; Appendix 2, Table A16).

After controlling for socio-demographics individuals with 4+ ACEs were 2.3 times more likely to have more than ten teeth removed times compared to those with none (Figure 23, Appendix 2, Table A17).

More than ten fillings

Defined as having more than ten remaining teeth with fillings or crowns/caps (not including veneers).

Figure 24: More than 10 fillings: percentage and adjusted odds ratio (AOR) by ACE count



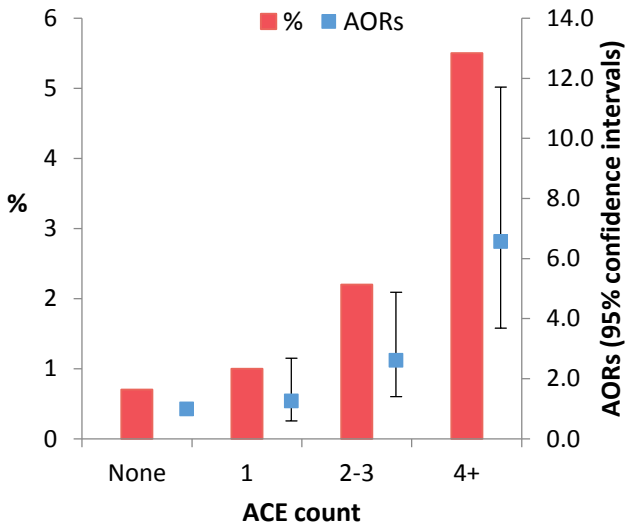
Only 2.6% of respondents reported having more than ten fillings, the prevalence of which did not significantly relate to ACE count (Figure 24). The prevalence of more than ten fillings was significantly higher among respondents in older age groups (e.g. 18-29 years, 0.2%; 60-69 years, 6.1%; p<0.001), those with White ethnicity (3.2%; Asian, 0.3%; Other, 0.3%; p<0.001) and individuals living in the least deprived quintile (4.6%; most deprived, 1.8%; p<0.001; Appendix 2, Table A16).

After controlling for socio-demographics the odds of having more than ten fillings were 2.2 times higher for those with 4+ ACEs compared to those with none (Figure 24, Appendix 2, Table A17).

Diagnosed with a sexually transmitted infection (STI)

Defined as having ever been diagnosed by a doctor or nurse with a sexually transmitted infection (STI: e.g. Chlamydia, HIV/AIDS, syphilis, gonorrhoea)

Figure 25: STI diagnosis: percentage and adjusted odds ratio (AOR) by ACE count



One in a hundred (1.4%) respondents reported having ever been diagnosed with an STI. The prevalence increased with ACE count (no ACEs, 0.7%; 4+ ACEs, 5.5%; p<0.001; Figure 25). The prevalence of being diagnosed with an STI was significantly higher for respondents in younger age groups (e.g. 18-29 years, 2.1%; 60-69 years, 0.4%; p<0.05), and those of a White ethnicity (1.6%; Asian, 0.3%; Other, 1.4%; p<0.05; Appendix 2, Table A16).

After controlling for socio-demographics, relationships between STI diagnosis and age and ethnicity were no longer significant. However, the relationship with ACE count remained with the odds of having being diagnosed with an STI being 6.6 times higher for those with 4+ ACEs compared to those with none (Figure 25, Appendix 2, Table A17).

3.6. Associations between ACEs and chronic disease

The following sections examine the associations between ACEs and chronic disease. First, the relationship between ACE count and developing any of a range of common chronic diseases (i.e. cancer, chronic heart disease or heart attack, type II diabetes, stroke, respiratory disease, digestive/liver disease and hypertension) is examined, followed by each individual chronic disease separately. For each chronic disease outcome life tables are calculated (based on first diagnosis of each relevant condition as the terminating event) and the same process repeated for earliest age of diagnoses of any chronic disease. In order to take into account age effects and adjust for other demographic factors, survival analyses were also undertaken using Cox regression.

Any disease

For any disease (i.e. all diseases combined), there was a lower cumulative survival rate for individuals with one or more ACE than individuals with no ACEs (without taking socio-demographics into account). The cumulative proportion avoiding diagnosis with any disease before age 70 years was 0.54 in those with no ACEs but only 0.22 in those with 4+ ACEs (Figure 28, Table A18). This means that, by the age of 70, 46% of individuals with no ACEs would be expected to have been diagnosed with at least one of the chronic diseases measured, rising to 78% of those with 4+ ACEs.

Controlling for socio-demographics, the rate of disease development was found to be significantly elevated in all ACE count categories compared with individuals with no ACEs. Thus, even a single ACE (versus no ACEs) increased the risk of diagnosis of any disease. Compared with individuals with no ACEs, those with 1 ACE had an increased risk of being diagnosed with any disease (hazard ratio, 1.3). Those with 2-3 and 4+ ACEs had a 1.5 and 2.5 times higher risks of being diagnosed, respectively (Appendix 2, Table 5).

Figure 28: Cumulative proportion of individuals diagnosed with any major disease with age by ACE count: unadjusted survival at period end

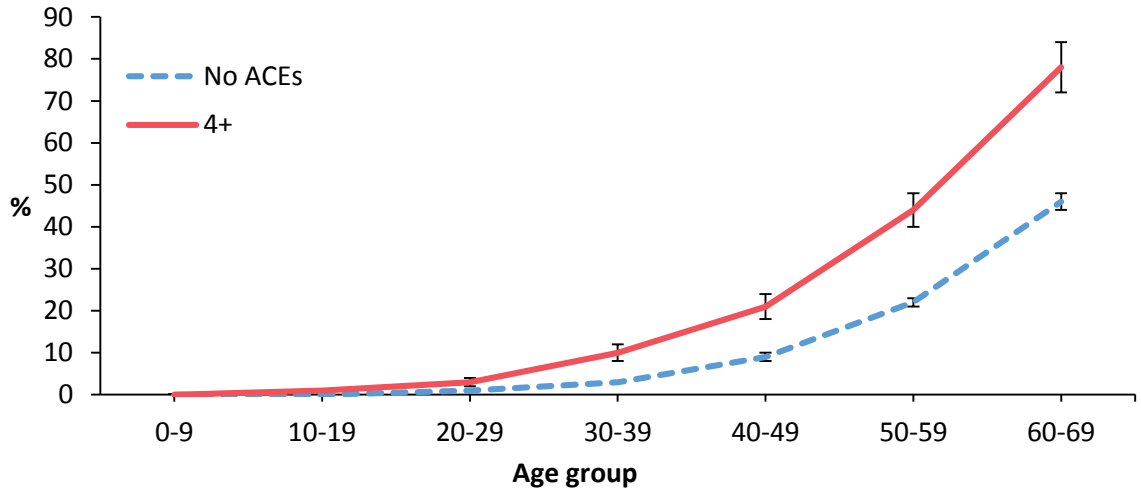


Table 5: Modelled changes in risk of disease development with ACEs counts using Cox regression survival analysis

	ACE count (reference category 0 ACEs)										
			1			2-3			4+		
Outcome	n	p^a	HR	95%CIs	p^b	HR	95%CIs	p^b	HR	95%CIs	p^b
Any disease	5454	<0.001	1.265	1.042-1.535	<0.05	1.454	1.190-1.777	<0.001	2.500	1.988-3.145	<0.001
Cancer	5166	<0.001	1.134	0.740-1.737	ns	1.190	0.747-1.895	ns	2.963	1.890-4.644	<0.001
CHD or heart attack	5452	ns	0.969	0.583-1.611	ns	1.407	0.877-2.257	ns	1.365	0.678-2.748	ns
Type II diabetes	5449	ns	1.025	0.718-1.462	ns	1.495	1.066-2.095	<0.05	1.133	0.650-1.973	ns
Stroke	5439	ns	1.463	0.723-2.964	ns	1.111	0.482-2.562	ns	2.883	1.295-6.421	<0.05
Respiratory disease	5447	<0.001	1.710	0.995-2.940	ns	2.546	1.526-4.250	<0.001	3.498	1.937-6.318	<0.001
Liver/Digestive disease	5407	<0.001	1.413	0.962-2.075	ns	1.894	1.298-2.762	<0.01	3.619	2.470-5.302	<0.001
Hypertension	5444	<0.001	1.229	1.008-1.500	ns	1.533	1.254-1.874	<0.001	1.780	1.375-2.305	<0.001

Abbreviations: CHD, coronary heart disease; HR, hazard ratio; 95% CI, 95% confidence intervals; ns, not significant.

[a] *p* refers to the overall significance of association between the outcome measure and ACE counts.

[b] *p* refers to the significance of association between the outcome measure and individual ACE categories with 0 ACEs as the reference category.

Individual diseases

Figures 29 to 32 present the cumulative survival rates for individuals in the sample with no ACEs and 4+ ACEs for cancer, respiratory disease, liver/digestive disease and hypertension (without taking socio-demographics into account). Analyses predicted that by age 70: 38% of sample respondents with 4+ ACEs would be diagnosed with cancer compared with 13% of those with no ACEs; 14% of those with 4+ ACEs would be diagnosed with respiratory disease compared with 5% of those with no ACEs; 29% of those with 4+ ACEs would be diagnosed with liver/digestive disease with 11% in those with no ACEs; and 59% of those with 4+ ACEs would be diagnosed with hypertension compared with 43% of those with no ACEs. For other conditions, patterns of disease development showed little variation by ACE count (Appendix 2, Table A18).

After controlling for socio-demographics, for all disease types except CHD/heart attack and type II diabetes, individuals with 4+ ACEs were at significantly increased risk of diagnosis by the age of 70 compared with those with no ACEs. Thus, the rate at which individuals with 4+ ACEs were likely to be diagnosed with hypertension was almost twice that of individuals with no ACEs; for cancer and stroke it was almost three times higher and for respiratory disease and liver/digestive it was more than three times higher (Table 5). For respiratory disease, liver/digestive disease and hypertension rates of diagnosis were also significantly increased in those with 2-3 ACEs compared with those with none (Table 5).

Figure 29: Cumulative proportion of individuals diagnosed with cancer with age by ACE count: unadjusted survival at period end

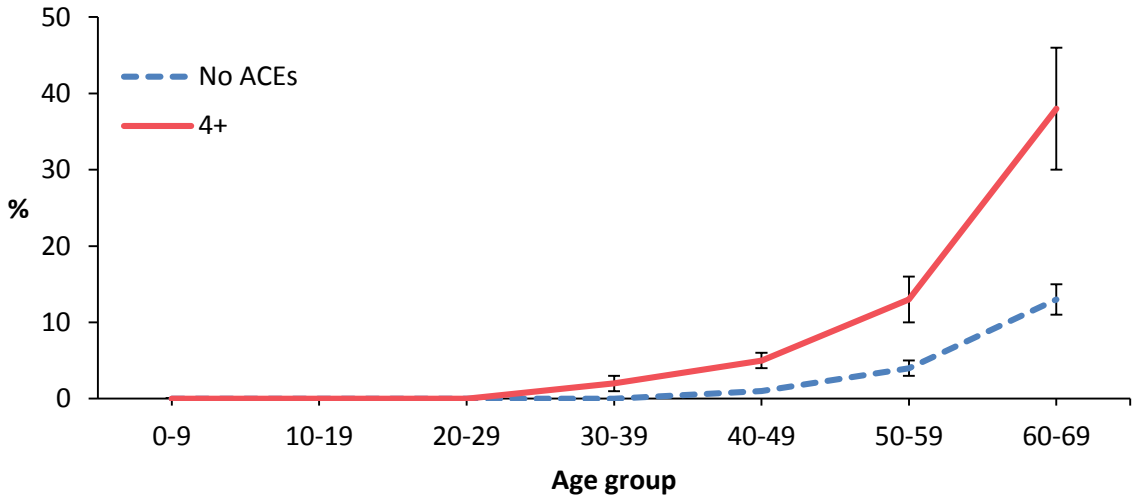


Figure 30: Cumulative proportion of individuals diagnosed with respiratory disease with age by ACE count: unadjusted survival at period end

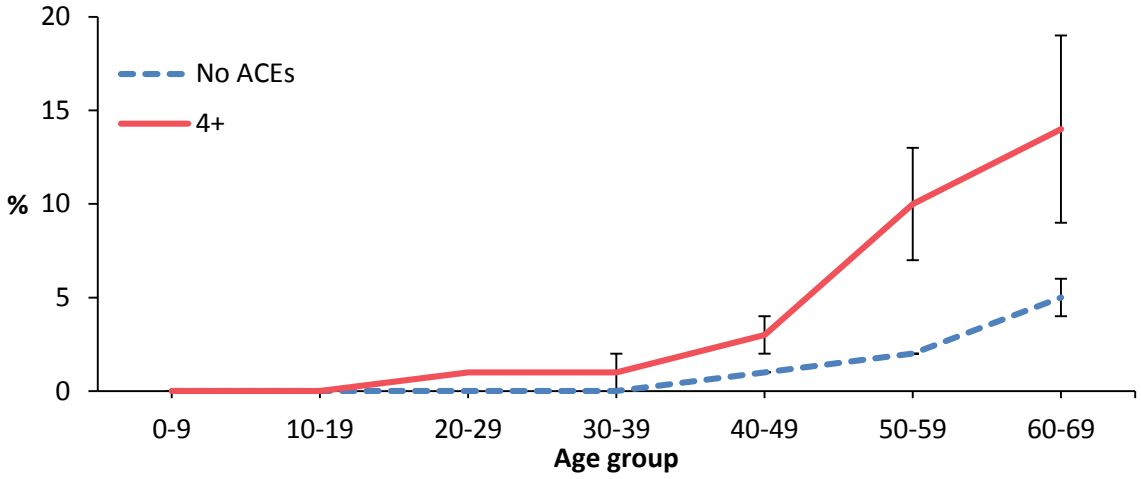


Figure 31: Cumulative proportion of individuals diagnosed with liver/digestive disease with age by ACE count: unadjusted survival at period end

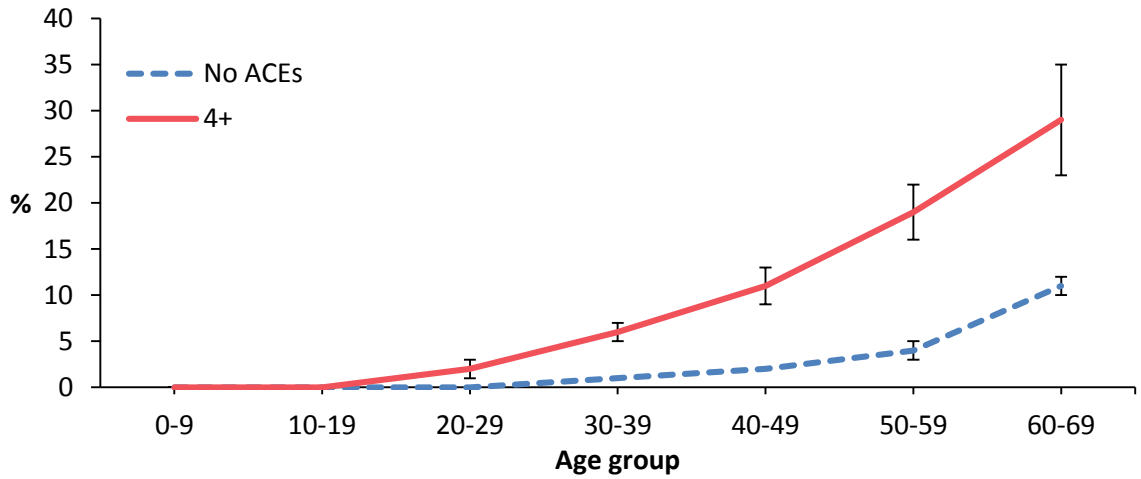
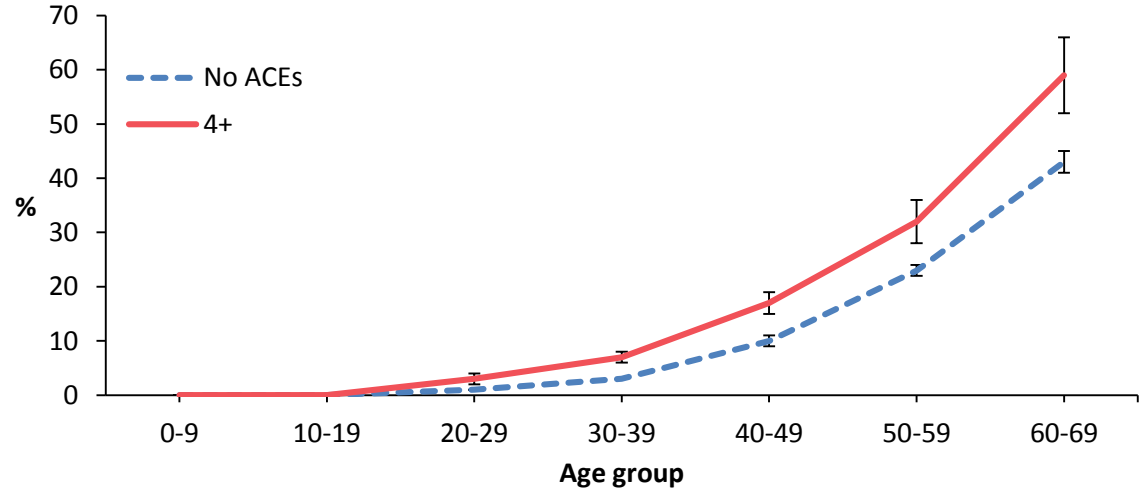


Figure 32: Cumulative proportion of individuals diagnosed with hypertension with age by ACE count: unadjusted survival at period end

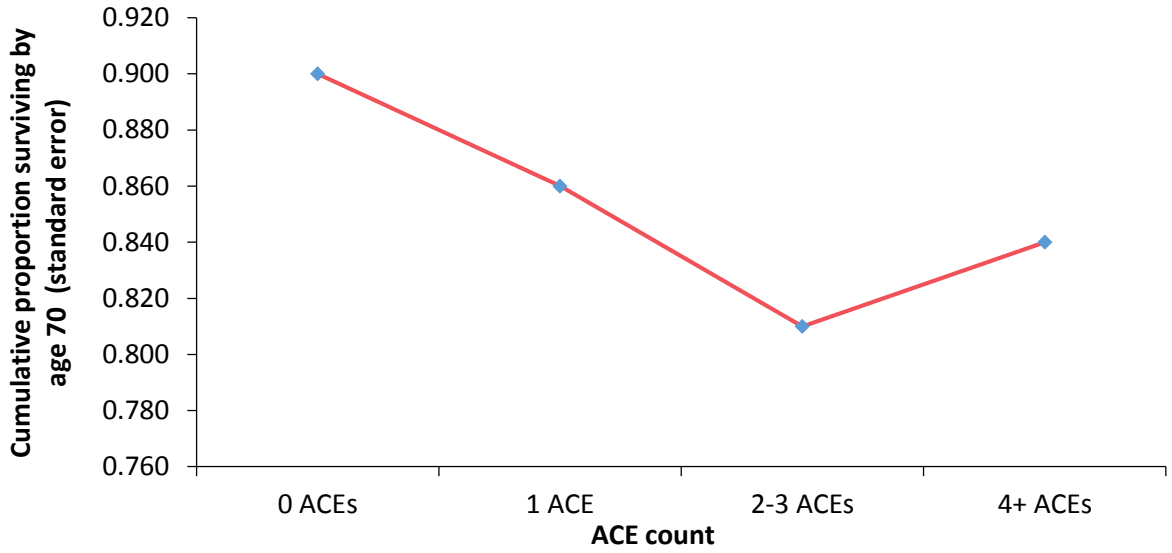


3.7. Associations between ACEs and premature mortality

To understand the relationship between ACEs and mortality across the life-course, respondents were asked to report the number of siblings they lived with during their childhood (including full-, half- and step-siblings). Respondents that lived with one or more sibling during childhood (n=4590, 88.2%) were also asked to provide their siblings' sex, age and mortality status, and where appropriate the age and year of death. For the purposes of analyses, respondents and their siblings were assigned to a birth cohort, either pre-1969 or 1969+ and respondents' ACEs were applied to their siblings. This methodology assumes that individuals in the same household will have been exposed to similar ACEs. Year of birth, gender and other issues may result in differences between siblings in ACE exposure. However, using a retrospective survey design it is not possible to measure mortality of respondents directly and a sibling based measure has been used as a proxy elsewhere[9]. Consequently, survival analysis (Cox's Regression) was undertaken on individual siblings with death of each sibling as the terminating event.

Life tables were then calculated for sibling mortality survival before 70 years of age. Better survival was strongly associated with lower ACE count with the cumulative proportion surviving up to 70 years being 0.90 in those with no ACEs and 0.84 in those with an ACE count of 4+ (Appendix 2, Table A19; Figure 36). After adjusting for socio-demographic factors, the poor survival effects of exposure to 4+ ACEs remained significant. The greatest increase in mortality was associated with 4+ ACEs (hazard ratio, 1.687; p <0.05; Reference Category 0 ACEs). Being male was also significantly associated with poorer survival (Appendix 2, Table A20).

Figure 36: Cumulative mortality (unadjusted survival data) and ACE count



4. Summary

Adjusted ACE prevalence

Just under half (44.4%) of adults aged 18-69 years residing in Hertfordshire, Luton and Northamptonshire experienced at least one ACE and nearly one in ten experienced four or more (9.1%). The prevalence of ACEs across Hertfordshire, Luton and Northamptonshire is comparable to findings from other ACE studies conducted in the UK (Appendix 2, Table A21) [2, 3, 14] and elsewhere[c][15]. Across the study area however there were local variations in ACE prevalence. Further, the prevalence of ACEs overall were higher amongst younger age groups, those of white ethnicity, females, individuals living in the more deprived areas, those with no qualifications and those who were currently unemployed/on long-term sickness. The prevalence of individual ACEs ranged from 3.1% living with someone incarcerated during their childhood, to 22.9% experiencing verbal abuse by a parent or adult in their home.

ACEs and health-harming behaviours

Exposure to ACEs was associated with a wide range of health-harming behaviours such as smoking, harmful alcohol consumption, drug misuse, violence, sexual behaviour and poor nutrition. In bivariate analysis the prevalence of all health-harming behaviours except those relating to diet, high-risk drinking and exercise significantly increased with ACE count (Appendix 2, Table A12). After adjusting for socio-demographics, having one or more ACE (versus no ACEs) was associated with a significant increase in smoking, e-cigarette use, binge drinking, high-risk drinking, cannabis use, violence and criminal justice outcomes (violence perpetration, violence victimisation and incarceration), unintended teenage pregnancy and early sexual initiation. The risks of all health-harming behaviours except low physical exercise were significantly higher in individuals with 4+ ACEs versus those who had experienced none. The odds of having used heroin or crack cocaine (lifetime), and all violence and criminal justice outcomes, were more than six times higher in those who had reported 4+ ACEs versus those with none (Appendix 2, Table A13).

The estimated reduction in health-harming behaviours if no ACEs were experienced

Findings suggest that if no individuals in the study population had been exposed to ACEs, then the prevalence of health-harming behaviours in the study area would be substantially lower (Table 4). The largest estimated reductions can be seen for violence and criminal justice outcomes: for example, preventing ACEs would account for approximately 30,144 fewer individuals having been a victim of violence in the last 12 months (a 56.1% decrease in prevalence) and approximately 29,944 fewer persons committing violence in the past 12 months (a 60.6% decrease in prevalence). In total, 42,908 fewer individuals would ever have been incarcerated, a reduction in prevalence of 50.4% (Table 4).

Findings for other health-harming behaviours indicate that reductions in prevalence of over a fifth would be seen for both smoking tobacco (24.7%) and binge drinking (21.7%), equivalent to having approximately 60,898 fewer smokers across the study area and 22,048 fewer binge drinkers. If no individuals in the population were exposed to ACEs, then the prevalence of unintended teenage pregnancies could be 44.0% lower. Further, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of early sexual initiation could be a third (36.1%) lower,

[c] There are difficulties with direct comparison of results from different ACE studies due to differences in sampling techniques used and variations in the age groups and communities included.

equivalent to approximately 62,967 fewer individuals having had sex under the age of 16 years (Table 4).

ACEs and health service utilisation

In bivariate analysis there was a positive association between ACE prevalence and: regular GP attendance; visiting an accident and emergency department; and staying a night in hospital. After adjusting for socio-demographics, these relationships remained with individuals with two or more ACEs being significantly more likely to use health services compared to those with no ACEs. There was no significant relationship between ACE prevalence and not visiting a dentist.

ACEs and health outcomes

Diagnosis of some health outcomes were associated with increased ACE count. Life satisfaction significantly reduced in participants who had experienced one or more ACEs, and mental wellbeing reduced rapidly in participants with 2 ACEs or more. In bivariate analysis diagnosis of an STI or allergy requiring treatment were significantly associated with ACE count; after adjustment for socio-demographics these relationships remained, however the odds of having an STI only significantly increased for individuals with 2 or more ACEs. In bivariate analysis having more than ten teeth removed or more than ten fillings was not significantly associated with ACE count, however after adjustment for socio-demographics, individuals with 4+ ACEs had a significantly higher risk of having more than ten teeth removed and more than ten fillings.

The association between ACEs and chronic disease

In cox regression survival analysis disease development was strongly associated with increased ACEs (Table 5). Individuals with 4+ ACEs had a 2.5 times higher rate of developing any disease (i.e. all diseases combined) before age 70 years (versus individuals with no ACEs). The increased rates for disease development for individuals with 4+ ACEs ranged from 1.78 for hypertension, to 3.62 for liver/digestive disease (Table 5). Thus highlighting the difference in life trajectories between individuals who have experienced no ACEs and those who have experienced 4+.

Risks of developing all other non-communicable disease conditions, were significantly higher in those with 4+ ACEs, except type II diabetes which was only associated with prevalence of 2-3 ACEs and CHD or Heart attack which did not show an association with ACE count. Previous research has shown a strong graded relationship between ACE score and heart disease[16]. The findings of this study may differ due to the retrospective study design rather than a lack of a relationship in the current study. Considering the high mortality rate associated with CHD and heart attack it is possible that individuals from high ACE categories (i.e. those with higher/increased mortality) will have been disproportionately removed (i.e. died of a heart attack), thus masking the relationship between CHD/heart attacks and ACE count in the current study. Further, the English national study did find a relationship between ACE count and CHD/heart attack[2], the difference in population demographics could also have contributed to this relationship not being found in the current study.

There was a strong association between cancer diagnosis and ACE count, with 13% of individuals by age 70 with no ACEs expected to be diagnosed with cancer, compared to 38% of individuals with 4+ ACEs. (Table 5).

ACEs and their association with premature mortality

There was a strong relationship between premature mortality and ACEs in the study area. A significant cumulative impact of ACEs was observed on survival, with premature mortality being estimated to be 1.69 times

higher for individuals who had experienced 4+ ACEs versus those who had experienced no ACEs (based on analysis of sibling survival). However this is likely to be an underestimate as it can be anticipated that higher mortality rates will have disproportionately removed individuals from high ACE categories, thus, masking their impact on morbidity.

Implications for practice

The ACE study for Hertfordshire, Luton and Northamptonshire has provided a wealth of information identifying the harmful impacts of childhood adversity on local populations. Findings show that almost half of adults resident in the study area suffered at least one ACE before the age of 18 years and almost one in ten suffered four or more. As adults these individuals are now suffering worse health and wellbeing, being more likely to engage in harmful behaviours and at greater risk of poor physical and mental health, chronic disease and premature mortality. Findings also show that over one in ten residents with 4+ ACEs had/caused an unintended pregnancy under 18 years. Such unplanned pregnancies have been shown in turn to increase the risk of ACEs against resulting children[17] and these taken together indicate how individuals affected by ACEs are at increased risk of exposing their own children to ACEs[8]. Furthermore, aligning with other studies[7, 14, 18-20] findings show how substantial numbers of people who have been exposed to ACEs have perpetrated violence themselves or been incarcerated in the criminal justice system. These findings should be considered in the context of the cyclical nature of violence[7], and serve to highlight the importance of promoting safe, and nurturing environments during childhood to prevent ACEs for future generations.

The extent of ACEs identified in this study and their relationships with poor outcomes are generally comparable to those from national studies (Appendix 2, Table A21)[2, 3]. However, the availability of local data puts authorities in Hertfordshire, Luton and Northamptonshire in a unique position to identify communities most affected by ACEs, the impact ACEs are having on their areas specific priorities, and the potential gains that could be made by preventing ACEs. This enables action to be driven through a genuine understanding of local circumstances.

The information provided in this report can be used to inform practice in a variety of ways. As the study has shown, ACEs are a major cross-cutting issue that affects the agendas of a wide range of organisations. These include agencies that work directly with children and parents (e.g. health services, social services, education services) and those that work to address the adverse behavioural, health and social outcomes suffered by those that have experienced ACEs (e.g. criminal justice services, mental health services, drug and alcohol services). By disseminating the study findings widely, a shared understanding can be developed between agencies of how ACEs affect individuals across the life course, how preventing and addressing ACEs can benefit all organisations, and how recognising and responding to the impacts of ACEs can support the delivery of more effective services. This shared understanding should facilitate the development of integrated, ACE-informed approaches that are better able to improve population health and reduce inequality in Hertfordshire, Luton and Northamptonshire. An ACE-informed approach to service delivery means working across various levels, including: strengthening early years interventions to prevent ACEs occurring; building resiliency in young people to moderate the effects of ACEs; and strengthening services for those affected by ACEs. Each of these are discussed in turn below.

Strengthening early years services

This study has estimated the potential gains that could be made if ACEs were prevented in future generations (section 3.3). A major part of preventing ACEs is ensuring the delivery of effective early years services that support parents and carers in providing safe, stable and nurturing environments for children. A range

of programmes already exist in England that aim to meet these goals. Some are targeted at high risk groups, such as the Family Nurse Partnership (FNP) programme which provides one-to-one support for young, disadvantaged mothers to develop parenting skills, build strong relationships with their children and make positive lifestyle choices that will give their children the best possible start in life. This programme is based on the Nurse Family Partnership programme in the USA, reported benefits of which have included: preventing child maltreatment, improving the stability of parental relationships, reducing maternal welfare use and criminal behaviour, and improving children's health and academic achievement[21]. While such programmes provide intensive support where it is needed most, the universal midwifery and health visitor programmes in England ensure all parents receive support throughout pregnancy and early childhood. This provides great potential for identifying and addressing possible ACEs, strengthening parenting practices and informing parents of the importance of nurturing care. Routine enquiry about substance use, domestic violence and mental wellbeing is already incorporated into many pre- and antenatal services and there is potential for such work to be strengthened as a key part of an integrated multi-agency approach to prevent ACEs.

Routine enquiry to prevent ACEs can also be applied in other health settings. For example, the SEEK programme in the USA uses a screening tool with parents attending paediatric primary care services to identify risk factors for child maltreatment[22, 23]. The short tool asks about maternal depression, substance use, domestic violence and parental stress and enables health professionals to identify potential problems and offer support via an onsite social worker, who can provide counselling and specialist referral where appropriate. SEEK has been associated with reductions in child maltreatment[22, 23]. Routine enquiry can be applied in a variety of other settings, and can be used to identify not only current ACEs in children and young people, but also past ACEs in adults to inform the delivery of services (see section *Supporting those affected by ACEs*).

Another measure that can help prevent ACEs is the provision of parenting programmes, which can be effective in improving parenting practices, decreasing parental stress and improving outcomes for children. Again these can be targeted at high risk groups or provided universally to all parents. Local authorities in Hertfordshire, Luton and Northamptonshire already provide a range of parenting programmes for families. In Hertfordshire, for example, these include the Nurturing Programme (Family Links), the Strengthening Families Strengthening Communities programme, and Families and Schools Together (FAST)[d]. Further information on the evidence behind parenting programmes, nurse home visiting programmes and a range of other early years interventions to prevent ACEs can be found in the European Report on Preventing Child Maltreatment[7].

In England, Children's Centres are important community assets for the delivery of early years services. Children's Centres can offer a wide range of services to families of young children including parenting programmes, drop in support sessions, childcare, child and parental education and health services, with differentiated support provided to families according to their specific needs. Research has indicated that positive benefits of the Children's Centres (formally Sure Start programme) include better child social development, reductions in maternal reports of harsh punishment and increased provision

[d] http://parentingcourses.hertsdirect.org/kb5/hertfordshire/courses/home.page

of stimulating home learning environments[24, 25]. As such Children's Centres can be important locations for interventions to prevent, identify and address ACEs.

Building resiliency in children

While individuals that suffer ACEs have increased risk of poor outcomes as adults, this study and others show that childhood adversity does not condemn people to harmful behaviours and ill health. Rather, many individuals who experience ACEs do not encounter these effects. An individual's ability to avoid harmful behavioural and psychological changes in response to chronic stress is known as resiliency. Individuals who are resilient have the skills or support that is required to enable them to adapt successfully to stress and trauma in their lives. School based social and emotional learning programmes can be important in developing children's problem solving and coping skills and increasing their confidence in seeking support. Such programmes have been associated with improved child behaviour and social competence. Comprehensive, multi-component programmes that incorporate teacher training and parental education (e.g. The Seattle Social Development Project) have also been associated with reduced violence, substance use and risky sexual behaviour in adolescence and better academic and employment outcomes, with many effects sustained into adulthood[26]. In England, social and emotional development fits within the personal, social, health and economic (PSHE) association programme of study, which aims to help to build pupils' self-esteem and resilience, with improving health and wellbeing being a core theme. PSHE services can be tailored to support local public health, safeguarding and educational objectives, and thus can be personalised so that local working aims can be addressed[e].

Research has shown that a key factor in developing resilience is having a strong relationship with a trusting adult throughout childhood; this has been found to reduce the long-term negative impacts of childhood adversity[27-29]. For children that grow up without supportive adult relationships at home, schools, social workers and interventions such as mentoring programmes can play an important role in providing these relationships. Special consideration needs to be given to children in care, many of whom will have suffered substantial adversity and have complex emotional and behavioural health needs. The National Institute for Health and Care Excellence (NICE) recommendations on promoting the quality of life for looked-after children (LAC) and young people outline how health, education and social care professionals, should work together to provide high quality care, placement stability and nurturing relationships for young children in care. The guidelines also indicate that services should be sensitive to the needs of LAC and should prioritise support to improve the emotional wellbeing and mental health of this population[30]. There is growing evidence that schools can play a key role in supporting the mental health needs of vulnerable children and young people[31]. Whole school programmes can reduce stigma or focus on skills-based development, and individualised support can also be used to assist pupils with mental health needs (e.g. therapeutic interventions, mentoring programmes). School based initiatives are currently in place across the study areas, for example the health and wellbeing in schools programme in Luton.

Supporting those affected by ACEs

This study has shown the strong relationships linking ACEs to issues such as poor mental health, substance use and criminal behaviour. Elsewhere, studies have shown that

[e] https://www.pshe-association.org.uk/local-authority-services

substantial proportions of individuals accessing services related to these outcomes have suffered ACEs. For example, a study of clients accessing substance use treatment services in Blackburn with Darwen Local Authority found that 95% reported at least one ACE and 64% reported four or more; a prevalence far higher than that in the general population[14]. Understanding how ACEs affect the behaviour and health prospects of individuals presents an opportunity to tailor services.

Research is starting to examine the effect of routine inquiry into childhood adversity amongst adults. In the USA work is being undertaken to assess the impact of delivering a short ACE questionnaire during assessments in primary care settings, with early findings suggesting it is having a positive effect on lowering health service attendance[32]. In Blackburn with Darwen, building on the findings from an ACE study conducted in 2012, the REACh (Routine Enquiry into Adversity in Childhood) programme is training professionals across a range of services to use the short ACE questionnaire as a tool for routine enquiry. The REACh training programme was designed to increase service providers' knowledge about the impact of ACEs on health and social outcomes and encourage services to routinely undertake enquiries about childhood experiences as part of assessments[33]. This work is based on the premise that the simple act of enquiring about ACEs may reduce the future burden of patients accessing health services[34]. It is envisaged that by routinely asking about childhood experiences during assessment, health professionals and practitioners are able to better understand their clients' needs thereby enabling them to offer appropriate interventions to support the clients' recovery and reduce the impact of childhood adversities on health and well-being. Similar work could be explored in Hertfordshire, Luton and Northamptonshire to further understand the effect of routine inquiry into childhood adversity amongst adults.

Local implementation

Developing ACE-informed practice in Hertfordshire, Luton and Northamptonshire does not necessarily require the development of new strategies or interventions, but rather consideration of how existing services can be fine-tuned and how agencies can better work together to support the delivery and development of current and emerging strategies and working practices. In Luton, for example, the Flying Start early years (pregnancy to five) strategy[f] recognises the importance of early years in determining a child's future outcomes and aims to improve educational and employment opportunities, resilience, and health and wellbeing into adulthood. Preventing and addressing ACEs fits firmly within the remit of this strategy. Likewise in Northamptonshire, to reduce pressure on Children's services there has been a shift in focus towards the prevention of ACEs. Work is on-going to engage key stakeholders in prevention, and Northamptonshire County Council is moving towards a Central Commissioning Unit which has arm's length management of organisations including a Children's Trust. In Hertfordshire, the findings of this study will be incorporated directly into the Joint Strategic Needs Assessment (JSNA) where they will inform local commissioning decisions and the development and application of a broad range of county-wide strategies.

Research shows that the cost benefits of effective preventive programmes that address ACEs can be substantial when viewed through a multi-agency lens[35-37]. The availability of local data on ACEs and their impacts on multi-agency priorities allows partnerships to work

[f] https://www.luton.gov.uk/Health_and_social_care/children_and_family_services/Pages/Flying-start.aspx

together to obtain the greatest benefits from shared resources. The findings from this study can make a substantial contribution to supporting practice in Hertfordshire, Luton and Northamptonshire, helping partners break cycles of adversity and improve public health.

References

1. Anda, R.F., et al. (2006). The enduring effects of abuse and related adverse experiences in childhood. A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry & Clinical Neuroscience,* **256**(3), pp. 174-186.
2. Bellis, M.A., Hughes, K., Leckenby, N., Perkins, C., and Lowey, H. (2014). National household survey of adverse childhood experiences and their relationship with resilience to health-harming behaviors in England. *BMC Med*, **12,** p. 72.
3. Bellis, M.A., et al. (2016). *Adverse Childhood Experiences and their impact on health-harming behaviours in the Welsh adult population*. Cardiff: Public Health Wales NHS Trust.
4. Felitti, V.J., et al. (1998). Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, **14**(4), pp. 245-258.
5. Chartier, M.J., Walker, J.R., and Naimark, B. (2010). Separate and cumulative effects of adverse childhood experiences in predicting adult health and health care utilization. *Child Abuse & Neglect*, **34**(6), pp. 454-464.
6. Dube, S.R., Felitti, V.J., Dong, M., Giles, W.H., and Anda, R.F. (2003). The impact of adverse childhood experiences on health problems: evidence from four birth cohorts dating back to 1900. *Prev Med*, 2003. **37**(3), pp. 268-277.
7. World Health Organisation (2013). *European report on preventing child maltreatment*.
8. Renner, L.M. and Slack, K.S. (2006). Intimate partner violence and child maltreatment: understanding intra- and intergenerational connections. *Child Abuse Negl*, **30**(6), pp. 599-617.
9. Bellis, M.A., et al. (2015). Measuring mortality and the burden of adult disease associated with adverse childhood experiences in England: a national survey. *J Public Health (Oxf)*, **37**(3), pp. 445-454.
10. Broyles, S.T., et al. (2012). Elevated C-reactive protein in children from risky neighborhoods: evidence for a stress pathway linking neighborhoods and inflammation in children. *PLoS ONE*, **7**(9), pp. e45419.
11. Danese, A. and McEwen, B.S. (2012). Adverse childhood experiences, allostasis, allostatic load, and age-related disease. *Physiol Behav*, **106**(1), pp. 29-39.
12. Currie, J. and Widom, C.S. (2010). Long-term consequences of child abuse and neglect on adult economic well-being. *Child Maltreat*, **15**(2), pp. 111-120.
13. Lozano, R., et al. (2012). Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, **380**(9859), pp. 2095-2128.
14. Bellis, M.A., Lowey, H., Leckenby, N., Hughes, K., and Harrison, D. (2014). Adverse childhood experiences: retrospective study to determine their impact on adult health behaviours and health outcomes in a UK population. *J Public Health (Oxf)*, **36**(1), pp. 81-91.
15. Bellis, M.A., et al. (2014). Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bulletin of the World Health Organization*, **92,** pp. 641-655.
16. Dong, M., et al. (2004). Insights into causal pathways for ischemic heart disease: adverse childhood experiences study. *Circulation*, **110**(13), pp. 1761-1766.
17. Sidebotham, P. and Heron, J. (2006). Child maltreatment in the "children of the nineties": a cohort study of risk factors. *Child Abuse Negl*, **30**(5), pp. 497-522.
18. Duke, N.N., Pettingell, S.L., McMorris, B.J., and Borowsky, I.W. (2010). Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics*, **125**(4), pp. e778-786.
19. Mair, C., Cunradi, C.B., and Todd, M. (2012). Adverse childhood experiences and intimate partner violence: testing psychosocial mediational pathways among couples. *Ann Epidemiol*, **22**(12), pp. 832-839.

20. Miller, E., et al. (2011). Adverse childhood experiences and risk of physical violence in adolescent dating relationships. *J Epidemiol Community Health*, **65**(11), pp. 1006-1013.
21. Olds, D.L., et al. (1997). Long-term effects of home visitation on maternal life course and child abuse and neglect. Fifteen-year follow-up of a randomized trial. *Jama*, **278**(8), pp. 637-643.
22. Dubowitz, H., Feigelman, S., Lane, W., and Kim, J. (2009). Pediatric primary care to help prevent child maltreatment: the Safe Environment for Every Kid (SEEK) Model. *Pediatrics,* **123**(3), pp. 858-864.
23. Dubowitz, H., Lane, W.G., Semiatin, J.N., and Magder, L.S. (2012). The SEEK model of pediatric primary care: can child maltreatment be prevented in a low-risk population? *Acad Pediatr,* **12**(4), pp. 259-268.
24. Melhuish, E. (2013). *Sure Start and its evaluation. Partnerships for a better start: perspectives on the role of children's centres*. The National Children's Bureau: London.
25. Melhuish, E., Belsky, J., Leyland, A.H., and Barnes, J. (2008). Effects of fully-established Sure Start Local Programmes on 3-year-old children and their families living in England: a quasi-experimental observational study. *The Lancet*, **372**(9650), pp. 1641-1647.
26. Hawkins, J., Catalano, R.F., Kosterman, R., Abbott, R., and Hill, K.G. (1999). Preventing adolescent health-risk behaviors by strengthening protection during childhood. *Archives of Pediatrics & Adolescent Medicine*, **153**(3), pp. 226-234.
27. Afifi, T.O. and Macmillan, H.L. (2011). Resilience following child maltreatment: a review of protective factors. *Can J Psychiatry*, **56**(5), pp. 266-272.
28. Heller, S.S., Larrieu, J.A., D'Imperio, R., and Boris, N.W. (1999). Research on resilience to child maltreatment: empirical considerations. *Child Abuse Negl*, **23**(4), pp. 321-338.
29. Norman, R.E., et al. (2012). The long-term health consequences of child physical abuse, emotional abuse, and neglect: a systematic review and meta-analysis. *PLoS Med*, **9**(11), p. e1001349.
30. National Institute for Health and Clinical Excellence and Social Care Institute for Excellence (2010). *Promoting the quality of life of looked-after children and young people Public Health guidance 28.* National Institute for Health and Clinical Excellence.
31. Hughes, K., Hardcastle, K., and Perkins, C. (2015). *The mental health needs of gang-affiliated young people: A briefing produced as part of the Ending Gang and Youth Violence programme*. London: Public health England.
32. *Unhappy child, unhealthy adult* (2016). BBC Radio 4.
33. McGee, C., et al. (2015). *A scoping study of the implementation of Routine Enquiry about Childhood Adversity (REACh)*. Liverpool: Centre for Public Health, Liverpool John Moores University.
34. Becker, A. L. (2015). The long reach of childhood trauma. *The Connectucut Mirror*. Available at http://ctmirror.org/2015/01/20/the-long-reach-of-childhood-trauma/ [Accessed 27.04.2016]
35. Washington State Institute for Public Policy (2015). *Benefit-Cost Results*. Available at http://www.wsipp.wa.gov/BenefitCost [Accessed 29.04.2016].
36. Bellis, M., A., Hughes, K., Perkins, C., and Bennett, A. (2012). *Protecting people, promoting health: A public health approach to violence prevention for England*. Liverpool: Department of Health.
37. Knapp, M., McDaid, D., and Parsonage, M. (2011). *Mental health promotion and mental illness prevention: the economic case*. London: Department of Health.
38. Stewart-Brown, S., et al. (2009). Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): a Rasch analysis using data from the Scottish Health Education Population Survey. *Health Qual Life Outcomes*, **7**(15).
39. Waldron, S. (2010). *Measuring subjective wellbeing in the UK*. Newport: Office for National Statistics.

Glossary

Adjusted odds ratio (AOR)	A measure of the association between a predictor variable (e.g. ACE count) and the outcome variable (e.g. smoking). It represents the odds that the outcome will occur given a particular exposure (e.g. 1, 2-3, 4+ ACE), compared to the odds of the outcome occurring in the absence of that exposure (e.g. no ACEs) when other confounding variables have been adjusted for.
Adverse childhood experiences (ACEs)	A range of events that children can be exposed to whilst growing up (before the age of 18 years) including neglect, abuse and harms that affect the environment in which the child lives (Table 1).
Allostatic load	The physiological consequences (the wear and tear on the body) of when an individual is exposed to the fluctuating or heightened neural or neuroendocrine response that results from repeated or chronic stress.
Chi square test for independence (referred to as bivariate analysis)	A measure used to determine whether there is a significant association between two categorical variables (e.g. smoking and ACE count) from a single population.
Computer Assisted Personal Interviewing (CAPI)	Interviewing technique using portable computers (tablets) to enter data.
Computer Assisted Self Interviewing (CASI)	Self-administered data collection using portable computers (tablets).
Confidence interval	The parameter of interest of an estimated range of values which is likely to contain the true value if the experiment is repeated. This is often expressed as a certain percentage (i.e. 95%)
Confounders	A confounding variable is associated with the outcome variable, but not an intermediate variable in the causal pathway between predictor and outcome.
Deprivation quintile	IMD is a continuous measure of relative deprivation thus to assign LSOAs to deprivation quintiles, the LSOAs are sort from the most to least deprived and divided into the five deprivation categories
Hazard ratio	A measure of how often a particular event happens in one group (ACEs) compared to how often it happens in another group (no ACEs), over time. Used in the current study as a measure of chronic disease development (e.g. cancer) before the age of 70 years.

Index of Multiple Deprivation	An overall measure of multiple deprivation experienced by people living in an area and calculated for every LSOA in England. The IMD is calculated using 38 separate indicators, organised across seven domains of deprivation (income, employment, health and disability, education skills and training, barriers to housing and other services, crime and living environment) which can be combined, using appropriate weights.
Logistic regression	A technique to assess the impact of a set of predictors (e.g. socio-demographics and ACE count) on a binary categorical dependent variable (e.g. mental wellbeing)
Lower super output area (LSOA)	Lower layer super output areas are a geographical hierarchy which have been automatically generated to be as consistent in population size as possible, with a minimum population of 1000 and a mean of 1500
Multinomial regression	A technique used to assess the impact of a set of predictors (e.g. socio-demographics) on a dependent variable with more than two categories (e.g. ACE count).
Socio-demographics	Properties of the research sample regarding age, gender, ethnicity and deprivation quintile.
SPSS	IBM Statistical Package for the Social Sciences (SPSS) Statistical Analysis Software, version 22 was used for the data analysis within this report.
Standard deviation	A measure of the dispersion or variation in the results from the average or the mean of the sample.
Standard error	A measure of the standard deviation of the sample mean. Quantifies how precisely you know the true mean of the population, taking into account the value of the standard deviation and the sample size
Stratified random probability sampling	Strata are formed based on individual's attributes or characteristics (i.e. age, gender, ethnicity, urban/rural, deprivation). A random sample of each strata is then taken in a number which is proportionate to the stratum's size when compared to the population
Survival analysis (cox regression)	A method for investigating the independent effect of several variables upon the time a specified event (e.g. death or first occurrence of a chronic disease) takes to happen.
Urban-Rural Categorisation	Categorises a range of statistical and administrative units on the basis of physical settlement and related characteristics. The 'urban' domain comprises all physical settlements with a population of 10,000 or more.

Appendix 1 – Methodology

A survey of adults (aged 18-69 years) resident in Hertfordshire, Luton, and Northamptonshire was undertaken between June and September 2015. The study was coordinated by the Centre for Public Health, Liverpool John Moores University in conjunction with Hertfordshire County Council, Luton Borough Council, Northamptonshire County Council, and Public Health England. A private market research company, BMG Research[g] was commissioned by Luton Borough Council to undertake the fieldwork. Ethical approval for the research was obtained from Liverpool John Moores University Research Ethics Committee and all interviewers followed the Market Research Society (MRS) Code of Conduct[h].

The research aimed to understand the prevalence of adverse childhood experiences (ACEs) in the study area and their impact on morbidity and mortality in later life. Within this study exposure to ACEs before the age of 18, including abuse (psychological/emotional abuse, physical abuse, sexual abuse) and household dysfunction (substance abuse in the household, imprisoned family member or criminal behaviour in the household, someone mentally ill, institutionalised or suicidal, domestic violence, parental separation or divorce) were examined.

Sampling

The study randomly selected a proportionate number of Lower Layer Super Output Areas (LSOAs)[i] representative of the diversity of each study area. A method of stratified random probability sampling was used, based on the Index of Multiple Deprivation (IMD)[j], ethnicity, and urban/rural breakdown of the LSOA. The ethnic breakdown of each LSOA was categorised into four ethnic categories of created (1, low Black, low Asian; 2, low Black, high Asian; 3, high Black, low Asian; and 4, high Black, high Asian) using the following cut offs: low Black < 5%, high Black 5% or higher, and low Asian < 10%, and high Asian 10% or higher. 2011 Rural-Urban Classification from ONS [k] were used (1, urban city and town; 2, urban major conurbation; 3, rural town and fringe; and 4, rural village and dispersed).

A total of 5,588 individuals was set as the target sample size. The achieved sample size was 5,623 (Hertfordshire, 2,587; Luton, 1,423; Northamptonshire, 1,611), once cleaned, cases where full demographic information and ACE count were not provided were removed for the sample, thus the sample size for analysis was 5,454 (2,511 Hertfordshire; 1,390 Luton; 1,553 Northamptonshire).

Recruitment

Using the Post Office Address file[l], letters were sent to randomly selected houses within each chosen LSOA. This letter outlined the study methodology, why the participant's household had been chosen, when the researchers will visit, and how the selected household could withdraw from the study. Contact details of the researchers were provided. BMG Research, a professional survey company delivered the questionnaire.

[g] More information about BMG Research can be found on their web pages: www.bmgresearch.co.uk

[h] https://www.mrs.org.uk/standards/code_of_conduct/

[i] LSOAs are geographic areas generated by the Office for National Statistics (ONS) to define areas in England with relatively similar population sizes (approximately 1,500 residents). For more information on LSOAs see: https://www.ons.gov.uk/methodology/geography/ukgeographies/censusgeography

[j] Adjusted IMD scores for 2010 which align the scores with 2011 boundaries for Lower Layer Super Output Areas (LSOAs). IMD data was sourced from Public Health England available from: http://www.apho.org.uk/resource/item.aspx?RID=125887

[k] For more information see: https://www.gov.uk/government/collections/rural-urban-definition

[l] For more information on the PAF see: http://www.royalmail.com/business/services/marketing/data-optimisation/paf

Households whom had not opted-out of the study were then visited by trained interviewers from BMG[m] and face-to-face interviews were undertaken on the doorstep using a validated questionnaire. Household visits were made on all days of the week and between the hours of 9am and 8pm.

Only one individual from each household was eligible to participate in the study. On contact with a member of the household, interviewers presented potential participants with a copy of the study information sheet which outlined the purpose of the study and provided information regarding confidentiality and anonymity, and informed consent for participation. It was made clear to potential participants that participation in the study was entirely voluntary and that they were free to withdraw at any point during the interview and that this would not affect their rights, any current or future health treatment, or services received. No personal identifiable details were collected from the individual at any stage during the recruitment process or interview.

If no one was at the address, or an individual was ineligible or refused to participate in the study, the interviewer recorded the outcome of the contact then moved on to the next randomly selected household. Potential participants were also given the option for the interviewers to call back at a date or time more suitable to them, or for an interpreter to visit with the interviewer if necessary. The study inclusion criteria were:

- Resident in Hertfordshire, Luton or Northamptonshire;
- Aged 18-69 years old; and,
- Cognitively able to provide informed consent and participate in an interview.

Surveys used Computer Assisted Personal Interviewing (CAPI) technology, and also Computer Assisted Self Interviewing (CASI) for sensitive sections of the questionnaire (eg. questions on ACEs). Respondents were also given the option to complete the survey on paper. The advantages of using the CAPI methodology includes the collection of data electronically thus minimising errors, time delays, security risk to respondents' data and environmental impact; and CASI interviewing allows participants to self-complete sections of the questionnaire which may be more sensitive, thus increasing interview compliance.

On completion of the interview, individuals were issued with a thank-you leaflet which included information on the survey, contact details for BMG and the research team, and relevant help lines and support services.

Questionnaire

The study used a validated questionnaire as used in previous ACE studies within the UK[3, 9, 14]. The questionnaire incorporated the short ACE tool developed by the Centre for Disease Control and Prevention in 1997 based on the questionnaire implemented by Felitti et al. (1998)[4] in the USA, which asks retrospective questions about participants' experiences of a range of adverse experiences before the age of 18 to measure the prevalence of ACEs[n]. This tool is routinely used as part of the US Behavioural Risk Factor Surveillance System – the largest telephone-based population health survey in the world. A longer version of the tool has been used internationally through the World Health Organization's ACE-IQ programme[o]. Alongside demographics, such as age, gender, ethnicity and marital status, the questionnaire included a series of questions on past and current health and social behaviours

[m] A sub set of visits were accompanied by LJMU researchers for quality assurance purposes.

[n] www.cdc.gov/nccdphp/ace

[o] http://www.who.int/violence_injury_prevention/violence/activities/adverse_childhood_experiences/en/

and outcomes pertinent to UK health policy (Table A1).

Questions were taken from previous ACE studies[9, 14], after consultation with the study commissioners, and interest in current health policy; unnecessary questions were removed and amended as required. The final tool contained 47 questions and took approximately 12 minutes to complete.

Response rate and compliance

17,003 letters were mailed out to households and at this stage 1,298 people opted-out of taking part in the research. A total of 13,456 households were visited during the study period, of which contact was made with 9,929 households. Of these households 1,149 (11.6%) were ineligible, a further 3,101 (31.2%) declined to take part in the research, and 5,623 completed a study questionnaire.[p] Thus, of the known occupied eligible households, 35.3% opted out of completing the survey leaving a compliance rate of 64.7% (Hertfordshire, 75.5%; Luton, 79.8%; Northamptonshire, 60.2%).

Data analysis

Data input was undertaken in Microsoft Excel and analysis was completed using SPSS v22. Only individuals with complete data relating to all ACEs, age, gender and IMD quintile were included in the final dataset (N=5,454). Analyses used chi square test for independence, survival analysis and cox, multinomial and logistic regression techniques.

Sample characteristics

Table A2 illustrates the sample demographics of the survey participants in comparison to the population of the research area[q]. Overall, the final sample included an over-representation of individuals in the most deprived areas compared to the population estimates. The final sample had a slight but significant over-representation of individuals aged to 30-39 years and 60-69 years, and an under-representation of those aged 18-29 years. The sample also had small but significant differences in ethnicity and gender.

Data on ethnicity was collected using self-identified UK Census categories. Because of the small numbers within some ethnic groups these were combined into White (includes: White British, White Irish, White Gypsy or Irish Traveller, White Other), Asian (includes: Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities) and Other (including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group) (Table A2).

Calculation of ACE count

Eleven questions within the survey examined experiences of the participant before the age of 18 years. These cover two main categories; childhood abuse and household dysfunction. A person's ACE score is calculated using a count of the number of different types of events experienced. This does not account for reoccurring events or the duration of events.

To ensure consistency with ACE study methodology undertaken elsewhere [9], ACE counts were calculated as a proxy for severity

[p] Efforts were made to ensure language was not a barrier to individuals completing the questionnaire, however, in 56 instances an interview was not completed at a household due to language. In these instances, the language of the household member was uncommon or interviewers were unable to return to the household before the quota for that LSOA was completed.

[q] Population data was obtained from Office for National Statistics' mid-2013 population estimates: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareamidyearpopulationestimates and from the 2011 Census for ethnicity: http://www.ons.gov.uk/ons/rel/census/2011-census/key-statistics-for-local-authorities-in-england-and-wales/rpt-ethnicity.html

of childhood adversity and respondents were classified into four cohorts:

- 0 ACEs (n =3,104)
- One ACE (n = 979)
- Two-three ACEs (n = 881)
- Four or more ACEs (n = 490).

The prevalence of ACEs (counts and prevalence of individual ACEs) have been adjusted to account for the population of the study areas (age, gender, ethnicity, deprivation and urban/rural categorisations).

Calculation of health-harming behaviours

The methodology used for calculating whether an individual recorded any health-harming behaviours is outlined in Table 2 (Section 2). For each health-harming behaviour, binary logistic regression was used to calculate the expected probability (Adjusted Odds Ratio) and provides the association between the explanatory (age, gender, deprivation, ethnicity and ACE count) and outcome variables (health-harming behaviours). However, this is just an association and does not imply causation. We adjusted for socio-demographics (e.g. age, gender etc.) which are known confounders but there may be unmeasured confounders that have not been accounted for in this analysis.

To model the impact that preventing ACEs would have on health-harming behaviours, the modelled probabilities of having each health-harming behaviour depending on demographics and ACE count was calculated. ACE counts were set to zero for all population demographics and the resulting counts of health-harming behaviours were compared with those seen when ACE counts of 1 or more were included.

Calculation of BMI

The questionnaire included the participants self-reported height and weight (see Table 2), this allowed for the calculation of participants' body mass index (BMI). BMI was calculated (BMI; weight [kg] divided by height [metres] squared) and categorised into four weight groups (World Health Organization, 2013):

- Underweight: BMI of 10 to less than 18.5
- Normal weight: BMI 18.5 to less than 25 (24.99)
- Overweight: BMI 25 to less than 30 (25 to 29.99)
- Obese: BMI of 30 or more

As BMI was calculated using self-reported figures for weight and height it is a possibility that there may have been a misclassification arising from differences between self-reported and measured values. The BMI calculation is therefore used as an estimate of overweight and obesity. Self-reported weight and height data are commonly used for identifying relationships within epidemiological studies.

Table A1: Topics included in the questionnaire

Child abuse and neglect	• Physical abuse and neglect • Psychological abuse and neglect • Sexual abuse
Household dysfunction	• Parental separation • Substance misuse within household • Incarceration • Domestic violence • Mental illness
Health	• Smoking (tobacco and/or e-cigarette use) • Alcohol consumption • Illicit drug use • Sexual risk behaviours • Violence perpetration and victimisation • Incarceration • Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) and life satisfaction • Physical activity • Healthy eating • Height and weight • Non-communicable diseases[a] • Accident and Emergency, GP and dentist visits • Number of hospital stays in last 12 months

[a]including the date diagnosed by a doctor or a nurse

Table A2: Sample socio-demographics and comparison with the Hertfordshire, Luton and Northamptonshire population

		Sample		Population			
		%	n	%	n	χ^2	*p*
Age group (years)	18-29	20.6	1124	22.5	300802		
	30-39	22.5	1225	20.8	278088		
	40-49	20.6	1124	23.2	309053		
	50-59	17.0	926	18.3	243595		
	60-69	19.3	1055	15.2	203089	98.499	<0.001
Gender	Male	44.7	2437	49.2	990406		
	Female	55.3	3017	50.8	1020809	44.527	<0.001
Ethnicity	White[a]	80.6	4394	85.7	1721396		
	Asian[b]	13	708	7.7	155219		
	Other[c]	6.5	352	6.5	130859	214.144	<0.001
Deprivation quintile	1 (*least deprived*)	28.5	1555	35.8	719461		
	2	20.2	1099	21.5	432018		
	3	20.8	1137	19.3	388307		
	4	20.0	1091	15.7	315647		
	5 (*most deprived*)	10.5	572	7.7	155782	211.709	<0.001

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[c] IncludingMixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Calculation of SWEMWBS and life satisfaction

Mental well-being was measured using the Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS)[38], which asks individuals how often over the past two weeks they have been: feeling optimistic about the future; feeling useful; feeling relaxed; dealing with problems well; thinking clearly; feeling close to other people; able to make up their own mind about things. Responses are scored from 1 (none of the time) to 5 (all of the time) and an overall mental well-being score is calculated, ranging from 7 (lowest possible mental well-being) to 35 (highest possible mental well-being). Overall scores were dichotomised to indicate low scores as >1 standard deviation (4.9) below the mean (27.3) thus low mental wellbeing was operationalised as scores <22.

Life satisfaction was measured on a scale of 1–10 using the standard question: *All things considered how satisfied are you with your life, with 1 being not at all satisfied and 10 very satisfied*[39]. Overall ratings were dichotomised, with low scores as >1 SD (1.8) below the mean (7.7) thus low life satisfaction was operationalised as scores <6.

Limitations

Non-participation was a limitation of this research, however compliance rates, were a little higher compared to other UK ACE studies[2, 3, 14]. Compliance differed across study areas; it was not possible to examine any if demographic factor had an effect on compliance as no information was recorded on individual who declined to participate. Although this sample aimed to be representative of the population of the three study areas, differences between the population and sample demographics existed (Table A2) and there are certain populations (e.g. homeless, incarcerated) who have been excluded in this research, who may have substantive ACE counts.

Recall capacity is a limitation to any retrospective study, and propensity to omit ACEs, however the use of CAPI/CASI will have helped to limit this potential bias. The majority of all individuals who completed the survey did complete all ACE questions. Health conditions were also self-reported, and whilst using the year diagnosed as a marker to gauge diagnosis, it is not possible to measure the extent of un-diagnosed morbidity. While siblings were used as a proxy measure for mortality, and limited to those the participant lived with during childhood, it is unknown if they experienced the same ACE count. Further, sibling mortality related to ACEs may also be underreported.

Appendix 2 – Data tables

ACE prevalence

Table A3: Adjusted ACE counts (%) at local authority level

Study area	Local authority	No ACEs	1	2-3	4+
Hertfordshire	Broxbourne	56.8	17.5	17.8	7.8
	Dacorum	56.1	18.0	17.4	8.4
	East Hertfordshire	53.5	19.4	17.6	9.5
	Hertsmere	56.0	18.2	17.6	8.2
	North Hertfordshire	54.1	19.5	17.3	9.2
	St Albans	54.7	19.3	16.9	9.1
	Stevenage	54.3	18.9	17.2	9.7
	Three Rivers	57.4	17.7	16.9	8.1
	Watford	63.7	14.9	15.1	6.2
	Welwyn Hatfield	57.1	18.3	16.2	8.4
Luton	Luton	63.6	15.0	13.4	8.0
Northamptonshire	Corby	52.2	18.3	17.7	11.8
	Daventry	51.3	20.1	18.4	10.3
	East Northamptonshire	50.7	20.2	18.4	10.7
	Kettering	52.6	19.4	17.4	10.7
	Northampton	54.8	18.3	17.4	9.5
	South Northamptonshire	49.9	20.5	18.9	10.7
	Wellingborough	52.2	19.5	17.7	10.6
Overall		55.6	18.3	17.0	9.1

Table A4: Adjusted ACE counts (%) at ward level

Study region	Local authority	Ward code	Ward name	No ACEs	1	2-3	4+
Hertfordshire	Broxbourne	E05009002	Broxbourne and Hoddesdon South	58.4	17.6	16.6	7.4
		E05009003	Cheshunt North	56.5	18.2	17.6	7.8
		E05009004	Cheshunt South and Theobalds	56.3	16.9	19.1	7.6
		E05009005	Flamstead End	57.3	17.0	17.7	8.0
		E05009006	Goffs Oak	57.1	18.0	16.7	8.1
		E05009007	Hoddesdon North	57.7	17.8	16.7	7.8
		E05009008	Hoddesdon Town and Rye Park	56.4	18.5	17.0	8.1
		E05009009	Rosedale and Bury Green	56.9	17.3	17.1	8.6
		E05009010	Waltham Cross	56.0	15.6	20.8	7.5
		E05009011	Wormley and Turnford	56.1	17.8	18.7	7.5
	Dacorum	E05004691	Adeyfield East	57.1	17.4	17.1	8.4
		E05004692	Adeyfield West	56.8	17.7	17.2	8.4
		E05004693	Aldbury and Wigginton	53.6	17.8	19.0	9.5
		E05004694	Apsley and Corner Hall	57.0	18.1	16.9	8.0
		E05004695	Ashridge	55.5	18.3	17.4	8.8
		E05004696	Bennetts End	58.3	16.8	16.7	8.1
		E05004697	Berkhamsted Castle	55.7	18.8	16.8	8.8
		E05004698	Berkhamsted East	54.9	19.4	16.9	8.8
		E05004699	Berkhamsted West	55.2	18.9	16.8	9.0
		E05004700	Bovingdon, Flaunden and Chipperfield	51.1	19.6	19.1	10.2
		E05004701	Boxmoor	57.9	17.9	16.6	7.5
		E05004702	Chaulden and Warners End	57.1	17.8	17.0	8.1
		E05004703	Gadebridge	57.3	17.4	17.1	8.2
		E05004704	Grovehill	56.7	16.1	19.2	8.0
		E05004705	Hemel Hempstead Town	56.6	17.6	17.2	8.6
		E05004706	Highfield	56.4	16.1	19.2	8.2
		E05004707	Kings Langley	59.1	16.8	16.6	7.5
		E05004708	Leverstock Green	57.6	17.7	16.7	8.1
		E05004709	Nash Mills	57.5	19.3	16.2	7.0
		E05004710	Northchurch	56.0	18.7	16.6	8.6
		E05004711	Tring Central	55.0	19.0	16.9	9.1
		E05004712	Tring East	55.8	18.8	16.7	8.7
		E05004713	Tring West and Rural	55.0	18.5	17.4	9.1
		E05004714	Watling	48.2	21.7	19.3	10.8
		E05004715	Woodhall Farm	59.5	15.9	18.3	6.3
	East Hertfordshire	E05004716	Bishop's Stortford All Saints	54.5	19.4	17.0	9.1
		E05004717	Bishop's Stortford Central	53.3	20.1	17.1	9.4
		E05004718	Bishop's Stortford Meads	54.2	19.9	16.9	9.0
		E05004719	Bishop's Stortford Silverleys	55.5	18.6	16.9	9.0
		E05004720	Bishop's Stortford South	55.4	18.6	16.9	9.0
		E05004721	Braughing	52.6	19.1	18.9	9.4
		E05004722	Buntingford	47.5	21.3	19.5	11.8
		E05004723	Datchworth & Aston	53.9	17.9	18.9	9.4
		E05004724	Great Amwell	55.2	17.8	18.0	9.0
		E05004725	Hertford Bengeo	55.1	19.3	16.8	8.8
		E05004726	Hertford Castle	54.6	19.1	17.1	9.2
		E05004727	Hertford Heath	49.9	21.5	18.2	10.5
		E05004728	Hertford Kingsmead	51.3	20.4	18.0	10.3
		E05004729	Hertford Rural North	53.6	17.8	19.0	9.6
		E05004730	Hertford Rural South	53.5	17.9	19.0	9.6
		E05004731	Hertford Sele	54.6	17.4	17.5	10.5
		E05004732	Hunsdon	51.4	20.3	18.9	9.4
		E05004733	Little Hadham	53.3	17.7	19.2	9.9
		E05004735	Much Hadham	52.7	16.8	19.5	11.0
		E05004734	Mundens and Cottered	51.5	20.2	18.9	9.4
		E05004736	Puckeridge	47.2	21.4	19.6	11.8
		E05004737	Sawbridgeworth	55.5	18.9	16.8	8.8
		E05004738	Stanstead Abbots	56.4	18.9	16.7	8.0
		E05004739	Thundridge & Standon	52.1	19.1	19.1	9.7
		E05009315	Walkern	49.2	20.8	19.4	10.7
		E05004741	Ware Chadwell	55.1	19.0	17.0	8.9
		E05004742	Ware Christchurch	54.1	19.9	17.0	9.0
		E05004743	Ware St Mary's	54.7	19.6	16.8	8.9
		E05004744	Ware Trinity	53.8	20.0	17.0	9.3
		E05004745	Watton-at-Stone	47.2	21.4	19.6	11.8
	Hertsmere	E05004746	Aldenham East	47.2	21.3	19.6	11.9

Study region	Local authority	Ward code	Ward name	No ACEs	1	2-3	4+
		E05004747	Aldenham West	48.0	21.3	19.4	11.3
		E05004748	Borehamwood Brookmeadow	55.9	17.8	19.5	6.8
		E05004749	Borehamwood Cowley Hill	56.6	15.8	20.5	7.1
		E05004750	Borehamwood Hillside	59.7	16.3	17.9	6.1
		E05004751	Borehamwood Kenilworth	56.3	16.9	19.7	7.1
		E05004752	Bushey Heath	59.6	18.0	15.5	6.9
		E05004753	Bushey North	57.9	17.1	16.7	8.3
		E05004754	Bushey Park	58.1	17.7	16.6	7.5
		E05004755	Bushey St James	58.1	17.7	16.6	7.6
		E05004756	Elstree	63.0	16.6	14.0	6.3
		E05004757	Potters Bar Furzefield	54.4	19.6	16.8	9.2
		E05004758	Potters Bar Oakmere	53.5	19.1	17.2	10.2
		E05004759	Potters Bar Parkfield	55.0	19.8	16.5	8.7
		E05004760	Shenley	54.2	19.3	17.0	9.5
	North Hertfordshire	E05004761	Arbury	49.8	20.8	19.0	10.4
		E05004762	Baldock East	55.0	19.0	17.0	9.0
		E05004763	Baldock Town	54.3	19.5	17.0	9.1
		E05004764	Cadwell	54.2	21.2	16.4	8.2
		E05004765	Chesfield	53.7	19.2	18.3	8.9
		E05004766	Codicote	55.0	19.8	16.6	8.7
		E05004767	Ermine	52.5	19.2	18.9	9.4
		E05004768	Hitchin Bearton	57.2	18.9	15.7	8.3
		E05004769	Hitchin Highbury	54.9	19.4	16.7	8.9
		E05004770	Hitchin Oughton	52.8	19.0	17.8	10.4
		E05004771	Hitchin Priory	55.5	19.3	16.6	8.6
		E05004772	Hitchin Walsworth	54.8	19.7	17.1	8.4
		E05004773	Hitchwood, Offa and Hoo	52.9	19.0	18.6	9.5
		E05004774	Kimpton	48.1	21.2	19.3	11.4
		E05004775	Knebworth	46.5	22.3	19.5	11.7
		E05004776	Letchworth East	54.8	20.3	16.2	8.7
		E05004777	Letchworth Grange	54.0	19.2	17.1	9.8
		E05004778	Letchworth South East	56.0	18.0	17.1	8.9
		E05004779	Letchworth South West	55.2	18.5	16.9	9.4
		E05004780	Letchworth Wilbury	54.4	18.4	17.1	10.1
		E05004781	Royston Heath	54.6	20.0	16.7	8.6
		E05004782	Royston Meridian	55.2	19.5	16.6	8.6
		E05004783	Royston Palace	53.6	20.3	17.0	9.1
		E05004784	Weston and Sandon	51.5	20.2	18.9	9.5
	St Albans	E05004785	Ashley	55.5	19.5	16.4	8.6
		E05004786	Batchwood	54.9	19.0	16.7	9.4
		E05004787	Clarence	54.7	19.9	16.7	8.8
		E05009028	Colney Heath	55.0	19.4	16.7	8.9
		E05004789	Cunningham	56.0	19.0	16.1	8.9
		E05004790	Harpenden East	55.2	18.8	16.9	9.1
		E05004791	Harpenden North	55.3	19.2	16.8	8.8
		E05004792	Harpenden South	56.2	18.6	16.6	8.6
		E05004793	Harpenden West	55.7	18.6	16.8	8.9
		E05004794	London Colney	55.0	19.8	16.4	8.7
		E05004795	Marshalswick North	55.6	18.8	16.8	8.8
		E05004796	Marshalswick South	55.4	18.8	16.9	8.9
		E05004797	Park Street	54.7	18.9	17.0	9.4
		E05004798	Redbourn	47.9	21.1	19.4	11.7
		E05004801	Sandridge	54.9	19.5	16.8	8.8
		E05004802	Sopwell	57.2	17.5	16.2	9.1
		E05004799	St Peters	53.6	20.1	17.1	9.2
		E05004800	St Stephen	55.7	19.4	16.5	8.5
		E05004803	Verulam	56.1	18.8	16.6	8.5
		E05004804	Wheathampstead	48.5	21.1	19.3	11.1
	Stevenage	E05004805	Bandley Hill	53.7	19.2	17.3	9.9
		E05004806	Bedwell	55.9	16.1	16.1	11.8
		E05004807	Chells	53.0	20.1	17.2	9.8
		E05004808	Longmeadow	53.5	20.1	17.0	9.5
		E05009316	Manor	55.0	19.0	17.0	9.1
		E05004810	Martins Wood	53.3	19.3	17.3	10.1
		E05004811	Old Town	53.2	20.0	17.2	9.5
		E05004812	Pin Green	53.5	18.3	17.6	10.6
		E05004813	Roebuck	53.5	17.9	17.6	10.9
		E05004815	Shephall	53.2	18.7	19.0	9.1

Study region	Local authority	Ward code	Ward name	No ACEs	1	2-3	4+
		E05004814	St Nicholas	59.9	16.4	16.6	7.0
		E05004816	Symonds Green	53.5	19.4	17.2	9.9
		E05004817	Woodfield	53.8	20.7	16.5	8.9
	Three Rivers	E05004818	Abbots Langley	58.3	17.2	16.7	7.7
		E05004819	Ashridge	56.3	17.5	18.9	7.3
		E05004820	Bedmond & Primrose Hill	56.5	18.6	16.8	8.0
		E05004821	Carpenders Park	59.6	17.9	15.6	6.9
		E05004822	Chorleywood East	59.4	17.7	15.3	7.5
		E05004823	Chorleywood West	55.9	18.7	16.7	8.7
		E05004824	Croxley Green	58.9	17.0	16.6	7.5
		E05004825	Croxley Green North	58.8	16.9	16.6	7.6
		E05004826	Croxley Green South	59.9	16.9	16.0	7.3
		E05004827	Hayling	56.5	16.7	17.6	9.3
		E05004828	Langleybury	57.3	17.5	17.0	8.2
		E05004829	Leavesden	57.6	17.5	17.7	7.2
		E05004830	Maple Cross & Mill End	50.6	20.2	18.5	10.7
		E05004831	Moor Park & Eastbury	60.7	17.0	15.4	6.9
		E05004832	Northwick	54.9	16.9	17.2	10.9
		E05004833	Oxhey Hall	57.8	18.2	16.5	7.5
		E05004834	Penn	57.5	17.4	17.1	8.1
		E05004835	Rickmansworth	58.4	17.9	16.4	7.3
		E05004836	Rickmansworth West	59.0	16.9	16.5	7.5
		E05004837	Sarratt	53.8	17.8	18.9	9.5
	Watford	E05004838	Callowland	67.2	13.2	14.7	4.9
		E05004839	Central	69.4	11.7	12.9	6.0
		E05004840	Holywell	69.3	12.9	12.4	5.4
		E05004841	Leggatts	65.0	14.6	14.6	5.8
		E05004842	Meriden	56.9	15.9	19.7	7.4
		E05004843	Nascot	59.5	17.4	15.8	7.3
		E05004844	Oxhey	60.7	16.8	15.4	7.0
		E05004845	Park	63.7	15.7	14.3	6.3
		E05004846	Stanborough	60.0	15.9	17.6	6.5
		E05004847	Tudor	62.3	16.5	14.8	6.4
		E05004848	Vicarage	68.8	14.2	12.2	4.8
		E05004849	Woodside	57.0	16.7	18.9	7.5
	Welwyn Hatfield	E05004850	Brookmans Park and Little Heath	52.1	19.5	18.4	10.0
		E05004851	Haldens	53.9	19.4	17.5	9.2
		E05004852	Handside	54.6	19.7	16.8	8.9
		E05004853	Hatfield Central	57.9	17.3	16.2	8.5
		E05004854	Hatfield East	57.0	16.9	17.5	8.6
		E05004855	Hatfield South	64.9	15.8	12.9	6.5
		E05004856	Hatfield Villages	60.4	18.1	14.3	7.2
		E05004857	Hatfield West	64.9	16.1	12.7	6.3
		E05004858	Hollybush	58.8	18.6	14.9	7.7
		E05004859	Howlands	57.4	18.5	15.7	8.4
		E05004860	Northaw and Cuffley	47.1	22.2	19.2	11.4
		E05004861	Panshanger	54.4	18.9	17.5	9.2
		E05004862	Peartree	53.2	17.0	19.8	10.0
		E05004863	Sherrards	53.9	20.6	16.7	8.8
		E05009029	Welham Green	52.9	21.5	16.7	8.9
		E05004865	Welwyn East	56.2	18.6	16.6	8.6
		E05004866	Welwyn West	55.0	19.7	16.7	8.6
Luton	Luton	E05002193	Barnfield	62.7	17.5	13.4	6.4
		E05002194	Biscot	60.6	15.7	13.3	10.4
		E05002195	Bramingham	65.3	16.4	12.6	5.7
		E05002196	Challney	67.2	13.4	12.7	6.6
		E05002197	Crawley	61.1	15.7	14.9	8.3
		E05002198	Dallow	63.1	14.4	13.0	9.5
		E05002199	Farley	65.5	13.7	12.5	8.2
		E05002200	High Town	65.0	13.9	12.7	8.4
		E05002201	Icknield	65.7	15.2	12.8	6.3
		E05002202	Leagrave	64.7	14.2	13.4	7.7
		E05002203	Lewsey	67.2	13.1	12.6	7.2
		E05002204	Limbury	67.4	14.3	12.3	6.0
		E05002205	Northwell	65.1	14.3	12.0	8.6
		E05002206	Round Green	64.8	14.9	13.1	7.2
		E05002207	Saints	66.9	12.8	13.1	7.2
		E05002208	South	63.2	14.9	12.6	9.3

Study region	Local authority	Ward code	Ward name	No ACEs	1	2-3	4+
		E05002209	Stopsley	53.9	20.2	16.8	9.0
		E05002210	Sundon Park	61.7	16.1	14.5	7.7
		E05002211	Wigmore	55.4	18.7	17.3	8.5
Northamptonshire	Corby	E05005926	Beanfield	54.2	16.6	17.8	11.4
		E05005927	Central	50.3	18.4	16.5	14.8
		E05005928	Danesholme	52.4	18.3	16.9	12.3
		E05005929	East	53.5	17.3	17.8	11.5
		E05005930	Exeter	48.9	18.8	16.3	16.0
		E05005931	Great Oakley	55.0	17.7	17.2	10.0
		E05005932	Kingswood	49.1	18.9	16.2	15.9
		E05005933	Lodge Park	54.1	17.2	17.6	11.1
		E05005934	Oakley Vale	53.3	18.7	19.3	8.7
		E05005935	Rowlett	53.1	17.8	17.7	11.5
		E05005936	Rural West	50.9	20.4	18.9	9.8
		E05005937	Shire Lodge	52.9	17.2	17.5	12.5
		E05005938	Stanion and Corby Village	50.4	19.6	17.7	12.2
		E05005939	Tower Hill	52.2	18.2	17.0	12.6
		E05005940	Weldon and Gretton	50.8	20.5	18.3	10.5
	Daventry	E05009012	Abbey North	53.3	19.0	17.5	10.3
		E05009013	Abbey South	54.1	19.2	17.1	9.6
		E05009014	Barby and Kilsby	49.8	20.8	19.5	9.9
		E05009015	Braunston and Welton	47.7	23.2	18.8	10.3
		E05009016	Brixworth	48.5	21.0	19.3	11.3
		E05009017	Drayton	53.7	19.1	17.2	10.0
		E05009018	Hill	52.9	19.1	16.7	11.3
		E05009019	Long Buckby	47.2	21.4	19.5	11.9
		E05009020	Moulton	54.4	19.4	17.3	8.9
		E05009021	Ravensthorpe	52.6	19.5	18.7	9.2
		E05009022	Spratton	53.4	19.1	17.9	9.6
		E05009023	Walgrave	51.7	20.3	18.7	9.3
		E05009024	Weedon	51.4	19.5	19.0	10.0
		E05009025	Welford	51.7	20.2	18.9	9.3
		E05009026	Woodford	48.9	20.8	19.3	11.0
		E05009027	Yelvertoft	45.8	24.0	19.1	11.1
	East Northamptonshire	E05005965	Barnwell	51.9	20.2	18.7	9.3
		E05005966	Fineshade	51.6	20.3	18.9	9.3
		E05005967	Higham Ferrers Chichele	55.0	19.1	16.8	9.0
		E05005968	Higham Ferrers Lancaster	55.3	18.1	17.0	9.6
		E05005969	Irthlingborough John Pyel	45.9	20.9	20.0	13.2
		E05005970	Irthlingborough Waterloo	46.2	20.1	20.1	13.6
		E05005971	King's Forest	51.9	20.3	18.7	9.1
		E05005972	Lower Nene	52.0	20.2	18.7	9.2
		E05005973	Lyveden	47.8	21.5	19.2	11.4
		E05005974	Oundle	47.2	22.0	19.3	11.5
		E05005975	Prebendal	51.9	20.3	18.7	9.2
		E05005976	Raunds Saxon	46.7	21.7	19.6	12.0
		E05005977	Raunds Windmill	47.0	20.3	19.8	12.9
		E05005978	Rushden Bates	55.0	18.1	17.1	9.7
		E05005979	Rushden Hayden	53.5	17.0	18.0	11.6
		E05005980	Rushden Pemberton	53.7	19.8	17.0	9.6
		E05005981	Rushden Sartoris	55.1	19.5	16.7	8.8
		E05005982	Rushden Spencer	53.8	20.3	16.8	9.1
		E05005983	Stanwick	47.9	21.4	19.3	11.4
		E05005984	Thrapston Lakes	46.9	22.3	19.4	11.4
		E05005985	Thrapston Market	46.3	22.8	19.4	11.5
		E05005986	Woodford	45.9	24.1	19.1	11.0
	Kettering	E05005987	All Saints	52.5	18.4	17.3	11.8
		E05005988	Avondale Grange	50.8	18.0	16.9	14.3
		E05005989	Barton	55.0	19.7	16.6	8.7
		E05008549	Brambleside	55.3	19.4	16.4	8.9
		E05005991	Burton Latimer	53.3	21.0	16.8	8.9
		E05005992	Desborough Loatland	53.3	20.0	17.1	9.6
		E05005993	Desborough St Giles	54.8	19.6	16.7	8.9
		E05005994	Ise Lodge	56.1	18.8	16.6	8.6
		E05005995	Northfield	52.6	17.0	18.0	12.5
		E05005996	Pipers Hill	53.0	19.1	16.9	10.9
		E05008550	Queen Eleanor and Buccleuch	49.6	20.8	19.1	10.5
		E05005998	Rothwell	46.1	21.0	19.8	13.0

Study region	Local authority	Ward code	Ward name	No ACEs	1	2-3	4+
		E05005999	St Michael's and Wicksteed	52.6	18.5	17.0	11.8
		E05006000	St Peter's	57.1	18.7	15.9	8.2
		E05006001	Slade	48.0	20.8	19.6	11.6
		E05006002	Welland	54.5	21.0	16.4	8.1
		E05006003	William Knibb	51.7	17.4	17.6	13.3
	Northampton	E05008824	Abington	54.5	18.8	18.0	8.6
		E05008825	Billing	53.6	18.9	18.3	9.2
		E05008827	Boothville	55.4	19.7	16.5	8.4
		E05008827	Brookside	55.4	16.6	17.7	10.4
		E05008828	Castle	59.3	15.1	15.8	9.8
		E05008829	Delapre and Briar Hill	51.8	19.5	18.3	10.4
		E05008830	East Hunsbury	54.7	19.3	17.0	9.0
		E05008831	Eastfield	55.3	17.1	17.2	10.5
		E05008832	Headlands	54.7	17.6	18.3	9.5
		E05008833	Kings Heath	51.2	18.0	18.6	12.2
		E05008834	Kingsley	53.3	17.6	18.0	11.1
		E05008835	Kingsthorpe	54.6	20.1	16.8	8.5
		E05008836	Nene Valley	55.2	19.3	16.7	8.9
		E05008837	New Duston	54.6	20.0	16.7	8.7
		E05008838	Obelisk	56.2	19.6	15.9	8.2
		E05008839	Old Duston	53.6	19.8	17.2	9.4
		E05008840	Park	56.9	18.4	15.7	9.0
		E05008841	Parklands	55.1	20.0	16.4	8.4
		E05008842	Phippsville	54.0	19.9	16.9	9.3
		E05008843	Rectory Farm	53.6	17.4	20.0	9.0
		E05008844	Riverside	57.3	17.2	18.0	7.5
		E05008845	Rushmills	56.1	17.9	16.4	9.6
		E05008846	St David's	52.0	18.2	18.2	11.6
		E05008847	St James	56.2	16.6	18.0	9.1
		E05008848	Semilong	54.4	16.3	19.8	9.6
		E05008849	Spencer	62.1	14.9	13.3	9.7
		E05008850	Spring Park	55.5	19.6	16.4	8.4
		E05008851	Sunnyside	56.9	17.4	16.1	9.6
		E05008852	Talavera	51.1	17.8	19.9	11.2
		E05008853	Trinity	52.3	18.9	19.9	8.9
		E05008854	Upton	52.8	19.8	17.5	9.9
		E05008855	West Hunsbury	55.1	17.9	18.2	8.8
		E05008856	Westone	55.1	20.0	16.3	8.7
	South Northamptonshire	E05006027	Astwell	53.4	17.8	19.1	9.7
		E05006028	Blakesley and Cote	52.9	18.9	18.8	9.3
		E05006029	Blisworth and Roade	47.9	22.0	19.1	10.9
		E05006031	Brackley East	55.3	19.5	16.6	8.6
		E05006032	Brackley South	53.9	20.0	17.0	9.1
		E05006032	Brackley West	55.1	18.7	17.0	9.2
		E05006033	Brafield and Yardley	51.1	20.0	18.9	10.0
		E05006034	Cosgrove and Grafton	51.9	18.7	19.2	10.1
		E05006035	Danvers and Wardoun	52.9	19.0	18.8	9.3
		E05006036	Deanshanger	46.4	22.5	19.5	11.6
		E05006037	Grange Park	45.8	21.5	20.2	12.5
		E05006038	Hackleton	53.7	17.9	18.9	9.5
		E05006039	Harpole and Grange	50.3	19.8	19.2	10.7
		E05006040	Heyfords and Bugbrooke	47.0	22.5	19.2	11.4
		E05006041	Kings Sutton	47.5	21.4	19.5	11.7
		E05006042	Kingthorn	48.5	21.3	19.2	11.0
		E05006043	Little Brook	46.8	21.6	19.8	11.9
		E05006044	Middleton Cheney	46.9	22.1	19.3	11.6
		E05006045	Old Stratford	47.3	21.3	19.6	11.8
		E05006046	Salcey	48.0	20.9	19.5	11.6
		E05006047	Silverstone	47.6	21.3	19.5	11.6
		E05006048	Steane	53.5	17.9	19.0	9.5
		E05006049	Tove	53.7	17.9	18.9	9.4
		E05006050	Towcester Brook	46.5	21.8	19.6	12.2
		E05006051	Towcester Mill	46.6	21.4	19.8	12.2
		E05006052	Washington	51.6	20.2	18.8	9.4
		E05006053	Whittlewood	47.8	21.3	19.4	11.5
	Wellingborough	E05008595	Brickhill	53.3	18.8	18.2	9.7
		E05006055	Castle	59.4	15.7	15.0	9.9
		E05006056	Croyland	52.9	17.7	18.0	11.5

Study region	Local authority	Ward code	Ward name	No ACEs	1	2-3	4+
		E05006057	Earls Barton	46.6	22.7	19.3	11.4
		E05006058	Finedon	46.0	21.6	19.7	12.8
		E05008596	Great Doddington and Wilby	54.8	21.2	16.1	7.9
		E05006060	Hemmingwell	56.4	18.1	15.9	9.6
		E05006061	Irchester	45.9	22.4	19.5	12.2
		E05006062	North	51.7	20.3	18.7	9.2
		E05008597	Queensway	52.2	17.3	20.1	10.5
		E05006064	Redwell East	54.7	20.5	16.4	8.4
		E05006065	Redwell West	55.8	18.8	16.8	8.7
		E05006066	South	45.9	24.0	19.0	11.0
		E05008598	Swanspool	51.9	19.2	16.3	12.5
		E05006068	West	51.8	20.2	18.8	9.2
		E05006069	Wollaston	46.3	23.0	19.3	11.4

Table A5: Adjusted prevalence (%) of individual ACEs across the study areas

		Childhood abuse			Household member				
Study area	Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
Hertfordshire	16.9	23.4	13.6	6.1	10.8	15.3	11.2	2.9	4.1
Luton	15.0	17.7	11.4	6.1	8.3	14.7	8.7	3.9	3.3
Northamptonshire	19.6	23.7	14.4	6.1	12.2	16.4	11.6	3.2	4.2
Overall	17.7	22.9	13.6	6.1	11.0	15.6	11.0	3.1	4.1

Table A6: Adjusted prevalence (%) of individual ACEs at local authority level

			Childhood abuse			Household member				
Study area	Local authority	Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
Hertfordshire	Broxbourne	17.8	24.6	13.8	6.2	10.1	13.7	11.2	2.9	4.3
	Dacorum	17.1	24.0	14.1	6.1	10.6	14.6	11.2	2.9	4.3
	East Hertfordshire	17.5	24.0	14.1	6.1	12.2	15.7	11.8	2.7	4.4
	Hertsmere	17.1	23.9	13.6	6.2	10.6	15.1	10.6	2.9	4.0
	North Hertfordshire	17.2	23.7	13.8	6.1	11.6	16.2	11.3	2.8	4.1
	St Albans	16.0	23.6	14.0	6.1	11.4	16.7	13.2	2.8	4.0
	Stevenage	19.8	23.9	14.1	6.1	11.5	16.0	11.0	3.2	4.5
	Three Rivers	15.9	23.7	14.2	6.2	10.1	14.6	11.3	2.9	4.1
	Watford	13.6	20.1	11.5	6.1	7.9	13.7	8.9	3.1	3.3
	Welwyn Hatfield	17.0	21.8	12.4	6.1	10.8	15.6	10.1	3.0	4.1
Luton	Luton	15.0	17.7	11.4	6.1	8.3	14.7	8.7	3.9	3.3
Northamptonshire	Corby	22.2	24.5	15.7	6.1	11.9	15.8	12.7	3.8	4.6
	Daventry	19.2	23.6	13.7	6.1	12.9	16.1	11.7	2.7	4.2
	East Northamptonshire	19.7	23.6	13.9	6.1	13.0	17.4	11.8	2.8	4.2
	Kettering	19.9	23.8	14.7	6.1	11.9	16.6	12.0	3.2	4.3
	Northampton	19.3	23.7	14.4	6.1	11.2	15.7	10.9	3.6	4.1
	South Northamptonshire	18.5	23.6	14.2	6.1	13.7	17.5	11.5	2.7	4.2
	Wellingborough	19.5	23.2	14.0	6.1	12.0	17.0	11.7	3.2	3.9

Table A7: Adjusted prevalence (%) of individual ACEs at ward level

					Childhood abuse			Household member				
Study area	Local authority	Ward code	Ward name	Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
Hertfordshire	Broxbourne	E05009002	Broxbourne and Hoddesdon South	14.7	23.6	14.0	6.1	9.7	13.5	11.7	2.6	4.2
		E05009003	Cheshunt North	18.3	24.5	13.3	6.2	10.0	13.7	11.0	2.8	4.4
		E05009004	Cheshunt South and Theobalds	19.0	25.4	13.5	6.2	10.2	13.6	11.0	3.2	4.2
		E05009005	Flamstead End	17.4	24.4	14.5	6.2	10.2	13.8	11.0	3.1	4.3
		E05009006	Goffs Oak	15.9	23.9	14.2	6.1	10.4	14.3	11.5	2.8	4.4
		E05009007	Hoddesdon North	16.0	23.8	13.6	6.2	9.8	13.6	12.1	2.6	4.4
		E05009008	Hoddesdon Town and Rye Park	18.6	24.3	13.2	6.1	9.9	13.8	11.7	2.7	4.6
		E05009009	Rosedale and Bury Green	19.4	24.0	14.2	6.2	9.9	13.7	11.3	3.1	4.5
		E05009010	Waltham Cross	20.2	26.6	14.3	6.2	10.6	13.5	10.0	3.7	4.0
		E05009011	Wormley and Turnford	18.8	25.3	13.2	6.2	10.3	13.6	11.0	2.9	4.3
	Dacorum	E05004691	Adeyfield East	18.3	24.2	14.1	6.1	10.0	13.7	11.9	3.0	4.7
		E05004692	Adeyfield West	19.4	24.4	13.8	6.1	10.0	13.8	11.0	2.9	4.7
		E05004693	Aldbury and Wigginton	17.7	23.2	14.7	6.2	13.3	12.0	11.2	2.7	3.9
		E05004694	Apsley and Corner Hall	17.5	24.1	14.1	6.0	9.6	14.6	10.6	3.0	4.3
		E05004695	Ashridge	15.4	22.9	14.7	6.2	12.0	14.0	11.1	2.6	3.8
		E05004696	Bennetts End	15.5	23.7	14.5	6.1	9.6	14.9	11.4	3.2	4.0
		E05004697	Berkhamsted Castle	15.2	23.9	14.7	6.1	11.3	15.8	11.5	2.8	4.2
		E05004698	Berkhamsted East	16.0	24.1	14.0	6.1	11.3	15.8	11.8	2.6	4.3
		E05004699	Berkhamsted West	16.4	23.9	14.7	6.2	11.4	15.8	11.2	2.9	4.3
		E05004700	Bovingdon, Flaunden and Chipperfield	17.1	23.8	14.7	6.2	13.4	17.5	11.1	2.8	4.0
		E05004701	Boxmoor	15.3	23.7	13.6	6.1	9.6	14.1	11.5	2.6	4.2
		E05004702	Chaulden and Warners End	17.8	24.2	14.2	6.2	10.0	13.7	11.0	2.9	4.6
		E05004703	Gadebridge	18.0	24.3	14.7	6.2	10.0	13.7	10.6	3.0	4.6
		E05004704	Grovehill	19.7	25.2	14.4	6.1	10.1	13.4	10.6	3.4	4.2
		E05004705	Hemel Hempstead Town	19.3	24.2	14.1	6.1	9.8	14.4	11.2	3.2	4.5
		E05004706	Highfield	20.6	25.4	14.9	6.2	10.2	13.6	10.2	3.6	4.3
		E05004707	Kings Langley	14.1	23.7	14.7	6.2	9.7	13.5	11.4	2.8	4.2
		E05004708	Leverstock Green	16.6	23.6	13.6	6.2	9.8	14.2	11.8	2.9	4.2
		E05004709	Nash Mills	14.1	23.2	11.3	6.1	9.0	15.1	12.2	2.2	3.5
		E05004710	Northchurch	14.7	23.5	14.7	6.1	11.3	15.6	11.3	2.7	4.1
		E05004711	Tring Central	16.7	24.0	14.7	6.2	11.6	15.8	11.2	2.9	4.4
		E05004712	Tring East	15.1	23.7	14.7	6.1	11.2	15.8	11.4	2.8	4.2
		E05004713	Tring West and Rural	16.1	23.8	14.7	6.1	12.0	14.8	11.5	2.8	4.2
		E05004714	Watling	20.5	23.9	12.5	6.1	14.2	16.9	12.3	2.3	4.3
		E05004715	Woodhall Farm	15.7	23.1	12.0	6.1	9.1	13.2	9.7	2.9	3.9
	East Hertfordshire	E05004716	Bishop's Stortford All Saints	16.6	24.3	14.2	6.1	11.6	16.0	12.0	2.8	4.6
		E05004717	Bishop's Stortford Central	18.6	24.6	13.0	6.1	11.7	16.0	12.7	2.7	4.7
		E05004718	Bishop's Stortford Meads	17.0	24.3	13.6	6.1	11.6	16.0	12.1	2.6	4.6
		E05004719	Bishop's Stortford Silverleys	15.4	24.1	14.7	6.1	11.5	15.9	11.6	2.9	4.3
		E05004720	Bishop's Stortford South	15.6	24.2	14.7	6.1	11.6	15.9	11.7	2.9	4.4
		E05004721	Braughing	18.7	23.1	13.1	6.1	13.3	12.0	11.7	2.3	3.9
		E05004722	Buntingford	18.2	23.6	14.7	6.2	14.6	20.7	11.4	2.8	4.1

Study area	Local authority	Ward code	Ward name	Parental separation	Childhood abuse			Household member				
					Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
		E05004723	Datchworth & Aston	17.4	23.0	14.8	6.1	13.1	12.0	11.1	2.6	3.8
		E05004724	Great Amwell	18.7	23.7	14.7	6.1	11.6	12.9	10.6	2.9	4.3
		E05004725	Hertford Bengeo	15.8	24.0	14.2	6.2	11.4	15.8	11.8	2.7	4.3
		E05004726	Hertford Castle	17.1	24.5	14.8	6.0	11.5	16.0	11.5	3.0	4.7
		E05004727	Hertford Heath	18.6	23.9	13.2	6.1	13.3	18.4	12.1	2.6	4.5
		E05004728	Hertford Kingsmead	18.0	24.6	13.9	6.2	12.8	17.9	12.2	2.7	4.6
		E05004729	Hertford Rural North	17.9	23.2	14.7	6.1	13.5	12.0	11.2	2.7	4.0
		E05004730	Hertford Rural South	18.0	23.2	14.7	6.1	13.4	12.1	11.2	2.7	4.0
		E05004731	Hertford Sele	19.5	24.3	15.0	6.2	11.6	15.9	12.5	3.4	4.5
		E05004732	Hunsdon	20.3	23.4	11.6	6.1	13.3	12.1	12.4	2.1	4.0
		E05004733	Little Hadham	18.3	23.7	14.7	6.2	13.6	12.2	11.5	2.8	4.1
		E05004735	Much Hadham	21.5	23.3	14.9	6.2	13.7	12.1	11.9	3.2	4.1
		E05004734	Mundens and Cottered	20.1	23.3	11.6	6.1	13.3	12.1	12.3	2.1	4.0
		E05004736	Puckeridge	18.5	23.8	14.7	6.1	14.6	20.8	11.5	2.8	4.2
		E05004737	Sawbridgeworth	16.0	23.7	14.7	6.1	11.3	15.7	11.0	2.8	4.2
		E05004738	Stanstead Abbots	15.7	23.9	13.4	6.1	10.4	14.6	12.0	2.5	4.3
		E05004739	Thundridge & Standon	19.7	23.6	13.4	6.1	13.4	12.2	11.9	2.5	4.2
		E05009315	Walkern	19.8	23.8	13.1	6.1	14.1	16.2	12.0	2.4	4.2
		E05004741	Ware Chadwell	16.0	24.2	14.8	6.0	11.4	15.9	11.6	2.9	4.6
		E05004742	Ware Christchurch	17.1	24.4	13.7	6.1	11.6	16.0	12.2	2.7	4.7
		E05004743	Ware St Mary's	16.3	24.0	13.9	6.1	11.5	15.8	11.9	2.7	4.4
		E05004744	Ware Trinity	18.5	24.3	13.7	6.2	11.6	16.0	11.5	2.7	4.5
		E05004745	Watton-at-Stone	18.5	23.8	14.7	6.1	14.5	20.7	11.5	2.8	4.2
	Hertsmere	E05004746	Aldenham East	18.6	23.8	14.7	6.1	14.7	20.7	11.5	2.8	4.3
		E05004747	Aldenham West	21.1	23.7	13.6	6.2	14.4	17.6	11.4	2.6	4.3
		E05004748	Borehamwood Brookmeadow	18.4	26.0	13.3	6.1	10.2	13.5	9.7	2.9	4.1
		E05004749	Borehamwood Cowley Hill	19.4	26.2	14.8	6.2	10.3	13.4	8.8	3.6	3.8
		E05004750	Borehamwood Hillside	16.5	23.6	12.2	6.1	9.2	13.2	8.4	3.0	3.7
		E05004751	Borehamwood Kenilworth	19.0	25.9	14.1	6.2	10.2	13.5	9.3	3.2	4.0
		E05004752	Bushey Heath	11.8	22.0	12.5	6.3	8.8	15.5	11.4	2.4	2.9
		E05004753	Bushey North	16.7	23.5	13.8	6.2	9.4	15.0	11.5	3.1	3.8
		E05004754	Bushey Park	15.0	23.8	13.7	6.2	9.8	13.6	11.9	2.6	4.3
		E05004755	Bushey St James	15.1	23.7	13.9	6.1	9.6	14.1	11.4	2.7	4.1
		E05004756	Elstree	11.3	19.3	11.4	6.2	8.1	15.4	9.1	2.7	2.7
		E05004757	Potters Bar Furzefield	17.4	23.9	14.0	6.2	11.8	15.8	11.5	2.8	4.5
		E05004758	Potters Bar Oakmere	20.5	23.9	13.7	6.2	11.8	15.8	12.3	3.1	4.6
		E05004759	Potters Bar Parkfield	15.5	23.4	13.4	6.2	11.4	16.4	11.8	2.6	4.1
		E05004760	Shenley	19.0	23.9	14.7	6.2	11.5	15.8	10.3	2.9	4.3
	North Hertfordshire	E05004761	Arbury	18.0	23.0	13.4	6.2	13.8	16.7	11.5	2.3	3.8
		E05004762	Baldock East	16.0	24.3	14.4	6.1	11.6	15.9	11.8	2.8	4.5
		E05004763	Baldock Town	17.8	24.1	14.2	6.1	11.4	15.9	11.1	2.8	4.4
		E05004764	Cadwell	16.0	23.1	11.6	6.2	11.1	15.4	12.2	2.0	3.9
		E05004765	Chesfield	17.5	25.4	14.2	6.1	12.0	15.5	11.5	2.9	4.6
		E05004766	Codicote	15.7	23.5	13.4	6.2	11.4	15.7	11.9	2.5	4.2

Study area	Local authority	Ward code	Ward name	Parental separation	Childhood abuse			Household member				
					Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
		E05004767	Ermine	19.1	23.2	13.0	6.2	13.3	12.0	11.8	2.3	3.9
		E05004768	Hitchin Bearton	14.7	22.0	12.8	6.0	10.1	17.6	10.0	3.0	3.4
		E05004769	Hitchin Highbury	16.5	23.8	14.1	6.1	11.2	16.3	11.3	2.8	4.2
		E05004770	Hitchin Oughton	20.4	25.0	15.8	6.2	11.9	15.9	11.4	3.7	4.4
		E05004771	Hitchin Priory	15.3	23.5	14.2	6.1	11.2	15.7	11.5	2.6	4.2
		E05004772	Hitchin Walsworth	15.7	23.9	13.4	6.1	11.1	16.6	11.0	2.6	3.8
		E05004773	Hitchwood, Offa and Hoo	19.0	23.4	13.6	6.2	13.0	12.6	11.4	2.5	3.9
		E05004774	Kimpton	17.3	23.1	14.7	6.1	14.3	20.4	11.1	2.7	3.9
		E05004775	Knebworth	19.3	23.7	13.7	6.2	14.7	20.7	11.8	2.5	4.3
		E05004776	Letchworth East	15.5	23.0	12.7	6.1	10.7	17.9	11.0	2.7	3.4
		E05004777	Letchworth Grange	19.6	23.9	14.1	6.1	11.5	15.8	11.4	3.0	4.4
		E05004778	Letchworth South East	16.1	23.0	14.5	6.1	10.8	17.0	10.4	3.2	3.3
		E05004779	Letchworth South West	17.4	23.6	14.8	6.1	11.4	15.7	11.3	3.0	4.3
		E05004780	Letchworth Wilbury	19.3	23.9	14.7	6.2	11.3	16.7	11.3	3.3	4.2
		E05004781	Royston Heath	16.3	23.8	13.6	6.1	11.3	15.8	11.9	2.5	4.4
		E05004782	Royston Meridian	15.5	23.6	13.9	6.1	11.2	15.7	11.7	2.5	4.1
		E05004783	Royston Palace	18.2	24.3	13.3	6.1	11.5	15.9	11.8	2.6	4.6
		E05004784	Weston and Sandon	20.1	23.4	11.6	6.2	13.4	12.1	12.4	2.1	3.9
	St Albans	E05004785	Ashley	14.1	23.5	13.4	6.1	10.8	18.0	11.7	2.8	3.6
		E05004786	Batchwood	16.7	23.5	13.7	6.2	10.9	17.4	11.6	3.0	3.7
		E05004787	Clarence	15.8	23.9	13.3	6.1	11.2	16.8	12.0	2.6	4.1
		E05009028	Colney Heath	15.9	23.8	13.8	6.1	11.2	16.6	11.4	2.7	4.0
		E05004789	Cunningham	14.2	22.4	13.2	6.1	10.2	18.9	11.1	3.0	2.8
		E05004790	Harpenden East	16.4	24.2	14.7	6.1	11.4	15.9	11.3	2.9	4.3
		E05004791	Harpenden North	15.5	23.9	14.1	6.2	11.4	15.8	11.8	2.7	4.2
		E05004792	Harpenden South	14.5	23.4	14.7	6.1	11.2	15.6	11.3	2.7	4.0
		E05004793	Harpenden West	15.2	24.0	14.7	6.1	11.4	15.8	11.6	2.8	4.2
		E05004794	London Colney	15.3	23.4	13.2	6.2	11.0	17.4	11.5	2.7	3.7
		E05004795	Marshalswick North	15.3	23.8	14.7	6.1	11.5	15.7	11.5	2.8	4.3
		E05004796	Marshalswick South	15.6	24.1	14.7	6.1	11.4	15.9	11.6	2.9	4.4
		E05004797	Park Street	17.7	23.8	13.9	6.1	11.3	15.8	12.1	2.8	4.3
		E05004798	Redbourn	20.6	23.5	14.7	6.3	14.3	19.0	10.6	2.8	4.0
		E05004801	Sandridge	16.0	23.9	13.8	6.2	11.5	15.8	11.9	2.6	4.3
		E05004802	Sopwell	15.9	22.5	13.3	6.1	10.3	16.9	11.3	3.2	3.7
		E05004799	St Peters	18.0	24.6	13.8	6.0	11.3	17.0	11.6	2.9	4.6
		E05004800	St Stephen	15.0	23.2	13.9	6.2	11.2	15.6	11.5	2.5	4.0
		E05004803	Verulam	14.6	23.4	14.7	6.1	11.1	15.6	11.2	2.7	4.0
		E05004804	Wheathampstead	18.8	23.6	13.9	6.2	14.3	18.3	11.7	2.6	4.1
	Stevenage	E05004805	Bandley Hill	19.7	24.4	14.2	6.1	11.8	16.0	11.6	3.1	4.7
		E05004806	Bedwell	21.0	22.2	14.8	6.1	10.6	16.4	12.6	4.4	4.0
		E05004807	Chells	20.8	24.5	14.0	6.2	11.9	16.0	10.8	3.0	4.8
		E05004808	Longmeadow	19.8	24.0	13.9	6.2	11.8	15.8	10.6	2.8	4.5
		E05009316	Manor	16.8	24.0	14.8	6.1	11.6	15.8	11.1	2.9	4.5
		E05004810	Martins Wood	20.9	24.3	14.1	6.1	11.7	16.0	11.5	3.1	4.7

Study area	Local authority	Ward code	Ward name	Parental separation	Childhood abuse			Household member				
					Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
		E05004811	Old Town	19.6	24.6	14.1	6.1	11.8	16.1	11.3	2.9	4.9
		E05004812	Pin Green	21.6	24.3	14.4	6.0	11.5	16.0	12.3	3.4	4.7
		E05004813	Roebuck	22.2	24.3	15.0	6.1	11.8	16.0	11.7	3.6	4.7
		E05004815	Shephall	21.1	25.3	14.8	6.2	12.0	15.8	9.5	3.4	4.4
		E05004814	St Nicholas	16.7	21.4	12.6	6.1	9.9	14.9	7.3	3.4	3.4
		E05004816	Symonds Green	20.5	24.0	14.1	6.1	11.5	15.9	11.4	3.0	4.6
		E05004817	Woodfield	17.2	23.6	12.4	6.2	11.3	16.9	11.7	2.5	4.0
	Three Rivers	E05004818	Abbots Langley	15.7	23.8	14.7	6.1	9.7	13.6	10.9	2.8	4.3
		E05004819	Ashridge	19.3	25.5	14.7	6.2	10.1	13.6	8.7	3.1	4.2
		E05004820	Bedmond & Primrose Hill	16.0	24.2	13.7	6.1	10.4	14.5	12.0	2.7	4.5
		E05004821	Carpenders Park	12.2	22.1	12.9	6.3	9.0	15.2	11.3	2.5	3.1
		E05004822	Chorleywood East	10.2	21.4	13.8	6.3	9.7	17.7	10.6	2.8	2.5
		E05004823	Chorleywood West	14.9	23.6	14.7	6.1	11.3	15.7	11.4	2.8	4.1
		E05004824	Croxley Green	14.3	23.8	14.7	6.2	9.7	13.6	11.5	2.8	4.2
		E05004825	Croxley Green North	14.4	23.8	14.7	6.2	9.9	13.6	11.5	2.8	4.3
		E05004826	Croxley Green South	12.2	22.9	14.2	6.3	9.2	15.2	11.2	2.8	3.4
		E05004827	Hayling	21.2	24.6	14.9	6.2	10.1	13.9	11.4	3.5	4.8
		E05004828	Langleybury	17.8	24.3	14.7	6.2	10.0	13.7	10.7	3.0	4.6
		E05004829	Leavesden	15.3	25.0	13.8	6.1	9.9	13.7	11.2	2.7	4.3
		E05004830	Maple Cross & Mill End	21.1	24.2	13.2	6.2	12.4	17.3	12.2	2.7	4.5
		E05004831	Moor Park & Eastbury	10.5	21.9	13.8	6.3	8.7	16.4	10.9	2.8	2.7
		E05004832	Northwick	22.9	24.7	16.0	6.2	10.2	13.9	13.1	4.1	4.9
		E05004833	Oxhey Hall	15.2	23.6	13.0	6.2	9.8	13.5	12.0	2.4	4.2
		E05004834	Penn	17.2	24.5	14.7	6.2	9.9	13.8	11.0	3.0	4.6
		E05004835	Rickmansworth	13.9	23.4	13.4	6.1	9.3	14.7	11.7	2.6	3.8
		E05004836	Rickmansworth West	14.1	23.6	14.7	6.2	9.7	13.6	11.4	2.8	4.1
		E05004837	Sarratt	17.6	23.1	14.7	6.2	13.4	12.0	11.1	2.7	3.9
	Watford	E05004838	Callowland	11.7	16.6	8.9	6.1	6.4	12.4	7.5	2.9	3.2
		E05004839	Central	14.0	16.7	10.4	5.9	6.4	12.5	7.7	4.0	3.3
		E05004840	Holywell	12.6	16.5	9.7	6.2	6.5	12.4	7.2	3.3	3.2
		E05004841	Leggatts	12.3	18.4	10.4	6.0	7.1	13.7	8.4	3.0	3.0
		E05004842	Meriden	18.6	25.5	14.0	6.2	10.0	14.1	10.2	3.5	3.7
		E05004843	Nascot	12.2	22.6	13.8	6.2	8.9	16.5	10.7	3.0	3.0
		E05004844	Oxhey	14.3	21.7	11.9	6.2	8.8	14.0	11.2	2.7	3.6
		E05004845	Park	11.9	19.9	12.4	6.1	7.8	14.9	8.7	3.0	2.9
		E05004846	Stanborough	15.2	23.7	12.6	6.1	9.5	13.2	9.7	3.0	3.8
		E05004847	Tudor	10.7	21.0	12.4	6.2	8.1	15.5	10.3	2.8	2.8
		E05004848	Vicarage	11.3	16.6	8.6	6.1	6.4	12.5	7.3	2.7	3.2
		E05004849	Woodside	18.3	25.3	14.8	6.1	10.0	13.5	9.7	3.2	4.1
	Welwyn Hatfield	E05004850	Brookmans Park and Little Heath	18.2	23.4	13.9	6.2	13.4	14.9	11.7	2.6	4.2
		E05004851	Haldens	19.2	24.3	14.2	6.1	11.6	15.8	10.8	2.9	4.4
		E05004852	Handside	17.0	23.8	13.9	6.1	11.4	15.8	11.4	2.7	4.3
		E05004853	Hatfield Central	18.5	21.5	12.8	6.0	10.2	15.2	9.1	3.8	4.0
		E05004854	Hatfield East	18.8	22.5	13.6	6.0	11.0	14.9	9.5	3.5	4.1

Study area	Local authority	Ward code	Ward name	Parental separation	Childhood abuse			Household member				
					Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
		E05004855	Hatfield South	14.4	16.7	9.2	5.9	8.2	14.7	7.6	3.4	3.9
		E05004856	Hatfield Villages	14.6	19.6	10.0	6.1	9.7	15.9	9.5	2.9	4.2
		E05004857	Hatfield West	13.9	16.7	8.9	6.0	8.3	14.6	7.5	3.2	3.8
		E05004858	Hollybush	16.0	20.8	10.9	6.1	9.9	15.3	9.8	2.5	4.0
		E05004859	Howlands	16.9	22.1	12.6	6.2	10.5	15.5	10.0	2.8	4.1
		E05004860	Northaw and Cuffley	18.4	23.2	13.7	6.1	14.5	20.5	11.6	2.5	4.0
		E05004861	Panshanger	18.2	24.4	14.5	6.1	11.7	15.8	11.0	3.0	4.5
		E05004862	Peartree	22.6	25.8	15.0	6.2	12.1	15.8	10.9	3.9	4.4
		E05004863	Sherrards	16.8	23.9	12.3	6.2	10.5	15.8	12.4	2.3	4.3
		E05009029	Welham Green	18.1	23.9	11.6	6.2	11.9	15.8	12.8	2.2	4.6
		E05004865	Welwyn East	14.5	23.3	14.8	6.1	11.2	15.6	11.2	2.7	4.0
		E05004866	Welwyn West	15.8	23.6	13.7	6.1	11.3	15.7	11.7	2.5	4.2
Luton	Luton	E05002193	Barnfield	11.0	18.4	9.5	6.2	8.6	16.0	9.2	2.4	2.8
		E05002194	Biscot	17.4	18.3	13.3	6.0	8.5	15.7	10.4	4.9	3.4
		E05002195	Bramingham	10.1	16.8	8.9	6.1	7.9	14.9	8.2	2.3	2.7
		E05002196	Challney	13.4	16.2	10.0	6.1	7.6	14.2	7.4	3.6	3.0
		E05002197	Crawley	16.5	19.6	12.2	6.1	9.2	14.8	9.0	3.7	3.5
		E05002198	Dallow	16.8	17.3	12.4	5.9	8.0	14.9	9.6	5.0	3.4
		E05002199	Farley	15.1	16.3	11.3	6.1	7.7	14.3	8.4	4.5	3.2
		E05002200	High Town	15.8	16.6	11.5	5.9	7.7	14.5	8.5	4.7	3.4
		E05002201	Icknield	11.5	16.9	10.3	6.2	8.0	14.9	7.6	3.0	2.7
		E05002202	Leagrave	14.7	17.3	11.6	6.2	8.1	14.3	7.9	4.0	3.0
		E05002203	Lewsey	13.6	16.1	10.6	6.2	7.7	14.2	7.6	3.9	2.9
		E05002204	Limbury	12.2	15.8	9.7	6.1	7.6	14.1	6.6	3.2	2.9
		E05002205	Northwell	14.4	15.9	11.5	6.2	7.6	14.1	9.0	4.4	2.9
		E05002206	Round Green	14.2	17.3	10.7	6.1	8.2	14.5	8.0	3.5	3.2
		E05002207	Saints	14.7	16.5	10.4	6.0	7.7	14.4	7.8	4.1	3.3
		E05002208	South	17.2	16.8	12.0	5.9	8.0	14.6	8.9	5.2	3.7
		E05002209	Stopsley	18.1	23.8	13.5	6.1	11.5	15.8	11.3	2.6	4.4
		E05002210	Sundon Park	15.5	19.2	11.7	6.1	9.1	14.7	8.6	3.5	3.4
		E05002211	Wigmore	17.7	23.7	13.1	6.2	11.3	15.6	10.9	2.9	4.2
Northamptonshire	Corby	E05005926	Beanfield	22.3	23.9	15.2	4.5	11.6	15.8	12.7	3.8	4.5
		E05005927	Central	24.8	24.2	18.0	3.3	11.5	15.9	15.0	4.8	4.7
		E05005928	Danesholme	22.7	23.9	16.1	5.0	11.7	15.8	12.8	3.9	4.5
		E05005929	East	22.7	24.3	15.3	4.4	11.7	16.0	12.5	3.8	4.7
		E05005930	Exeter	26.5	24.7	18.3	4.8	12.0	16.1	16.0	5.1	4.9
		E05005931	Great Oakley	18.3	23.9	14.9	4.0	11.7	15.8	12.1	3.3	4.4
		E05005932	Kingswood	26.2	24.4	18.3	5.9	11.9	16.0	15.8	5.1	4.9
		E05005933	Lodge Park	21.9	23.9	15.1	5.3	11.6	15.8	12.1	3.6	4.5
		E05005934	Oakley Vale	17.8	26.4	15.1	6.1	12.0	15.9	10.5	3.3	4.4
		E05005935	Rowlett	23.0	24.5	15.2	3.3	11.8	16.0	12.3	3.8	4.8
		E05005936	Rural West	20.0	23.0	12.1	3.7	13.6	13.3	11.7	2.2	3.9
		E05005937	Shire Lodge	23.3	24.1	16.0	3.4	11.6	15.9	13.4	4.1	4.6
		E05005938	Stanion and Corby Village	22.8	23.8	14.6	4.7	12.8	13.8	13.8	3.4	4.4

Study area	Local authority	Ward code	Ward name	Parental separation	Childhood abuse			Household member				
					Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
		E05005939	Tower Hill	23.1	24.1	16.3	4.6	11.7	15.9	13.1	4.1	4.6
		E05005940	Weldon and Gretton	20.8	23.5	14.1	3.9	12.9	16.7	10.2	2.8	4.1
	Daventry	E05009012	Abbey North	20.9	24.7	14.6	4.6	11.8	16.1	11.6	3.3	4.8
		E05009013	Abbey South	18.9	23.8	14.0	4.6	11.4	15.8	11.8	2.9	4.5
		E05009014	Barby and Kilsby	20.3	23.8	12.8	5.1	13.1	14.8	11.8	2.3	4.4
		E05009015	Braunston and Welton	18.6	22.6	11.6	5.0	13.8	18.3	12.0	1.9	3.6
		E05009016	Brixworth	18.6	23.5	14.1	5.5	14.5	18.6	11.6	2.6	4.1
		E05009017	Drayton	19.8	23.8	13.3	6.1	11.5	15.8	12.8	3.0	4.4
		E05009018	Hill	20.3	24.2	15.8	6.2	11.6	16.0	12.5	3.6	4.5
		E05009019	Long Buckby	19.1	23.5	14.7	6.1	14.6	20.6	11.0	2.8	4.1
		E05009020	Moulton	16.5	23.1	13.6	6.1	12.1	14.3	11.6	2.5	4.1
		E05009021	Ravensthorpe	18.5	22.8	12.7	4.6	13.1	11.9	11.7	2.2	3.7
		E05009022	Spratton	16.1	23.2	14.7	4.1	12.7	15.8	11.3	2.7	3.9
		E05009023	Walgrave	19.7	23.1	11.6	6.2	13.2	12.1	12.3	2.0	3.8
		E05009024	Weedon	19.3	23.1	13.9	4.9	13.4	14.0	11.0	2.5	3.9
		E05009025	Welford	19.7	23.2	11.6	6.1	13.2	12.0	12.2	2.0	3.9
		E05009026	Woodford	18.7	23.5	13.9	4.6	14.2	17.8	11.7	2.6	4.1
		E05009027	Yelvertoft	19.4	23.1	11.7	6.1	14.3	20.4	12.2	2.0	3.9
	East Northamptonshire	E05005965	Barnwell	19.4	22.9	11.6	3.2	13.4	11.9	12.1	2.0	3.8
		E05005966	Fineshade	20.0	23.2	11.6	3.4	13.3	12.0	12.2	2.0	3.9
		E05005967	Higham Ferrers Chichele	16.8	23.8	14.7	4.6	11.3	15.8	11.0	2.8	4.3
		E05005968	Higham Ferrers Lancaster	17.3	23.8	14.9	3.9	11.3	15.8	11.8	3.1	4.2
		E05005969	Irthlingborough John Pyel	23.0	24.1	14.9	5.4	14.8	20.9	11.4	3.2	4.5
		E05005970	Irthlingborough Waterloo	23.1	23.9	15.0	3.6	14.7	20.8	12.0	3.3	4.4
		E05005971	King's Forest	19.4	22.9	11.6	3.3	13.1	11.9	12.1	2.0	3.8
		E05005972	Lower Nene	19.2	22.9	11.6	2.9	13.2	11.9	12.1	2.0	3.7
		E05005973	Lyveden	21.3	23.0	14.0	3.6	14.1	18.3	10.1	2.6	3.8
		E05005974	Oundle	18.9	23.4	13.9	3.9	14.5	20.2	11.5	2.6	4.1
		E05005975	Prebendal	19.3	22.9	11.6	3.1	13.1	11.9	12.1	2.0	3.7
		E05005976	Raunds Saxon	20.5	23.6	14.8	6.1	14.6	20.6	10.7	2.9	4.3
		E05005977	Raunds Windmill	21.1	23.4	14.9	6.1	14.5	20.6	11.9	3.1	4.2
		E05005978	Rushden Bates	18.1	23.9	14.9	3.3	11.4	15.8	11.7	3.2	4.3
		E05005979	Rushden Hayden	23.2	24.4	15.2	5.3	11.7	16.0	12.8	3.9	4.8
		E05005980	Rushden Pemberton	19.3	23.8	13.4	6.1	11.4	15.8	11.8	2.8	4.4
		E05005981	Rushden Sartoris	15.9	23.5	13.7	3.1	11.2	15.7	11.8	2.6	4.1
		E05005982	Rushden Spencer	18.6	23.6	13.1	5.1	11.2	15.7	11.5	2.6	4.2
		E05005983	Stanwick	17.5	23.2	14.8	6.1	14.2	20.5	11.2	2.7	3.9
		E05005984	Thrapston Lakes	20.0	23.8	13.0	4.7	14.4	19.4	12.1	2.4	4.3
		E05005985	Thrapston Market	19.4	23.6	13.2	4.2	14.5	20.7	12.0	2.4	4.2
		E05005986	Woodford	19.3	23.0	11.7	6.1	14.3	20.4	12.1	2.0	3.9
	Kettering	E05005987	All Saints	22.5	24.6	15.8	4.9	11.7	16.1	12.9	3.9	4.9
		E05005988	Avondale Grange	25.1	24.4	17.2	4.2	11.8	16.0	14.8	4.6	4.8
		E05005989	Barton	16.4	23.4	13.8	4.9	11.1	15.7	11.2	2.6	4.1
		E05008549	Brambleside	15.2	23.3	13.9	5.0	11.1	16.6	11.8	2.8	3.9

Study area	Local authority	Ward code	Ward name	Parental separation	Childhood abuse			Household member				
					Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
		E05005991	Burton Latimer	18.2	23.9	12.4	6.2	11.5	15.9	12.0	2.4	4.4
		E05005992	Desborough Loatland	20.5	24.3	14.3	5.4	11.5	16.0	10.4	2.9	4.6
		E05005993	Desborough St Giles	17.7	23.2	14.4	4.5	11.2	15.6	10.3	2.7	4.1
		E05005994	Ise Lodge	14.7	23.4	14.7	5.8	11.2	15.6	11.3	2.7	4.1
		E05005995	Northfield	24.5	24.7	15.8	3.6	11.6	16.2	13.7	4.2	5.0
		E05005996	Pipers Hill	21.0	23.9	14.6	5.0	11.5	15.8	12.6	3.3	4.4
		E05008550	Queen Eleanor and Buccleuch	18.4	23.1	13.3	5.6	13.8	16.8	11.7	2.4	3.9
		E05005998	Rothwell	23.1	23.6	14.9	6.1	14.6	20.6	11.0	3.1	4.3
		E05005999	St Michael's and Wicksteed	22.3	24.1	16.0	6.1	11.5	15.9	12.3	3.8	4.5
		E05006000	St Peter's	12.1	22.5	14.0	6.1	10.4	18.2	10.9	2.8	3.0
		E05006001	Slade	20.0	23.9	14.7	6.1	14.3	18.9	11.1	2.8	4.2
		E05006002	Welland	15.5	22.5	11.6	4.1	11.1	14.9	11.9	1.9	3.6
		E05006003	William Knibb	25.2	24.7	16.3	5.5	11.9	16.1	14.2	4.4	5.1
	Northampton	E05008824	Abington	20.0	24.3	14.1	4.9	11.2	16.3	8.8	3.4	4.2
		E05008825	Billing	19.0	24.3	15.0	6.0	11.4	15.9	10.2	3.4	3.5
		E05008826	Boothville	15.2	23.1	13.8	5.6	11.2	15.5	11.5	2.5	4.1
		E05008827	Brookside	21.0	23.3	15.8	4.7	10.7	15.1	10.7	4.6	3.6
		E05008828	Castle	19.6	20.7	13.4	5.4	9.6	15.6	10.2	4.8	3.8
		E05008829	Delapre and Briar Hill	22.4	25.4	15.3	6.1	11.9	15.9	11.1	3.6	4.6
		E05008830	East Hunsbury	16.5	24.3	14.2	4.3	11.6	16.0	11.9	2.8	4.6
		E05008831	Eastfield	20.9	23.2	15.2	5.2	10.9	15.4	11.0	4.1	4.0
		E05008832	Headlands	20.6	24.3	14.4	3.4	11.5	15.7	10.4	3.5	4.2
		E05008833	Kings Heath	23.8	25.4	17.4	4.0	11.8	15.6	12.3	4.9	4.0
		E05008834	Kingsley	22.5	24.5	14.6	4.3	11.8	16.0	12.8	3.6	4.7
		E05008835	Kingsthorpe	16.4	23.4	12.9	4.6	11.3	15.5	11.7	2.4	4.1
		E05008836	Nene Valley	15.4	24.0	13.8	5.6	11.2	16.6	11.9	2.7	4.1
		E05008837	New Duston	16.6	23.6	13.5	5.4	11.3	15.7	11.5	2.5	4.2
		E05008838	Obelisk	15.8	22.3	12.7	3.6	10.9	15.5	11.0	2.6	4.1
		E05008839	Old Duston	18.7	24.1	14.3	4.5	11.5	15.8	11.2	2.9	4.4
		E05008840	Park	14.3	22.0	14.6	3.8	10.4	16.3	11.2	3.0	3.4
		E05008841	Parklands	15.6	23.1	13.3	3.3	11.2	15.5	11.5	2.4	4.0
		E05008842	Phippsville	19.1	23.9	12.5	3.4	11.3	15.9	12.1	2.7	4.5
		E05008843	Rectory Farm	20.8	25.5	14.2	5.4	12.0	15.5	10.7	3.5	4.0
		E05008844	Riverside	17.6	23.0	13.1	4.9	10.6	15.0	8.5	3.2	3.5
		E05008845	Rushmills	17.3	22.8	14.4	2.6	10.8	15.5	11.6	3.3	4.1
		E05008846	St David's	23.8	24.7	16.7	4.4	11.8	15.5	11.3	5.0	4.2
		E05008847	St James	20.1	23.1	14.5	3.8	10.5	15.2	9.5	4.3	3.8
		E05008848	Semilong	22.8	24.9	14.7	4.0	11.5	15.6	10.1	4.5	4.3
		E05008849	Spencer	16.7	17.7	13.1	4.4	8.4	14.5	9.6	4.9	3.2
		E05008850	Spring Park	15.1	23.1	13.8	6.2	11.2	15.5	11.5	2.5	4.0
		E05008851	Sunnyside	20.0	21.7	13.6	4.0	10.8	15.5	10.0	3.7	4.3
		E05008852	Talavera	23.6	26.1	17.2	5.4	12.1	15.5	11.5	4.7	3.9
		E05008853	Trinity	22.3	26.2	14.8	3.3	12.2	15.9	9.1	3.5	4.6
		E05008854	Upton	21.6	25.0	14.8	5.1	11.7	16.2	10.5	3.2	5.0

Study area	Local authority	Ward code	Ward name	Parental separation	Childhood abuse			Household member				
					Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse
		E05008855	West Hunsbury	17.3	24.5	14.9	4.3	11.6	15.6	11.0	3.1	4.1
		E05008856	Westone	15.8	22.5	12.3	5.5	10.6	16.6	12.0	2.4	3.5
	South Northamptonshire	E05006027	Astwell	18.1	23.5	14.7	6.1	13.4	12.2	11.4	2.8	4.0
		E05006028	Blakesley and Cote	18.3	23.0	13.3	6.1	13.1	11.9	11.5	2.3	3.8
		E05006029	Blisworth and Roade	18.6	23.1	13.5	5.3	14.3	18.9	11.6	2.4	4.0
		E05006030	Brackley East	15.5	23.5	13.8	3.7	11.3	15.7	11.7	2.6	4.2
		E05006031	Brackley South	18.2	24.1	13.7	4.7	11.4	15.9	11.4	2.7	4.5
		E05006032	Brackley West	16.0	24.5	14.7	5.8	11.7	16.1	11.9	3.0	4.5
		E05006033	Brafield and Yardley	18.3	23.0	13.4	5.3	13.6	14.8	11.6	2.4	3.8
		E05006034	Cosgrove and Grafton	18.1	23.5	14.8	3.0	13.6	14.2	11.3	2.7	4.1
		E05006036	Deanshanger	19.4	23.8	13.5	6.2	14.5	20.7	11.9	2.5	4.2
		E05006037	Grange Park	20.7	25.3	14.7	6.1	14.9	21.4	12.1	3.0	4.8
		E05006038	Hackleton	17.6	23.1	14.7	4.3	13.3	12.0	11.2	2.6	3.8
		E05006039	Harpole and Grange	17.9	23.3	14.7	3.6	14.0	16.8	11.3	2.7	4.0
		E05006040	Heyfords and Bugbrooke	18.6	23.2	13.5	5.4	14.5	20.4	11.6	2.4	4.0
		E05006041	Kings Sutton	18.2	23.5	14.7	6.1	14.6	20.6	11.3	2.7	4.2
		E05006042	Kingthorn	16.6	22.7	14.8	6.1	14.0	20.2	10.9	2.6	3.7
		E05006043	Little Brook	19.4	24.0	14.9	5.9	14.7	20.9	11.5	2.9	4.6
		E05006044	Middleton Cheney	18.7	23.5	13.8	6.2	14.6	20.6	11.7	2.6	4.1
		E05006045	Old Stratford	18.4	23.8	14.8	4.7	14.5	20.7	11.5	2.8	4.2
		E05006046	Salcey	18.6	23.8	14.8	3.5	14.5	19.5	11.5	2.8	4.3
		E05006047	Silverstone	18.0	23.5	14.7	6.1	14.4	20.6	11.3	2.7	4.1
		E05006048	Steane	17.9	23.3	14.7	6.1	13.3	12.0	11.2	2.7	4.0
		E05006049	Tove	17.6	23.1	14.7	6.2	13.2	12.0	11.1	2.6	3.9
		E05006050	Towcester Brook	21.1	23.7	14.7	4.6	14.7	20.6	10.6	2.9	4.3
		E05006051	Towcester Mill	19.5	24.4	14.7	5.7	14.9	21.0	11.8	2.9	4.5
		E05006052	Washington	19.9	23.2	11.6	6.1	13.4	12.0	12.3	2.1	3.9
		E05006053	Whittlewood	17.7	23.2	14.7	6.2	14.5	20.4	11.2	2.7	4.0
	Wellingborough	E05008595	Brickhill	19.9	24.5	14.9	6.2	11.5	15.5	11.2	3.4	3.8
		E05006055	Castle	18.4	20.2	13.3	6.0	9.5	15.8	10.4	4.2	3.7
		E05006056	Croyland	22.0	24.7	14.9	6.3	11.9	15.9	13.1	3.7	4.4
		E05006057	Earls Barton	19.0	23.4	13.2	6.2	14.5	20.5	11.8	2.4	4.1
		E05006058	Finedon	22.8	23.3	13.9	6.1	14.3	20.5	11.6	2.9	4.1
		E05008596	Great Doddington and Wilby	15.1	22.4	11.6	6.1	10.8	15.3	11.8	1.9	3.6
		E05006060	Hemmingwell	16.3	21.9	14.4	6.2	10.2	16.7	11.0	3.9	3.1
		E05006061	Irchester	21.4	23.1	12.8	6.1	14.3	20.4	12.3	2.5	4.0
		E05006062	North	19.6	22.9	11.6	6.2	13.2	12.0	12.2	2.0	3.8
		E05008597	Queensway	22.6	25.8	16.6	6.2	12.0	15.4	11.0	4.4	3.8
		E05006064	Redwell East	15.8	23.2	12.6	6.2	11.2	15.6	11.9	2.3	4.0
		E05006065	Redwell West	15.1	23.7	14.8	6.1	11.3	15.8	11.4	2.8	4.2
		E05006066	South	19.3	23.1	11.6	6.1	14.2	20.4	12.2	2.0	3.8
		E05008598	Swanspool	22.0	23.7	16.5	6.1	11.3	16.6	12.7	4.1	4.3
		E05006068	West	19.6	23.0	11.7	6.1	13.3	11.9	12.1	2.0	3.9
		E05006069	Wollaston	19.4	23.6	12.9	6.1	14.4	20.6	12.0	2.3	4.1

Table A8: Bivariate relationship between socio-demographics, individual ACEs and ACE count (unadjusted)

		Individual ACEs									ACE count			
			Child abuse			Household member								
		Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse	None	1	2-3	4+
Prevalence	%	16.9	21.6	13.1	6.3	10.7	15.7	10.5	3.1	3.7	56.9	18.0	16.2	9.0
	n (total sample size)	921	1179	716	344	583	859	573	170	203	3104	979	881	490
Age group	18-29	26.6	23.9	12.9	5.6	13.4	17.3	12.3	4.9	6.8	51.2	19.6	17.3	11.9
(years)	30-39	19.2	23.8	11.8	6.9	10.0	16.0	10.9	2.9	4.2	55.6	18.5	17.0	8.9
	40-49	17.0	23.8	14.9	6.7	10.8	17.3	12.1	3.6	3.2	56.5	16.5	16.6	10.4
	50-59	12.5	20.7	13.6	6.8	12.2	14.1	9.4	2.8	3.0	59.5	15.7	16.3	8.5
	60-69	7.6	15.1	12.7	5.6	7.2	13.6	7.4	1.3	1.0	62.7	19.1	13.4	4.8
	X^2	157.801	37.254	5.379	3.117	25.209	9.222	19.118	24.230	53.154				61.183
	p	<0.001	<0.001	ns	ns	<0.001	ns	0.001	<0.001	<0.001				<0.001
Gender	Male	15.6	21.9	14.3	4.1	8.1	15.1	9.0	3.0	3.3	57.7	18.0	16.9	7.4
	Female	18.0	21.4	12.2	8.1	12.8	16.3	11.7	3.2	4.0	56.2	17.9	15.5	10.3
	X^2	5.422	0.142	4.944	36.887	30.840	1.490	10.530	0.052	1.754				140.977
	p	<0.05	ns	<0.05	<0.001	<0.001	ns	<0.01	ns	ns				<0.001
Ethnicity	White[a]	19.0	23.0	13.6	6.8	12.0	16.3	11.9	3.5	4.0	53.6	19.3	17.3	9.8
	Asian[b]	2.1	13.7	9.2	3.7	4.7	11.9	2.8	1.3	1.3	77.4	9.6	8.6	4.4
	Other[c]	19.9	20.7	15.6	6.0	6.8	16.5	8.5	2.0	5.1	56.5	17.6	17.3	8.5
	X^2	126.602	31.046	12.329	9.906	40.035	9.263	55.015	11.660	14.755				140.977
	p	<0.001	<0.001	<0.01	<0.01	<0.001	<0.05	<0.001	<0.01	<0.01				<0.001
Deprivation	1 (*least deprived)*	15.2	22.3	14.3	6.9	11.4	16.5	11.1	2.7	3.8	54.6	19.2	17.2	9.1
quintile	2	16.1	23.1	10.9	5.9	11.6	14.8	11.6	2.1	3.5	54.9	20.6	16.4	8.2
	3	17.5	19.9	13.1	5.6	10.3	15.6	8.4	3.0	3.8	57.9	18.1	15.8	8.2
	4	18.1	20.3	12.6	6.5	8.8	14.5	10.1	3.8	3.4	60.9	14.2	15.9	9.1
	5 *(most deprived)*	19.6	22.9	15.0	6.3	11.4	18.4	11.7	5.1	4.4	57.7	16.4	14.2	11.7
	X^2	8.045	5.444	8.752	2.318	6.383	5.573	8.271	13.933	1.130				29.156
	p	ns	ns	ns	ns	ns	ns	ns	<0.01	ns				<0.01
Urban/rural	Urban city & town	16.3	20.7	12.5	6.0	10.1	15.5	10.4	3.3	3.6	58.5	17.4	15.4	8.7
	Urban major conurbation	15.9	22.0	12.5	6.0	9.2	13.6	9.1	2.7	3.3	59.5	16.7	16.4	7.5
	Rural town & fringe	19.8	25.9	16.6	7.9	14.6	20.5	12.2	2.8	4.5	46.8	21.8	19.5	11.9
	Rural village & dispersed	20.5	23.0	14.6	7.9	13.8	12.1	11.3	2.1	5.0	51.9	19.2	18.8	10.0
	X^2	7.481	9.276	9.205	4.675	16.087	16.288	3.767	1.806	2.672				38.750
	p	ns	<0.05	<0.05	ns	<0.01	<0.01	ns	ns	ns				<0.001

Abbreviation: ns, not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A9: Multinomial logistic regression analysis of the relationship between ACEs count and socio-demographics

			ACE count (reference category 0 ACEs)								
			1			2-3			4+		
		n	AOR	95%CIs	*p*	AOR	95%CIs	*p*	AOR	95%CIs	*p*
Age group (years)	18-29	1124	1.407	1.123-1.763	<0.05	1.760	1.374-2.255	<0.001	3.335	2.361-4.711	<0.001
	30-39	1225	1.265	1.012-1.580	<0.05	1.661	1.302-2.120	<0.001	2.308	1.620-3.287	<0.001
	40-49	1124	1.021	0.812-1.285	ns	1.483	1.159-1.897	<0.01	2.511	1.771-3.559	<0.001
	50-59	926	0.876	0.687-1.118	ns	1.308	1.011-1.693	<0.05	1.862	1.284-2.701	<0.01
	60-69 (ref.)	1055									
Gender	Male	2437	0.992	0.857-1.149	ns	1.097	0.942-1.278	ns	0.721	0.590-0.881	<0.01
	Female (ref.)	3017									
Ethnicity	White[a] (ref.)	4394									
	Asian[b]	708	0.343	0.262-0.450	<0.001	0.325	0.245-0.431	<0.001	0.266	0.181-0.391	<0.001
	Other[c]	352	0.874	0.646-1.181	ns	0.906	0.668-1.227	ns	0.705	0.470-1.057	ns
Deprivation quintile	1 (*least deprived)* (ref.)	1555									
	2	1099	1.093	0.892-1.339	ns	0.965	0.777-1.200	ns	0.906	0.680-1.208	ns
	3	1137	0.940	0.764-1.158	ns	0.924	0.743-1.149	ns	0.898	0.674-1.195	ns
	4	1091	0.750	0.600-0.939	<0.05	0.931	0.746-1.163	ns	0.999	0.753-1.327	ns
	5 *(most deprived)*	572	0.944	0.718-1.240	ns	0.902	0.676-1.203	ns	1.425	1.025-1.982	<0.05

Abbreviations: ref., reference category; AOR, adjusted odds ratio; 95% CI, 95% confidence intervals; ns, not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A10: Bivariate association between education outcomes and socio-demographics and ACE count (unadjusted)

		No qualifications
All	%	17.3
	n	946
Age group (years)	18-29	7.0
	30-39	10.5
	40-49	12.5
	50-59	19.7
	60-69	39.4
	χ^2	504.274
	p	<0.001
Gender	Male	18.6
	Female	16.3
	χ^2	4.595
	p	<0.05
Ethnicity	White[a]	16.4
	Asian[b]	22.0
	Other[c]	19.6
	χ^2	14.795
	p	<0.01
Deprivation quintile	1 *(least deprived)*	10.3
	2	14.2
	3	19.0
	4	20.3
	5 *(most deprived)*	33.6
	χ^2	175.618
	p	<0.001
ACE count	None	18.5
	1	15.3
	2-3	14.6
	4+	18.8
	χ^2	10.995
	p	<0.05

Abbreviation: ns, not significant.
[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A11: Adjusted odds ratios (AOR) of educational outcome with ACE count

			ACE count (reference category 0 ACEs)									Socio-demographic factors			
			1			2-3			4+			Age	Gender	Ethnicity	Deprivation
Outcome	n	p^a	AOR	95%CIs	p^b	AOR	95%CIs	p^b	AOR	95%CIs	p^b	*p* (direction of increasing odds)			
No qualifications	5454	<0.05	0.904	0.729-1.121	ns	0.922	0.736-1.155	ns	1.456	1.114-1.903	<0.01	<0.001(O)	ns	<0.001(A)	<0.001(D)

Abbreviations: AOR, adjusted odds ratio; 95% CI, 95% confidence intervals; ns, not significant.
[a] *p* refers to the overall significance of association between the outcome measure and ACE counts.
[b] *p* refers to the significance of association between the outcome measure and individual ACE categories with 0 ACEs as the reference category.
Letters indicate direction of increasing odds: Y, youngest; O, oldest; W, white; A, Asian; O, other; F, female; M, male; D, deprived; ND, not (least) deprived. Where there is no clear pattern only significance is provided.

Table A12: Bivariate associations between health-harming behaviours, socio-demographics and ACE count (unadjusted)

		Smoking tobacco (current)	E-cigarettes (current)	Either smoking tobacco or using e-cigarettes (current)	Binge drinking[a] (current)	High risk drinking (AUDIT-C = 5 or over)	Cannabis use (lifetime)	Heroin or crack cocaine use (lifetime)
All	%	18.2	5.8	20.6	6.6	22.1	14.6	2.0
	n	990	316	1124	357	1204	794	107
Age group (years)	18-29	23.6	7.0	27.0	8.5	26.0	22.7	3.0
	30-39	19.0	6.0	21.4	5.6	21.7	18.7	2.8
	40-49	17.6	5.4	20.1	7.2	23.2	13.5	2.0
	50-59	20.4	6.8	22.9	7.3	23.2	11.0	1.2
	60-69	10.0	3.7	11.4	4.4	16.3	5.7	0.5
	χ^2	74.020	13.876	87.038	18.375	32.087	151.740	25.976
	p	<0.001	<0.01	<0.001	<0.01	<0.001	<0.001	<0.001
Gender	Male	22.0	6.6	25.2	10.4	31.3	19.7	2.8
	Female	15.1	5.2	16.9	3.5	14.7	10.5	1.3
	χ^2	42.389	4.575	55.124	102.723	216.832	89.199	15.031
	p	<0.001	<0.05	<0.001	<0.001	<0.001	<0.001	<0.001
Ethnicity	White[b]	20.4	6.7	23.3	7.9	26.0	16.9	2.3
	Asian[c]	8.5	1.4	9.2	0.4	2.7	3.1	0.3
	Other[d]	9.7	2.8	10.5	2.3	12.5	10.3	1.1
	χ^2	76.551	37.594	97.311	66.664	212.727	97.911	14.313
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01
Deprivation quintile	1 (*least deprived*)	13.2	5.6	15.8	8.0	28.2	15.8	1.9
	2	17.4	6.6	20.4	6.0	25.1	16.1	2.1
	3	18.8	6.7	21.5	6.1	18.3	14.2	1.5
	4	19.1	4.8	21.0	6.2	16.5	12.9	2.6
	5 (*most deprived*)	29.9	4.9	31.5	5.2	18.2	13.0	1.6
	χ^2	79.665	6.181	63.770	7.922	73.252	7.558	3.924
	p	<0.001	ns	<0.001	ns	<0.001	ns	ns
ACE count	None	13.7	4.0	15.5	5.0	18.1	8.2	0.9
	1	18.0	6.6	20.9	7.9	28.5	18.3	1.5
	2-3	23.6	9.0	26.9	8.5	26.4	24.4	3.9
	4+	36.9	9.6	40.8	10.0	27.3	30.9	6.3
	χ^2	175.646	48.272	192.645	29.731	68.678	284.327	85.021
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test Consumption; ns not significant.
[a] Six or more standard alcoholic drinks in one occasion, at least once a week.
[b] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[c] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[d] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A12 (b): Bivariate associations between health-harming behaviours, socio-demographics and ACE count (unadjusted)

		Violence victimisation (last 12 months)	Violence perpetration (last 12 months)	Incarceration (lifetime)	Poor diet (current)	Unintended teenage pregnancy (<18 years)	Early sexual initiation (<16 years)	Low physical exercise (current)
All	%	3.7	3.5	5.9	10.2	6.1	12.7	37.4
	n	204	191	320	558	331	572	2034
Age group (years)	18-29	8.7	8.3	7.2	14.5	5.9	20.1	31.7
	30-39	4.0	4.1	6.1	7.8	6.3	14.2	34.7
	40-49	2.9	2.5	6.0	10.9	7.0	12.6	37.3
	50-59	1.7	1.3	6.5	9.5	7.1	11.6	39.7
	60-69	0.9	0.8	3.6	8.5	4.3	4.4	44.7
	χ^2	115.019	117.399	14.144	34.748	9.257	99.073	45.371
	p	<0.001	<0.001	<0.01	<0.001	ns	<0.001	<0.001
Gender	Male	4.7	4.2	10.4	13.1	3.5	14.2	36.9
	Female	3.0	3.0	2.3	7.9	8.2	11.5	37.9
	χ^2	10.273	5.709	158.193	38.582	52.019	7.131	0.516
	p	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	ns
Ethnicity	White[a]	3.8	3.6	6.4	10.0	6.8	14.0	36.3
	Asian[b]	2.8	2.8	3.6	11.1	1.0	2.1	46.2
	Other[c]	4.6	4.3	4.5	11.6	7.7	14.1	33.2
	χ^2	2.323	1.549	9.858	1.548	37.213	54.640	28.054
	p	ns	ns	<0.01	ns	<0.001	<0.001	<0.001
Deprivation quintile	1 (*least deprived*)	3.5	3.1	4.4	7.5	5.2	11.4	34.8
	2	4.4	3.6	5.9	9.8	6.2	14.1	36.4
	3	3.7	3.5	4.9	12.2	6.9	12.4	37.0
	4	3.8	3.1	7.0	11.5	6.3	12.2	41.4
	5 (*most deprived*)	3.3	5.3	9.6	12.1	6.5	15.1	39.8
	χ^2	1.784	6.385	24.824	21.436	3.767	6.641	13.842
	p	ns	ns	<0.001	<0.001	ns	ns	<0.01
ACE count	None	1.6	1.3	3.0	9.0	3.4	7.6	38.4
	1	3.6	2.9	5.8	11.1	7.5	13.0	33.9
	2-3	6.9	6.7	9.7	10.63	8.3	19.3	36.0
	4+	12.0	12.9	17.6	16.4	16.3	28.1	40.5
	χ^2	158.328	197.668	190.618	26.198	136.181	182.829	9.054
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05

Abbreviation: ns not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A13: Adjusted odds ratios (AOR) of health-harming behaviours with number of ACEs suffered

			ACE count (reference category 0 ACEs)									Socio-demographic factors			
			1			2-3			4+			Age	Gender	Ethnicity	Deprivation
Outcome	n	p^a	AOR	95%CIs	p^b	AOR	95%CIs	p^b	AOR	95%CIs	p^b	*p* (direction of increasing odds)			
Smoking															
Daily smoker (*current*)	5454	<0.001	1.276	1.045-1.558	<0.05	1.768	1.457-2.145	<0.001	3.359	2.694-4.189	<0.001	<0.001(Y)	<0.001 (M)	<0.001 (W)	<0.001 (D)
E-cigarette user (*current*)	5449	<0.001	1.514	1.109-2.067	<0.01	2.057	1.531-2.764	<0.001	2.210	1.550-3.152	<0.001	<0.01(Y)	<0.01 (M)	<0.001 (W)	ns
Either smoking tobacco or using e-cigarettes (*current*)	5454	<0.001	1.322	1.094-1.597	<0.01	1.807	1.501-2.174	<0.001	3.431	2.766-4.256	<0.001	<0.001(Y)	<0.001 (M)	<0.001 (W)	<0.001 (D)
Alcohol															
Binge drinking[c] (*current*)	5449	<0.001	1.433	1.072-1.916	<0.05	1.481	1.105-1.986	<0.01	1.984	1.401-2.810	<0.001	<0.01	<0.001 (M)	<0.001 (W)	ns
High-risk drinking (*AUDIT-C = 5 or over*)	5444	<0.001	1.606	1.346-1.917	<0.001	1.370	1.138-1.650	<0.01	1.578	1.251-1.991	<0.001	<0.001(Y)	<0.001 (M)	<0.001 (W)	<0.001 (ND)
Illicit drugs															
Cannabis use (*lifetime*)	5426	<0.001	2.214	1.783-2.748	<0.001	3.188	2.584-3.934	<0.001	4.664	3.654-5.953	<0.001	<0.001(Y)	<0.001 (M)	<0.001 (W)	ns
Heroin or crack cocaine use (*lifetime*)	5435	<0.001	1.481	0.781-2.809	ns	3.753	2.240-6.287	<0.001	6.607	3.869-11.281	<0.001	<0.001	<0.001 (M)	<0.001 (W)	ns
Violence and criminal justice															
Violence victimisation (*last 12 months*)	5444	<0.001	2.143	1.375-3.341	<0.01	4.348	2.949-6.411	<0.001	7.739	5.185-11.551	<0.001	<0.001(Y)	<0.001 (M)	ns	ns
Violence perpetration (*last 12 months*)	5441	<0.001	2.020	1.238-3.297	<0.01	5.017	3.329-7.563	<0.001	9.956	6.578-15.070	<0.001	<0.001(Y)	<0.001 (M)	ns	ns
Incarceration (*lifetime*)	5443	<0.001	1.997	1.410-2.828	<0.001	3.369	2.457-4.619	<0.001	8.154	5.840-11.385	<0.001	ns	<0.001 (M)	<0.01 (W)	<0.001 (D)
Diet and exercise															
Poor diet (*current*)	5446	<0.001	1.289	1.017-1.634	<0.05	1.163	0.904-1.496	ns	2.017	1.532-2.655	<0.001	<0.01	<0.001 (M)	ns	<0.001
Low physical exercise (*current*)	5436	ns										<0.001(O)	ns	<0.001 (A)	<0.05
Sexual behaviour															
Unintended teenage pregnancy (*<18 years*)	5412	<0.001	2.056	1.508-2.803	<0.001	2.346	1.719-3.202	<0.001	4.657	3.405-6.371	<0.001	ns	<0.001 (F)	<0.001 (O)	ns
Early sexual initiation (*<16 years*)	4503	<0.001	1.582	1.226-2.040	<0.001	2.454	1.936-3.112	<0.001	4.023	3.096-5.227	<0.001	<0.001(Y)	<0.001 (M)	<0.001 (W)	ns

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test Consumption; BMI, body mass index; AOR, adjusted odds ratio; 95% CI, 95% confidence intervals; ns, not significant.

[a] *p* refers to the overall significance of association between the outcome measure and ACE counts.

[b] *p* refers to the significance of association between the outcome measure and individual ACE categories with 0 ACEs as the reference category.

Letters indicate direction of increasing odds: Y, youngest; O, oldest; W, white; A, Asian; O, other; F, female; M, male; D, deprived; ND, not (least) deprived. Where there is no clear pattern only significance is provided.

[c] Six or more standard alcoholic drinks in one occasion, at least once a week.

Table A14: Bivariate association between health service utilisation, socio-demographics and ACE count (unadjusted)

		Visited GP more than 3 times (last 12 months)	Visited ED (last 12 months)	Spent 1 night or more in hospital (last 12 months)	Not visited dentist (last 12 months)
All	%	23.0	14.4	7.6	27.6
	n	1252	787	413	1505
Age group (years)	18-29	15.7	20.0	6.9	37.0
	30-39	20.2	13.1	7.2	29.6
	40-49	18.6	13.1	7.0	22.1
	50-59	25.6	11.1	6.1	23.9
	60-69	36.3	14.4	10.7	24.5
	χ^2	161.252	40.222	19.45	80.02
	p	<0.001	<0.001	<0.01	<0.001
Gender	Male	17.8	14.6	6.4	32.5
	Female	27.1	14.3	8.5	23.6
	χ^2	65.46	0.054	7.702	52.879
	p	<0.001	ns	<0.01	<0.001
Ethnicity	White[a]	22.4	14.9	7.6	25.1
	Asian[b]	28.5	12.4	7.9	38.8
	Other[c]	18.5	12.5	6.0	36.5
	χ^2	17.177	4.134	1.418	72.483
	p	<0.001	ns	ns	<0.001
Deprivation quintile	1 (*least deprived*)	19.0	13.3	6.2	20.2
	2	21.6	13.7	8.3	24.3
	3	21.8	17.3	6.7	31.8
	4	26.7	13.6	8.7	30.1
	5 (*most deprived*)	31.5	14.7	9.6	40.9
	χ^2	47.516	10.371	11.884	113.075
	p	<0.001	<0.05	<0.05	<0.001
ACE count	None	21.7	12.0	6.1	27.5
	1	21.0	13.2	6.9	27.2
	2-3	24.5	19.4	10.3	26.2
	4+	32.0	23.3	13.3	31.8
	χ^2	28.959	64.458	42.282	5.351
	p	<0.001	<0.001	<0.001	ns

Abbreviation: GP, General practitioner; ED, Emergency department; ns, not significant.
[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A15: Adjusted odds ratios (AOR) of health service utilisation with number of ACEs suffered

			ACE count (reference category 0 ACEs)									Socio-demographic factors			
			1			2-3			4+			Age	Gender	Ethnicity	Deprivation
Outcome	n	p^a	AOR	95%CIs	p^b	AOR	95%CIs	p^b	AOR	95%CIs	p^b	p (direction of increasing odds)			
In the last 12 months:															
Visited GP more than 3 times	5454	<0.001	1.070	0.891-1.287	ns	1.393	1.159-1.675	<0.001	2.068	1.662-2.575	<0.001	<0.001 (O)	<0.001 (F)	<0.001 (A)	<0.001 (D)
Visited ED	5452	<0.001	1.086	0.876-1.347	ns	1.752	1.434-2.140	<0.001	2.167	1.707-2.750	<0.001	<0.001 (Y)	ns	ns	ns
Spent 1 night or more in hospital	5452	<0.001	1.147	0.858-1.534	ns	1.874	1.439-2.442	<0.001	2.486	1.833-3.370	<0.001	<0.001 (O)	<0.01 (F)	ns	<0.01 (D)
Not visited dentist	5452	ns										<0.001 (Y)	<0.001 (M)	<0.001 (A)	<0.001 (D)

Abbreviations: GP, General practitioner; ED, emergency department; AOR, adjusted odds ratio; 95% CI, 95% confidence intervals; ref., reference category; ns, not significant.

[a] *p* refers to the overall significance of association between the outcome measure and ACE counts.

[b] *p* refers to the significance of association between the outcome measure and individual ACE categories with 0 ACEs as the reference category.

Letters indicate direction of increasing odds: Y, youngest; O, oldest; W, white; A, Asian; O, other; F, female; M, male; D, deprived; ND, not (least) deprived. Where there is no clear pattern only significance is provided.

Table A16: Bivariate association between health outcomes, socio-demographics and ACE count (unadjusted)

		Overweight and obese (BMI ≥25)	Low mental wellbeing score (SWEMBWS<22)	Low life satisfaction (<6)	More than 10 teeth removed	More than 10 fillings	STI (ever diagnosed with)
All	%	49.0	10.6	11.7	4.1	2.6	1.4
	n	2438	561	636	223	140	78
Age group (years)	18-29	30.7	11.5	10.7	2.1	0.2	2.1
	30-39	44.8	11.1	11.0	1.3	1.0	1.7
	40-49	54.8	10.6	10.8	1.6	1.4	1.3
	50-59	60.4	11.2	14.9	3.7	5.5	1.5
	60-69	56.9	8.7	11.9	12.8	6.1	0.4
	χ^2	225.832	5.418	11.806	251.015	121.284	12.983
	p	<0.001	ns	<0.05	<0.001	<0.001	<0.05
Gender	Male	52.9	10.9	12.7	4.8	2.9	1.6
	Female	45.8	10.5	10.9	3.6	2.4	1.3
	χ^2	24.925	0.167	3.810	4.193	0.962	0.717
	p	<0.001	ns	ns	<0.05	ns	ns
Ethnicity	White[a]	48.7	10.8	12.3	4.6	3.2	1.6
	Asian[b]	47.5	9.8	9.2	1.6	0.3	0.3
	Other[c]	56.3	10.1	9.1	2.9	0.3	1.4
	χ^2	7.313	0.789	8.032	15.536	26.392	7.719
	p	<0.05	ns	<0.05	<0.001	<0.001	<0.05
Deprivation quintile	1 (*least deprived*)	47.9	7.7	9.7	3.4	4.6	1.8
	2	50.6	8.8	9.6	3.7	2.9	1.4
	3	48.3	11.4	13.2	4.3	1.5	1.4
	4	50.5	13.5	13.5	4.1	1.1	1.0
	5 (*most deprived*)	15.3	47.9	14.7	6.7	1.8	1.4
	χ^2	3.035	40.028	21.517	12.813	41.114	2.919
	p	ns	<0.001	<0.001	<0.05	<0.001	ns
ACE count	None	48.0	8.2	8.6	3.6	2.2	0.7
	1	49.2	9.1	11.7	4.4	3.3	1.0
	2-3	52.2	11.8	13.4	4.4	2.6	2.2
	4+	49.6	27.1	28.2	5.9	3.7	5.5
	χ^2	4.485	159.104	158.600	6.324	6.044	73.584
	p	ns	<0.001	<0.001	ns	ns	<0.001

Abbreviations: BMI, body mass index; SWEMBWS, Short Warwick-Edinburgh Mental Well-being Scale; STI, sexually transmitted infection; ns, not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A17: Adjusted odds ratios (AOR) of health outcomes with ACE count

		ACE count (reference category 0 ACEs)										Socio-demographic factors			
			1			2-3			4+			Age	Gender	Ethnicity	Deprivation
Outcome	n	p^a	AOR	95%CIs	p^b	AOR	95%CIs	p^b	AOR	95%CIs	p^b	p (direction of increasing odds)			
Overweight and obese (*BMI >25*)	4973	<0.05	1.131	0.968-1.321	ns	1.277	1.085-1.503	<0.01	1.236	1.008-1.517	<0.05	<0.001(O)	<0.001 (M)	<0.01 (O)	ns
Low mental wellbeing score (*SWEMWBS<22*)	5269	<0.001	1.174	0.906-1.520	ns	1.544	1.205-1.977	<0.01	4.232	3.322-5.390	<0.001	ns	ns	ns	<0.001 (D)
Low life satisfaction (*<6*)	5430	<0.001	1.438	1.136-1.820	<0.01	1.653	1.307-2.092	<0.001	4.341	3.411-5.524	<0.001	<0.01 (O)	<0.01 (M)	<0.05 (W)	<0.001 (D)
More than 10 teeth removed	5404	<0.01	1.247	0.858-1.811	ns	1.414	0.960-2.083	ns	2.268	1.452-3.542	<0.001	<0.001 (O)	ns	<0.05 (W)	<0.001 (D)
More than 10 fillings	5321	<0.05	1.469	0.948-2.275	ns	1.250	0.766-2.039	ns	2.155	1.244-3.733	<0.01	<0.01 (O)	ns	<0.05 (W)	<0.001 (ND)
STI (*ever diagnosed with*)	5443	<0.001	1.261	0.593-2.681	ns	2.617	1.405-4.876	<0.01	6.571	3.689-11.705	<0.001	ns	ns	ns	ns

Abbreviations: BMI, body mass index; SWEMBWS, Short Warwick-Edinburgh Mental Well-being Scale; STI, sexually transmitted infection; AOR, adjusted odds ratio; 95% CI, 95% confidence intervals; ns, not significant.

[a] *p* refers to the overall significance of association between the outcome measure and ACE counts.

[b] *p* refers to the significance of association between the outcome measure and individual ACE categories with 0 ACEs as the reference category.

Letters indicate direction of increasing odds: Y, youngest; O, oldest; W, white; A, Asian; O, other; F, female; M, male; D, deprived; ND, not (least) deprived. Where there is no clear pattern only significance is provided.

Table A18: Modelled cumulative proportion of individuals not diagnosed with each disease at the end of each age period by number of ACEs suffered

		Cumulative proportion not diagnosed at period end (years)						
Outcome	**ACEs**	0-9	10-19	20-29	30-39	40-49	50-59	60-69
Any disease	**None**	**1**	**1**	**0.99**	**0.97**	**0.91**	**0.78**	**0.54**
	SE+/-	0	0	0	0	0.01	0.01	0.02
	1	**1**	**0.99**	**0.98**	**0.94**	**0.87**	**0.74**	**0.53**
	SE+/-	0	0	0.01	0.01	0.01	0.02	0.04
	2-3	**1**	**1**	**0.97**	**0.94**	**0.85**	**0.71**	**0.50**
	SE+/-	0	0	0.01	0.01	0.02	0.03	0.04
	4+	**1**	**0.99**	**0.97**	**0.90**	**0.79**	**0.56**	**0.22**
	SE+/-	0	0	0.01	0.02	0.03	0.04	0.06
Cancer	**None**	**1**	**1**	**1**	**1**	**0.99**	**0.96**	**0.87**
	SE+/-	0	0	0	0	0	0.01	0.02
	1	**1**	**1**	**1**	**0.99**	**0.98**	**0.95**	**0.87**
	SE+/-	0	0	0	0	0.01	0.01	0.03
	2-3	**1**	**1**	**1**	**0.99**	**0.98**	**0.95**	**0.88**
	SE+/-	0	0	0	0	0.01	0.01	0.03
	4+	**1**	**1**	**1**	**0.98**	**0.95**	**0.87**	**0.62**
	SE+/-	0	0	0	0.01	0.01	0.03	0.08
CHD or heart attack	**None**	**1**	**1**	**1**	**1**	**0.98**	**0.96**	**0.89**
	SE+/-	0	0	0	0	0	0.01	0.01
	1	**1**	**1**	**1**	**1**	**0.98**	**0.96**	**0.92**
	SE+/-	0	0	0	0	0.01	0.01	0.02
	2-3	**1**	**1**	**1**	**0.99**	**0.99**	**0.95**	**0.94**
	SE+/-	0	0	0	0	0.01	0.01	0.04
	4+	**1**	**1**	**1**	**0.99**	**0.98**	**0.96**	**0.88**
	SE+/-	0	0	0	0.01	0.01	0.01	0.06
Type II diabetes	**None**	**1**	**1**	**1**	**0.99**	**0.96**	**0.90**	**0.82**
	SE+/-	0	0	0	0	0	0.01	0.02
	1	**1**	**1**	**1**	**0.99**	**0.96**	**0.92**	**0.84**
	SE+/-	0	0	0	0	0.01	0.01	0.03
	2-3	**1**	**1**	**0.99**	**0.98**	**0.95**	**0.89**	**0.78**
	SE+/-	0	0	0	0	0.01	0.02	0.04
	4+	**1**	**1**	**1**	**1**	**0.98**	**0.91**	**0.80**
	SE+/-	0	0	0	0	0.01	0.03	0.07
Stroke	**None**	**1**	**1**	**1**	**1**	**1**	**0.98**	**0.96**
	SE+/-	0	0	0	0	0	0	0.01
	1	**1**	**1**	**1**	**1**	**0.99**	**0.98**	**0.95**
	SE+/-	0	0	0	0	0	0.01	0.02
	2-3	**1**	**1**	**1**	**1**	**0.99**	**0.98**	**0.96**
	SE+/-	0	0	0	0	0	0.01	0.02
	4+	**1**	**1**	**1**	**0.99**	**0.98**	**0.95**	**0.95**
	SE+/-	0	0	0	0.01	0.01	0.02	0.02
Respiratory disease	**None**	**1**	**1**	**1**	**1**	**0.99**	**0.98**	**0.95**
	SE+/-	0	0	0	0	0	0	0.01
	1	**1**	**1**	**1**	**0.99**	**0.99**	**0.96**	**0.92**
	SE+/-	0	0	0	0	0	0.01	0.02
	2-3	**1**	**1**	**1**	**0.99**	**0.98**	**0.94**	**0.85**
	SE+/-	0	0	0	0	0.01	0.01	0.04
	4+	**1**	**1**	**0.99**	**0.99**	**0.97**	**0.90**	**0.86**
	SE+/-	0	0	0	0.01	0.01	0.03	0.05
Liver/ Digestive disease	**None**	**1**	**1**	**1**	**0.99**	**0.98**	**0.96**	**0.89**
	SE+/-	0	0	0	0	0	0.01	0.01
	1	**1**	**1**	**0.99**	**0.98**	**0.95**	**0.94**	**0.88**
	SE+/-	0	0	0	0.01	0.01	0.01	0.03
	2-3	**1**	**1**	**0.98**	**0.97**	**0.95**	**0.92**	**0.84**
	SE+/-	0	0	0	0.01	0.01	0.01	0.03
	4+	**1**	**1**	**0.98**	**0.94**	**0.89**	**0.81**	**0.71**
	SE+/-	0	0	0.01	0.01	0.02	0.03	0.06
Hypertension	**None**	**1**	**1**	**0.99**	**0.97**	**0.90**	**0.77**	**0.57**
	SE+/-	0	0	0	0	0.01	0.01	0.02
	1	**1**	**1**	**0.99**	**0.96**	**0.88**	**0.73**	**0.51**
	SE+/-	0	0	0	0.01	0.01	0.02	0.04
	2-3	**1**	**1**	**0.99**	**0.96**	**0.86**	**0.67**	**0.45**
	SE+/-	0	0	0	0.01	0.02	0.03	0.04
	4+	**1**	**1**	**0.97**	**0.93**	**0.83**	**0.68**	**0.41**
	SE+/-	0	0	0.01	0.01	0.02	0.04	0.07

Abbreviations: CHD, coronary heart disease; SE, standard error

Table A19: Modelled cumulative survival of siblings at period end

	Age interval (years)						
ACEs	0-9	10-19	20-29	30-39	40-49	50-59	60-69
None	**1**	**1**	**1**	**0.99**	**0.98**	**0.96**	**0.90**
SE+/-	0	0	0	0	0	0	0.01
1	**1**	**0.99**	**0.99**	**0.98**	**0.97**	**0.94**	**0.86**
SE+/-	0	0	0	0	0.01	0.01	0.02
2-3	**1**	**1**	**0.99**	**0.99**	**0.98**	**0.95**	**0.81**
SE+/-	0	0	0	0	0.01	0.01	0.03
4+	**1**	**0.99**	**0.99**	**0.99**	**0.97**	**0.93**	**0.84**
SE+/-	0	0	0	0	0.01	0.02	0.04

Abbreviation: SE, standard error.

Table A20: Modelled independent impacts on sibling mortality using Cox regression analysis

		HR	95%CIs	*p*
Gender	Male (ref.)			
	Female	0.62	0.492-0.78	<0.001
Ethnicity	White[a](ref.)			<0.05
	Asian[b]	0.643	0.433-0.957	<0.05
	Other[c]	1.443	0.937-2.223	ns
Deprivation quintile	1 (*least deprived*) (ref.)			ns
	2	1.131	0.828-1.543	ns
	3	1.162	0.842-1.604	ns
	4	1.071	0.762-1.505	ns
	5 (*most deprived*)	1.101	0.719-1.686	ns
ACE count	None (ref.)			<0.01
	1	1.464	1.103-1.944	<0.01
	2-3	1.572	1.162-2.126	<0.01
	4+	1.687	1.126-2.526	<0.05

Abbreviations: ref., reference category; HR, hazard ratio; 95% CI, 95% confidence intervals; ns, not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A21: Comparison of ACE prevalence (adjusted) to other UK ACE studies

		Hertfordshire, Luton and Northamptonshire	English national study	Welsh national study
Sample size		5,454	3,885	2,028
ACE prevalence (%)				
	None	55.6	53.6	54.4
	1	18.3	22.7	19.0
	2-3	17.0	15.4	13.0
	4+	9.1	8.3	13.6
Individual ACE				
	Parental separation	17.7	22.6	20.1
Childhood abuse:	Verbal	22.9	17.3	22.5
	Physical	13.6	14.3	17.1
	Sexual	6.1	6.2	9.7
Household member:	Mental illness	11.0	12.1	13.8
	Domestic violence	15.6	12.1	16.1
	Alcohol abuse	11.0	9.1	14.0
	Incarceration	3.1	4.1	4.8
	Drug abuse	4.1	3.9	4.5

Table A22: Modelled percentage reduction in health-harming behaviours by preventing ACEs in future generations by local authority and study area

Study region	Local authority	Smoking	Binge drinking	Cannabis use	Heroin or crack cocaine use	Violence victimisation	Violence perpetration	Incarceration	Poor diet	Unintended teenage pregnancy	Early sex
Hertfordshire	Broxbourne	36.7	32.5	51.6	58.2	61.7	66.2	56.4	27.2	51.9	45.1
	Dacorum	24.3	20.4	41.8	52.8	56.0	60.3	49.9	12.6	43.3	36.2
	East Hertfordshire	25.9	20.6	66.7	54.0	56.5	61.1	51.4	13.0	44.5	36.0
	Hertsmere	23.8	20.6	42.0	52.6	55.6	59.9	49.7	13.3	42.6	35.7
	North Hertfordshire	25.4	21.4	40.9	53.2	56.1	60.6	50.9	13.4	44.1	36.0
	St Albans	25.6	21.1	40.3	52.3	55.8	60.4	50.6	13.4	44.0	36.0
	Stevenage	24.5	21.6	41.0	54.1	56.4	61.1	50.6	13.2	43.8	36.0
	Three Rivers	24.2	19.8	41.7	51.9	55.7	59.9	49.7	12.5	42.9	36.1
	Watford	20.3	18.1	39.5	48.7	50.9	55.2	44.7	16.9	38.8	32.3
	Welwyn Hatfield	23.3	20.8	40.1	52.6	53.0	58.0	48.9	12.1	42.4	33.9
	Total	25.4	21.6	47.4	53.0	55.7	60.3	50.4	14.5	43.9	36.2
Luton	Luton	19.9	18.9	39.0	49.9	51.4	56.2	45.1	10.9	39.4	31.9
Northamptonshire	Corby	25.2	22.5	43.1	56.3	58.8	63.4	51.9	14.6	46.2	37.8
	Daventry	26.9	22.3	43.5	56.1	58.3	62.7	53.3	14.4	46.2	37.5
	East Northamptonshire	27.0	22.8	44.1	56.5	58.9	63.5	53.4	14.7	46.5	38.3
	Kettering	25.6	22.3	42.3	55.3	58.0	62.7	51.9	14.3	45.6	37.5
	Northampton	23.4	21.5	41.6	54.0	56.2	60.7	50.1	12.9	43.6	35.4
	South Northamptonshire	28.4	22.6	45.2	57.2	59.5	63.8	55.4	15.1	47.4	38.9
	Wellingborough	24.8	22.6	43.8	55.3	58.2	62.4	51.7	14.0	45.4	37.3
	Total	25.3	22.2	43.0	55.3	57.8	62.2	51.8	13.9	45.3	37.1
Overall		24.7	21.7	45.2	53.7	56.1	60.6	50.4	13.9	44.0	36.1

Table A23: Bivariate relationship between socio-demographics, individual ACEs and ACE count in Hertfordshire (unadjusted)

		Individual ACEs									ACE count			
			Child abuse			Household member								
		Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse	None	1	2-3	4+
Prevalence	%	17.8	23.7	13.7	7.0	11.5	16.2	12.1	3.2	4.5	53.4	19.0	18.0	9.5
	n (total sample size)	446	596	343	177	289	406	303	80	113	1342	478	453	238
Age group	18-29	27.3	25.7	13.9	6.7	13.8	18.1	12.0	4.3	7.5	48.1	19.8	21.2	10.8
(years)	30-39	20.0	26.4	12.5	7.5	10.4	17.4	13.6	3.3	5.3	51.1	21.1	17.8	10.1
	40-49	18.4	28.0	14.3	7.4	11.9	16.5	14.8	3.4	4.0	53.2	16.3	19.5	11.0
	50-59	14.2	21.6	13.2	6.4	14.5	13.7	10.5	3.4	4.2	57.1	16.7	16.2	10.0
	60-69	7.7	15.8	14.3	7.1	7.5	14.5	8.7	1.4	1.4	58.8	21.0	14.9	5.3
	χ^2	71.726	27.320	1.151	0.680	14.628	4.767	11.341	7.382	22.676				31.689
	p	<0.001	<0.001	ns	ns	<0.01	ns	<0.05	ns	<0.001				<0.01
Gender	Male	16.6	24.0	15.0	4.9	8.6	14.9	10.2	3.2	4.2	54.4	18.9	19.0	7.6
	Female	18.7	23.5	12.6	8.7	13.8	17.2	13.5	3.2	4.7	52.7	19.1	17.3	11.0
	χ^2	1.738	0.072	2.755	13.134	16.047	2.261	6.109	0.000	0.269				8.718
	p	ns	ns	ns	<0.001	<0.001	ns	<0.05	ns	ns				<0.05
Ethnicity	White[a]	18.7	24.2	13.4	7.2	12.2	16.0	12.7	3.4	4.4	52.1	19.7	18.5	9.7
	Asian[b]	2.8	16.9	12.9	3.4	3.9	15.7	3.9	1.1	2.8	70.8	11.8	12.9	4.5
	Other[c]	23.1	25.0	20.4	9.3	9.3	19.4	12.0	2.8	10.2	51.9	16.7	17.6	13.9
	χ^2	30.722	5.046	4.340	4.599	11.688	0.905	11.992	2.759	9.409				26.351
	p	<0.001	ns	ns	ns	<0.01	ns	<0.01	ns	<0.01				<0.001
Deprivation	1 (*least deprived)*	14.2	22.8	13.4	8.1	11.9	16.8	12.5	2.5	4.2	53.6	19.5	17.8	9.1
quintile	2	16.8	24.8	10.8	6.8	12.0	14.7	13.3	2.7	4.3	52.0	22.5	16.7	8.8
	3	18.4	20.9	15.6	4.9	10.9	15.1	9.0	3.6	4.4	56.1	16.7	18.7	8.5
	4	27.9	29.5	16.3	7.5	9.4	19.1	13.8	5.3	5.6	51.4	15.4	20.1	13.2
	5 *(most deprived)*	40.0	30.0	10.0	15.0	30.0	15.0	15.0	5.0	10.0	45.0	20.0	20.0	15.0
	χ^2	38.132	9.713	8.196	7.859	8.609	3.795	7.305	7.100	2.678				17.208
	p	<0.001	<0.05	ns	ns	ns	ns	ns	ns	ns				ns
Urban/rural	Urban city & town	18.6	24.7	14.0	7.1	11.9	17.7	13.5	3.4	4.9	51.1	20.2	18.7	10.0
	Urban major conurbation	15.9	22.0	12.5	6.0	9.2	13.6	9.1	2.7	3.3	59.5	16.7	16.4	7.5
	Rural town & fringe	16.5	20.7	12.2	9.0	13.3	14.9	12.8	3.7	5.9	53.7	19.1	16.5	10.6
	Rural village & dispersed	19.4	25.6	17.5	8.8	16.3	14.4	11.3	2.5	4.4	48.8	18.8	20.6	11.9
	χ^2	2.782	3.251	3.241	2.944	7.958	6.480	8.978	1.125	3.687				17.002
	p	ns	ns	ns	ns	<0.05	ns	<0.05	ns	ns				<0.05
Adjusted ACE prevalence[d]		16.9	23.4	13.6	6.1	10.8	15.3	11.2	2.9	4.1	56.1	18.3	17.0	8.6

Abbreviation: ns, not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

[d] Adjusted to Hertfordshire's population by age, gender, ethnicity and deprivation quintile of residence.

Table A24: Bivariate associations between health-harming behaviours, socio-demographics and ACE count in Hertfordshire (unadjusted)

		Smoking tobacco (current)	E-cigarettes (current)	Either smoking tobacco or using e-cigarettes (current)	Binge drinking[a] (current)	High-risk drinking (AUDIT-C = 5 or over)	Cannabis use (lifetime)	Heroin or crack cocaine use (lifetime)
All	%	17.6	6.8	20.8	7.6	26.9	17.9	3.1
	n	443	171	522	192	676	447	77
Age group (years)	18-29	23.8	9.2	28.5	9.8	31.4	25.5	4.3
	30-39	17.2	6.6	20.3	6.8	26.9	22.5	4.4
	40-49	16.8	6.9	19.9	9.6	30.0	18.8	3.3
	50-59	20.8	8.1	24.3	8.4	29.1	13.5	2.2
	60-69	10.1	3.4	11.5	3.6	17.2	7.6	0.8
	χ^2	35.724	14.684	47.505	18.494	32.811	68.842	15.456
	p	<0.001	<0.01	<0.001	<0.01	<0.001	<0.001	<0.01
Gender	Male	22.0	8.1	25.9	11.7	37.1	24.0	4.6
	Female	14.2	5.8	16.7	4.4	18.8	13.0	1.9
	χ^2	25.354	4.706	31.504	44.646	104.874	49.821	14.500
	p	<0.001	<0.05	<0.001	<0.001	<0.001	<0.001	<0.001
Ethnicity	White[b]	18.9	7.4	22.3	8.5	29.1	19.3	3.3
	Asian[c]	8.4	1.1	9.0	1.7	5.6	4.5	1.1
	Other[d]	6.5	3.7	8.3	0.9	16.7	11.1	0.9
	χ^2	22.168	11.922	28.465	17.908	52.418	28.208	4.472
	p	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	ns
Deprivation quintile	1 (*least deprived*)	14.9	6.3	18.0	8.7	30.9	19.1	2.9
	2	17.7	7.7	21.5	6.3	29.7	18.4	3.0
	3	19.0	7.0	21.4	6.3	19.4	15.4	2.6
	4	22.3	6.3	25.7	9.1	23.5	17.3	4.7
	5 (*most deprived*)	35.0	10.0	40.0	10.0	30.0	25.0	5.0
	χ^2	14.571	1.577	14.184	5.780	28.953	4.302	3.794
	p	<0.01	ns	<0.01	ns	<0.001	ns	ns
ACE count	None	13.0	5.3	15.5	6.0	24.1	10.8	1.4
	1	16.7	6.5	19.9	7.7	30.8	21.2	2.7
	2-3	24.1	9.7	27.8	9.9	29.4	27.5	6.0
	4+	33.2	10.5	39.1	12.2	30.7	33.3	7.6
	χ^2	72.292	16.165	84.957	15.198	12.180	116.018	41.200
	p	<0.001	<0.01	<0.001	<0.01	<0.01	<0.001	<0.001

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test Consumption; ns not significant.

[a] Six or more standard alcoholic drinks in one occasion, at least once a week.

[b] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[c] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[d] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A24 (b): Bivariate associations between health-harming behaviours, socio-demographics and ACE count in Hertfordshire (unadjusted)

		Violence victimisation (last 12 months)	Violence perpetration (last 12 months)	Incarceration (lifetime)	Poor diet (current)	Low physical exercise (current)	Unintended teenage pregnancy (<18 years)	Early sexual initiation (<16 years)
All	%	4.3	3.9	6.3	10.1	34.5	6.3	13.3
	n	108	97	159	254	864	158	281
Age group (years)	18-29	11.4	8.9	6.9	15.9	28.5	6.1	22.4
	30-39	4.2	4.6	7.0	6.8	32.4	5.2	12.9
	40-49	2.7	2.5	6.5	10.8	33.9	7.3	15.4
	50-59	2.2	2.2	6.9	8.4	33.8	8.9	10.1
	60-69	0.6	0.8	4.5	8.5	44.2	4.7	4.8
	χ^2	86.407	52.847	3.804	28.669	30.255	8.979	60.431
	p	<0.001	<0.001	ns	<0.001	<0.001	ns	<0.001
Gender	Male	6.1	4.8	11.2	13.1	34.0	2.7	14.9
	Female	2.9	3.1	2.4	7.7	34.9	9.2	12.0
	χ^2	14.886	4.664	78.861	19.054	0.182	42.888	3.327
	p	<0.001	<0.05	<0.001	<0.001	ns	<0.001	ns
Ethnicity	White[a]	4.5	4.0	6.6	9.9	33.3	6.7	14.2
	Asian[b]	2.8	2.3	4.0	11.8	48.9	0.6	0.8
	Other[c]	2.8	3.7	4.6	11.1	34.3	8.3	11.8
	χ^2	1.731	1.327	2.464	0.749	17.587	11.063	17.867
	p	ns	ns	ns	ns	<0.001	<0.01	<0.001
Deprivation quintile	1 (*least deprived*)	4.5	3.8	5.7	7.9	34.4	5.7	12.8
	2	4.2	3.0	6.3	9.3	34.2	5.7	12.9
	3	3.6	3.7	5.8	13.4	33.4	7.8	14.1
	4	5.3	6.0	9.1	11.6	37.2	7.0	14.9
	5 (*most deprived*)	5.0	5.0	10.0	20.0	35.0	0.0	5.0
	χ^2	1.711	5.107	5.483	15.615	1.357	4.872	2.276
	p	ns	ns	ns	<0.01	ns	ns	ns
ACE count	None	1.8	1.7	3.3	8.9	34.3	3.9	9.7
	1	4.2	2.7	4.8	10.7	32.5	6.7	11.7
	2-3	8.4	7.7	10.8	9.3	34.1	9.1	17.9
	4+	10.9	10.9	18.1	17.6	40.3	14.0	24.8
	χ^2	64.045	68.182	93.242	17.632	4.490	42.677	45.435
	p	<0.001	<0.001	<0.001	<0.01	ns	<0.001	<0.001

Abbreviation: ns not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A25: Bivariate association between health service utilisation, health outcomes, and ACE count in Hertfordshire (unadjusted)

Outcome		All		ACE count					
		%	n	None	1	2-3	4+	χ^2	*p*
Health service utilisation									
In last 12 months:	Visited GP more than 3 times	19.6	493	17.2	19.0	21.6	30.7	24.618	<0.001
	Not visited dentist	26.5	664	24.6	28.0	27.4	31.9	6.829	ns
	Visited ED	14.0	351	11.8	11.7	18.1	23.1	30.311	<0.001
	Spent 1 night or more in hospital	7.1	179	5.1	6.5	10.8	13.0	30.671	<0.001
Health outcomes									
	Overweight and obese (*BMI>25*)	47.1	1088	43.9	48.2	53.9	49.8	13.377	<0.01
	Low mental wellbeing score (*SWEMWBS<22*)	10.1	247	7.3	8.5	11.7	26.8	84.954	<0.001
	Low life satisfaction (*<6*)	12.9	322	9.6	12.8	13.7	29.8	74.305	<0.001
	More than 10 teeth removed	3.3	83	2.8	3.2	3.8	5.5	4.717	ns
	More than 10 fillings	3.1	76	3.0	4.0	2.0	3.8	3.691	ns
	STI (*ever diagnosed with*)	2.2	55	1.1	0.6	3.3	9.2	70.265	<0.001

Abbreviations: GP, General practitioner; ED, emergency department; BMI, body mass index; SWEMBWS, Short Warwick-Edinburgh Mental Well-being Scale; STI, sexually transmitted infection; ns, not significant.

Table A26: Hertfordshire sample socio-demographics and comparison with the population

		Sample		Population			
		%	n	%	n	χ^2	*p*
Age group (years)	18-29	20.3	509	21.8	160520		
	30-39	21.7	546	21.0	155136		
	40-49	22.0	553	23.6	174316		
	50-59	16.2	408	18.6	136865		
	60-69	19.7	495	15.0	110464	50.654	<0.001
Gender	Male	44.4	1115	49.0	547110		
	Female	55.6	1396	51.0	568952	21.219	<0.001
Ethnicity	White[a]	88.6	2225	87.6	977495		
	Asian[b]	7.1	178	6.5	72581		
	Other[c]	4.3	108	5.9	65986	12.512	<0.01
Deprivation quintile	1 (*least deprived*)	39.2	984	43.9	489735		
	2	23.9	600	22.9	255441		
	3	23.4	588	20.9	233783		
	4	12.7	319	11.3	126549		
	5 (*most deprived*)	0.8	20	0.9	10554	26.050	<0.001

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group

Table A27: Bivariate relationship between socio-demographics, individual ACEs and ACE count in Luton (unadjusted)

		Individual ACEs									ACE count			
			Child abuse				Household member							
		Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse	None	1	2-3	4+
Prevalence	%	11.6	14.8	9.8	4.7	7.9	11.9	7.2	2.5	2.6	69.4	13.0	11.1	6.5
	n (total sample size)	161	206	136	65	110	166	100	35	36	965	181	154	90
Age group	18-29	19.3	16.5	9.7	4.0	9.7	12.8	9.3	4.0	4.4	64.2	15.3	11.8	8.7
(years)	30-39	11.1	15.2	7.3	5.5	6.4	9.6	5.5	1.5	2.3	70.8	13.4	10.8	5.0
	40-49	10.2	15.9	12.5	5.3	8.7	14.8	8.3	3.4	2.3	69.7	12.5	9.1	8.7
	50-59	9.4	15.0	12.2	6.1	9.9	13.6	7.5	2.3	2.3	69.0	10.3	13.6	7.0
	60-69	5.6	10.8	8.4	2.4	5.2	9.6	5.2	1.2	1.2	74.3	12.4	10.4	2.8
	χ^2	28.935	4.133	6.562	4.931	6.213	5.802	5.630	7.268	6.131				18.316
	p	<0.001	ns	ns	ns	ns	ns	ns	ns	ns				ns
Gender	Male	9.4	15.5	10.4	2.0	5.6	12.3	6.7	2.3	1.8	70.6	12.7	11.3	5.4
	Female	13.3	14.3	9.3	6.8	9.7	11.6	7.5	2.7	3.2	68.5	13.3	10.9	7.3
	χ^2	4.767	0.267	0.301	16.647	7.437	0.099	0.220	0.078	2.090				2.208
	p	<0.05	ns	ns	<0.001	<0.01	ns	ns	ns	ns				ns
Ethnicity	White[a]	16.4	17.2	10.9	5.5	10.9	13.6	10.5	3.7	3.7	63.7	14.6	13.1	8.7
	Asian[b]	1.7	11.1	7.2	3.1	4.4	9.0	2.2	1.1	0.9	81.9	8.5	5.7	3.9
	Other[c]	16.4	14.2	11.5	5.5	4.4	12.6	6.0	1.1	2.2	61.7	18.0	16.4	3.8
	χ^2	64.529	8.406	5.193	4.019	20.520	5.963	30.221	9.854	9.383				58.986
	p	<0.001	<0.05	ns	ns	<0.001	ns	<0.001	<0.01	<0.01				<0.001
Deprivation	1 (*least deprived)*	12.8	10.3	12.8	7.7	10.3	10.3	7.7	2.6	0.0	66.7	17.9	7.7	7.7
quintile	2	13.9	21.1	11.9	4.6	12.4	16.5	7.2	1.5	2.1	61.3	14.4	16.5	7.7
	3	15.6	14.9	9.5	5.7	8.6	10.5	8.6	2.2	3.8	68.3	14.6	10.2	7.0
	4	8.2	11.9	7.8	4.0	5.4	9.5	5.6	1.8	1.6	75.0	10.7	9.3	5.0
	5 *(most deprived)*	11.5	15.9	11.5	4.4	8.3	14.5	8.3	4.4	3.5	67.3	13.6	11.8	7.4
	χ^2	11.732	10.435	4.861	2.159	10.300	9.361	3.482	6.968	6.313				18.277
	p	<0.05	<0.05	ns	ns	<0.05	ns	ns	ns	ns				ns
Adjusted ACE prevalence[d]		15.0	17.7	11.4	6.1	8.3	14.7	8.7	3.9	3.3	63.6	15.0	13.4	8.0

Note: all of Luton is urban city and town
Abbreviation: ns, not significant.
[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.
[d] Adjusted to Luton's population by age, gender, ethnicity and deprivation quintile of residence.

Table A28: Bivariate associations between health-harming behaviours, socio-demographics and ACE count in Luton (unadjusted)

		Smoking tobacco (current)	E-cigarettes (current)	Either smoking tobacco or using e-cigarettes (current)	Binge drinking[a] (current)	High-risk drinking (AUDIT-C = 5 or over)	Cannabis use (lifetime)	Heroin or crack cocaine use (lifetime)
All	%	18.0	3.6	19.4	4.5	13.7	8.9	0.7
	n	250	50	269	63	191	124	10
Age group (years)	18-29	21.2	4.1	23.4	5.0	16.5	17.5	0.6
	30-39	17.8	3.5	18.7	4.4	11.4	9.4	1.2
	40-49	22.3	3.4	23.5	3.8	13.6	4.9	1.1
	50-59	18.3	4.3	20.2	5.6	14.6	6.1	0.0
	60-69	9.2	2.8	10.0	4.0	12.9	4.0	0.4
	χ^2	18.577	0.949	20.235	1.260	3.992	43.448	3.539
	p	<0.01	ns	<0.001	ns	ns	<0.001	ns
Gender	Male	22.5	4.0	24.8	6.7	19.9	12.4	0.8
	Female	14.5	3.3	15.1	2.8	9.0	6.3	0.6
	χ^2	14.607	0.231	20.197	11.319	33.684	15.024	0.007
	p	<0.001	ns	<0.001	<0.01	<0.001	<0.001	ns
Ethnicity	White[b]	25.5	5.1	27.5	7.9	21.8	12.9	1.1
	Asian[c]	8.7	1.5	9.6	0.0	1.7	2.4	0.0
	Other[d]	10.4	2.7	10.4	2.2	10.9	9.3	1.1
	χ^2	62.426	10.776	69.188	43.439	97.469	38.285	4.967
	p	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	ns
Deprivation quintile	1 (*least deprived*)	5.1	7.7	12.8	5.1	15.4	5.3	0.0
	2	14.4	3.6	15.5	5.7	19.1	13.4	0.5
	3	16.5	5.4	18.7	5.1	15.6	9.2	0.0
	4	15.1	1.8	15.5	4.2	10.5	7.0	1.4
	5 (*most deprived*)	27.1	4.1	28.6	3.8	13.6	9.5	0.6
	χ^2	28.572	9.932	26.419	1.360	9.981	7.864	5.960
	p	<0.001	<0.05	<0.001	ns	<0.05	ns	ns
ACE count	None	14.8	2.0	15.8	3.4	9.8	4.3	0.3
	1	17.7	4.4	18.8	4.4	18.8	11.7	0.0
	2-3	26.0	8.5	29.2	9.1	22.7	22.9	1.3
	4+	38.9	11.1	42.2	8.9	30.0	30.0	5.6
	χ^2	39.895	32.855	47.825	14.110	46.810	112.889	33.693
	p	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test Consumption; ns not significant.

[a] Six or more standard alcoholic drinks in one occasion, at least once a week.

[b] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[c] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[d] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A28 (b): Bivariate associations between health-harming behaviours, socio-demographics and ACE count in Luton (unadjusted)

		Violence victimisation (last 12 months)	Violence perpetration (last 12 months)	Incarceration (lifetime)	Poor diet (current)	Low physical exercise (current)	Unintended teenage pregnancy (<18 years)	Early sexual initiation (<16 years)
All	%	2.8	3.3	5.3	11.3	43.3	4.6	9.2
	n	39	46	74	157	599	63	97
Age group (years)	18-29	5.0	7.2	8.7	14.6	36.9	5.0	16.1
	30-39	2.9	4.1	3.8	9.6	36.7	5.3	8.6
	40-49	3.0	3.0	3.8	11.0	46.0	4.2	6.3
	50-59	0.5	0.0	7.0	13.2	49.8	6.1	12.1
	60-69	1.6	0.4	3.2	8.1	52.4	2.0	2.6
	χ^2	11.212	29.426	13.487	7.853	24.145	5.412	25.939
	p	<0.05	<0.001	<0.01	ns	<0.001	ns	<0.001
Gender	Male	3.3	4.1	9.1	14.2	42.3	2.5	11.3
	Female	2.4	2.7	2.4	9.1	44.1	6.2	7.6
	χ^2	0.634	1.759	28.452	8.228	0.367	9.883	3.857
	p	ns	ns	<0.001	<0.01	ns	<0.01	ns
Ethnicity	White[a]	2.5	3.2	6.6	11.1	43.9	5.7	11.3
	Asian[b]	2.2	3.1	3.5	11.4	46.5	1.1	1.9
	Other[c]	5.5	4.4	4.9	12.0	32.8	8.8	15.9
	χ^2	5.639	0.771	5.288	0.138	10.141	22.036	29.941
	p	ns	ns	ns	ns	<0.01	<0.001	<0.001
Deprivation quintile	1 (*least deprived*)	2.6	2.6	7.9	12.8	42.1	5.3	0.0
	2	5.2	5.2	4.6	12.4	40.4	1.6	13.5
	3	3.8	4.8	4.5	12.1	44.8	4.8	8.7
	4	2.2	1.4	5.2	11.6	46.0	5.2	7.9
	5 (*most deprived*)	1.5	3.8	6.5	9.5	39.8	5.0	9.6
	χ^2	7.962	10.234	2.071	1.619	4.153	4.756	7.020
	p	ns	<0.05	ns	ns	ns	ns	ns
ACE count	None	1.0	1.2	3.1	10.1	44.3	2.4	4.3
	1	4.4	4.4	7.2	11.0	42.5	6.7	16.0
	2-3	6.5	8.5	9.1	15.6	41.2	9.2	16.1
	4+	12.2	14.4	18.9	17.8	38.2	15.6	27.3
	χ^2	49.573	61.050	47.549	8.008	1.634	44.360	66.090
	p	<0.001	<0.001	<0.001	<0.05	ns	<0.001	<0.001

Abbreviation: ns not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A29: Bivariate association between health service utilisation, health outcomes, and ACE count in Luton (unadjusted)

Outcome		All		ACE count					
		%	n	None	1	2-3	4+	χ^2	*p*
Health service utilisation									
In last 12 months:	Visited GP more than 3 times	29.6	412	29.3	28.7	31.2	32.2	0.578	ns
	Not visited dentist	34.9	485	36.3	31.5	31.8	32.2	2.650	ns
	Visited ED	14.9	207	12.3	16.0	24.7	23.3	21.863	<0.001
	Spent 1 night or more in hospital	8.9	124	8.6	8.3	11.7	8.9	1.663	ns
Health outcomes									
	Overweight and obese (*BMI>25*)	49.1	605	49.5	50.3	45.5	50.0	0.927	ns
	Low mental wellbeing score (*SWEMWBS<22*)	11.6	156	9.4	12.0	15.5	27.8	29.775	<0.001
	Low life satisfaction (*<6*)	9.9	137	7.3	12.7	10.6	31.1	54.334	<0.001
	More than 10 teeth removed	4.5	61	4.7	3.4	5.9	2.2	2.305	ns
	More than 10 fillings	1.2	16	0.7	1.7	2.7	3.4	8.813	<0.05
	STI (*ever diagnosed with*)	0.3	4	0.0	0.6	1.3	1.1	10.838	<0.05

Abbreviations: GP, General practitioner; ED, emergency department; BMI, body mass index; SWEMBWS, Short Warwick-Edinburgh Mental Well-being Scale; STI, sexually transmitted infection; ns, not significant.

Table A30: Luton sample socio-demographics and comparison with the population

		Sample		Population			
		%	n	%	n	χ^2	*p*
Age group	18-29	23.1	321	30.5	40837		
(years)	30-39	24.7	343	22.5	30130		
	40-49	19.0	264	20.4	27334		
	50-59	15.3	213	15.3	20492		
	60-69	17.9	249	11.1	14888	87.232	<0.001
Gender	Male	43.7	608	50.2	101954		
	Female	56.3	782	49.8	101247	23.196	<0.001
Deprivation	1 (*least deprived*)	2.8	39	4.3	8752		
quintile	2	14.0	194	14.4	29350		
	3	22.7	315	21.5	43578		
	4	36.2	503	32.6	66295		
	5 (*most deprived*)	24.4	339	27.2	55226	17.806	<0.01
Ethnicity	White[a]	53.9	749	54.7	111079		
	Asian[b]	32.9	458	30.0	60952		
	Other[c]	13.2	183	15.3	31170	8.339	<0.05

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[c] IncludingMixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Northamptonshire

Table A31: Bivariate relationship between socio-demographics, individual ACEs and ACE count in Northamptonshire (unadjusted)

		Individual ACEs									ACE count			
			Child abuse				Household member							
		Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse	None	1	2-3	4+
Prevalence	%	20.2	24.3	15.3	6.6	11.8	18.5	10.9	3.5	3.5	51.3	20.6	17.6	10.4
	n (total sample size)	314	377	237	102	184	287	170	55	54	797	320	274	162
Age group	18-29	33.3	28.9	14.6	5.4	17.0	20.7	16.0	6.8	8.2	42.5	23.8	16.3	17.3
(years)	30-39	26.2	28.3	15.2	7.1	12.8	20.2	12.2	3.6	4.5	47.3	19.6	22.0	11.0
	40-49	20.2	23.1	17.9	6.5	10.4	20.8	10.4	3.9	2.6	51.1	20.2	17.9	10.7
	50-59	12.5	23.6	15.1	7.9	10.8	15.1	9.2	2.3	2.0	56.1	18.0	18.4	7.5
	60-69	9.0	17.4	13.5	5.8	8.4	15.4	7.1	1.3	0.3	59.5	21.5	13.2	5.8
	χ^2	74.412	14.737	2.515	1.939	12.309	7.088	14.051	15.293	32.205				43.661
	p	<0.001	<0.01	ns	ns	<0.05	ns	<0.01	<0.01	<0.001				<0.001
Gender	Male	19.2	23.9	16.5	4.5	9.4	17.6	9.0	3.4	3.2	52.0	21.0	18.3	8.7
	Female	21.1	24.6	14.2	8.3	13.9	19.2	12.6	3.7	3.7	50.8	20.3	17.0	11.9
	χ^2	0.757	0.047	1.461	8.754	7.254	0.511	4.961	0.047	0.136				4.452
	p	ns	ns	ns	<0.01	<0.01	ns	<0.05	ns	ns				ns
Ethnicity	White[a]	20.9	24.0	15.2	6.7	12.1	18.2	11.3	3.6	3.6	50.7	21.2	17.6	10.5
	Asian[b]	2.8	22.2	12.5	8.3	8.3	20.8	4.2	2.8	0.0	65.3	11.1	16.7	6.9
	Other[c]	24.6	32.8	19.7	1.6	9.8	23.0	9.8	3.3	4.9	49.2	18.0	19.7	13.1
	χ^2	14.727	2.622	1.345	2.815	1.183	1.165	3.695	0.146	3.026				7.927
	p	<0.01	ns	ns	ns	ns	ns	ns	ns	ns				ns
Deprivation	1 (*least deprived)*	17.1	22.2	16.2	4.7	10.5	16.4	8.6	3.0	3.4	55.6	18.6	16.7	9.0
quintile	2	16.1	21.0	10.5	4.9	10.5	14.1	11.1	1.3	3.0	56.4	20.7	15.7	7.2
	3	17.9	23.9	11.5	7.3	11.1	23.5	6.8	2.6	2.1	48.3	26.5	16.2	9.0
	4	24.9	25.3	17.5	10.0	14.5	18.2	14.1	5.9	4.1	45.7	19.3	23.0	11.9
	5 *(most deprived)*	30.5	33.3	21.1	8.5	14.6	24.9	16.9	6.1	5.2	43.7	20.7	17.4	18.3
	χ^2	24.874	12.737	14.893	11.072	4.851	15.213	17.490	14.191	3.625				36.487
	p	<0.001	<0.05	<0.01	<0.05	ns	<0.01	<0.01	<0.01	ns				<0.001
Urban/rural	Urban city & town	19.6	23.1	14.3	6.2	10.5	17.3	10.4	4.2	3.0	54.3	19.5	16.4	9.8
	Rural town & fringe	21.0	27.8	18.4	7.4	15.1	22.7	12.0	2.5	3.9	44.1	22.9	20.6	12.4
	Rural village & dispersed	22.8	17.7	8.9	6.3	8.9	7.6	11.4	1.3	6.3	58.2	20.3	15.2	6.3
	χ^2	0.744	5.992	6.853	0.843	7.122	12.823	0.813	4.255	2.775				16.127
	p	ns	ns	<0.05	ns	<0.05	<0.01	ns	ns	ns				<0.05
Adjusted ACE prevalence[d]		19.6	23.7	14.4	6.1	12.2	16.4	11.6	3.2	4.2	52.5	19.3	17.9	10.4

Abbreviation: ns, not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

[d] Adjusted to Northamptonshire's population by age, gender, ethnicity and deprivation quintile of residence.

Table A32: Bivariate associations between health-harming behaviours, socio-demographics and ACE count in Northamptonshire (unadjusted)

		Smoking tobacco (current)	E-cigarettes (current)	Either smoking tobacco or using e-cigarettes (current)	Binge drinking[a] (current)	High-risk drinking (AUDIT-C = 5 or over)	Cannabis use (lifetime)	Heroin or crack cocaine use (lifetime)
All	%	19.1	6.1	21.4	6.6	21.8	14.4	1.3
	n	297	95	333	102	337	223	20
Age group (years)	18-29	25.9	6.5	28.6	9.9	27.1	23.4	3.4
	30-39	23.2	7.7	25.9	4.8	23.7	22.2	1.8
	40-49	15.0	4.6	17.6	5.9	19.2	11.4	0.7
	50-59	21.3	6.9	23.0	6.9	21.5	10.9	0.7
	60-69	10.3	4.8	12.2	5.8	17.7	4.2	0.0
	χ^2	32.275	4.129	31.646	7.487	9.665	67.112	17.164
	p	<0.001	ns	<0.001	ns	<0.05	<0.001	<0.01
Gender	Male	21.4	6.4	24.2	11.4	32.1	19.2	1.7
	Female	17.2	5.8	19.1	2.5	13.1	10.4	1.0
	χ^2	4.266	0.145	5.793	47.946	80.1	23.101	1.092
	p	<0.05	ns	<0.05	<0.001	<0.001	<0.001	ns
Ethnicity	White[b]	20.0	6.6	22.5	7.0	23.4	15.1	1.3
	Asian[c]	6.9	1.4	6.9	0.0	1.4	4.2	0.0
	Other[d]	13.1	1.6	14.8	4.9	10.0	11.5	1.6
	χ^2	9.034	5.401	11.485	5.731	24.489	7.051	1.029
	p	<0.05	ns	<0.01	ns	<0.001	<0.05	ns
Deprivation quintile	1 (*least deprived*)	10.7	4.1	12.0	6.8	24.2	10.4	0.4
	2	18.7	6.6	21.3	5.6	19.8	13.1	1.3
	3	21.4	7.7	25.6	6.9	19.3	17.6	0.9
	4	22.7	8.6	25.7	6.7	19.4	18.7	2.2
	5 (*most deprived*)	33.8	5.6	35.2	7.0	24.5	17.5	2.8
	χ^2	56.993	7.572	57.232	0.608	5.164	14.853	9.638
	p	<0.001	ns	<0.001	ns	ns	<0.01	<0.05
ACE count	None	13.4	4.4	15.3	5.3	18.0	8.4	0.6
	1	20.0	8.1	23.8	10.0	30.5	17.9	0.6
	2-3	21.5	8.0	24.1	5.9	23.4	20.0	1.8
	4+	41.4	7.4	42.6	7.5	20.6	27.8	4.9
	χ^2	69.699	8.556	62.979	8.806	21.372	56.428	21.396
	p	<0.001	<0.05	<0.001	<0.05	<0.001	<0.001	<0.001

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test Consumption; ns not significant.

[a] Six or more standard alcoholic drinks in one occasion, at least once a week.

[b] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[c] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[d] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A32 (b): Bivariate associations between health-harming behaviours, socio-demographics and ACE count in Northamptonshire (unadjusted)

		Violence victimisation (last 12 months)	Violence perpetration (last 12 months)	Incarceration (lifetime)	Poor diet (current)	Low physical exercise (current)	Unintended teenage pregnancy (<18 years)	Early sexual initiation (<16 years)
All	%	3.7	3.1	5.6	9.5	36.9	7.2	14.6
	n	57	48	87	147	571	110	194
Age group (years)	18-29	8.2	8.6	6.1	11.9	31.7	6.5	19.8
	30-39	4.8	3.3	6.8	7.5	36.4	9.3	21.4
	40-49	2.9	2.0	6.9	10.8	36.1	9.0	12.4
	50-59	2.0	1.0	5.6	8.6	40.7	5.3	13.1
	60-69	0.6	1.0	2.6	9.0	39.4	5.5	5.2
	χ^2	29.057	39.661	7.479	4.653	6.125	6.777	36.081
	p	<0.001	<0.001	ns	ns	ns	ns	<0.001
Gender	Male	3.7	3.2	10.1	12.2	36.7	5.5	15.4
	Female	3.7	3.0	1.8	7.2	37.0	8.5	13.9
	χ^2	0.000	0.018	48.767	10.735	0.003	4.668	0.524
	p	ns	ns	<0.001	<0.01	ns	<0.05	ns
Ethnicity	White[a]	3.5	3.0	5.9	9.5	37.0	7.6	15.0
	Asian[b]	6.9	2.8	2.8	6.9	37.5	1.4	6.0
	Other[c]	4.9	4.9	3.3	11.5	32.8	3.4	13.0
	χ^2	2.633	0.717	1.880	0.826	0.465	5.145	3.210
	p	ns	ns	ns	ns	ns	ns	ns
Deprivation quintile	1 (*least deprived*)	1.7	1.9	1.9	6.4	35.0	4.2	9.4
	2	4.3	3.6	5.9	9.2	38.2	10.3	17.1
	3	3.8	1.3	3.0	9.4	35.6	7.4	12.6
	4	4.9	3.0	7.8	11.2	37.7	7.5	16.5
	5 (*most deprived*)	6.1	7.5	14.6	15.5	40.3	9.5	23.9
	χ^2	10.890	19.459	51.910	15.754	2.337	13.215	25.754
	p	<0.05	<0.01	<0.001	<0.01	ns	<0.05	<0.001
ACE count	None	1.9	0.8	2.3	7.8	38.3	3.9	7.6
	1	2.2	2.2	6.6	11.9	31.3	9.2	13.2
	2-3	4.7	4.0	8.1	9.1	36.3	6.6	23.4
	4+	13.6	14.8	16.0	13.7	42.0	20.0	33.6
	χ^2	54.967	90.280	53.833	8.136	6.930	54.082	83.785
	p	<0.001	<0.001	<0.001	<0.05	ns	<0.001	<0.001

Abbreviation: ns not significant.

[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.

[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.

[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group.

Table A33: Bivariate association between health service utilisation, health outcomes, and ACE count in Northamptonshire (unadjusted)

Outcome		All		ACE count					
		%	n	None	1	2-3	4+	χ^2	*p*
Health service utilisation									
In last 12 months:	Visited GP more than 3 times	22.3	347	19.9	19.7	25.5	34.0	18.132	<0.001
	Not visited dentist	22.9	356	21.6	23.5	21.2	31.5	8.065	<0.05
	Visited ED	14.8	229	12.0	13.8	18.6	23.5	17.883	<0.001
	Spent 1 night or more in hospital	7.1	110	4.9	6.6	8.8	16.0	26.870	<0.001
Health outcomes									
	Overweight and obese (*BMI>25*)	52.0	745	53.0	50.0	53.1	49.0	1.447	ns
	Low mental wellbeing score (*SWEMWBS<22*)	10.6	158	8.3	8.4	9.9	27.0	51.443	<0.001
	Low life satisfaction (*<6*)	11.4	177	8.7	9.4	14.2	24.1	34.740	<0.001
	More than 10 teeth removed	5.1	79	3.8	6.9	4.8	8.7	9.286	<0.05
	More 10 fillings	3.1	48	2.8	3.2	3.7	3.8	0.808	ns
	STI (*ever diagnosed with*)	1.2	19	0.9	1.9	0.7	2.5	4.536	ns

Abbreviations: GP, General practitioner; ED, emergency department; BMI, body mass index; SWEMBWS, Short Warwick-Edinburgh Mental Well-being Scale; STI, sexually transmitted infection; ns, not significant.

Table A34: Northamptonshire sample socio-demographics and comparison with the population

		Sample		Population			
		%	n	%	n	χ^2	*p*
Age group	18-29	18.9	294	21.4	99445		
(years)	30-39	21.6	336	20.0	92822		
	40-49	19.8	307	23.2	107403		
	50-59	19.6	305	18.6	86238		
	60-69	20.0	311	16.8	77737	24.905	<0.001
Gender	Male	46.0	714	49.3	341342		
	Female	54.0	839	50.7	350610	6.867	<0.01
Ethnicity	White[a]	91.4	1420	91.5	632822		
	Asian[b]	4.6	72	3.7	25427		
	Other[c]	3.9	61	4.9	33703	6.68	<0.05
Deprivation	1 (*least deprived*)	34.3	532	31.9	220974		
quintile	2	19.6	305	21.3	147227		
	3	15.1	234	16	110946		
	4	17.3	269	17.7	122803		
	5 (*most deprived*)	13.7	213	13	90002	6.287	ns

Abbreviation: ns, not significant.
[a] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[b] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian ethnicities.
[c] Including Mixed/Multiple ethnic group, Black/African/Caribbean/Black British, Other ethnic group

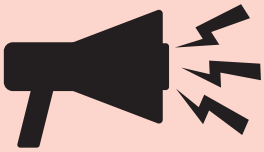
Appendix 3 – Local authority infographics

Adverse Childhood Experiences (ACEs) in Broxbourne

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Broxbourne have suffered each ACE?

CHILD MALTREATMENT

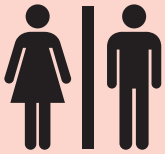


Verbal abuse
25%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



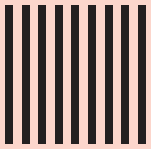
Parental separation
18%

Domestic violence
14%

Mental illness
10%

Alcohol abuse
11%

Drug use
4%



Incarceration
3%

For every 100 adults in Broxbourne 43 have suffered at least one ACE during their childhood and 8 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in Broxbourne

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Broxbourne preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 45%

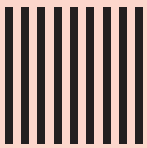
Unintended teen pregnancy
by 52%

Smoking
(current)
by 37%

Binge drinking
(current)
by 33%

Cannabis use
(lifetime)
by 52%

Heroin/crack use
(lifetime)
by 58%



Incarceration
(lifetime)
by 56%

Violence perpetration
(past year)
by 66%

Violence victimisation
(past year)
by 62%

Poor diet
(current; <2 fruit & veg portions daily)
by 27%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

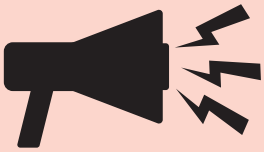
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Corby

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Corby have suffered each ACE?

CHILD MALTREATMENT

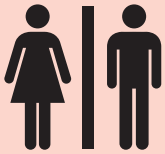


Verbal abuse
24%

Physical abuse
16%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



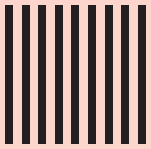
Parental separation
22%

Domestic violence
16%

Mental illness
12%

Alcohol abuse
13%

Drug use
5%



Incarceration
4%

For every 100 adults in Corby 48 have suffered at least one ACE during their childhood and 12 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in Corby

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Corby preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 38%

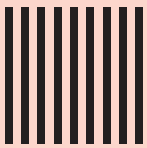
Unintended teen pregnancy
by 46%

Smoking
(current)
by 25%

Binge drinking
(current)
by 23%

Cannabis use
(lifetime)
by 43%

Heroin/crack use
(lifetime)
by 56%



Incarceration
(lifetime)
by 52%

Violence perpetration
(past year)
by 63%

Violence victimisation
(past year)
by 59%

Poor diet
(current; <2 fruit & veg portions daily)
by 15%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

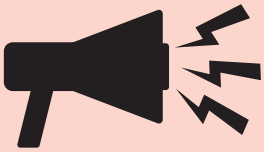
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Dacorum

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Dacorum have suffered each ACE?

CHILD MALTREATMENT

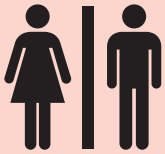


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



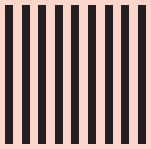
Parental separation
17%

Domestic violence
15%

Mental illness
11%

Alcohol abuse
11%

Drug use
4%



Incarceration
3%

For every 100 adults in Dacorum 44 have suffered at least one ACE during their childhood and 9 have suffered 4 or more

0 ACEs 56%

1 ACEs 18%

2-3 ACEs 17%

4+ ACEs 9%

Figures based on population adjusted prevalence in adults aged 18-69 years in Dacorum

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Dacorum preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

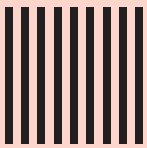
Unintended teen pregnancy
by 43%

Smoking
(current)
by 24%

Binge drinking
(current)
by 20%

Cannabis use
(lifetime)
by 42%

Heroin/crack use
(lifetime)
by 53%



Incarceration
(lifetime)
by 50%

Violence perpetration
(past year)
by 60%

Violence victimisation
(past year)
by 56%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

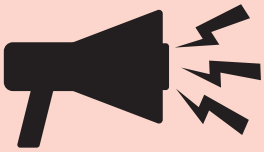
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Daventry

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Daventry have suffered each ACE?

CHILD MALTREATMENT

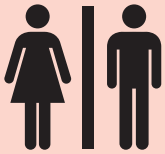


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



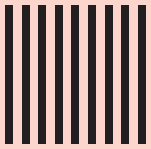
Parental separation
19%

Domestic violence
16%

Mental illness
13%

Alcohol abuse
12%

Drug use
4%



Incarceration
3%

For every 100 adults in Daventry 49 have suffered at least one ACE during their childhood and 10 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in Daventry

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Daventry preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 38%

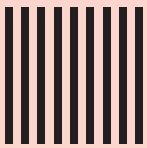
Unintended teen pregnancy
by 46%

Smoking
(current)
by 27%

Binge drinking
(current)
by 22%

Cannabis use
(lifetime)
by 44%

Heroin/crack use
(lifetime)
by 56%



Incarceration
(lifetime)
by 53%

Violence perpetration
(past year)
by 63%

Violence victimisation
(past year)
by 58%

Poor diet
(current; <2 fruit & veg portions daily)
by 14%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

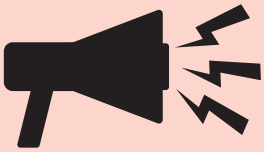
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in East Hertfordshire

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in East Hertfordshire have suffered each ACE?

CHILD MALTREATMENT

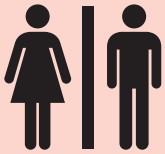


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



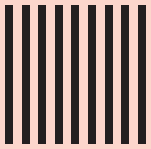
Parental separation
18%

Domestic violence
16%

Mental illness
12%

Alcohol abuse
12%

Drug use
4%



Incarceration
3%

For every 100 adults in East Hertfordshire 47 have suffered at least one ACE during their childhood and 10 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in East Hertfordshire

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In East Hertfordshire preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

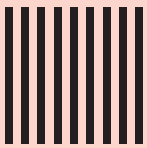
Unintended teen pregnancy
by 45%

Smoking
(current)
by 26%

Binge drinking
(current)
by 21%

Cannabis use
(lifetime)
by 67%

Heroin/crack use
(lifetime)
by 54%



Incarceration
(lifetime)
by 51%

Violence perpetration
(past year)
by 61%

Violence victimisation
(past year)
by 57%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

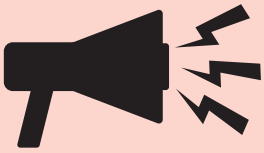
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in East Northamptonshire

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in East Northamptonshire have suffered each ACE?

CHILD MALTREATMENT

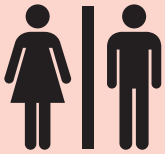


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



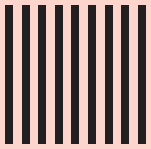
Parental separation
20%

Domestic violence
17%

Mental illness
13%

Alcohol abuse
12%

Drug use
4%



Incarceration
3%

For every 100 adults in East Northamptonshire 49 have suffered at least one ACE during their childhood and 11 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in East Northamptonshire

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In East Northamptonshire preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 38%

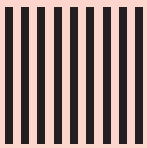
Unintended teen pregnancy
by 47%

Smoking
(current)
by 27%

Binge drinking
(current)
by 23%

Cannabis use
(lifetime)
by 44%

Heroin/crack use
(lifetime)
by 56%



Incarceration
(lifetime)
by 53%

Violence perpetration
(past year)
by 63%

Violence victimisation
(past year)
by 59%

Poor diet
(current; <2 fruit & veg portions daily)
by 15%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

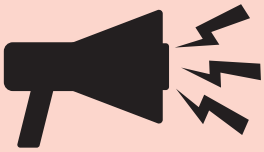
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Hertsmere

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Hertsmere have suffered each ACE?

CHILD MALTREATMENT

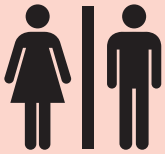


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



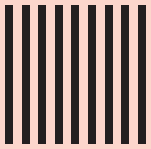
Parental separation
17%

Domestic violence
15%

Mental illness
11%

Alcohol abuse
11%

Drug use
4%



Incarceration
3%

For every 100 adults in Herstmere 44 have suffered at least one ACE during their childhood and 8 have suffered 4 or more

0 ACEs 56%

1 ACEs 18%

2-3 ACEs 18%

4+ ACEs 8%

Figures based on population adjusted prevalence in adults aged 18-69 years in Hertsmere

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Hertsmere preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

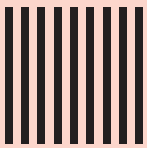
Unintended teen pregnancy
by 43%

Smoking
(current)
by 24%

Binge drinking
(current)
by 21%

Cannabis use
(lifetime)
by 42%

Heroin/crack use
(lifetime)
by 53%



Incarceration
(lifetime)
by 50%

Violence perpetration
(past year)
by 60%

Violence victimisation
(past year)
by 56%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

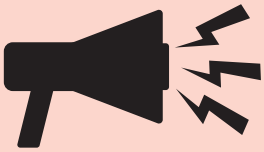
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Kettering

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Kettering have suffered each ACE?

CHILD MALTREATMENT

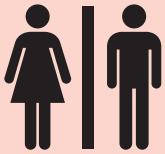


Verbal abuse
24%

Physical abuse
15%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



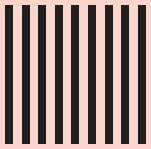
Parental separation
20%

Domestic violence
17%

Mental illness
12%

Alcohol abuse
12%

Drug use
4%



Incarceration
3%

For every 100 adults in Kettering 47 have suffered at least one ACE during their childhood and 11 have suffered 4 or more

0 ACEs 53%

1 ACEs 19%

2-3 ACEs 17%

4+ ACEs 11%

Figures based on population adjusted prevalence in adults aged 18-69 years in Kettering

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Kettering preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 38%

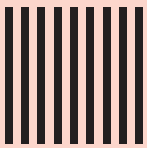
Unintended teen pregnancy
by 46%

Smoking
(current)
by 26%

Binge drinking
(current)
by 22%

Cannabis use
(lifetime)
by 42%

Heroin/crack use
(lifetime)
by 55%



Incarceration
(lifetime)
by 52%

Violence perpetration
(past year)
by 63%

Violence victimisation
(past year)
by 58%

Poor diet
(current; <2 fruit & veg portions daily)
by 14%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

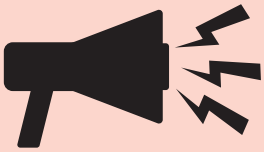
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Luton

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Luton have suffered each ACE?

CHILD MALTREATMENT

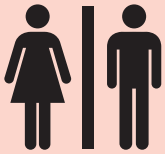


Verbal abuse
18%

Physical abuse
11%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



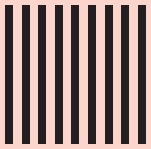
Parental separation
15%

Domestic violence
15%

Mental illness
8%

Alcohol abuse
9%

Drug use
3%



Incarceration
4%

For every 100 adults in Luton 36 have suffered at least one ACE during their childhood and 8 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in Luton. Some caution should be taken when interpreting the levels of ACEs identified in Luton. Previous studies have found associations between ACE prevalence and deprivation, thus a higher ACE prevalence for Luton may have been anticipated. The population in Luton is ethnically diverse, with almost a third of residents being of Asian ethnicity. This and other studies have found a much lower prevalence of ACEs reported among this population which may be due to cultural variations in reporting.

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Luton preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 32%

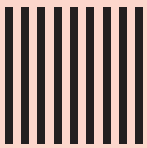
Unintended teen pregnancy
by 39%

Smoking
(current)
by 20%

Binge drinking
(current)
by 19%

Cannabis use
(lifetime)
by 39%

Heroin/crack use
(lifetime)
by 50%



Incarceration
(lifetime)
by 45%

Violence perpetration
(past year)
by 56%

Violence victimisation
(past year)
by 51%

Poor diet
(current; <2 fruit & veg portions daily)
by 11%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

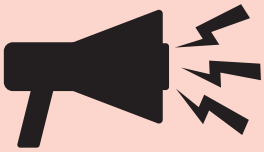
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in North Hertfordshire

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in North Hertfordshire have suffered each ACE?

CHILD MALTREATMENT

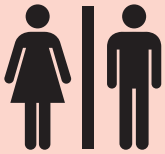


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



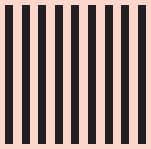
Parental separation
17%

Domestic violence
16%

Mental illness
12%

Alcohol abuse
11%

Drug use
4%



Incarceration
3%

For every 100 adults in North Hertfordshire 46 have suffered at least one ACE during their childhood and 9 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in North Hertfordshire

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In North Hertfordshire preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

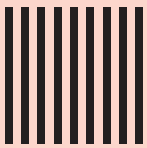
Unintended teen pregnancy
by 44%

Smoking
(current)
by 25%

Binge drinking
(current)
by 21%

Cannabis use
(lifetime)
by 41%

Heroin/crack use
(lifetime)
by 53%



Incarceration
(lifetime)
by 51%

Violence perpetration
(past year)
by 61%

Violence victimisation
(past year)
by 56%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

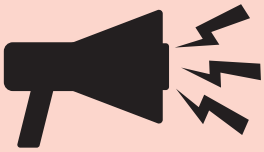
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Northampton

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Northampton have suffered each ACE?

CHILD MALTREATMENT

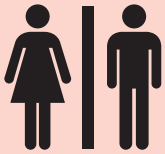


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



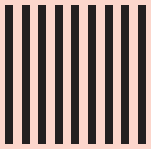
Parental separation
19%

Domestic violence
16%

Mental illness
11%

Alcohol abuse
11%

Drug use
4%



Incarceration
4%

For every 100 adults in Northampton 45 have suffered at least one ACE during their childhood and 10 have suffered 4 or more

0 ACEs 55%

1 ACEs 18%

2-3 ACEs 17%

4+ ACEs 10%

Figures based on population adjusted prevalence in adults aged 18-69 years in Northampton

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Northampton preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 35%

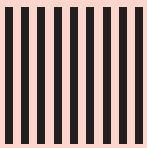
Unintended teen pregnancy
by 44%

Smoking
(current)
by 23%

Binge drinking
(current)
by 22%

Cannabis use
(lifetime)
by 42%

Heroin/crack use
(lifetime)
by 54%



Incarceration
(lifetime)
by 50%

Violence perpetration
(past year)
by 61%

Violence victimisation
(past year)
by 56%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

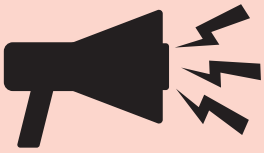
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in South Northamptonshire

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in South Northamptonshire have suffered each ACE?

CHILD MALTREATMENT

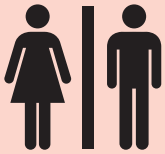


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



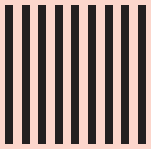
Parental separation
18%

Domestic violence
17%

Mental illness
14%

Alcohol abuse
12%

Drug use
4%



Incarceration
3%

For every 100 adults in South Northamptonshire 50 have suffered at least one ACE during their childhood and 11 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in South Northamptonshire

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In South Northamptonshire preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 39%

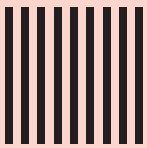
Unintended teen pregnancy
by 47%

Smoking
(current)
by 28%

Binge drinking
(current)
by 23%

Cannabis use
(lifetime)
by 45%

Heroin/crack use
(lifetime)
by 57%



Incarceration
(lifetime)
by 55%

Violence perpetration
(past year)
by 64%

Violence victimisation
(past year)
by 60%

Poor diet
(current; <2 fruit & veg portions daily)
by 15%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

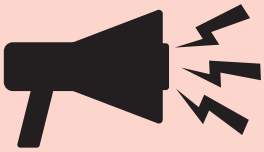
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in St Albans

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in St Albans have suffered each ACE?

CHILD MALTREATMENT

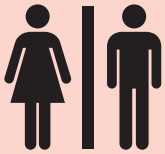


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



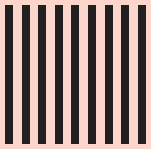
Parental separation
16%

Domestic violence
17%

Mental illness
11%

Alcohol abuse
13%

Drug use
4%



Incarceration
3%

For every 100 adults in St Albans 45 have suffered at least one ACE during their childhood and 9 have suffered 4 or more

0 ACEs 55%

1 ACEs 19%

2-3 ACEs 17%

4+ ACEs 9%

Figures based on population adjusted prevalence in adults aged 18-69 years in St Albans

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In St Albans preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

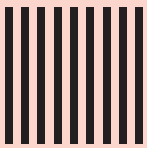
Unintended teen pregnancy
by 44%

Smoking
(current)
by 26%

Binge drinking
(current)
by 21%

Cannabis use
(lifetime)
by 40%

Heroin/crack use
(lifetime)
by 52%



Incarceration
(lifetime)
by 51%

Violence perpetration
(past year)
by 60%

Violence victimisation
(past year)
by 56%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

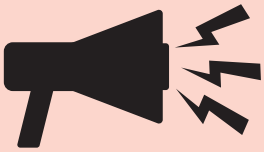
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Stevenage

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Stevenage have suffered each ACE?

CHILD MALTREATMENT

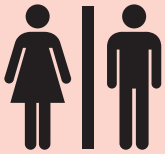


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



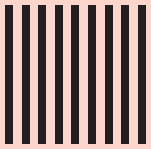
Parental separation
20%

Domestic violence
16%

Mental illness
11%

Alcohol abuse
11%

Drug use
4%



Incarceration
3%

For every 100 adults in Stevenage 46 have suffered at least one ACE during their childhood and 10 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in Stevenage

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Stevenage preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

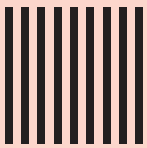
Unintended teen pregnancy
by 44%

Smoking
(current)
by 25%

Binge drinking
(current)
by 22%

Cannabis use
(lifetime)
by 41%

Heroin/crack use
(lifetime)
by 54%



Incarceration
(lifetime)
by 51%

Violence perpetration
(past year)
by 61%

Violence victimisation
(past year)
by 56%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

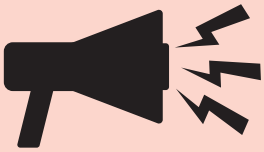
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Three Rivers

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Three Rivers have suffered each ACE?

CHILD MALTREATMENT

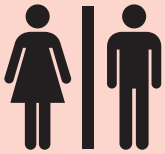


Verbal abuse
24%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



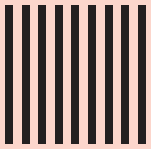
Parental separation
16%

Domestic violence
15%

Mental illness
10%

Alcohol abuse
11%

Drug use
4%



Incarceration
3%

For every 100 adults in Three Rivers 43 have suffered at least one ACE during their childhood and 8 have suffered 4 or more

0 ACEs 57%

1 ACEs 18%

2-3 ACEs 17%

4+ ACEs 8%

Figures based on population adjusted prevalence in adults aged 18-69 years in Three Rivers

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Three Rivers preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 36%

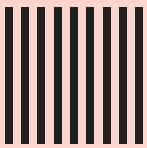
Unintended teen pregnancy
by 43%

Smoking
(current)
by 24%

Binge drinking
(current)
by 20%

Cannabis use
(lifetime)
by 42%

Heroin/crack use
(lifetime)
by 52%



Incarceration
(lifetime)
by 50%

Violence perpetration
(past year)
by 60%

Violence victimisation
(past year)
by 56%

Poor diet
(current; <2 fruit & veg portions daily)
by 13%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

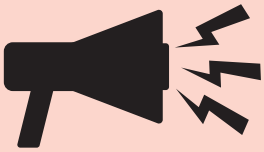
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Watford

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Watford have suffered each ACE?

CHILD MALTREATMENT

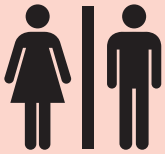


Verbal abuse
20%

Physical abuse
12%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



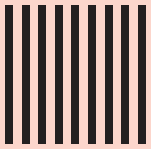
Parental separation
14%

Domestic violence
14%

Mental illness
8%

Alcohol abuse
9%

Drug use
3%



Incarceration
3%

For every 100 adults in Watford 36 have suffered at least one ACE during their childhood and 6 have suffered 4 or more

0 ACEs 64%

1 ACEs 15%

2-3 ACEs 15%

4+ ACEs 6%

Figures based on population adjusted prevalence in adults aged 18-69 years in Watford

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Watford preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 32%

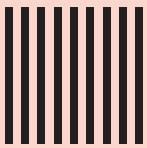
Unintended teen pregnancy
by 39%

Smoking
(current)
by 20%

Binge drinking
(current)
by 18%

Cannabis use
(lifetime)
by 40%

Heroin/crack use
(lifetime)
by 49%



Incarceration
(lifetime)
by 45%

Violence perpetration
(past year)
by 55%

Violence victimisation
(past year)
by 51%

Poor diet
(current; <2 fruit & veg portions daily)
by 17%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

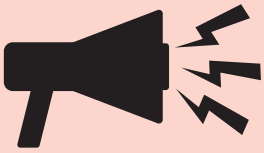
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Wellingborough

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Wellingborough have suffered each ACE?

CHILD MALTREATMENT

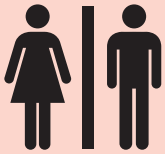


Verbal abuse
23%

Physical abuse
14%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



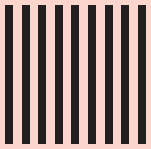
Parental separation
20%

Domestic violence
17%

Mental illness
12%

Alcohol abuse
12%

Drug use
4%



Incarceration
3%

For every 100 adults in Wellingborough 48 have suffered at least one ACE during their childhood and 11 have suffered 4 or more

Figures based on population adjusted prevalence in adults aged 18-69 years in Wellingborough

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Wellingborough preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 37%

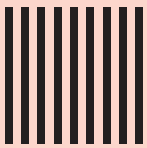
Unintended teen pregnancy
by 45%

Smoking
(current)
by 25%

Binge drinking
(current)
by 23%

Cannabis use
(lifetime)
by 44%

Heroin/crack use
(lifetime)
by 55%



Incarceration
(lifetime)
by 52%

Violence perpetration
(past year)
by 62%

Violence victimisation
(past year)
by 58%

Poor diet
(current; <2 fruit & veg portions daily)
by 14%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

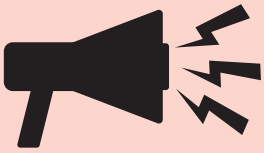
Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

Adverse Childhood Experiences (ACEs) in Welwyn Hatfield

ACEs are stressful events occurring during childhood that directly affect a child (e.g. child maltreatment) or affect the environment in which they live (e.g. growing up in a house where there is domestic violence)

How many adults in Welwyn Hatfield have suffered each ACE?

CHILD MALTREATMENT

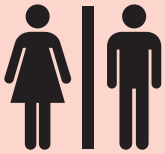


Verbal abuse
22%

Physical abuse
12%

Sexual abuse
6%

CHILDHOOD HOUSEHOLD INCLUDED



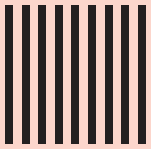
Parental separation
17%

Domestic violence
16%

Mental illness
11%

Alcohol abuse
10%

Drug use
4%



Incarceration
3%

For every 100 adults in Welwyn Hatfield 43 have suffered at least one ACE during their childhood and 9 have suffered 4 or more

0 ACEs 57%

1 ACEs 18%

2-3 ACEs 16%

4+ ACEs 9%

Figures based on population adjusted prevalence in adults aged 18-69 years in Welwyn Hatfield

ACEs increase individuals' risks of developing health-harming behaviours

Compared with people with no ACEs, those with 4+ ACEs are*:

- **2** times more likely to currently binge drink or have a poor diet
- **3** times more likely to be a current smoker
- **4** times more likely to have had sex while under 16 years old or to have smoked cannabis
- **4** times more likely to have had or caused unintended teenage pregnancy
- **8** times more likely to have been a victim of violence in the last year or ever been incarcerated
- **10** times more likely to have been a perpetrator of violence in the last year

In Welwyn Hatfield preventing ACEs in future generations could reduce levels of:

Early sex
(before age 16)
by 34%

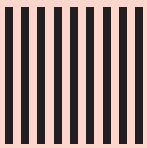
Unintended teen pregnancy
by 42%

Smoking
(current)
by 23%

Binge drinking
(current)
by 21%

Cannabis use
(lifetime)
by 40%

Heroin/crack use
(lifetime)
by 53%



Incarceration
(lifetime)
by 49%

Violence perpetration
(past year)
by 58%

Violence victimisation
(past year)
by 53%

Poor diet
(current; <2 fruit & veg portions daily)
by 12%

*These figures relate to the full study sample.

The Northamptonshire, Hertfordshire and Luton ACE study interviewed nearly 5,500 residents (aged 18-69) in 2015. Around six in ten people asked to participate agreed to do so and we are grateful to all those who freely gave up their time. A report presenting the full methodology and results is available at www.cph.org.uk: Ford K, Butler N, Hughes K, Quigg Z, Bellis M. (2016) Adverse Childhood Experiences (ACEs) in Northamptonshire, Hertfordshire and Luton. Liverpool: Centre for Public Health.

We would like to acknowledge the following contributors to this research: Public Health England, Luton Borough Council, Hertfordshire County Council and Northamptonshire County Council. April 2016.

Centre for Public Health, Faculty of Education, Health and Community, Liverpool John Moores University,
Henry Cotton Campus, 15-21 Webster Street,
Liverpool, L3 2ET | 0151 231 4542 | www.cph.org.uk

CPH | CENTRE FOR PUBLIC HEALTH
LIVERPOOL JOHN MOORES UNIVERSITY

LIVERPOOL JOHN MOORES UNIVERSITY

1
Centre for Public Health,
Faculty of Education, Health and Community,
Liverpool John Moores University,
Henry Cotton Building,
15-21 Webster Street,
Liverpool,
L3 2ET

www.cph.org.uk

2
Public Health Wales,
Hadyn Ellis Building,
Maindy Road,
Cathays,
Cardiff,
CF24 4HQ

Hertfordshire

LUTON BOROUGH COUNCIL

Northamptonshire County Council

Public Health England