GIG CYMRU NHS WALES | Iechyd Cyhoeddus Cymru Public Health Wales

Welsh Adverse Childhood Experiences (ACE) Study

Adverse Childhood Experiences

and their impact on health-harming behaviours in the Welsh adult population

ALCOHOL USE, DRUG USE, VIOLENCE, SEXUAL BEHAVIOUR, INCARCERATION, SMOKING AND POOR DIET

Preface

This is one in a series of reports examining the prevalence of Adverse Childhood Experiences (ACEs) in the Welsh adult population and their impact on health and well-being across the life course. The series will include reports on:

- The prevalence of Adverse Childhood Experiences and their association with health-harming behaviours in the Welsh adult population.
- The impact of Adverse Childhood Experiences on chronic ill health, use of health and social care services and premature mortality in Welsh adults.
- The impact of Adverse Childhood Experiences on mental well-being in Welsh adults.

Over 2,000 adults aged 18-69 years participated in the ACE Study for Wales, providing anonymous information on their exposure to ACEs before the age of 18 years and their health and lifestyles as adults. The study achieved a compliance rate of 49.1% and the sample was designed to be representative of the general population in Wales. Data were collected in participants' places of residence using an established questionnaire incorporating the short ACE tool developed by the US Centers for Disease Control and Prevention and based on work by Felitti et al (1998) [1].

ISBN 978-1-910768-23-5

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Adverse Childhood Experiences

and their impact on health-harming behaviours in the Welsh adult population

Alcohol Use, Drug Use, Violence, Sexual Behaviour, Incarceration, Smoking and Poor Diet

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Foreword

Adverse Childhood Experiences (ACEs) are an increasing international concern. There is a growing body of evidence that our experiences during childhood can affect health throughout the life course. Children who experience stressful and poor quality childhoods are more likely to adopt health-harming behaviours during adolescence which can themselves lead to mental health illnesses and diseases such as cancer, heart disease and diabetes later in life. Adverse Childhood Experiences are not just a concern for health. Experiencing ACEs means individuals are more likely to perform poorly in school, more likely to be involved in crime and ultimately less likely to be a productive member of society.

People who experience ACEs as children often end up trying to raise their own children in households where ACEs are more common. Such a cycle of childhood adversity can lock successive generations of families into poor health and anti-social behaviour for generations. Equally however, preventing ACEs in a single generation or reducing their impacts can benefit not only those children but also future generations in Wales. That is why Public Health Wales is leading a collaboration to improve early life experiences across Wales. The United in Improving Health initiative pulls together health, social, local authority, criminal justice, educational and other sectors to fully utilise the expertise and assets we have in Wales to improve the health of the Welsh population. We believe our United in Improving Health initiative and its focus on the first two years of life will be better informed by a deeper understanding of childhood adversity in Wales and therefore we welcome this first national report on ACEs. We hope that all those with an interest in improving the health, educational, social and economic prospects for Wales take note of what it tells us about the long reach of childhood experiences and that all organisations identify the steps they can take to give every child in Wales the best start in life.

Dr Tracey Cooper
Chief Executive
Public Health Wales

Professor Sir Mansel Aylward
Chair
Public Health Wales

Executive Summary

An increasing body of research identifies the long-term harms that can result from chronic stress on individuals during childhood. Such stress arises from the abuse and neglect of children but also from growing up in households where children are routinely exposed to issues such as domestic violence or individuals with alcohol and other substance use problems.

Collectively such childhood stressors are called ACEs (Adverse Childhood Experiences). Exposure to ACEs can alter how children's brains develop as well as changing the development of their immunological and hormonal systems. Subsequently, those with greater exposure to ACEs are more likely to go on to develop health-harming and anti-social behaviours, often during adolescence, such as binge drinking, smoking and drug use. Ultimately, such poor health and social behaviour means individuals progress more rapidly to develop diseases such as diabetes, cancer, cardiovascular disease and mental illness.

Preventing ACEs can improve health across the whole life course, enhancing individuals' well-being and productivity while reducing pressures and costs on the National Health Service (NHS). Those experiencing more ACEs are also more likely to be involved in violence and other anti-social behaviour and perform more poorly in schools. Thus, health, social, criminal justice and educational systems are all likely to see better results for the Welsh population if ACEs are prevented.

Tackling ACEs in Wales relies on having intelligence on how many individuals are exposed to ACEs, the characteristics of those most at risk and the consequences across the life course. Consequently, in 2015, Public Health Wales in collaboration with Liverpool John Moores University undertook the first ACE study for Wales which consisted of a national cross-sectional survey of adults residential in Wales. With an overall sample size of 2,028, Welsh adults were asked about their current health behaviours and their exposure to ACEs using an internationally validated ACE questionnaire. Initial analysis of the study has focused on identifying how health-harming behaviours (for example, drug use and binge drinking) are linked with experiencing ACEs during childhood. Full details of the methodology and results are contained in this report and a summary of the findings is presented as an info-graphic.

This first Welsh ACE survey identifies that substantial proportions of the Welsh population suffered abuse, neglect and other ACEs during their childhood with 47% reporting having experienced at least one ACE and 14% experiencing four or more ACEs. However, the report also outlines a substantive range of policies and programmes that have now been implemented in Wales to both prevent ACEs and identify and intervene where children are already experiencing such stressors.

Findings show that ACEs have a major impact on the development of health-harming behaviours in Wales and the prevention of ACEs is likely not only to improve the early years experiences of children born in Wales but also reduce levels of health-harming behaviours such as problem alcohol use, smoking, poor diets and violent behaviour. Further reports from this survey will detail how ACEs in Wales are associated with chronic ill health in later life such as the development of cancer, heart disease, diabetes and ultimately premature death.

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Adverse Childhood Experiences (ACEs) in Wales

ACEs are stressful experiences occurring during childhood that directly harm a child (e.g. sexual or physical abuse) or affect the environment in which they live (e.g. growing up in a house with domestic violence).

How many adults in Wales have been exposed to each ACE?

CHILD MALTREATMENT

Verbal abuse 23%

Physical abuse 17%

Sexual abuse 10%

CHILDHOOD HOUSEHOLD INCLUDED

Parental separation 20%

Domestic violence 16%

Mental illness 14%

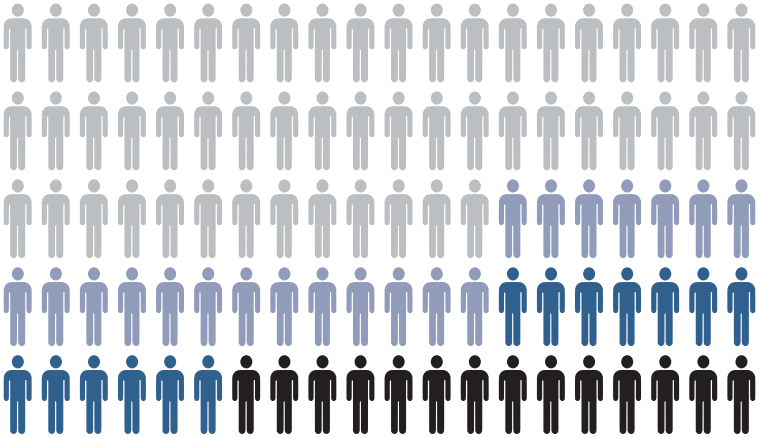
Alcohol abuse 14%

Drug use 5%

Incarceration 5%

For every 100 adults in Wales 47 have suffered at least one ACE during their childhood and 14 have suffered 4 or more.

0 ACEs	53%
1 ACE	20%
2-3 ACEs	13%
4+ ACEs	14%



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

ACEs increase individuals' risks of developing health-harming behaviours

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

- **4 times more likely** to be a high-risk drinker
- **6 times more likely** to have had or caused unintended teenage pregnancy
- **6 times more likely** to smoke e-cigarettes or tobacco
- **6 times more likely** to have had sex under the age of 16 years
- **11 times more likely** to have smoked cannabis
- **14 times more likely** to have been a victim of violence over the last 12 months
- **15 times more likely** to have committed violence against another person in the last 12 months
- **16 times more likely** to have used crack cocaine or heroin
- **20 times more likely** to have been incarcerated at any point in their lifetime

Preventing ACEs in future generations could reduce levels of:

Heroin/crack cocaine use (lifetime) **by 66%**

Incarceration (lifetime) **by 65%**

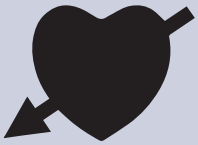
Violence perpetration (past year) **by 60%**

Violence victimisation (past year) **by 57%**

Cannabis use (lifetime) **by 42%**

Unintended teen pregnancy by 41%

High-risk drinking (current) **by 35%**



Early sex (before age 16) **by 31%**

Smoking tobacco or e-cigarettes (current) **by 24%**

Poor diet (current; <2 fruit & veg portions daily) **by 16%**

The national survey of Adverse Childhood Experiences in Wales interviewed approximately 2000 people (aged 18-69 years) from across Wales at their homes in 2015. Of those eligible to participate, just under half agreed to take part and we are grateful to all those who freely gave their time.

Introduction

Adverse Childhood Experiences

Globally there is an increasing body of evidence examining how experiences during childhood have long-term impacts on our health [1-2]. Chronic stressful experiences in childhood, termed in this study Adverse Childhood Experiences (ACEs), can set individuals on a health-harming life course; increasing their risks of adopting health-harming behaviours such as smoking, problem drinking, poor diet, low levels of exercise and risky sexual behaviour [2-3]. In turn, such behaviours can lead to premature ill health through increasing risks of non-communicable diseases such as diabetes, heart disease and cancers [1, 3, 4]. The same chronic stressors in early childhood can also lead to individuals developing anti-social behaviours, including a propensity for aggressive and violent behaviour and ultimately problems with criminal justice services [5]. Individuals' engagement in education, their ability to gain qualifications and ultimately their contribution to the economy can all be affected by the combination of anti-social behaviour, difficulties with social adjustment and ill health [3,6]. Consequently, understanding the prevalence and impact of ACEs across Wales and how they can inform prevention strategies is in the interest of health, education and criminal justice agencies as well as to the long-term economic benefit of the country.

What are ACEs?

ACEs are stressful experiences occurring during childhood that directly hurt a child (e.g. maltreatment) or affect them through the environment in which they live (e.g. growing up in a house with domestic violence). ACEs can continue to harm the health of children throughout their life. A full list of ACEs used in the Welsh ACE study is outlined in Table 1.

How ACEs can affect children and change their life course

ACEs are known to have direct and immediate effects on a child's health through, for instance, physical injury to a child who is abused [7]. However, recent evidence demonstrates that chronic traumatic stress in early life alters how a child's brain develops and can fundamentally alter nervous, hormonal and immunological system development [8-10]. This can result in individuals whose systems are 'locked' into a higher state of alertness; permanently prepared for further trauma. Such physiological changes increase the wear and tear (allostatic load) on their body; increasing risks of premature ill health such as cancer, heart disease and mental illness [1-2; see Figure 1]. During school years, the same individuals may display a heightened emotional state of anxiety (ready to fight or always prepared to run away) and consequently be distracted from educational pursuits, resulting in poor educational attainments [11]. Children raised in environments where violence, assault and abuse are common are more likely to develop such traits themselves as these behaviours are seen as normal (i.e. normalised); leaving them more likely to both commit violent acts and/or be the victim of such acts in adulthood. Furthermore, the psychological problems associated with exposure to ACEs can leave individuals with feelings of low self-worth and a propensity for behaviours offering short-term relief at the expense of longer-term health. This combination leaves affected individuals prone to adopting harmful behaviours such as smoking, harmful alcohol consumption, poor diets and even early sexual activity [12].

The strong associations between exposure to ACEs and vulnerability to harms including substance use, unintended teenage pregnancy, violence, mental illness and physical health problems, mean the children of those affected by ACEs are at increased risk of exposing their own children to ACEs [13]. This is often referred to as the 'cycle of violence' [14]. Consequently, preventing ACEs in a single generation or reducing their impact on children can benefit not only those individuals but also future generations across Wales.

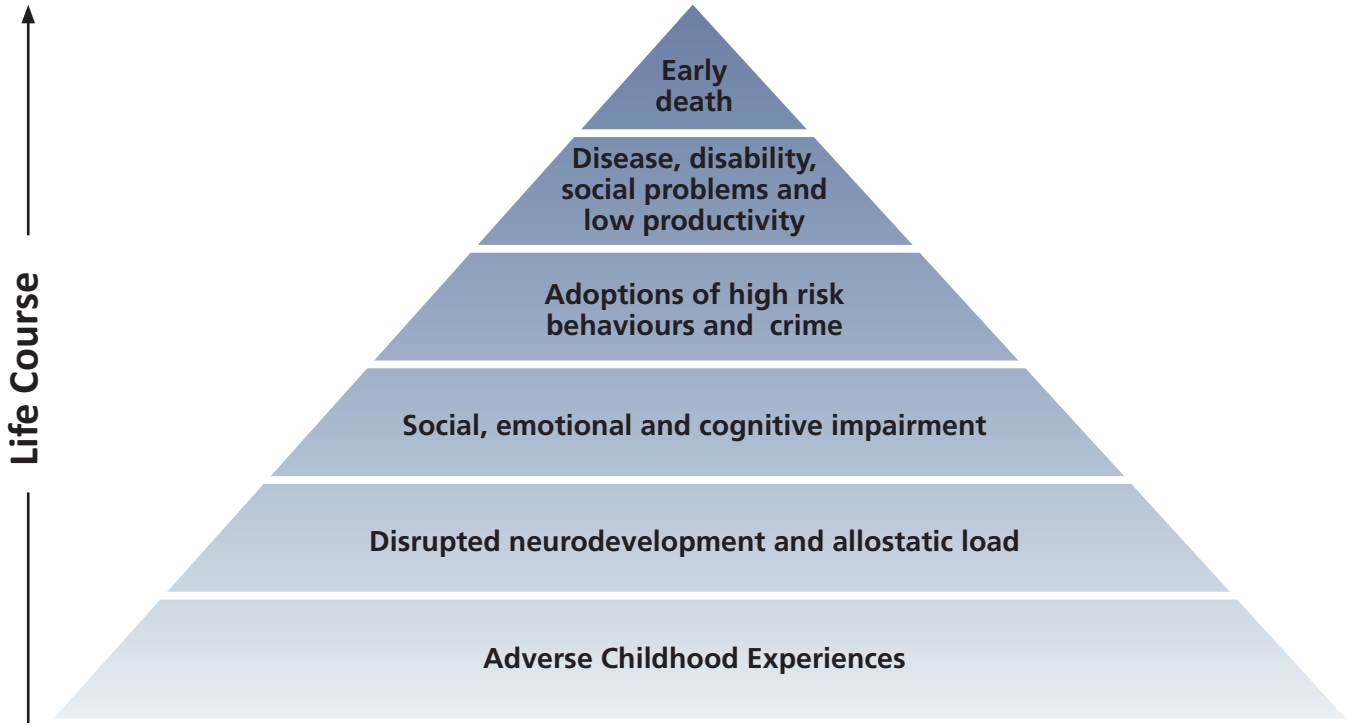


Figure 1: Model of ACE impacts across the life course[1]

ACE Survey for Wales

In 2015, Public Health Wales undertook the first Welsh ACE survey to help inform its future actions and that of other health and well-being stakeholders in Wales.

Survey objectives

The ACE survey for Wales study had the following objectives:

- To investigate the prevalence of ACEs during the first 18 years of life in order to provide a baseline measure of the prevalence of ACEs in Wales.
- To investigate the association between ACEs and health-harming behaviours, healthcare utilisation and non-communicable diseases.
- To estimate the potential impact of preventing ACEs on subsequent changes in ill health, anti-social behaviour, crime and economic activity in the Welsh population.
- To ensure we understand which communities and population groups in Wales are most affected by ACEs so that existing investments in child and parent support across Wales can be effectively directed.
- To help inform a multi-agency response to ACEs which includes a focus on both the prevention of ACEs and the appropriate service response (health, social, criminal justice and educational) to those already affected by ACEs.

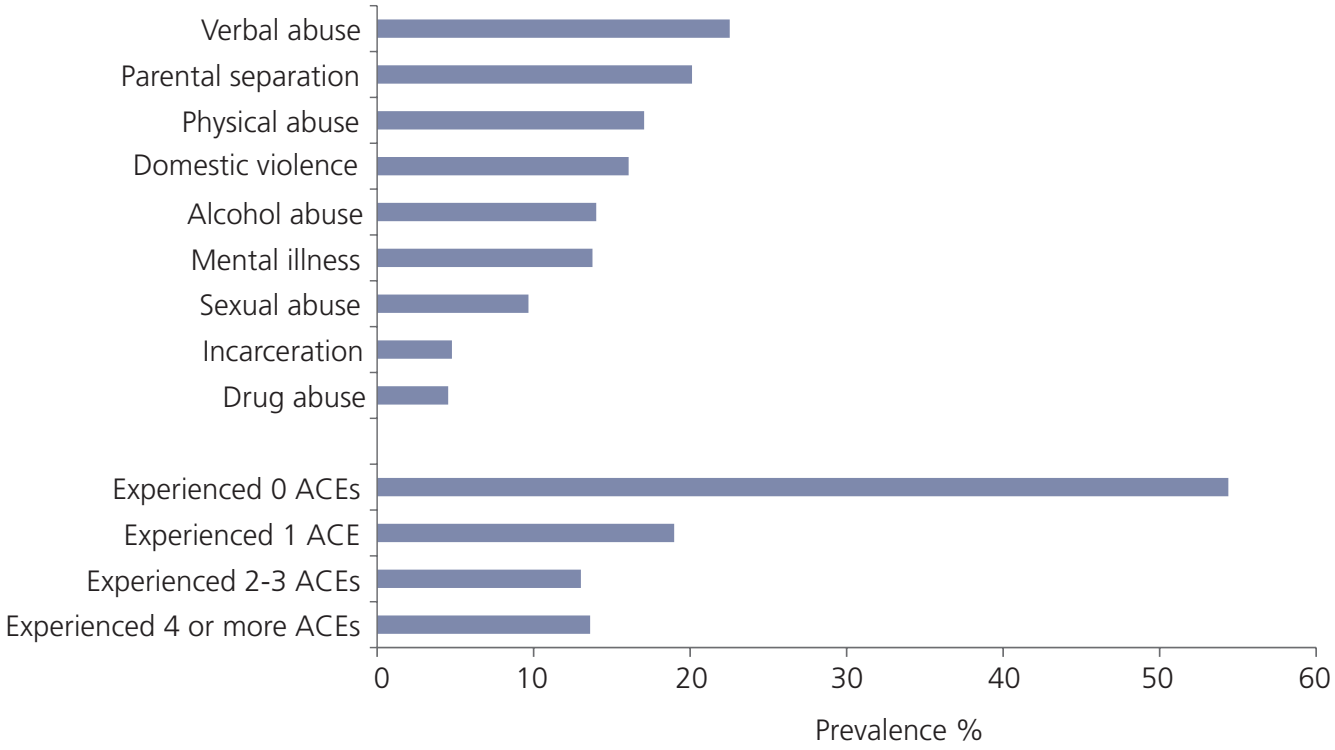
Details of the methodology used to undertake the Welsh ACE Survey are outlined in Appendix 1. All reported differences were found to be statistically significant, unless otherwise stated (see Appendix 2 for all data tables).

1 Based on the US Centers for Disease Control and Prevention 'ACE Pyramid': http://www.cdc.gov/violenceprevention/acestudy

Prevalence of Adverse Childhood Experiences in Wales

Just under half of all individuals surveyed had experienced at least one ACE before the age of 18 years (46.5%). 13.6% had experienced four or more ACEs. The prevalence of individual ACEs ranged from 4.6% of respondents reporting living with a drug-using household member during their childhood, to 22.8% experiencing more than one episode of verbal abuse as a child[2] (see Figure 2 and Appendix 2 Table i).

Figure 2: Prevalence of the number of ACEs and individual ACEs experienced



2 Estimates have been adjusted to mid-2013 national population estimates.

Table 1: ACEs included in the study

All ACE questions were preceded by the statement 'While you were growing up, before the age of 18...' Responses listed are those categorised as an ACE.

ACE	Question	Qualifying response[3]
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[4]	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

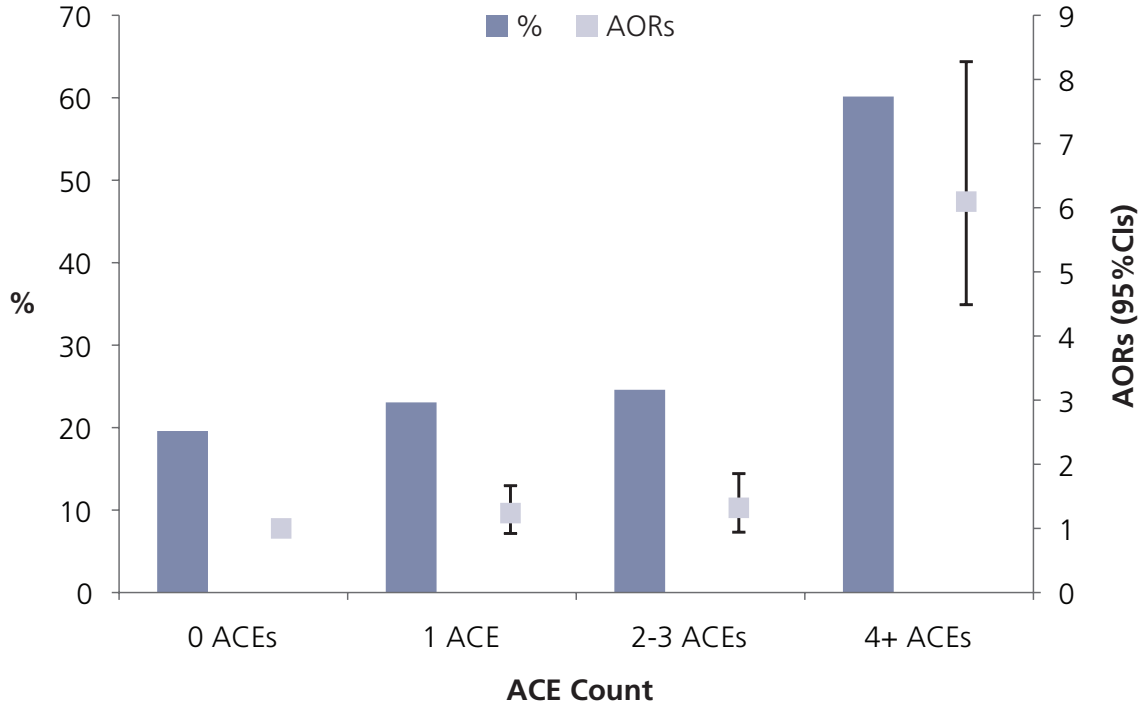
3 Qualifying response is the level of abuse, neglect or family problem recorded as an ACE. Levels are based on ACE studies undertaken elsewhere [3, 15].

4 The specific act of divorce or parental separation can be either harmful or beneficial to the child but in ACE studies divorce or parental separation is often used as a marker of substantive, often long-term conflict between parents.

Smoking Tobacco or E-Cigarettes

Smoking tobacco or e-cigarettes was defined as individuals who stated that they currently smoked either.

Figure 3: Currently Smoking Tobacco or E-Cigarettes: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with smoking tobacco or e-cigarettes

Overall 26.5% of individuals participating in the ACE survey were either currently smoking tobacco or using e-cigarettes. However, the prevalence of smoking tobacco or e-cigarette use increased with ACE count, rising from 19.6% of respondents with no ACEs to more than half (60.2%) of those reporting four or more ACEs (see Figure 3, Appendix 2 Table iii). The relationship between smoking tobacco or e-cigarettes and exposure to ACEs remained significant after accounting for the effects of age, sex, ethnicity and deprivation. Thus, the odds (after adjustment for demographics) of being a current smoker or e-cigarette user were 6.1 times higher in those with four or more ACEs compared to those with none (see Figure 3). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of smoking and e-cigarette use by adults could be as much as 24% lower. This would be equivalent to having approximately 126,937 fewer smokers or e-cigarette users across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

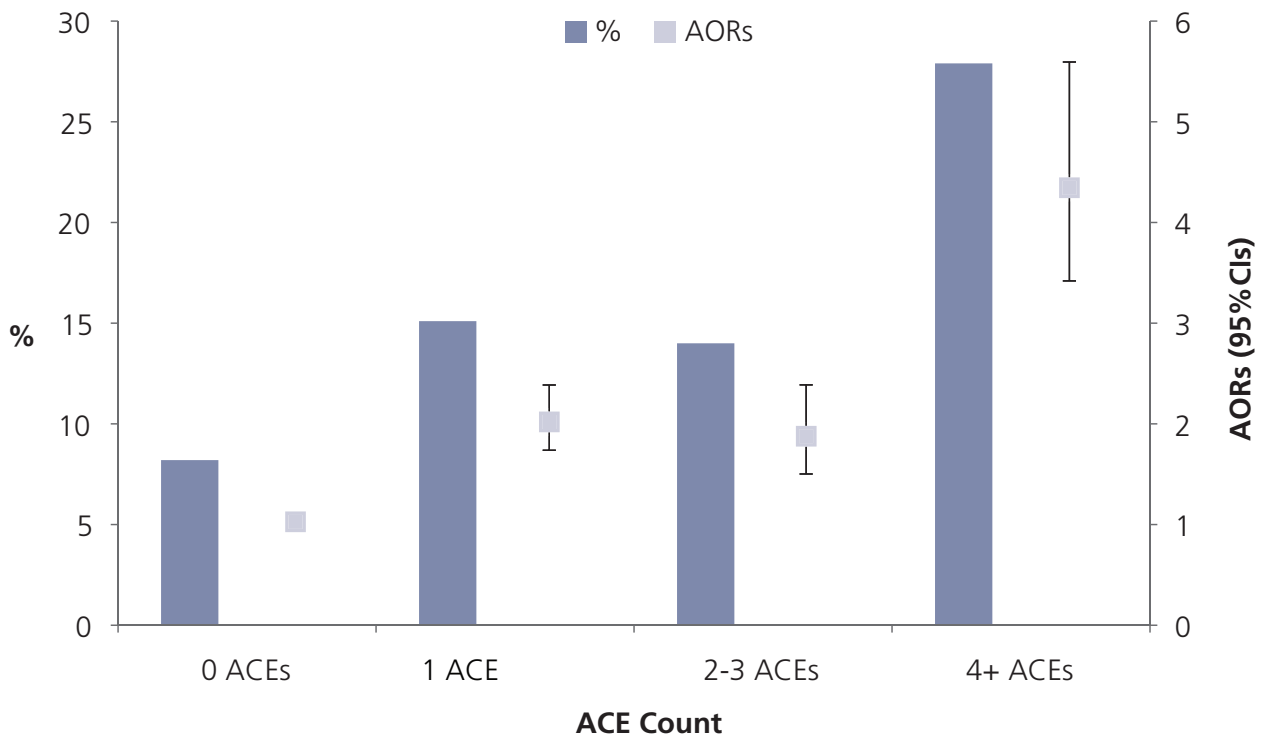
Other demographics

Prevalence of smoking either e-cigarettes or tobacco was significantly higher for males (32.1%, males; 20.8%, females), respondents in younger age groups (36.4%, 18-29 years; 13.6%, 60-69 years), those within the most deprived fifth of Wales (37.2% compared to 21.3% in the least deprived fifth) and those of white ethnicity (26.9%, white; 12.1%, other ethnicities; see Appendix 2 Table ii). After accounting for the relationships between socio-demographic variables and ACEs, the prevalence of currently smoking tobacco or e-cigarettes remained significantly higher amongst: males, 18-29 year olds, those of a white ethnicity and those living in the most deprived areas in Wales.

Alcohol Use – High-Risk Drinking

High-risk drinking was calculated using the Alcohol Use Disorder Identification Test (AUDIT-C)[5]. Individuals with a score of eight or over were classified as high-risk drinkers.

Figure 4: High-Risk Drinking: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with high-risk drinking

In total, 12.9% of respondents were classified as high-risk drinkers. The prevalence of high-risk drinking increased with ACEs, with 8.2% of those who had indicated no exposure to ACEs reporting this behaviour compared to 27.9% of individuals who had experienced four or more ACEs (see Appendix 2 Table iii). After adjustment for socio-demographics, the relationships remained with the odds of participating in high-risk drinking increasing with the number of ACEs experienced; those experiencing four or more ACEs were 4.4 times more likely to be a high-risk drinker than those with none (see Figure 4). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of high-risk drinking by adults could be as much as 34.8% lower. This would be equivalent to having approximately 89,004 fewer high-risk drinkers across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

Other demographics

There was a significantly higher prevalence of high-risk drinking amongst males (19.8%, males; 6.2% females). Consistent with Welsh statistics[6], high-risk drinking was more prevalent, but not limited to younger age groups (18.7%, 18-29 years old; 5.4%, 60-69 year olds; see Appendix 2 Table ii). The most deprived areas in Wales had the highest prevalence of high-risk drinking with 15.7% recorded in the most deprived fifth compared to 9.6% in the least deprived fifth (see Appendix 2 Table ii). These relationships remained significant after accounting for the relationships between socio-demographic variables and ACE count.

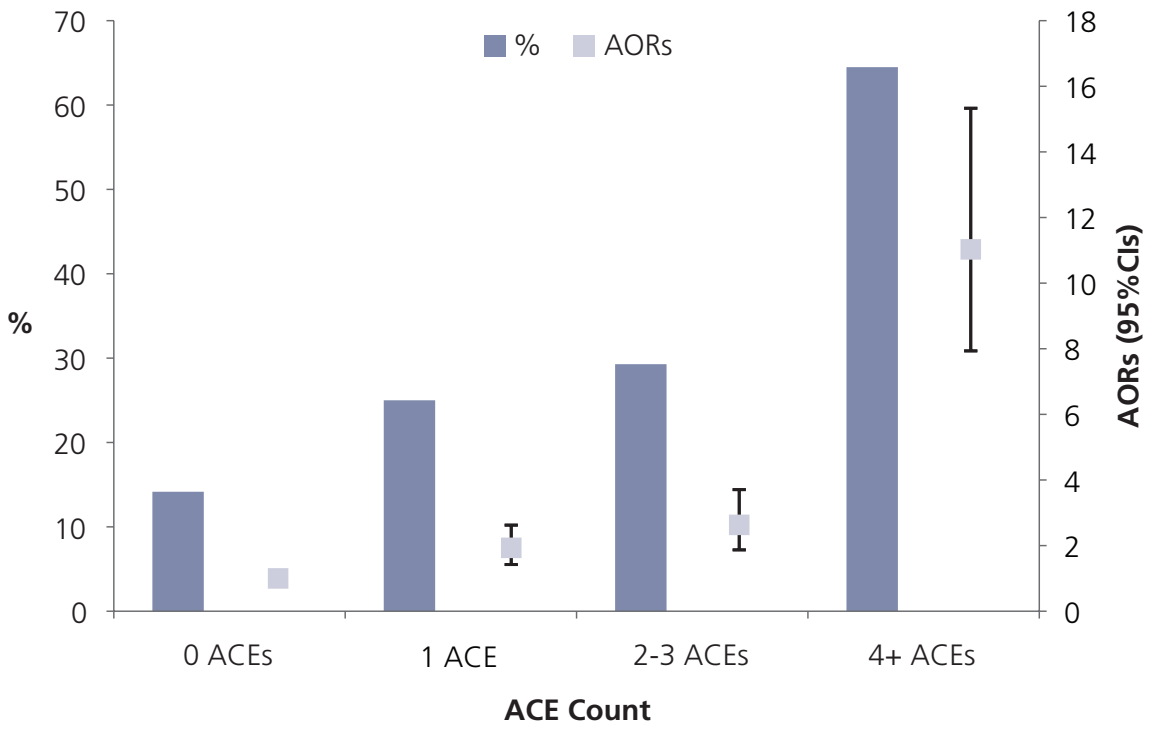
5 AUDIT-C is the Alcohol Use Disorder Identification Test Consumption which creates an overall measure of risk associated with alcohol consumption by combining measures of drinking levels, dependence and harms. More information on AUDIT-C can be found at: http://www.alcohollearningcentre.org.uk/Topics/Browse/BriefAdvice/?parent=4444&child=4898

6 Welsh Government (2015) Welsh Health Survey http://gov.wales/statistics-and-research/welsh-health-survey/?lang=en

Cannabis Use

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

Figure 5: Cannabis Use: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with cannabis use

A quarter of respondents reported that they had used cannabis at some point in their lives. However, the prevalence of cannabis use increased with ACE count, rising from 14.2% of those reporting no ACEs to 64.5% of those with four or more ACEs (see Appendix 2 Table iii). This relationship remained after accounting for the effects of sex, age, ethnicity and level of deprivation; odds of individuals using cannabis being 11.0 times more likely for those who had been exposed to four or more ACEs compared to none (see Figure 5). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of adults who have ever smoked cannabis could be as much as 41.6% lower. This would be equivalent to approximately 205,804 fewer individuals ever having used cannabis across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

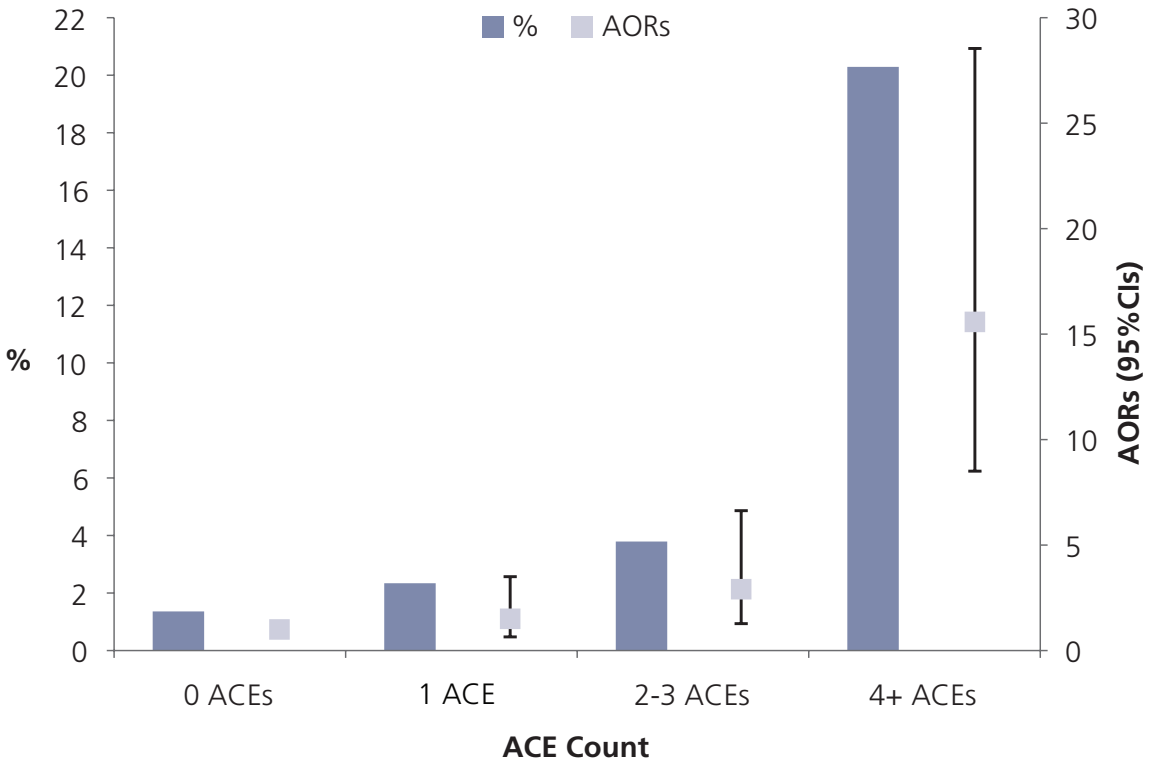
Other demographics

Males were significantly more likely to record cannabis use (31.5%, males; 18.7%, females). Cannabis use was more prevalent but not limited to younger age groups with only 5.1% of 60-69 year olds disclosing previous cannabis use, compared to two in five (40.5%) of 18-29 year olds (see Appendix 2 Table ii). After accounting for the relationships between socio-demographic variables and ACE count, relationships with gender remained.

Heroin or Crack Cocaine Use

A respondent was defined as having used heroin or crack cocaine if they reported having used either of these drugs at any point during their lifetime.

Figure 6: Heroin or Crack Cocaine Use: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with heroin or crack cocaine use

In total, 4.4% of respondents reported having used crack cocaine or heroin at some point in their lives. However, the prevalence of heroin or crack cocaine use increased with ACE count, rising from 1.4% of those with no ACEs to 20.3% of those with four or more ACEs (see Appendix 2 Table iii). This relationship remained the same after accounting for the effects of age, sex, ethnicity and deprivation. The odds of respondents who had experienced four or more ACEs of participating in heroin or crack cocaine use were 15.6 times higher than those who had experienced none (see Figure 6). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of adults who have ever used heroin or crack cocaine could be as much as 66.3% lower. This would be equivalent to having approximately 57,788 fewer individuals who have ever used heroin or crack cocaine across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

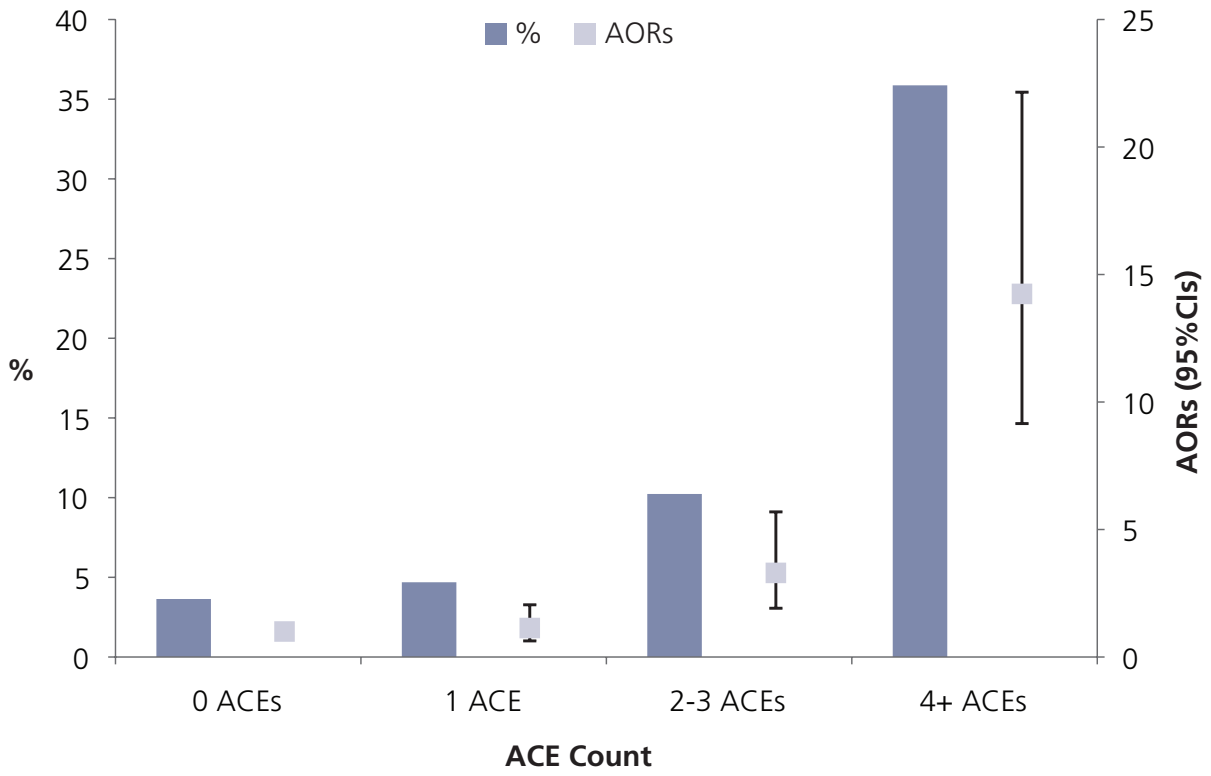
Other demographics

A higher prevalence of crack cocaine or heroin use was recorded amongst males (7.0%, males; 1.9%, females). Ever having used heroin or crack cocaine was more prevalent in the youngest age groups compared to all other age groups (7.9%, 18-29 years; 0.7%, 60-69 years; see Appendix 2 Table ii). This pattern remained the same after accounting for the confounding effects of ACE count, demographics and deprivation.

Violence Victimisation

Violence victimisation accounts for anyone who reported they had been physically hit by anyone in the last 12 months.

Figure 7: Violence Victimisation: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with levels of violence victimisation

Overall in this survey, the prevalence of violence victimisation amongst respondents was 9.1%. However, the prevalence of being a victim of violence was over nine times higher in participants who had recorded an ACE count of four or more than those who had been exposed to no ACEs (35.9%, four or more ACEs; 3.6%, no ACEs; see Appendix 2 Table iii). Further analysis accounting for the confounding factors of age, ethnicity, sex and deprivation resulted in the same relationships, with individuals exposed to four or more ACEs being 14.2 times more likely to have been victims of violence over the last 12 months than individuals exposed to no ACEs (see Figure 7). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of individuals experiencing violence victimisation could be as much as 56.9% lower. This would be equivalent to approximately 97,000 fewer individuals having been a victim of violence in the last 12 months across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

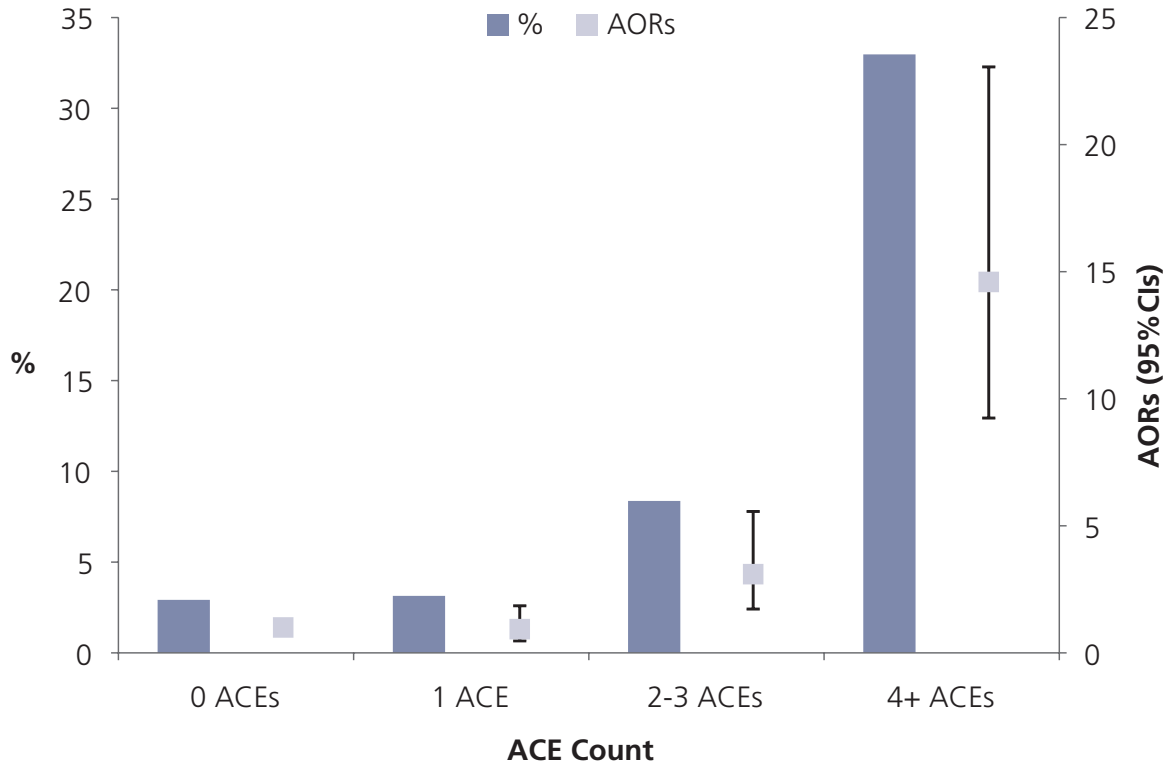
Other demographics

Higher rates of violence victimisation were recorded for males (13.7%, males; 4.5% females) and almost one fifth of 18-29 year olds (18.8%) disclosed that they had been victims of violence over the last 12 months. The prevalence significantly decreased with older age, with the lowest prevalence observed in the group aged 60-69 years at only 1.0%. Over a tenth of individuals (11.7%) living in the most deprived fifth in Wales experienced violence victimisation compared with 7.7% in the least deprived fifth (see Appendix 2 Table ii). After accounting for the confounding effects of socio-demographic variables and ACE count, the relationships between violence victimisation and both age groups and gender remained.

Violence Perpetration

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

Figure 8: Violence Perpetration: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with levels of violence perpetration

Overall, 7.8% of respondents stated that they had hit another individual in last 12 months. However, the prevalence rises by ACE count with 2.9% of those who had been exposed to no ACEs reporting violence perpetration compared to 33.0% of all adults who had been exposed to four or more ACEs (see Appendix 2 Table iii). Even after accounting for confounding socio-demographic variables, the prevalence of violence perpetration and exposure to ACEs remains highly related. The odds (after adjustment for demographics) of perpetrating violence were 14.6 times higher in those with four or more ACEs compared to those who had experienced none (see Figure 8). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of individuals committing violence could be as much as 59.5% lower. This would be equivalent to approximately 90,253 fewer individuals committing violence perpetration in the past 12 months across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

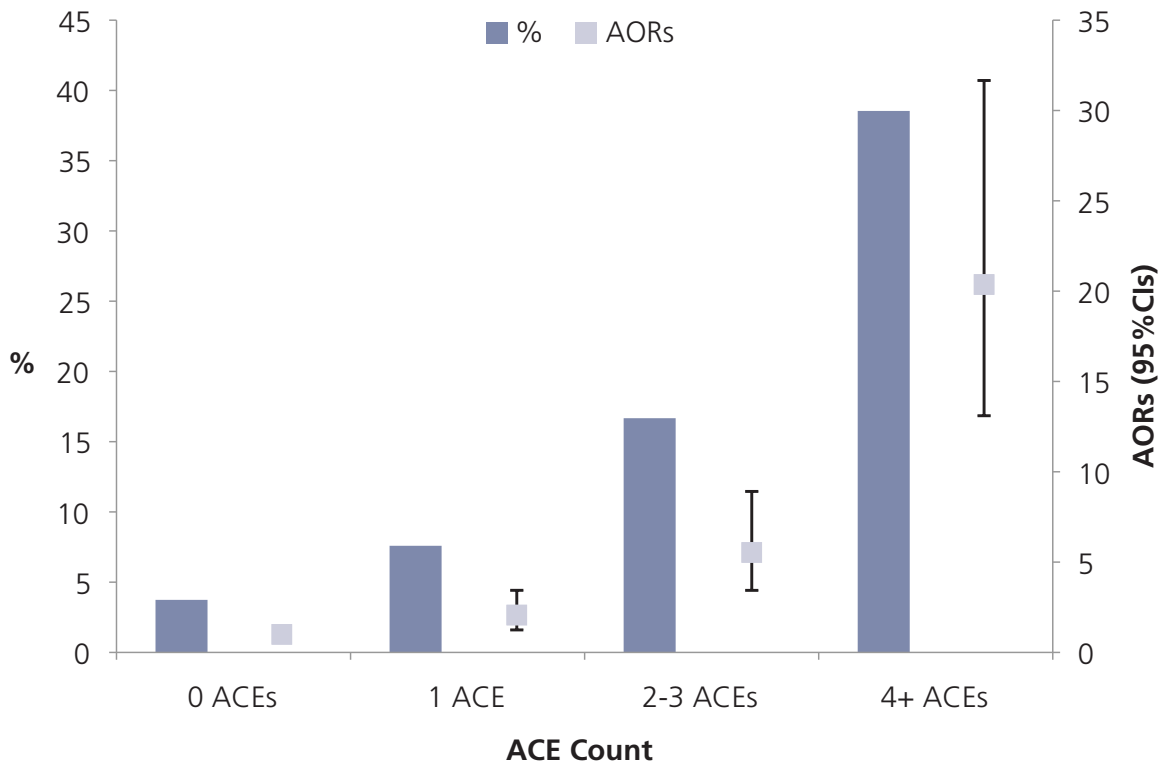
Other demographics

The prevalence of violence perpetration reported by males was significantly higher than females (11.6%, males; 4.0% females). In total, 14.3% of 18-29 year olds reported violence perpetration which was significantly higher than any other age group, with only 1.7% of 60-69 year olds reporting violence perpetration in the last 12 months (see Appendix 2 Table ii). After accounting for socio-demographics and ACE count, these relationships remained the same.

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 9: Incarceration: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with incarceration

In total, 10.1% of the sample disclosed that they had been incarcerated at some stage in their lives. However, there was a considerable difference between the proportion of individuals who had been exposed to no ACEs and those who had experienced four or more (3.7%, no ACEs; 38.5%, four or more ACEs; see Appendix 2 Table iii). A strong positive relationship was identified between ACE count and risk of incarceration which remained significant after accounting for socio-demographics. The odds of having been incarcerated were 20.4 times higher for those who had experienced four or more ACEs compared to individuals who had experienced none (see Figure 9). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of incarceration amongst Welsh adults could be as much as 64.6% lower. This would be equivalent to approximately 138,054 fewer individuals having ever been incarcerated across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

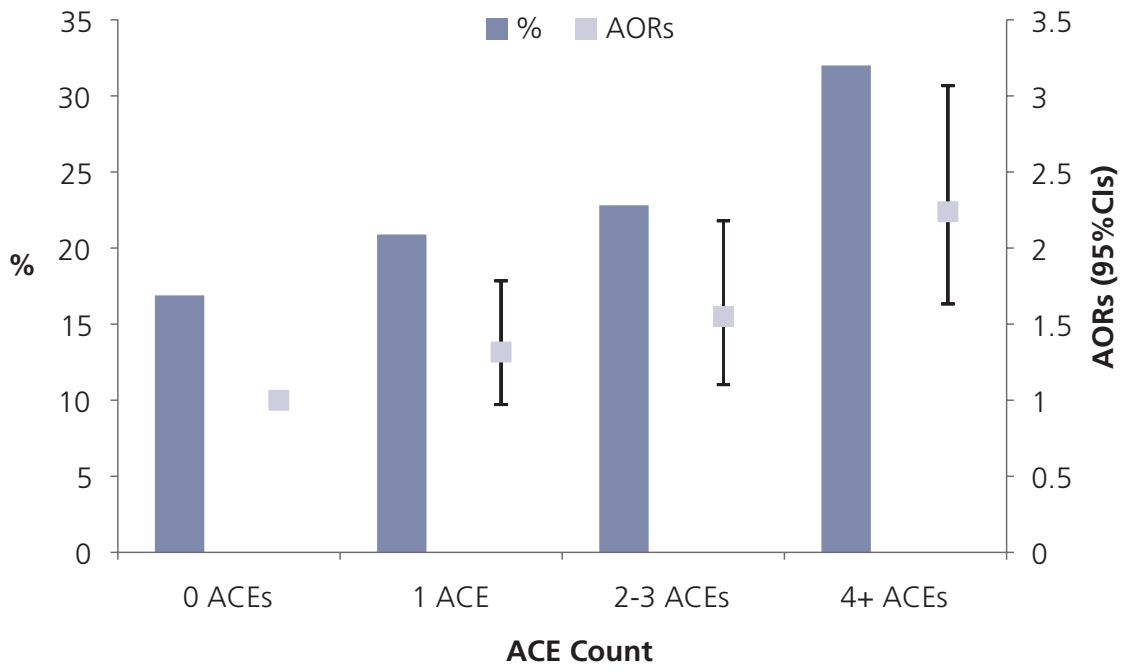
Other demographics

Just over four times as many males as females reported being incarcerated (17.6%, males; 4.3%, females) and incarceration was most prevalent in individuals aged 18-29 (14.6%; see Appendix 2 Table ii). There were significantly higher rates of incarceration from those resident in the most deprived areas of Wales compared to the least deprived (15.7%, most deprived fifth; 8.7% least deprived fifth). The above relationship remained after accounting for the confounding effects of socio-demographics and ACE count.

Poor Diet

Respondents were asked how many portions of fruit and vegetables (excluding potatoes) they would eat on a normal day. Using this data, poor diet was defined as those individuals who reported that they ate less than two portions a day.

Figure 10: Poor Diet: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with poor diet

One fifth of respondents (20.5%) reported eating less than two portions of fruit or vegetables on a normal day. However, an increasing prevalence of poor diet was reported as the number of ACEs experienced increased (16.9%, no ACEs; 32.0%, four or more ACEs; see Appendix 2 Table iii). This relationship remained after accounting for socio-demographic factors, with the odds of having a poor diet being 2.2 times higher for those who had experienced four or more ACEs compared to individuals who had experienced none (see Figure 10). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of poor diet could be as much as 16.3% lower. This would be equivalent to approximately 64,872 fewer individuals having a poor diet across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

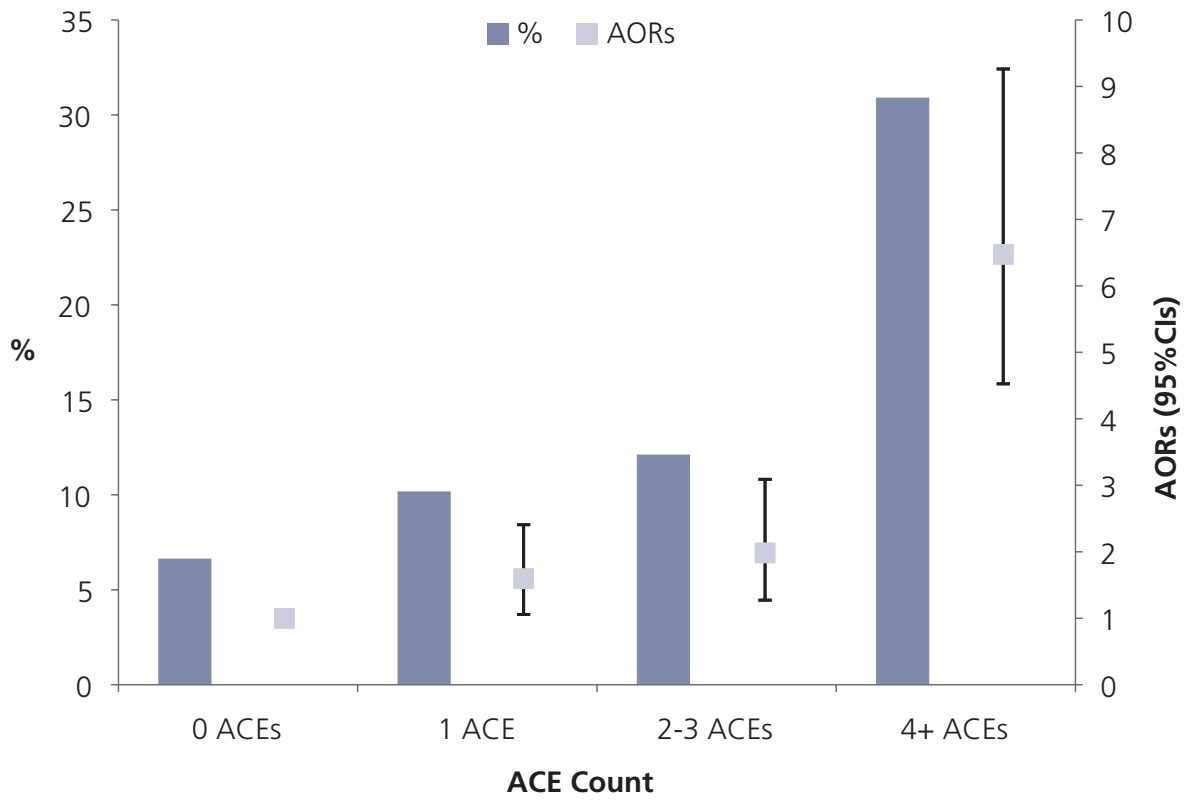
Other demographics

The prevalence of maintaining a poor diet was twice as common amongst the male population (27.7%, males; 13.4% females) and was significantly higher in the lowest age group (30.0%, 18-29 year olds; 14.2%, 60-69 year olds). A poor diet was also most prevalent amongst individuals from the poorest deprivation fifth in Wales at around 22% compared to 18.2% in the least deprived fifth of areas in Wales (see Appendix 2 Table ii).

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 11: Unintended Teenage Pregnancy: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with unintended teenage pregnancy

In total, 11.3% of all respondents reported that they had either accidently got pregnant, or accidently got someone else pregnant before the age of 18 years. However, this rises with ACE count, with 6.6% of those who reported no ACEs to 30.9% amongst those individuals who had experienced four or more ACEs (see Appendix 2 Table iii). The ACE survey data indicates a positive relationship between having had an unintended teenage pregnancy and exposure to ACEs, which remained significant after accounting for socio-demographics. Thus, the odds (after adjustment for demographics) of experiencing unintended teenage pregnancy were 6.5 times higher in those with four or more ACEs compared to those reporting none (see Figure 11). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of teenage pregnancies experienced by adults could be as much as 41.3% lower. This would be equivalent to approximately 96,618 fewer individuals having been pregnant or caused someone to be pregnant as a teenager across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

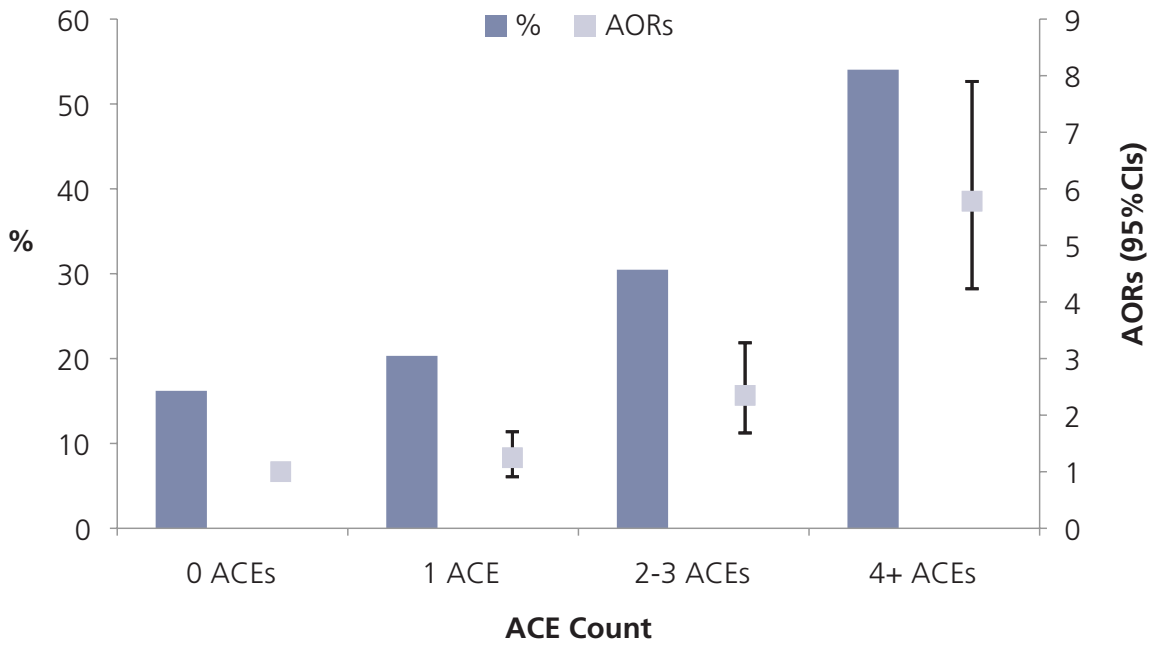
Other demographics

Although marginally higher rates of unintended teenage pregnancy (being pregnant or causing pregnancy) were reported by females and individuals aged 18-29 years, neither differences were statistically significant from levels reported by males or older age groups (see Appendix 2 Table ii). However, after accounting for confounding demographic and other factors (e.g. ACE count) females were at higher risk of teenage pregnancy (being pregnant or causing pregnancy) than males and individuals who live in the most deprived quintile in Wales were more likely to experience/cause unintended teenage pregnancy compared to those resident in more affluent areas.

Early Sexual Initiation

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

Figure 12: Early Sexual Initiation: Percentage and Adjusted Odds Ratio (AOR) by ACE count[a]



[a] p<0.001. AORs (adjusted odds ratios) have been adjusted for age, sex, deprivation and ethnicity. 0 ACEs is used as the reference category. 95%CIs=95% Confidence Intervals.

ACEs and their association with early sexual initiation

Just under a quarter of respondents (24.0%) reported early sexual initiation. However, this increased to 54.0% of those who had experienced four or more ACEs and drops to 16.2% of those who had reported no exposure to ACEs (see Appendix 2 Table iii). Taking into consideration the confounding effects of age, sex, ethnicity and deprivation, the odds of early sexual initiation are 6 times higher amongst individuals who had experienced four or more ACEs compared to those who had experienced none (see Figure 12). After adjusting the figures to match national population demographics, results suggest that if no individuals in the population were exposed to ACEs, then the prevalence of early sexual initiation could be as much as 30.9% lower. This would be equivalent to approximately 144,412 fewer individuals having started to have sex under 16 years of age across Wales (see Appendix 1 and Appendix 2 Table iv for more details).

Other demographics

Males were more likely to have participated in early sexual initiation (27.6%, males; 20.5% females). Prevalence of early sexual initiation was highest amongst those aged 18-29 years (38.1%) and decreased with increasing age (see Appendix 2 Table ii). Adults from the most deprived fifth of areas in Wales reported the highest levels of early sexual initiation in their childhood (28.9%) compared to 19.4% of the least deprived fifth. These relationships remained after accounting for demographics, deprivation and ACE count.

Breaking the ACE Cycle in Wales

Results from the Welsh ACE survey identify both the potential harms across the life course resulting from avoidable stress and adversity in childhood and the huge potential health gains possible if childhood experiences are improved. As these analyses have shown, the benefits of preventing ACEs are not limited to health, but also impact on violent crime and social issues such as teenage pregnancy.

Wales is already pioneering a range of national policies and programmes which aim to:

- Identify and intervene where children may already be victims of abuse, neglect or living in adverse childhood environments;
- Better equip parents and care-givers with the necessary skills to avoid ACEs arising within the home environment and encourage development of social and emotional well-being and resilience in the child;
- Ensure that indirect harms from for instance, domestic violence, substance use and other mental and behavioural problems in the family setting are identified, addressed and their impact on children minimised.

The Building a Brighter Future: Early Years and Childcare Plan 2013-2023 [16] and The Healthy Child Wales programme[7] set out the policy framework and plan for supporting families to ensure their children attain their health and developmental potential and aims to increase family resilience. This includes the following:

- Influencing Welsh national public health strategies to enhance healthier communities;
- Delivery of key public health messages throughout the child's first seven years of their life from conception so that families are supported to make long-term health enhancing choices;
- Promotion of bonding and attachment to support positive good parent-child relationships resulting in secure emotional attachment for children; and,
- The promotion of positive maternal and family emotional health and resilience.

Health visitors in Wales work in partnership with families to meet these goals, assess resilience (See Box 1) and provide support to meet their needs.

While no communities should be considered free from ACEs, those living in areas of deprivation are at greater risk of experiencing multiple ACEs. In Wales this is being addressed through Tackling Poverty Programmes such as Flying Start; Families First and Communities First. These programmes are targeted at the most deprived communities in Wales. Flying Start is the Welsh Government's Early Years programme for families with children less than four years of age who live in some of the most deprived areas of Wales. The core elements of the programme are free quality, part-time childcare for two-three year olds, an enhanced health visiting service, access to parenting programmes and speech, language and communication support[8]. Those families assessed as experiencing substance

Box 1: ACEs and Resilience

Within the context of ACEs, resilience can be considered as an individual's ability to avoid harmful behavioural and physiological changes in response to chronic stress. Such individuals have the skills and often have received the support necessary to adapt successfully to the stress, trauma and other forms of chronic adversity [17]. Alongside the ACE questionnaire, resilience questionnaires have also been developed to identify whether children have assets available to them (e.g. a loving parent/carer) that may help reduce the acute and long-term impacts of ACEs on their health and behaviour. Health visitors may use resilience tools to identify the supportive factors that need to be delivered through targeted services in order to improve health outcomes for individuals.

7 More information on the Healthy Child Wales programme can be found here: http://gov.wales/topics/people-and-communities/people/children-and-young-people/parenting-support-guidance/help/?lang=en

8 More information on Flying Start can be found here: http://gov.wales/topics/people-and-communities/people/children-and-young-people/parenting-support-guidance/help/flyingstart/?lang=en

misuse; domestic violence or abuse; a history of violent or abusive behaviour or mental health issues can be referred to the Integrated Family Support Services which are funded by Welsh Government.

Public Health Wales' Strategic Plan 2015-2018 has prioritised working across sectors to improve the health of our children in their early years [18]. Further, the collective initiative United in Improving Health aims to ensure co-ordinated system-based working across public services, voluntary and private organisations at a national and local level. Through United in Improving Health, Wales can exploit assets not just in the health systems but the professionals, volunteers and other resources that make up our schools and workplaces, housing, police, fire and rescue services. United in Improving Health is re-aligning these assets to accomplish a shared set of goals. The first of these is improving outcomes in the early years, with a focus on the first two years of life. An understanding of the life-time costs of ACEs, who is most affected by them in Wales, and the most effective mechanisms for their prevention, are all critical elements in advocating for and accomplishing this United in Improving Health goal.

As part of a united approach, Public Health Wales recognises the Police as a fundamental in preventing ACEs; not just as a service which responds to crises, but as part of the ACE prevention process. The South Wales Police and Crime Commissioner has adopted early intervention as a key principle and has signed a memorandum of understanding with Public Health Wales [19] that commits both organisations to:

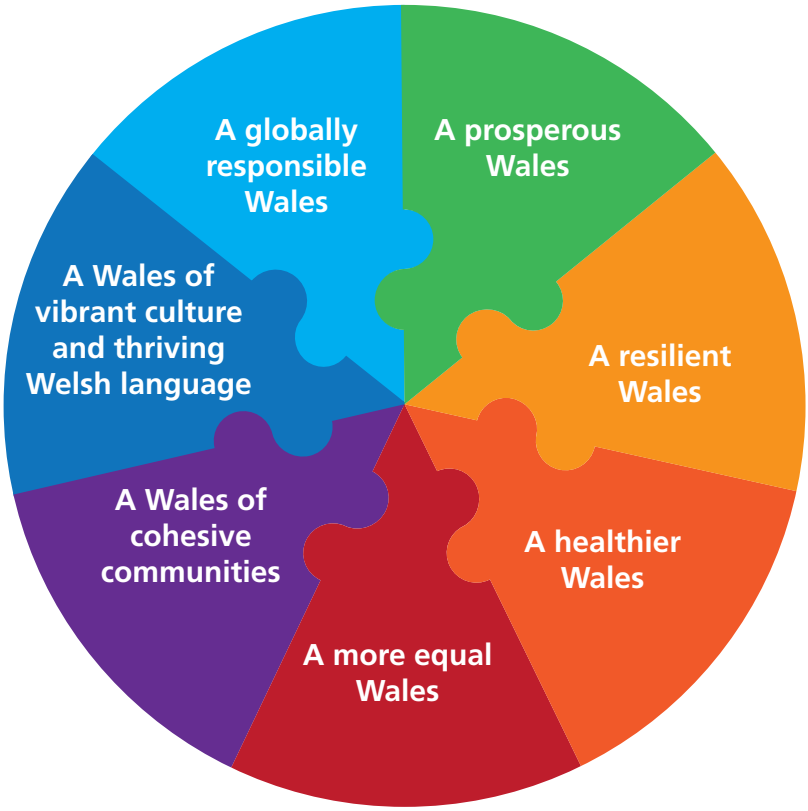
- Wherever possible focus efforts on ensuring that, from the earliest possible age, individuals are supported to follow a health benefiting and crime free life course that allows them to realise their full potential.
- Promote the positive impact that parents can have in the early years by encouraging early intervention initiatives and promotion of positive lifestyle and well-being choices within the family.

Such commitments are consistent with modern demands on police forces. For instance, in South Wales only 11% of contacts with the public are reports of crime with the vast majority relating to welfare, public safety and vulnerability. A public health approach to policing means equipping and supporting the police to identify early indicators of adversity and using their contacts with the public to help prevent further adversity and trauma amongst those who are most vulnerable. Such measures are consistent with both an ACE preventing and resilience promoting agenda likely to reduce crime, improve health and benefit the national economy [20].

More broadly, the Well-being of Future Generations (Wales) Act (2015)[21] aims to improve the social, economic, environmental and cultural well-being of Wales, whilst ensuring the health and well-being of future generations is secured. The Act has put in place seven well-being goals (see Figure 13) and this groundbreaking piece of legislation provides an opportunity for the reduction of ACEs across Wales through efforts to achieve its goals of both a healthier and a more equal Wales.

The aspirations for a healthier Wales includes the creation of a society in which people's physical and mental well-being are maximised from the beginning of the life course and in which choices and behaviours which benefit future health outcomes are understood and supported. Preventing ACEs and building resilience in children will directly support the achievement of this goal. A more equal Wales envisages a society that enables people to fulfill their potential, reducing inequality and placing a greater value on diversity. This goal relies on every child growing up free from ACEs and on understanding that ACEs do not arise in isolation but are associated with environments that tolerate inequalities. Whilst life expectancy and health outcomes are often poorer for men, domestic abuse, sexual violence and other forms of gender-based discrimination are more likely to be experienced by women and girls. Tackling gender inequalities is part of creating households free from ACEs [22]. The Violence Against Women, Domestic Abuse and Sexual Violence Act (Wales) 2015 provides another important policy framework in the prevention and protection against gender-based violence [23].

Figure 13: The seven well-being goals taken from the Well-being of Future Generations (Wales) Act (2015)



International support

As well as policy in Wales, international developments are requiring nations to provide safe, secure and supportive childhoods and are providing access to international evidence about the best ways to achieve this goal. With an estimated 9.6% of all children suffering sexual abuse across Europe and as many as 22.9% suffering physical abuse, the World Health Organization has launched Investing in Children: the European child maltreatment prevention action plan 2015–2020 [24]**.** The plan aims to reduce the prevalence of child maltreatment by implementing preventive programmes that reduce risk and increase protective factors. In addition the United Nations in 2015 launched the Sustainability Goals (SDGs). With much in common with the Well-being of Future Generations (Wales) Act 2015, the SDGs include the aim of ending abuse, exploitation, trafficking and all forms of violence against and torture of children [25]. Such ambitions are also consistent with the recent World Health Assembly resolution on violence which directs health systems globally to play a central role in addressing violence, in particular against women and children [26]. Public Health Wales is already an active member of an international network working with the World Health Organization and other regions and nations to develop and share evidence on what works in the prevention of ACEs.

Research

Whilst this first ACE report for Wales has begun to identify the scale and impact of ACEs in Wales, a better understanding of their impact on the life course is required along with an ability to monitor the effectiveness of efforts to prevent ACEs. Systems such as the Secure Anonymised Information Linkage (SAIL) databank already enable information on individuals to be anonymously linked both across organisations and over time. Consequently, longitudinal studies on ACEs and their on-going impact on the Welsh population are already in development. New research initiatives across Wales, such as HealthWise Wales, will create even greater opportunities to understand and address ACEs[9].

9 HealthWise Wales is a Health and Care Research Wales initiative for a Welsh National Population cohort study, which will engage with the population of Wales and encourage them to become actively involved in research to improve health and well-being, and provide a platform for research, policy and service development and evaluation. For more information, see http://www.healthwisewales.gov.wales/

Conclusion

This report is primarily aimed at identifying the extent of exposure to ACEs across the adult population of Wales and their impact on health-harming behaviours. This first ACE survey found that adults resident in Wales experience ACEs at levels comparable (Wales; 47% experienced at least one ACE and 14% experienced four or more ACEs) to other parts of the UK (England; 48% experienced at least one ACE and 9% experienced four or more ACEs [3]) as well as further afield (for example, Eastern Europe; 53% experienced at least one ACE and 7% experienced four or more ACEs [12])[10]. The impact of such ACEs may include being responsible for nearly a quarter of current adult smoking, over a third of teenage pregnancy and more than half of the violence, heroin/crack use and incarceration reported by study participants. Reflected in population terms, eradicating ACEs could ultimately result in over 125,000 less smokers or e-cigarette users across Wales and over 55,000 fewer people who have ever used heroin or crack cocaine.

The existing international evidence on ACEs has informed the priority given to the early years in Wales. However despite significant investment, the overall impact of these programmes on preventing ACEs is often unclear. In order to effectively reduce ACEs in Wales and improve individuals' life course prospects, a number of issues should be addressed. Firstly, improved awareness is needed of the importance of early life experiences on the long-term health, social and economic prospects of children. Information should be available to a wide range of professionals (health, education, social, criminal justice and others) on ACEs, their consequences and how they can be prevented. Information should also be disseminated to the public and especially those planning or having children. All parents and their children in Wales should already have access to support services – especially in early years. However, a better understanding is needed of specifically what support every individual should and ultimately does receive. Support must conform to established and emerging evidence of what works in the prevention of ACEs and the successful development of resilience in children. Finally, some families (often but not exclusively in deprived communities) require enhanced support in parenting and child development. Again, such services are already in place across some parts of Wales. However, what is actually delivered, how well needs are met and how well interventions match the evidence for ACE prevention is sometimes unclear.

ACEs may be prevented through enhanced public and professional awareness, evidence-informed universal service specifications, effective pathways into additional support, monitoring of intervention coverage and content and, routine audit of fidelity to intervention specifications. While Public Health may have a leadership role in these developments they require partnerships and investment from healthcare services, local authorities and more widely across the whole public sector. Policies including the Well-being of Future Generations (Wales) Act 2015 provide the legitimacy for such activity, and structures such as United in Improving Health provide the opportunity for the essential co-ordination of assets, investments and activity in order to make it happen. The results from this ACE survey will help inform and enhance developments in this area to increase the focus on preventing ACEs in the future.

10 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.

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We would like to thank Dinesh Sethi, Helen Lowey, Janine Roderick and staff in Welsh Government for their comments on drafts of this document. Many people were involved in the development and delivery of the ACE survey. We thank them for helping make this survey possible and also thank all those respondents who freely gave up their time so that we can better understand and respond to the long reach of childhood adversity in Wales.

Funding

This report was funded by Public Health Wales as part of its strategic focus on evidence based approaches to improving early years outcomes across Wales.

Appendix 1 Methodology

A national cross-sectional survey of adults resident in Wales was undertaken between February and May 2015. The study was coordinated jointly by Public Health Wales NHS Trust and Liverpool John Moores University. The fieldwork element was commissioned from a private market research company, Future Focus Research[11]. Ethical approval was obtained from Liverpool John Moores University and Research and Development approval was obtained from the Public Health Wales Research and Development Office. All interviewers followed the Market Research Society (MRS) Code of Conduct[12]

Sample frame and sample selection

Adults aged 18-69 years and resident in Wales were recruited to participate in the study using a method of quota sampling. In order to allow adequate representation of residents of Wales by age, sex and deprivation, a target sample size of 2,000 individuals was set. The achieved sample size was 2,028 (1,009 males and 1,019 females). Sample selection was stratified using Local Health Boards (LHBs), the Welsh Index of Multiple Deprivation (WIMD) and Lower Super Output Areas (LSOAs). LSOAs are geographic areas generated by the Office for National Statistics (ONS) to define areas in Wales with relatively similar population sizes (between 400-1,200 households)[13]. Each LSOA was assigned to a deprivation quintile based on the WIMD. In order to get an equal range of lower deprivation and higher deprivation areas across Wales, the study randomly selected a proportionate number of LSOAs across each deprivation quintile within each LHB in Wales. This approach ensured that the LSOAs selected were broadly representative of the geo-demographic diversity of each LHB.

Recruitment

Face-to-face interviews were undertaken on the doorstep of participants' homes using a validated questionnaire. Households were visited by trained interviewers from the market research company with a sub set of visits being accompanied by researchers from Liverpool John Moores University and Public Health Wales (for quality assurance purposes). Within each LSOA, a random starting address was selected for each interviewer shift. Each interviewer then followed a random route until they had met their quota of respondents (based on age and gender) for each LSOA. Household visits were made on all days of the week and between the hours of 9:00 am and 8:00 pm during weekdays; at weekends visit times were limited to between the hours of 10:00 am to 6:00 pm.

Only one individual from each household was eligible to participate in the study. On contact with a member of the household, interviewers presented individuals with a letter of authority from Public Health Wales NHS Trust. This letter outlined the purpose of the study and provided information regarding the utility of the results, confidentiality and anonymity, and informed consent for participation. This made it clear to individuals that participation in the study was entirely voluntary and that they were free to withdraw at any point during the interview. 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 refused to participate, or were ineligible to participate in the study, the interviewer recorded the outcome of the contact then moved on to the next household on their random route. Potential participants were also given the option for the interviewers to call back at a date or time more suitable to them. All individuals were given the option to complete the interview in Welsh, and where possible translators for other languages were arranged.

The study inclusion criteria were:

- Resident in selected LSOA
- Aged 18-69 years
- Cognitively able to participate.

11 More information about Future Focus Research can be found on their web pages: http://www.futurefocusresearch.co.uk/

12 https://www.mrs.org.uk/standards/code_of_conduct/

13 http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/census/super-output-areas--soas-/index.html

Questionnaire

The study used an established survey tool developed by the US Center for Disease Control and Prevention to measure the prevalence of ACEs[14]. Alongside basic demographics, such as age, sex, ethnicity and marital status, data was collected on the following categories outlined in Table i.

Table i: Topics included in 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-harming behaviours	■ Smoking ■ Alcohol consumption ■ Illicit drug use ■ Sexual risk behaviours ■ Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) ■ Importance of physical activity ■ Healthy eating ■ Height and weight (to allow for calculation of Body Mass Index)
Health complaints and healthcare utilisation	■ Non-communicable diseases ■ Allergies ■ How often visited GP and dentist ■ Number of hospital stays in last 12 months

The interview utilised methods of Computer Assisted Personal Interviewing (CAPI), and also Computer Assisted Self Interviewing (CASI) for the more sensitive sections of the questionnaire. Respondents were also given the option to complete the survey on paper. On completion of interview, individuals were issued with a thank-you leaflet which included information on the survey, contact details for help-lines in Wales and contact details for the research team if they required further information regarding the study.

Response rate and compliance

A total of 14,893 households were visited during the study period. Contact was made with 6,293 households, of which 4,127 included individuals conforming to the inclusion criteria. Thus, of the known eligible households, 2,099 (50.86%) opted out of completing the survey, leaving a compliance rate of 49.14% (n=2028).

Sample characteristics

Table ii illustrates the sample demographics of the survey participants in comparison to the Welsh population[15]. Overall, 49.8% of respondents were male and 50.2% were female, which did not differ significantly from the Welsh population estimates in mid-2013 for gender (p=0.901). However, the final ACE sample had a slight but significant over-representation of individuals aged 18 to 29 years and 60-69 years, and an under-representation of those aged 30-59 years. There was also an over-representation of individuals within the least deprived deprivation quintile in Wales and significant differences in ethnicity.

14 www.cdc.gov/nccdphp/ace

15 For ethnicity, data was obtained from the 2011 Census: http://www.ons.gov.uk/ons/rel/census/2011-census/key-statistics-for-local-authorities-in-england-and-wales/rpt-ethnicity.html . All other population estimates were obtained from the Office for National Statistics' mid-2013 population estimates: http://www.ons.gov.uk/ons/rel/sape/small-area-population-estimates/mid-2013/mid-2013-small-area-population-estimates-statistical-bulletin.html

Table ii: Sample demographics and comparison with the Welsh national population[a] (aged 18-69 years)

		Sample		Population		X^2	P
		n	%	n	%		
Age Years	18-29	617	30.4	487,274	23.9		
	30-39	287	14.2	349,286	17.1		
	40-49	360	17.8	423,900	20.8		
	50-59	355	17.5	401,040	19.7		
	60-69	409	20.2	379,068	18.6	63.17	<0.001
Sex	Male	1009	49.8	1,012,433	49.6		
	Female	1019	50.2	1,028,135	50.4	0.015	0.901
Deprivation quintile	1[b]	441	21.7	404,334	19.8		
	2	394	19.4	527,384	25.8		
	3	393	19.4	314,271	15.4		
	4	380	18.7	407,730	20.0		
	5	420	20.7	386,849	19.0	116.8	<0.001
Ethnicity	White[c]	1933	96.6	1,943,973	95.6		
	Asian[d]	69	3.5	89,539	4.5	4.434	0.035

[a] Population data obtained from Office for National Statistics, Lower Super Output Area population estimates mid-2013 and the 2011 Census for Ethnicity
[b] From 1 (least deprived) to 5 (most deprived).
[c] Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[d] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian and Other Ethnicities.

Calculation of ACE Count

ACEs fall into two main categories; childhood abuse and household dysfunction. The ACE module within the questionnaire included 11 questions covering 9 ACEs experienced by the individual when they were under the age of 18 years (three questions were used to measure sexual abuse; see Table i). From this, the ACE count was calculated. A person's ACE count is based on the number of different types of adverse events they experienced (range 0 to 9). This does not account for reoccurring events or the duration of events.

To ensure consistency with ACE study methodology undertaken elsewhere [3], ACE counts were classified into four cohorts:

- 0 ACEs (n = 1103)
- One ACE (n = 385)
- Two or three ACEs (n = 264)
- Four or more ACEs (n = 276).

Calculation of Health-Harming Behaviours (HHBs)

The methodology used for calculating whether an individual recorded any health-harming behaviours is outlined in Table iii.

Table iii: Health-Harming Behaviours

Outcome	Question (text in brackets is the response indicating behaviour)
Smoking either e-cigarettes or tobacco	Derived outcome: In terms of smoking tobacco, which of the following best describes you? *(I smoke daily)* or Do you smoke e-cigarettes? *(Yes)*
Higher risk drinkers	Derived outcome : includes all individuals who had an AUDIT-C score of 8 or more[a]
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)*

[a] 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).

Data analysis

Data input was undertaken in Microsoft Excel and analysis was completed using SPSS v22. Analyses used chi squared and binary logistic regression techniques. For each health-harming behaviour, binary logistic regression was used to calculate the expected probability (Adjusted Odds Ratio) and identify the association between the explanatory (age, sex, deprivation, ethnicity and ACE count) and outcome variables (health-harming behaviours). However, this is an association and does not imply causation by itself. We have been able to adjust for socio-demographics which are known confounders but there may be unmeasured confounders that have not been accounted for in this analysis.

Final estimates of the prevalence of ACEs in Wales have been modelled using the mid-2013 official population estimates for sex, age group and WIMD produced by the ONS[15] (see Table ii). Ethnicity was excluded from the model as recent data on ethnicity by age, sex and WIMD is not available within national estimates. Estimates for the impact of preventing ACEs at the sample and national population levels was calculated using the modelled probabilities (from the logistic regression model) of having each health-harming behaviour depending on demographics and ACE count. To calculate the reductions in health-harming behaviours associated with preventing all ACEs, the model set ACE counts to zero for all population demographics and compared resulting counts of health-harming behaviours with those seen when ACE counts were included.

Appendix 2 Data Tables

Table i: Bivariate relationship between participant demographics, individual ACEs and ACE Count[a]

		Individual ACEs									ACE Count			
			Child abuse			Household dysfunction					0	1	2-3	4+
		Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse				
Prevalence	%	20.12	22.53	17.06	9.67	13.76	16.07	14.00	4.78	4.54	54.39	18.98	13.02	13.61
	n (total sample size)	2028	2028	2028	2028	2028	2028	2028	2028	2028	2028	2028	2028	2028
Age Years	18-29	27.39	25.45	17.02	8.10	14.59	18.48	18.64	5.83	7.78	53.48	17.67	11.18	17.67
	30-39	33.45	27.53	20.20	12.89	18.47	19.16	16.73	8.71	7.67	42.16	25.44	11.50	20.91
	40-49	21.39	25.56	20.56	10.56	16.67	17.22	17.22	5.28	3.89	48.61	17.78	19.17	14.44
	50-59	9.58	16.90	13.52	11.83	11.83	12.68	7.89	3.38	1.97	61.41	17.46	13.24	7.89
	60-69	7.82	16.87	14.91	7.09	8.31	12.22	7.58	1.22	0.24	63.33	18.83	11.25	6.60
	X^2	115.415	22.944	5.953	10.486	19.619	12.552	40.911	24.333	44.611	32.639			
	P	<0.001	<0.001	0.048	0.033	<0.001	0.014	<0.001	<0.001	<0.001	<0.001			
Sex	Male	21.21	26.66	20.22	7.63	12.39	18.14	15.46	5.95	4.56	51.64	19.92	12.98	15.46
	Female	19.0	18.45	13.94	11.68	15.11	14.03	12.56	3.63	4.61	57.11	18.06	13.05	11.78
	X^2	1.487	19.579	14.143	9.51	3.172	6.328	3.539	5.968	0.027	8.786			
	P	0.223	<0.001	<0.001	0.002	0.075	0.012	0.060	0.015	0.869	0.032			
Deprivation quintile	1 (least deprived)	18.82	23.36	18.59	9.75	12.24	17.68	14.97	5.21	5.21	58.05	14.74	11.34	15.87
	2	16.5	26.4	18.78	14.97	14.72	12.69	12.18	5.08	5.58	50.00	23.60	11.93	14.47
	3	19.08	19.34	14.76	7.38	11.7	18.07	13.74	3.82	3.31	56.74	19.59	11.96	11.70
	4	19.21	18.68	16.05	5.53	15.53	13.68	12.63	5.79	3.42	55.26	18.95	15.26	10.53
	5 (most deprived)	26.67	24.52	16.9	10.48	14.76	17.86	16.19	4.05	5.00	51.67	18.57	14.76	15.00
	X^2	15.339	10.015	3.31	22.850	3.913	7.949	3.708	2.405	4.137	22.516			
	P	0.004	0.040	0.507	<0.001	0.418	0.093	0.447	0.662	0.388	0.032			
Ethnicity	White[c]	20.02	22.40	16.76	9.62	13.61	15.99	14.02	4.60	4.55	54.32	19.30	13.04	13.35
	Other[d]	23.19	26.09	24.64	8.70	20.29	20.29	17.39	5.80	2.90	56.52	11.59	10.14	21.74
	X^2	0.416	0.519	2.924	0.066	2.497	0.912	0.624	0.214	0.424	6.008			
	P	0.519	0.471	0.087	0.797	0.114	0.340	0.430	0.644	0.515	0.111			
Adjusted ACE prevalence[b]		19.73	22.81	17.49	10.38	14.05	15.65	13.57	4.92	4.59	53.34	19.64	13.48	13.54

Abbreviations: ACE adverse childhood experience

[a] Bivariate relationships should be treated with caution as, for instance, demographic (e.g. age, sex, ethnicity) differences between deprivation quintiles are not accounted at this stage.

[b] Adjusted to Welsh national population by age, sex and deprivation quintile of residence. Sources for population data: Office for National Statistics Lower Super Output Area population estimates mid-201316

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

[d] Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian and Other Ethnicities.

Table ii: Bivariate associations between health-harming behaviours and demographics[a]

Outcome		Smoking	Alcohol	Illicit drugs		Violence and criminal justice			Diet	Sexual behaviour	
		Tobacco or e-cigarettes (current)	High-risk drinkers (AUDIT-C = 8 or over)	Cannabis use (lifetime)	Heroin or crack cocaine use (lifetime)	Violence victimiza-tion (past year)	Violence perpetration (past year)	Incarcera-tion (life-time)	Poor diet (current)	Unintended teenage pregnancy (<18 years)	Early sexual initiation (<16 years)
All	%	26.45	12.92	25.04	4.44	9.09	7.79	10.09	20.47	11.33	24.03
	n	1932	2021	2025	2026	2024	2016	2018	2022	2021	1981
Age Years, %	18-29	36.41	18.70	40.50	7.90	18.80	14.30	14.60	30.00	13.50	38.12
	30-39	31.82	12.94	33.40	6.60	12.20	11.20	12.20	15.30	10.50	30.96
	40-49	22.16	10.31	18.90	3.30	5.60	4.50	8.40	17.50	12.60	18.36
	50-59	24.02	14.49	20.40	2.00	2.50	4.00	12.50	18.40	11.00	17.68
	60-69	13.64	5.38	5.10	0.70	1.00	1.70	5.10	14.20	7.80	8.10
	x^2	71.968	41.775	186.915	40.324	130.286	74.675	26.476	51.318	8.727	142.039
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.680	<0.001
Sex, %	Male	32.12	19.78	31.50	7.00	13.70	11.60	17.60	27.70	9.50	27.59
	Female	20.79	6.21	18.70	1.90	4.50	4.00	4.30	13.40	13.10	20.50
	x^2	31.919	82.510	44.300	31.981	51.606	39.830	91.261	63.385	6.537	13.613
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.110	<0.001
Deprivation Quintile, %	1(least deprived)[a]	21.32	9.59	23.86	3.63	7.73	7.53	8.72	18.18	8.62	19.44
	2	22.71	9.97	23.47	5.61	8.38	8.14	7.36	17.35	14.32	18.46
	3	25.95	13.23	24.94	5.60	8.16	5.61	11.00	22.19	9.97	27.65
	4	25.96	16.62	24.21	3.42	9.52	8.75	11.67	22.63	9.00	26.22
	5 (most deprived)	37.20	15.71	28.57	4.05	11.67	8.89	15.71	22.25	14.76	28.86
	x^2 trend	24.213	12.903	2.341	0.118	4.168	0.622	14.300	4.494	2.454	15.668
	p	<0.001	<0.001	0.126	0.731	0.041	0.430	<0.001	0.034	0.117	<0.001
Ethnicity, %	White[b]	26.87	13.24	25.10	4.60	9.10	7.90	11.10	20.80	11.40	24.38
	Other[c]	12.12	8.70	21.70	2.90	7.20	4.40	5.80	13.00	8.70	15.15
	x^2	7.143	1.210	0.408	0.426	0.285	1.089	1.943	2.433	0.493	2.971
	p	0.008	0.271	0.523	0.514	0.593	0.297	0.163	0.119	0.483	0.085

Abbreviation: AUDIT-C Alcohol use disorders identification test consumption
[a]Bivariate relationships should be treated with caution as, for instance, demographic (e.g. age, sex, ethnicity) differences between deprivation quintiles are not accounted at this stage.
[b]Including White British, White Irish, White Gypsy or Irish Traveller, White Other.
[c]Including Indian, Pakistani, Bangladeshi, Chinese, Other Asian and Other Ethnicities.

Table iii: Bivariate association between health-harming behaviours and ACE count

Outcome	All		ACE Count, %				X^2_{trend}	P
	%	n	0	1	2-3	4+		
Smoking								
Tobacco or E-cigarettes (current)	26.45	1932	19.59	23.06	24.59	60.15	183.581	<0.001
Alcohol								
High-risk drinking (AUDIT-C = 8 or over[a])	12.92	2021	8.20	0.10	14.01	27.9	68.965	<0.001
Illicit drugs								
Cannabis use (lifetime)	25.04	2025	14.16	25.00	29.28	64.49	266.896	<0.001
Heroin or crack cocaine use (lifetime)	4.44	2026	1.36	2.34	3.79	20.29	138.867	<0.001
Violence and criminal justice								
Violence victimization (past year)	9.09	2024	3.64	4.69	10.23	35.87	221.366	<0.001
Violence perpetration (past year)	7.79	2016	2.92	3.14	8.37	32.97	215.747	<0.001
Incarceration (lifetime)	10.09	2018	3.74	7.59	16.67	38.54	256.869	<0.001
Diet								
Poor diet (current)	20.47	2022	16.89	20.89	22.81	32.00	30.082	<0.001
Sexual behaviour								
Unintended teenage pregnancy (<18 years)	11.33	2021	6.64	10.18	12.12	30.91	106.821	<0.001
Early sexual initiation (<16 years)	24.03	1981	16.20	20.32	30.47	54.04	160.134	<0.001

Abbreviation: ACE adverse childhood experience; AUDIT-C Alcohol use disorders identification test consumption
[a] Individuals are defined as high-risk if their AUDIT-C score was 8 or over

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

Outcome	Sample							Adjusted to national population estimates						
	Current prevalence		Estimates with 0 ACEs			% change	Number saved	Current prevalence		Estimates with 0 ACEs			% change	Number saved
	%	n	%	n				%	n	%	n			
Smoking														
Either tobacco or e-cigarettes (current)	26.45	511	20.30	412	-	23.24	99	25.88	528084	19.66	401147	-	24.04	126937
Alcohol														
High-risk drinking (AUDIT-C = 8 or over[a])	12.92	261	8.45	172	-	34.59	89	12.52	255500	8.16	166496	-	34.84	89004
Illicit drugs														
Cannabis use (lifetime)	25.04	507	14.88	302	-	40.59	205	24.23	494517	14.15	288713	-	41.62	205804
Heroin or crack cocaine use (lifetime)	4.44	90	1.48	30	-	66.63	60	4.27	87132	1.44	29344	-	66.32	57788
Violence and criminal justice														
Violence victimization (past year)	9.09	184	3.95	80	-	56.51	104	8.39	171105	3.61	73676	-	56.94	97429
Violence perpetration (past year)	7.79	157	3.13	64	-	59.84	93	7.43	151678	3.01	61425	-	59.50	90253
Incarceration (lifetime)	10.09	220	3.86	78	-	61.76	142	10.48	213771	3.71	75717	-	64.58	138054
Diet and weight														
Poor diet (current)	20.47	414	17.22	350	-	15.89	64	19.55	399030	16.38	334158	-	16.26	64872
Sexual behaviour														
Unintended teenage pregnancy (<18 years)	11.33	229	6.65	135	-	41.30	94	11.47	233777	6.72	137159	-	41.33	96618
Early sexual initiation (<16 years)	24.03	476	16.78	341	-	30.18	135	22.89	467080	15.81	322668	-	30.92	144412

Abbreviation: ACE adverse childhood experience; AUDIT-C Alcohol use disorders identification test consumption

[a] Individuals are defined as high-risk if their AUDIT-C score was 8 or over

About us

Public Health Wales exists to protect and improve health and wellbeing and reduce health inequalities for people in Wales.

We are part of the NHS and report to the Minister for Health and Social Services in the Welsh Government.

Our vision is for a healthier, happier and fairer Wales. We work locally, nationally and, with partners, across communities in the following areas:

Health protection – providing information and advice and taking action to protect people from communicable disease and environmental hazards.

Primary, community and integrated care – strengthening its public health impact through policy, commissioning, planning and service delivery.

Microbiology – providing a network of microbiology services which support the diagnosis and management of infectious diseases.

Safeguarding – providing expertise and strategic advice to help safeguard children and vulnerable adults.

Screening – providing screening programmes which assist the early detection, prevention and treatment of disease.

Health intelligence – providing public health data analysis, evidence finding and knowledge management.

NHS quality improvement and patient safety – providing the NHS with information, advice and support to improve patient outcomes.

Policy, research and international development – influencing policy, supporting research and contributing to international health development.

Health improvement – working across agencies and providing population services to improve health and reduce health inequalities.

Further information

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