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The Prisoner ACE Survey

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GIG CYMRU NHS WALES | Iechyd Cyhoeddus Cymru Public Health Wales

Camau Cynnar gyda'n Gilydd Early Action Together

Rhaglen ACEau yr Heddlu a Phartneriaid Police & Partners ACEs Programme

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[1] The Early Action Together (EAT) programme is a multi-agency partnership between Public Health Wales, the four Wales Police Forces and Police and Crime Commissioners and Barnardo's. EAT is working with Criminal Justice partners including Her Majesty's Prison and Probation Service in Wales and Wales Probation Services to address the root causes of criminal behaviour and enable police and criminal justice staff to take preventative measures when dealing with vulnerable people.

Contents

Adverse childhood experiences (ACEs) in an offender population in Wales

The Prisoner ACE Survey interviewed 468 adults (aged 18-69)[a] in a Welsh prison between February and June 2018. Participants were asked about their exposure to 11 ACEs in childhood, their offending history and recent involvement in violence.

How many prisoners reported each ACE?

Child maltreatment

- Verbal abuse 50%
- Physical abuse 41%
- Sexual abuse 18%
- Emotional neglect 19%
- Physical neglect 12%

Household ACEs

- Parental separation 58%
- Mental illness 28%
- Domestic violence 40%
- Alcohol abuse 31%
- Drug abuse 32%
- Incarceration 33%

Over 8 in 10 prisoners reported at least 1 ACE, and nearly half had 4 or more ACEs[b]

- 0 ACEs 16%
- 1 ACE 18%
- 2-3 ACEs 21%
- ≥4 ACEs 46%

Prisoners with 4 or more ACEs were 4 times more likely to have ever served a sentence in a young offender institution (YOI) than those with no ACEs

Of the 46% of prisoners who had ever served a sentence in a YOI:

9 in 10
had **at least 1 ACE** compared to **8 in 10** of those who did not spend time in a YOI

6 in 10
had **4 or more ACEs** compared to **3 in 10** of those who did not spend time in a YOI

Compared with prisoners with no ACEs, those with 4 or more ACEs were:

- **3x more likely** to have ever been convicted of **criminal damage**
- **3x more likely** to have ever been convicted of **violence against the person**
- **3x more likely** to have ever been convicted of **theft**
- **2x more likely** to have ever been convicted of **drugs offences**

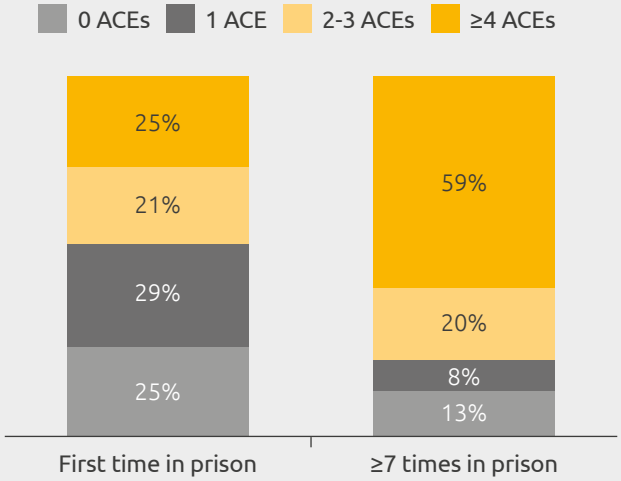
Those with 4 or more ACEs were also 3.5 times more likely to be prolific offenders[c]

Of the 39% of prisoners categorised as prolific offenders:

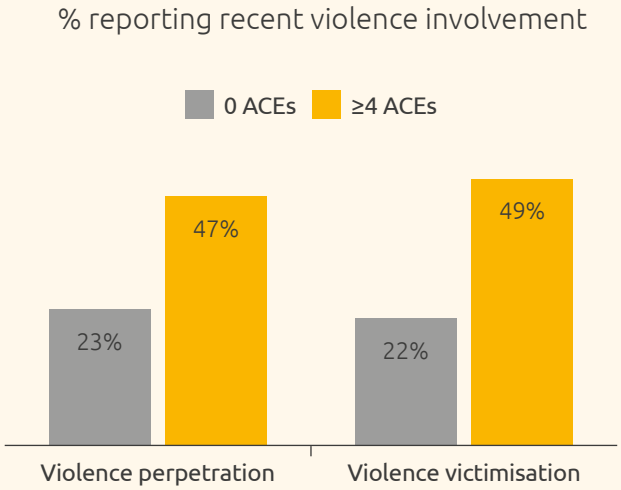
9 in 10
had **at least 1 ACE** compared to **8 in 10** of those not categorised as prolific offenders

6 in 10
had **4 or more ACEs** compared to **4 in 10** of those not categorised as prolific offenders

The proportion of individuals reporting 4 or more ACEs increased with number of times in prison



ACEs substantially increased the risks of recent[d] violence involvement



[a] Seven in 10 participants were Welsh, 25% were aged 18-24, 84% were white and almost a third reported that they had no educational qualifications, see main report.

[b] ACE counts do not add up to 100% due to rounding. In comparison, ACE prevalence figures for males in the general population were 54% 0 ACEs, 19% 1 ACE, 16% 2-3 ACEs, 12% ≥4 ACEs, see main report.

[c] Based on how many convictions they reported, classified using the Ministry of Justice prolific offending definition, see main report.

[d] In the past 12 months.

1. Introduction

The experiences that children have while growing up can have life-long effects on their health and well-being. A growing body of research in Wales and internationally is showing how adverse childhood experiences (ACEs; see Box 1) can negatively impact individuals' life opportunities, and increase the risk of involvement in crime [1].

The Welsh ACE studies found that half of adults in the general population in Wales suffered at least one ACE in childhood, and over one in 10 suffered four or more [1,2]. Individuals who had suffered four or more ACEs were 20 times more likely to have been incarcerated at some point in their lives [1]. Correspondingly, studies have found that individuals in the criminal justice system report higher levels of childhood adversity than those in the general population [3-5], and that ACEs are associated with more serious offending and recidivism. However, very few studies have explored the prevalence of ACEs in UK prison populations or associations between ACEs and crime. To develop this knowledge in Wales, the Prisoner ACE Survey surveyed a prison population to understand how many ACEs they had experienced and the associations between ACEs and offending histories (e.g. type of crime).

Box 1: Adverse childhood experiences (ACEs)

ACEs are traumatic or stressful experiences occurring before the age of 18 years, such as suffering physical, emotional or sexual abuse, or living in a household affected by domestic violence or drug misuse. Individuals who have experienced ACEs are at an increased risk of poor health across the life course, including mental illness [2,6], the early development of chronic health conditions (e.g. asthma, type 2 diabetes [1,7]), and premature mortality [7,8]. ACEs are also associated with a range of health-harming behaviours (e.g. drug use), poor educational attainment, violence and involvement with the criminal justice system [9-12]. The more ACEs people experience, the greater their risk of negative outcomes [12].

Until recently, research in justice-involved populations had tended to focus on just one (e.g. physical abuse) or a few types of trauma [13,14]. However, studies are now starting to emerge that use the ACE framework to measure multiple types of childhood adversity and their cumulative impact on offending behaviour [15-18]. For example, in a sample of incarcerated male adults in the USA, over 90% reported at least one ACE and 50% reported four or more ACEs [19]. In Scotland, ACE questions were incorporated into the 2017 Scottish Prisoner Survey; this identified high prevalence of individual ACEs but did not report ACE count levels [20]. Among youth, ACEs have been associated with an increased risk of serious offending, and reoffending [16,21,22]. For example, a US study of juvenile offenders found that while 80% had at least one ACE and 23% had four or more ACEs, ACE counts were, on average, twice as high among youths that were serious, violent or chronic offenders [23]. In the UK, a study following a cohort of high-risk boys from London found that the mean number of lifetime convictions (from age 10 to 56 years) tended to increase as ACE count increased [16].

ACEs can be intergenerational, with children that suffer ACEs at increased risk of developing behaviours and conditions which can later become ACEs for their own children [24]. In 2009 in England and Wales, an estimated 200,000 children had at least one parent incarcerated [25]. Through intergenerational cycles of crime, an estimated 65% of males with a parent incarcerated during their childhood are likely to offend at some point in their lifetime [26]. The prevention of ACEs and supporting those affected by them is therefore vital in preventing ACE transmission across generations and improving population health.

Welsh Government policy: *Prosperity for All: The national strategy*, sets a national agenda for the prevention of ACEs and support for individuals affected by childhood trauma [27]. This includes the priority of establishing ACE-informed (e.g. educated on the impact of ACEs) public services across Wales [27]. As an essential part of the development of an ACE-informed society, it is vital that criminal justice agencies have an understanding of the prevalence of ACEs amongst those involved in the criminal justice system. Although overall responsibility for criminal justice is not devolved in Wales, the Welsh Government highlight their commitment to reducing (re)offending in the *Framework to support positive change for those at risk of offending in Wales* [28]. The framework outlines the prevention and early intervention of ACEs as a priority for Her Majesty's Prison and Probation Service (HMPPS).

An increased knowledge of the prevalence of ACEs in the prisoner population can be used to inform the implementation of appropriate and effective interventions for individuals requiring support. To contribute to this understanding, here we have examined the prevalence of ACEs within a UK male prisoner population. This report also explores the relationship between ACEs and offending histories, crime types and violence involvement. Findings in this report add to the evidence base on ACEs and offending and help to inform the potential benefits of ensuring the criminal justice sector is trauma-informed (i.e. understands the experiences during childhood which may underpin offending).

2. Methods

In 2018, the Public Health Collaborating Unit at Bangor University and Public Health Wales undertook the first ACE prevalence study within a male prison setting in Wales. Data collection ran between February and June 2018. The Prisoner ACE Survey aimed to measure the prevalence of ACEs amongst an offender population and examine any associations between ACEs and crime types. The survey also aimed to investigate the association between ACEs and offending.

Survey questions included: an established tool to record exposure to 11 types of ACE; participants' demographics (e.g. age, ethnicity); number of convictions and type of crimes; number of times incarcerated; and total (lifetime) length of time in prison (see Appendix 1 for further details on questions asked). The survey also collected information on the family structure and health and well-being of the participant. All measures were self-reported.

For study participation, individuals needed to meet the inclusion criteria: aged 18-69 years; cognitively able to participate; and not currently managed under Assessment, Care in Custody & Teamwork (ACCT) procedures. Potential participants were informed of the study through advertisements on prisoner electronic information points, the distribution of flyers outlining the study on prison units and researchers visiting prison units to speak face-to-face with residents. All materials clearly outlined that the study purpose was to explore participants' childhood experiences and that this would include personal questions such as if they had ever experienced abuse, seen violence at home or if members of their household were affected by drug use. As a result of advertisements and flyers, 100 individuals initially expressed an interest in participation. A further 596 individuals were approached to participate. Of the 696 individuals, 529 agreed to participate in an interview and 167 declined participation. A total of 470 individuals completed the questionnaire: 59 people who volunteered did not take part in the research (e.g. withdrew, were ineligible or left the prison during the study period; see Appendix 1). The final sample size for analysis was 468 (two individuals were removed due to missing ACE data).

Analyses for this report focused on the overall ACE prevalence and associations between ACEs and demographics (i.e. age, ethnicity and educational attainment; see Appendix 1), offending history (e.g. young offender institution [YOI] incarceration, prolific offending) and crime types (see Appendix 2 for all data tables). Associations between ACEs and past year violence perpetration and victimisation were also explored. Analyses explored ACEs using a count variable that categorised participants based on the number of ACEs experienced during childhood: no ACEs, one ACE, two to three ACEs, and four or more ACEs. Further details of the methodology and analysis used for this report are provided in Appendix 1.

Approval for the research was granted by HMPPS (formerly known as the National Offending Management Service [NOMS]) National Research Committee and the National Health Service (NHS) Research and Development Office. Ethical approval was obtained from an NHS Research Ethics Committee and Bangor University Healthcare and Medical Sciences Ethics Committee.

3. Findings

3.1. Sample demographics

In total, 468 male participants completed the survey. A quarter (25.4%) were aged 24 years or under at the time of survey, with over half aged 30 years or older (range 18-69; Figure 1). Almost seven in 10 reported their nationality as Welsh (68.6%; Figure 2) and the majority reported that their ethnicity was white (84.2%; Appendix 2, Table A1). Over six in 10 (63.5%) reported that they had fathered children. A comparison of the sample to the total prison population for HMP Parc and male prisoners in England and Wales is shown in Appendix 1 (Table Aiii).

Figure 1: Participant age

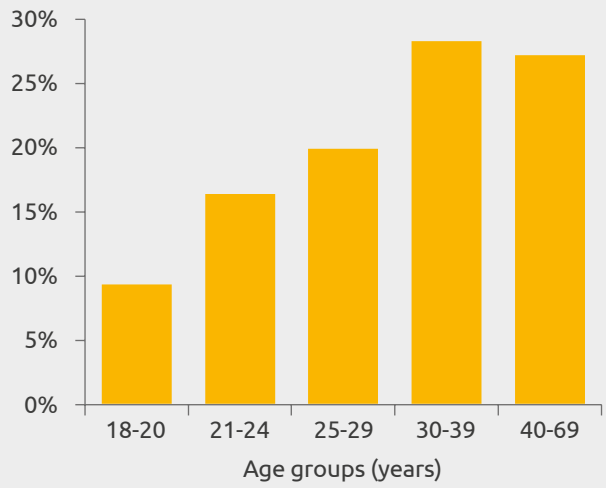
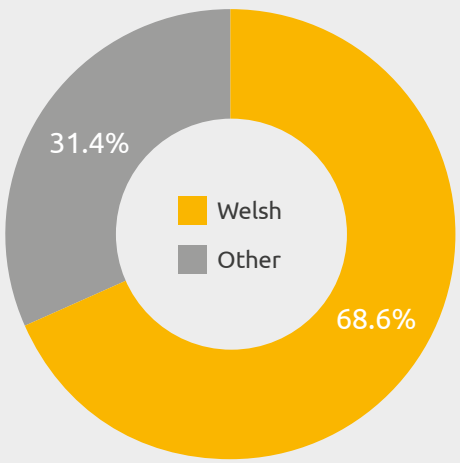


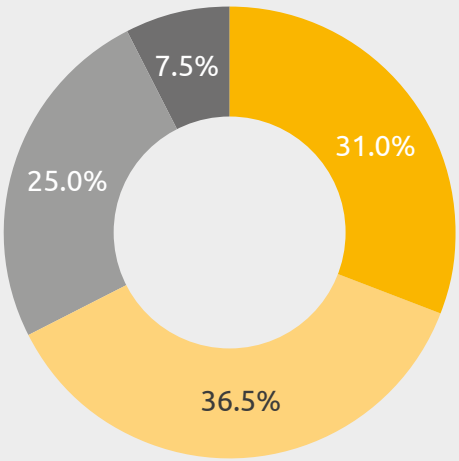
Figure 2: Participant nationality



Almost a third (31.0%) of the sample reported that they had no educational qualifications, with only a third (32.5%) reporting they had attained a further (e.g. college/sixth form) or higher (e.g. university) education qualification (Figure 3; Appendix 2, Table A1).

Before entering the prison, less than half of all individuals who completed the survey had been in employment (48.5%; full/part-time or self-employed), with over one in 10 (11.1%) reporting that they had not been in employment due to a long-term sickness or disability (LTSD; Appendix 2, Table A1).

Figure 3: Highest level of educational qualification gained



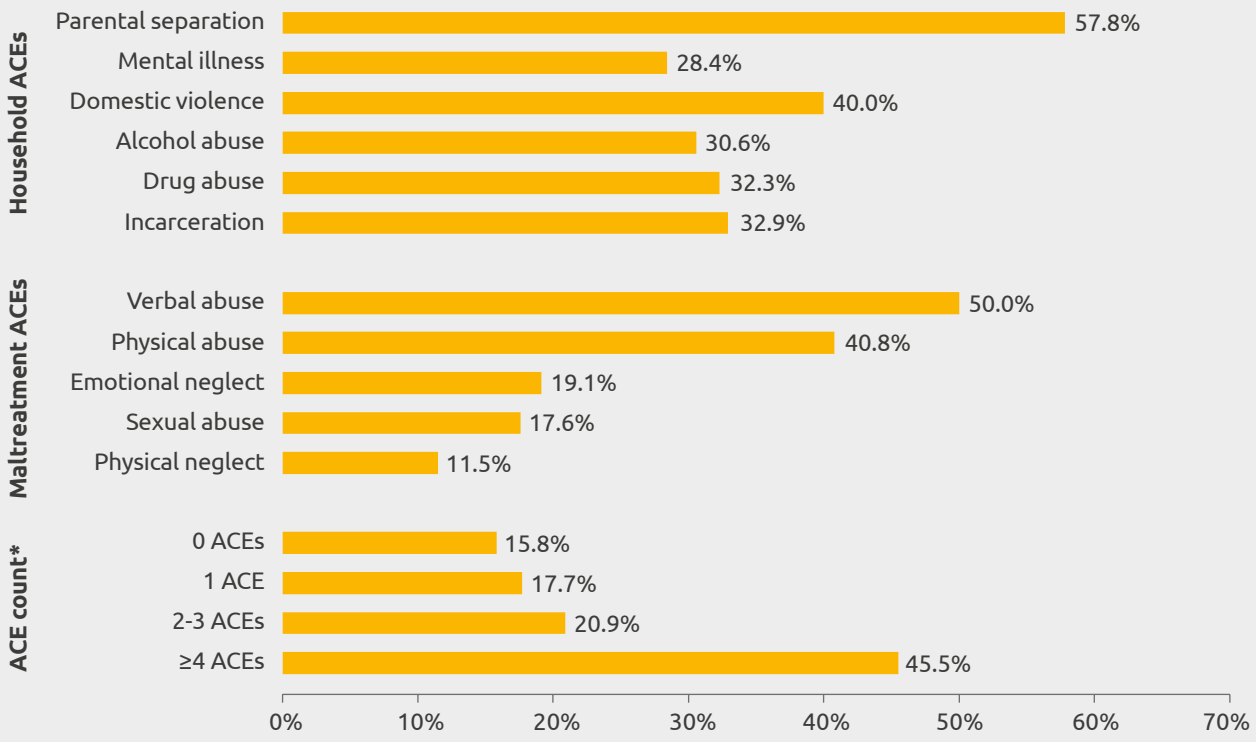
- No qualifications
- Secondary education (e.g. O level, CSE/GCSE, NVQ level 1 or 2, City & Guilds Craft)
- Further education (e.g. AS / A levels, Apprenticeship, NVQ level 3, City & Guilds Advanced Craft)
- Higher education (e.g. University degree, NVQ level 4-5, Higher diploma)

3.2. Prevalence of ACEs

The survey measured exposure to 11 types of ACE before the age of 18 (see Appendix 1, Table Ai for the questions used). Over eight in 10 (84.1%) participants reported that they had experienced at least one ACE, with just under half reporting exposure to four or more ACEs (45.5%; Figure 4).

The proportion of prisoners reporting individual ACEs ranged from 11.5% reporting physical neglect to 57.8% reporting parental separation or divorce. A third (32.9%) reported that while they were growing up a member of their household served time or was sentenced to serve time in a prison or YOI. A comparison of ACE count prevalence to males in the general population in Wales is shown in Box 2.

Figure 4: Prevalence of individual ACEs and ACE count



* Due to rounding, ACE counts do not add up to 100%.

Box 2: Comparison to the 2017 Welsh ACE and Resilience Study [2]

In comparison to the 2017 Welsh ACE and Resilience Study, which asked Welsh residents in the general population if they had experienced the same 11 ACEs, individuals in the Prisoner ACE Survey reported a considerably higher ACE prevalence. Nearly half of all individuals (45.5%) in the Prisoner ACE Survey reported exposure to four or more ACEs in comparison to just over one in 10 (11.9%) males in the general population survey (unadjusted prevalence; Figure 5). The prevalence of all individual ACEs was higher in this study than the general population; comparisons are presented in Appendix 2 (Table A2).

Figure 5: ACE count prevalence measured in the Welsh male general population (2017 Welsh ACE and Resilience Study) and the 2018 Prisoner ACE Survey

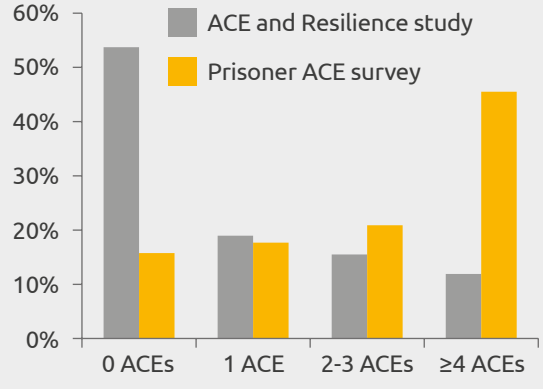
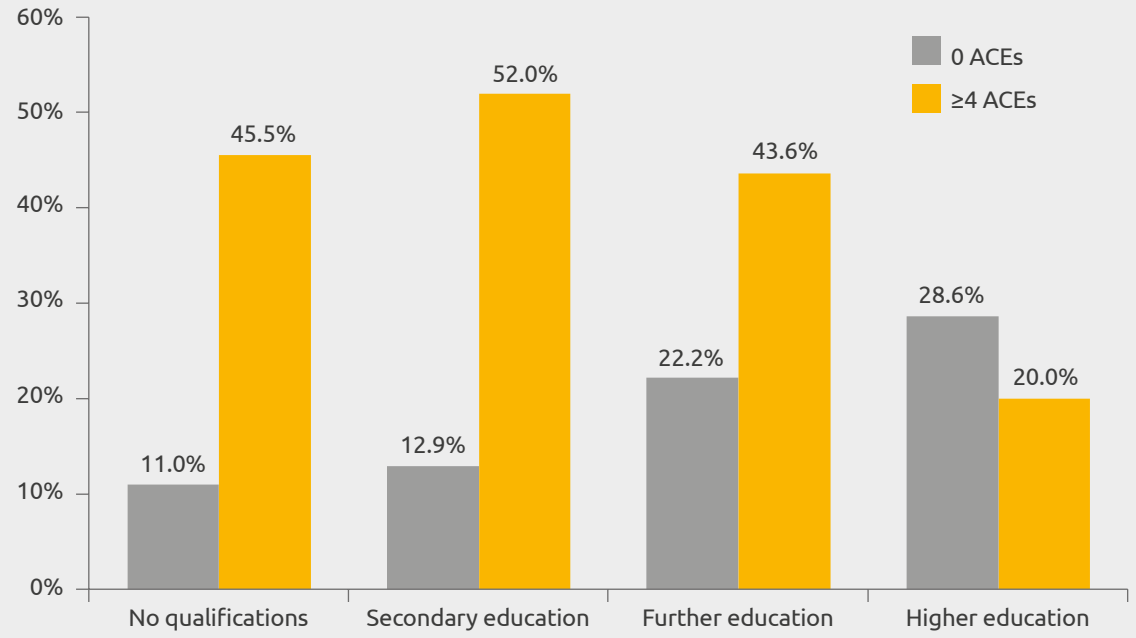


Figure 6: Proportion reporting educational qualifications by ACE count (no ACEs and four or more ACEs)



3.2.1. Relationship between ACEs and participant demographics

ACE count

There was no significant association between the number of ACEs that individuals reported and their age, ethnicity or nationality (Appendix 2, Table A1).

An increased ACE count was associated with significantly poorer educational outcomes (i.e. a decreased prevalence of further and higher education qualifications; $p<0.05$; Appendix 2, Table A1). The proportion of individuals reporting four or more ACEs increased from 20.0% of those with higher education qualifications to 45.5% of those with no qualifications (Figure 6). Just under a third (31.0%) of individuals with four or more ACEs had no formal educational qualification compared with just over two in 10 (21.6%) of those with no ACEs.

An increased ACE count was also significantly associated with being unemployed or LTSD before entering prison (Appendix 2, Table A1). Only 39.4% of individuals reporting four or more ACEs had been employed prior to entering prison, compared with 62.2% of those with no ACEs ($p<0.05$).

Individual ACEs

The prevalence of physical abuse, parental separation and growing up with a household member incarcerated varied significantly by age. The proportions reporting parental separation and household member incarceration were highest in the youngest age group and lowest in the oldest age group. For example, household member incarceration reduced from 48.8% among those aged 18-20 years to 22.2% in those aged 40-69 years ($p<0.05$; Appendix 2, Table A1). The opposite was found for physical abuse which increased with age, from 14.0% of those aged 18-20 years to 50.8% of those aged 40-69 years ($p<0.001$; Appendix 2, Table A1). The only ACE significantly associated with ethnicity was household member alcohol abuse, with a higher prevalence amongst white respondents (33.0% compared with 17.6% among non-white individuals; $p<0.05$; Appendix 2, Table A1).

The prevalence of parental separation, household member incarceration, drug abuse and emotional neglect was higher among those with lower educational attainment (no qualifications or secondary qualifications only) than in those with further or higher qualifications. For example, the proportion reporting household member incarceration during childhood increased from 8.6% in those with higher education qualifications to 37.9% in those with no qualifications ($p<0.05$; Appendix 2, Table A1).

3.3. Offending history

3.3.1. Youth offending

Just under half of the sample (45.9%; Appendix 2, Table A3) reported that they had ever served a sentence in a YOI.

The proportion of having served a sentence in a YOI was higher for younger individuals (65.1% of 18-20 year olds compared with 32.5% of 40-69 year olds; p<0.001) and those reporting no educational qualifications (54.5% of those with no qualifications compared with 14.3% of those with higher education qualifications; p<0.001; Appendix 2, Table A3).

YOI incarceration was significantly associated with ACEs (Figures 7 and 8). Of those with four or more ACEs, 60.6% reported having spent time in a YOI, compared with 25.7% of those with no ACEs (p<0.001; Figure 8; Appendix 2, Table A3). More than nine in 10 (91.2%) prisoners who had served a sentence in a YOI had experienced at least one ACE, with six in 10 (60.0%) reporting four or more ACEs (p<0.001; Figure 7).

Over six in 10 (62.3%) prisoners who reported the ACE household member incarceration, reported that they had spent time in a YOI.

45.9%
of prisoners had served a sentence in a YOI

91.2%
of prisoners who had served a sentence in a YOI had at least one ACE and 60.0% had four or more

Prisoners with four or more ACEs were **4.2 times** more likely to have spent time in a YOI than prisoners with no ACEs

The relationship between ACE count and YOI incarceration remained after controlling for participant demographics (i.e. age, ethnicity and educational qualification). The odds (adjusted odds ratio, AOR) of having spent time in a YOI were 4.2 times higher among prisoners who had four or more ACEs than prisoners who had experienced no ACEs (Figure 8; Appendix 2, Table A5).

Figure 7: YOI incarceration by ACE count

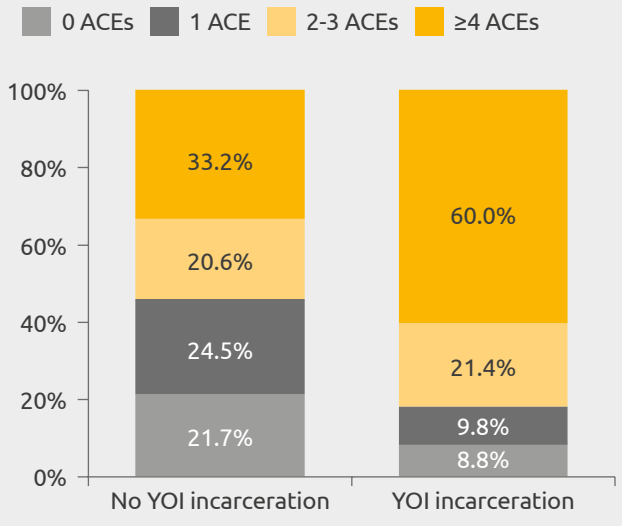
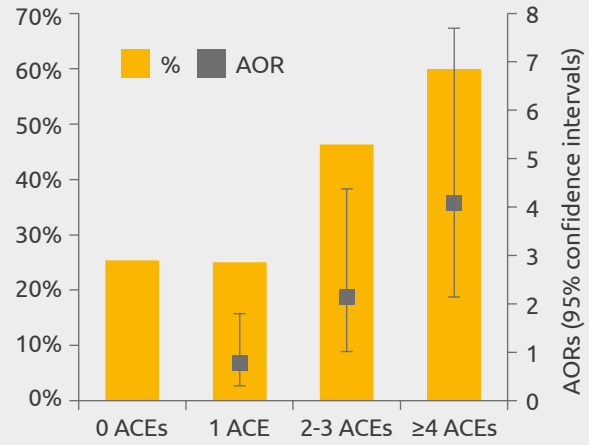


Figure 8: YOI incarceration: percentage and adjusted odds ratio (AOR) by ACE count



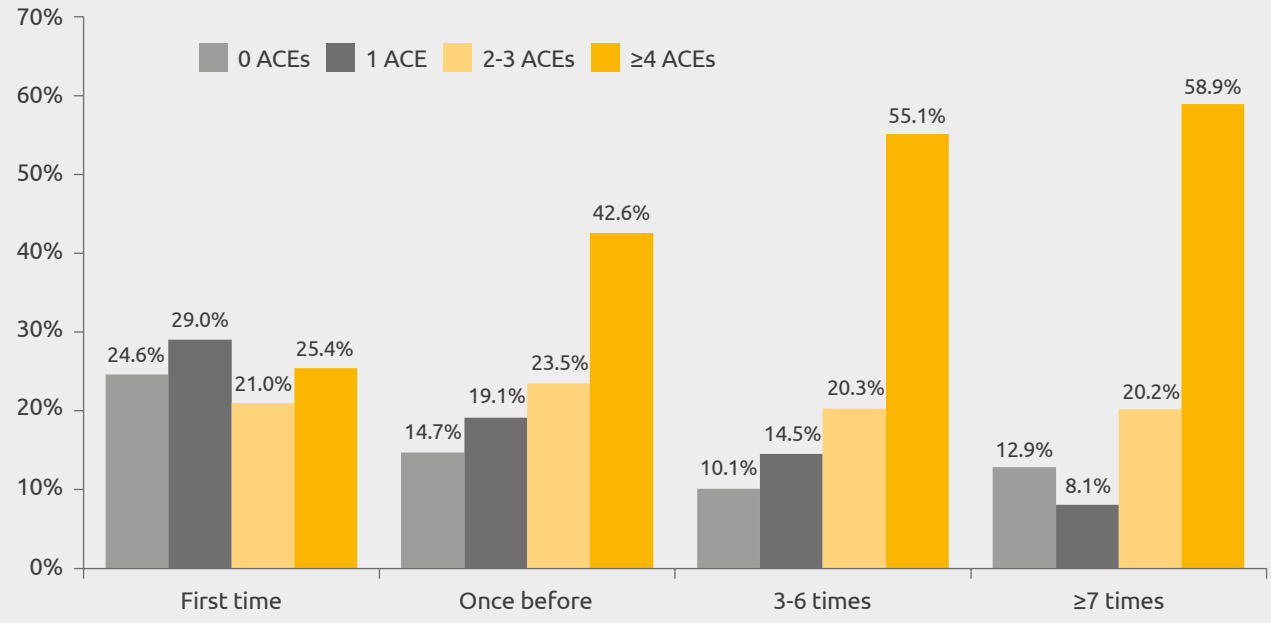
3.3.2. Number of times in prison (lifetime)

Participants were asked how many times they had ever been in prison before. Three in 10 (29.5%; Appendix 2, Table A4) reported that this was the first time they had been in prison in their lifetime. A further 14.5% reported that this was their second time in prison (i.e. they had been in prison once before), with over half (56.0%) reporting more previous incarcerations (i.e. at least two). Nearly two in 10 (16.2%) reported that they had been in prison >10 times before this period of incarceration.

The number of times in prison was significantly associated with age, ethnicity and qualifications, with individuals who were older, of white ethnicity, and those with no qualifications reporting an increased number of times in prison (Appendix 2, Table A4).

ACEs were positively associated with the number of times participants had been in prison. The proportion of individuals reporting four or more ACEs increased from 25.4% of those in prison for the first time to 58.9% of those who reported that they had been in prison ≥7 times ($p<0.001$; Figure 9). After adjusting for participant demographics (i.e. age, ethnicity and educational qualification) the odds of having been in prison for an increased number of times increased with ACE count, but only reached significance for those with four or more ACEs. Compared to prisoners with no ACEs, prisoners with four or more ACEs were 4.9 times more likely to have been in prison 3-6 times (reference category those in prison for the first time; CIs 2.236-10.633; $p<0.001$) and were 4.5 times more likely to have been in prison ≥7 times (CIs 2.013-9.943; $p<0.001$).

Figure 9: Number of times in prison by ACE count



3.3.3. Total length of time spent in prison

Participants were asked the total length of time they had spent in prison over their lifetime (until time of survey completion and not including time still to serve). One in five (21.6%) reported that they had spent <1 year of their life in prison. Four in 10 (40.0%) reported that they had spent >1 year but <5 years in prison, under one in five (17.5%) reported that they had spent >5 but <10 years in prison, and one in five (20.9%) reported that they had been in prison for ≥10 years of their life.

An increased total length of time in prison was associated with an increased age ($p<0.001$) but there were no significant relationships with ethnicity or educational qualifications (Appendix 2, Table A4).

Length of time in prison was significantly associated with ACE count, with 27.7% of those who had been in prison <1 year reporting four or more ACEs, compared with 57.5% of those reporting >3 years in prison ($p<0.001$). After adjusting for participant demographics (i.e. age, ethnicity and educational qualification), the odds of having been in prison for an increased length of time increased with ACE count. Compared to prisoners with no ACEs, prisoners with two to three ACEs were 3.8 times more likely to be in prison for >1 year but <3 years (reference category prisoners who had spent less than a year in prison; CIs 1.550-9.363; $p=0.004$). Compared to prisoners with no ACEs, prisoners with four or more ACEs were 2.4 times more likely to have been in prison for >1 year but <3 years (reference category prisoners who had spent less than a year in prison; CIs 1.056-5.681; $p=0.037$) and 4.4 times more likely to have been in prison >3 years (CIs 2.194-8.915; $p<0.001$).

3.3.4. Prolific offending

Individuals were asked how many convictions they had (i.e. had been found guilty of a criminal offence – this did not include any cautions received). This information was used to classify individuals as prolific- or non-prolific offenders. In line with the Ministry of Justice prolific offending definition [29], individuals were categorised as a prolific offender if they were aged between 18-20 years old and reported eight or more convictions, or if they were aged 21 years and older and reported having 16 or more convictions (see Appendix 1 for more information).

Almost four in 10 (38.5%) participants were classified as prolific offenders.

The proportion of prolific offending was significantly higher among the youngest and oldest age groups (41.9% of those aged 18-20 reducing to 22.4% in those aged 21-24; $p<0.05$), individuals of white ethnicity (41.6% compared with 21.6% of those with other ethnicity; $p=0.001$) and those with no qualifications (41.4% compared with 14.3% in those with a higher education qualification; $p<0.05$; Appendix 2, Table A3).

Prolific offending was significantly associated with ACE count (Figures 10 and 11). The proportion of prolific offending increased with ACEs, with 25.7% of those with no ACEs being prolific offenders, compared with 52.1% of those with four or more ACEs (Figure 11; Appendix 2, Table A3).

38.5%
of the sample were classified as prolific offenders

89.4%
of prolific offenders had at least one ACE and 61.7% had four or more ACEs

Prisoners with four or more ACEs were **3.4 times** more likely to be prolific offenders than prisoners with no ACEs

Nine in 10 (89.4%) prolific offenders reported at least one ACE, with six in 10 (61.7%) reporting four or more ACEs ($p<0.001$; Figure 10).

The relationship between ACE count and prolific offending remained after controlling for participant demographics. Individuals with four or more ACEs were 3.4 times more likely to have been a prolific offender than prisoners with no ACEs (Figure 11; Appendix 2, Table A5).

Figure 10: Prolific offending by ACE count

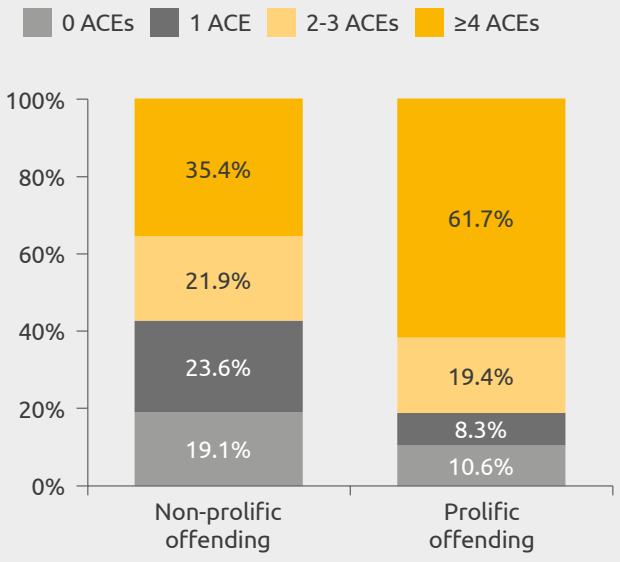
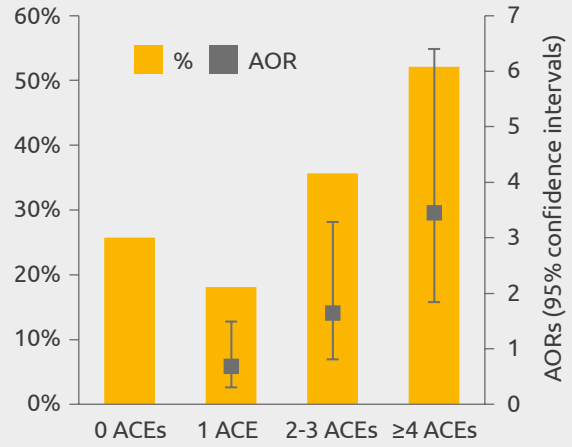


Figure 11: Prolific offending: percentage and adjusted odds ratio (AOR) by ACE count



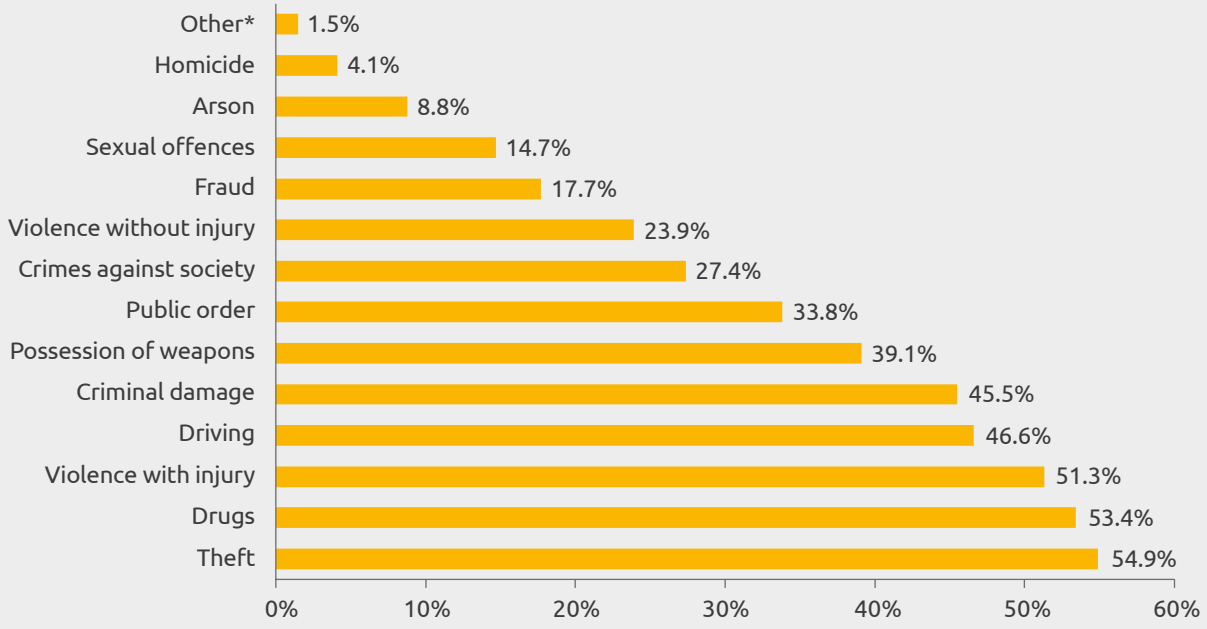
3.4. Relationship between ACEs and crime types

Participants were asked to report the type of crimes that they had ever been convicted of (from a list of 13 crime types; Figure 12; Appendix 1, Table Aii). This did not include any cautions that they may have received, or crimes that they may have committed but not been convicted for.

The most prevalent type of crime was theft (reported by 54.9% of participants), followed by drugs and violence with injury. The least prevalent crime type was homicide (4.1%). Over one in 10 (14.7%) reported that they had a criminal conviction for a sexual offence (Figure 12). On average, individuals reported having been convicted of four crime types (range one to 11).

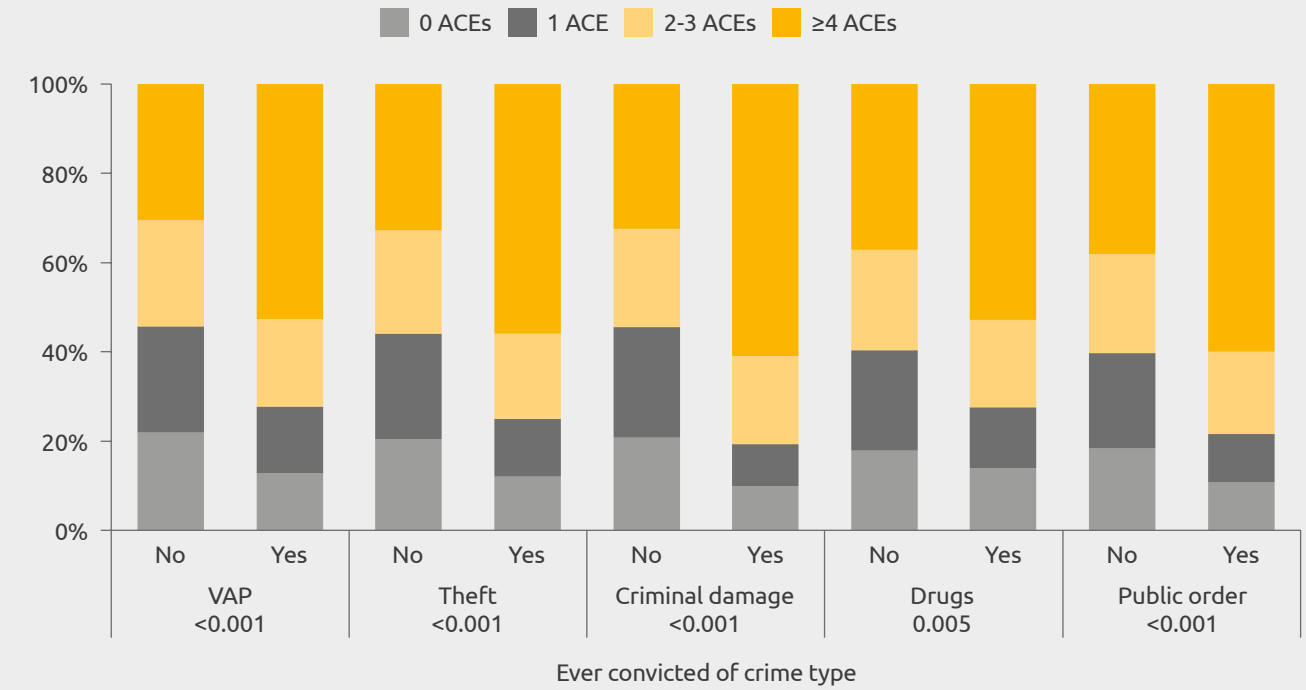
Crime types were collapsed into seven broader categories for analysis: violence against the person (VAP), driving, theft, criminal damage, drugs, public order and sexual offences (Figure 13 and Appendix 1, Table Aii). ACE count varied by crime type and some crime types had strong associations with ACEs (Figure 13; Appendix 2, Table A3). For example, 52.7% of those that had convictions for VAP had four or more ACEs compared with 30.5% of those without these convictions. For criminal damage these figures were 61.0% and 32.5% respectively. There were no associations between ACE count and sexual offending or driving offences.

Figure 12: Prevalence of crime types



*Other was an additional option and includes crime types that could not be classified into other types.

Figure 13: Prevalence of crime types by ACE count



VAP = Violence against the person.

Relationships between ACEs and crime types remained after adjusting for participant demographics (Appendix 2, Tables A6a and A6b). Compared with prisoners with no ACEs, prisoners with four or more ACEs were:

3.5 times more likely to have been convicted of **criminal damage**

2.9 times more likely to have been convicted of **violence against the person**

2.6 times more likely to have been convicted of **theft**

2.6 times more likely to have been convicted of **public order**

1.8 times more likely to have been convicted of **drugs offences**

3.5. Violence involvement

To enable an exploration of violence involvement in the past year regardless of crime types reported, all participants were asked to self-report:

Violence perpetration
How many times they had physically hit someone else in the past 12 months

Violence victimisation
How many times they had been physically hit in the past 12 months

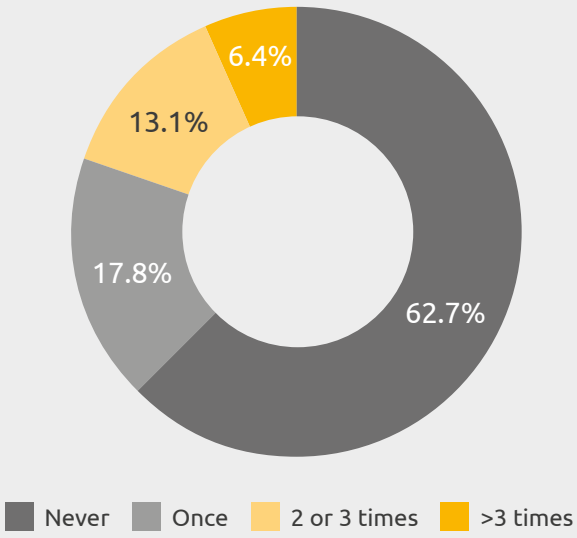
This included any violence involvement in the past year. We did not distinguish between violence perpetration and victimisation which had occurred in prison and outside of prison (see Section 4.6).

3.5.1. Violence perpetration

Over a third (37.3%) reported that they had perpetrated violence within the last year. Almost one in five (19.5%) reported that they had perpetrated violence two or more times in the period (Figure 14).

Proportions reporting violence perpetration reduced with age, from 55.8% in 18-20 year olds to 28.6% in 40-69 year olds (p<0.001). Individuals with no educational qualifications also reported the highest levels of violence perpetration (44.8%, reducing to 14.3% in those with a higher education qualification; p<0.05; Appendix 2, Table A3).

Figure 14: Frequency of violence perpetration



Of those who reported that they had perpetrated violence, seven in 10 (69.5%) reported that they had also been a victim of violence in the past 12 months (see Section 3.5.2).

Violence perpetration was significantly associated with experiencing all individual ACE types except physical abuse, physical neglect, or having a household member incarcerated (Appendix 2, Table A7).

Violence perpetration was significantly associated with ACE count (Figures 15 and 16). Nearly half (47.2%) of prisoners exposed to four or more ACEs reported having been physically violent in the last 12 months compared with under a quarter (23.0%) of those who reported no ACEs (p<0.001; Figure 16; Appendix 2, Table A3). Of those reporting violence perpetration, 57.5% had four or more ACEs (Figure 15).

The relationships between violence perpetration and ACE count remained after controlling for participant demographics. Individuals exposed to four or more ACEs were 3.0 times more likely to have perpetrated violence in the last 12 months compared with prisoners exposed to no ACEs (Figure 16; Appendix 2, Table A8). Individuals aged 18-20 years old were 3.4 times more likely to have perpetrated violence than prisoners aged 40 years and over (Appendix 2, Table A8).

Figure 15: Violence perpetration by ACE count

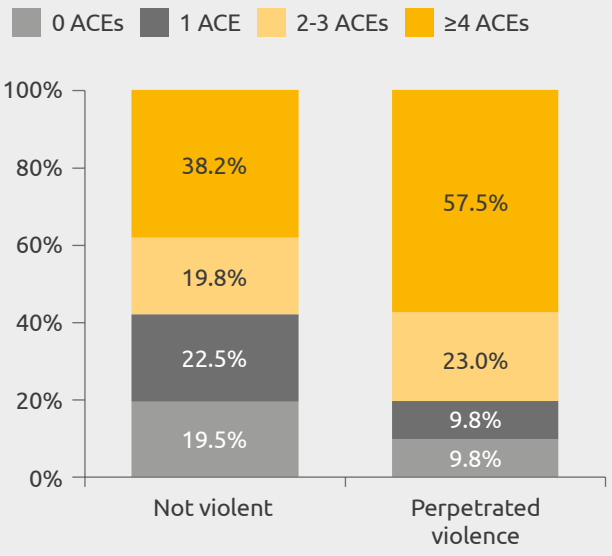
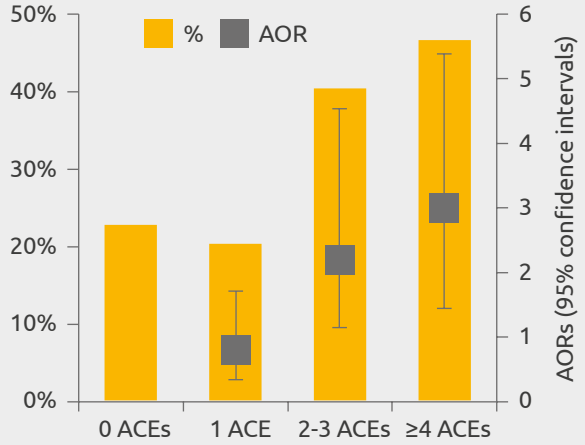


Figure 16: Violence perpetration: percentage and adjusted odds ratio (AOR) by ACE count



3.5.2. Violence victimisation

A third of the sample (34.5%) reported that they had been a victim of violence in the last 12 months. Two in 10 (19.5%) reported that they had been a victim of violence two or more times in this period (Figure 17).

There were no significant associations between being a victim of violence and participant age group, ethnicity or level of educational qualification (Appendix 2, Table A3).

Being a victim of violence was significantly associated with having experienced any individual ACE type except having a household member incarcerated (Figures 18 and 19; Appendix 2, Table A7). Violence victimisation was significantly associated with ACE count, with 49.1% of prisoners exposed to four or more ACEs reporting violence victimisation compared with 21.6% of prisoners who reported no ACEs ($p<0.001$; Figure 19). Of those reporting violence victimisation, 64.6% had four or more ACEs (Figure 18).

After controlling for socio-demographics, the relationship between violence victimisation and ACE count remained. Prisoners exposed to four or more ACEs were 3.5 times more likely to have been a victim of violence in the last 12 months compared with prisoners exposed to no ACEs (Figure 19; Appendix 2, Table A8).

Figure 17: Frequency of violence victimisation

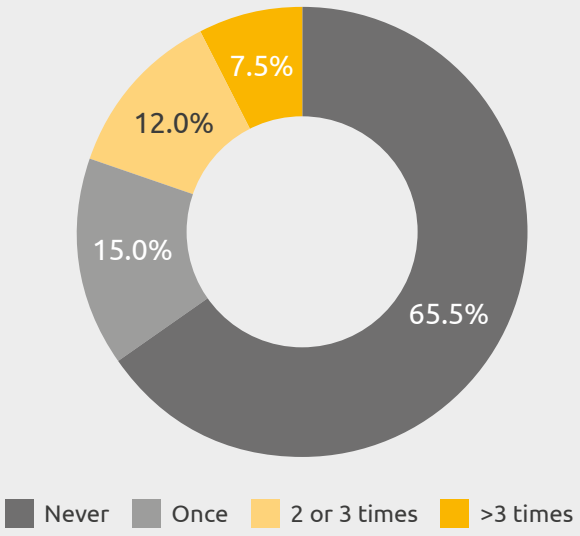


Figure 18: Violence victimisation by ACE count

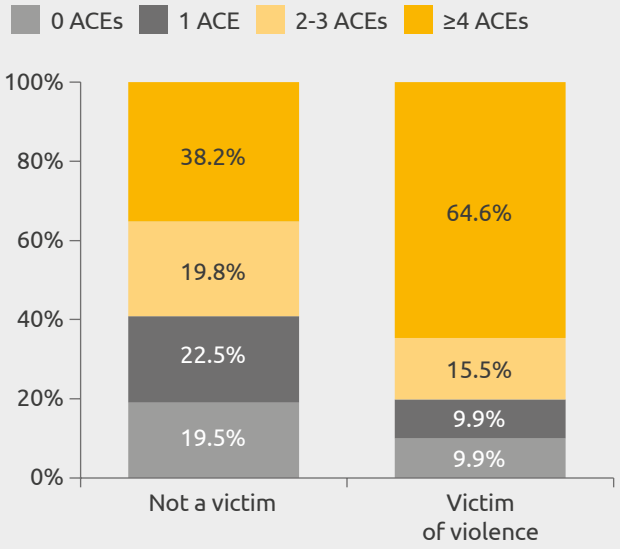
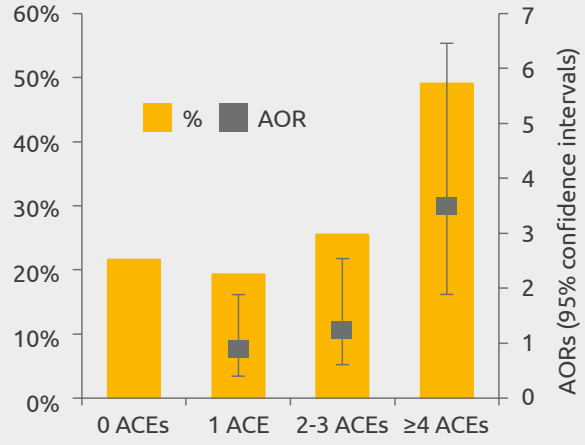


Figure 19: Violence victimisation: percentage and adjusted odds ratio (AOR) by ACE count



4. Discussion

4.1. High prevalence of ACEs

The Prisoner ACE Survey identified high levels of childhood adversity in a prisoner population in Wales, with 84.1% having suffered at least one ACE while growing up and nearly half reporting exposure to four or more types of ACE. This is consistent with international ACE prevalence rates found in justice-involved populations [4,30,31]. For example, in a sample of male offenders in the USA, only 9.3% reported no ACEs and 48.3% reported four or more [32]. In the Prisoner ACE Survey, the prevalence of four or more ACEs was over three times the level identified for males in the general population (11.9%) in the 2017 Welsh ACE and Resilience study, which measured the same 11 ACEs [2]. The ACE count prevalence in the Prisoner ACE Survey was also higher than reported by males who had ever been incarcerated (i.e. self-reported that they had ever spent a night in prison, jail or in a police station; 26.3% 0 ACEs, 20.1% 1 ACE, 24.7% 2-3 ACE, 29.0% =4 ACE, n= 876) in previous ACE general population surveys in England and Wales. Furthermore, the Prisoner ACE Survey identified a higher prevalence of all individual ACEs than found in general population studies across Wales and England [10,33].

No previous studies have explored ACE count levels in UK prison populations. However, for individual ACEs, the levels identified in this study are similar to those identified among Scottish prisoners [20]. Four in 10 (40%) participants in our study reported domestic violence in their home while growing up, in comparison to 44% of male respondents in the Scottish prison setting [20]. Similar prevalence levels were also identified across studies for physical abuse (41% in this study compared with 44% in Scotland) and mental illness (28% and 32% respectively). However, direct comparisons between surveys cannot be made due to differences in study population (i.e. age range of participants), methodology (e.g. survey delivery), questions asked and coding of responses (e.g. verbal/emotional abuse and sexual abuse). The findings here indicate a high prevalence of childhood adversity in justice-involved populations and confirm associations between ACE exposure and offending. Given gender differences in exposure to trauma amongst incarcerated populations [34], further research should explore the prevalence of ACEs and associations with offending and intergenerational cycles within female offender populations in the UK setting.

4.2. ACEs and participant demographics

The Prisoner ACE Survey found no significant associations between ACE count and participant age, highlighting that justice-involved adults are likely to report having experienced childhood adversity regardless of age. Although we did not distinguish educational attainment by place of schooling (i.e. if qualifications had been gained in prison or in traditional schooling; see Section 4.6), the low levels of educational attainment identified in this study are consistent with the low levels of education and poor literacy skills commonly found in justice-involved populations [35]. Individuals who reported multiple ACEs had significantly poorer educational outcomes, with nearly a third of those with four or more ACEs (31.0%) stating that they had no formal educational qualification. ACEs were also associated with unemployment prior to entering the prison. Of the sample who were unemployed before prison (36.1%), over half (54.4%) reported four or more ACEs.

These findings are consistent with international literature evidencing the impact of ACEs on school absenteeism, educational attainment and employment in adulthood [9,11,36,37]. Engagement with education or the completion of vocational training opportunities while in prison are associated with improved employment outcomes on release [38] and significant reductions in reoffending [39,40]. Individuals in prison with no qualifications are likely to enter education in this setting. Given the high prevalence of ACEs in this cohort, education in prisons could follow models in the general population [41] to adopt ACE-informed approaches (e.g. staff understanding ACEs) which may help to improve educational attainment and employment outcomes for these individuals on release.

Educational qualification was used as a proxy measure of deprivation with no qualifications representing high deprivation, and higher education qualifications representing low deprivation (education is one domain of the index of multiple deprivation [IMD] - a standardised measure for comparing deprivation between areas; see [42]). Using this proxy measure, this survey evidenced high levels of deprivation amongst justice-involved individuals.

This is unsurprising given that deprivation is an important predictor of anti-social behaviour, violence and crime [43-45]. General population studies have highlighted strong associations between ACEs and deprivation, with populations in highly deprived areas more likely to report multiple ACEs [46]. Furthermore, social capital and support systems for individuals to draw upon may be lower in areas facing wider structural inequalities [47]. Research has identified that increased disadvantage and decreased affluence at a community level affects exposure to ACEs [48], with poverty and social deprivation being known risk factors for criminality [45,49,50]. Enhancing resilience (i.e. the ability to overcome serious hardship) at the community level and creating supportive environments may therefore play an important role in preventing adversity, or mitigating its negative effects, thus reducing offending [51,52]. If trauma-informed (i.e. understanding experiences during childhood which may underpin offending), prison as a community, may offer an opportunity for the provision of a rehabilitative and supportive environment, which could build individuals' resiliency prior to their release back into the wider community.

The findings here highlight the need to tackle adversities, which co-exist, while also increasing resilience across individual, family and community levels. There are a number of factors that have been shown to increase resilience and offer protective factors for individuals exposed to ACEs (e.g. having a trusted adult relationship during childhood [2,33]). However, these protective factors do not entirely counter the risks associated with exposure to multiple ACEs, and individuals with ACEs report lower resilience resources, thus, focus on the primary prevention of ACEs should also remain. Research has begun to examine the protective factors which may buffer the associations between ACEs and offending (e.g. social bonds, see [30], and social support, see [53]). However, future research should explore the protective factors for offending from a UK perspective, including their relationships with the outcomes examined here (e.g. YOI incarceration, prolific offending, violence involvement).

4.3. Association of ACEs with offending

4.3.1. Intergenerational cycles

Research has identified that criminality and victimisation can be intergenerational [54]. The replication of ACEs across generations can also occur when individuals exposed to adversity and stress in childhood develop coping mechanisms such as alcohol misuse and expose their own children to ACEs [55,56]. Parental imprisonment can also predict anti-social outcomes in youth [26]. A third (32.9%) of participants in this study reported that while they were growing up a member of their household served time or was sentenced to serve time in a prison or YOI. The prevalence of this ACE was higher in this study than reported in the Scottish prison setting, where 23% of male adult prisoners reported this ACE [20], but is lower than some estimates elsewhere. For example, in a sample of incarcerated males in the USA, over four in 10 (46%) reported parental incarceration [19]. Of individuals in this study who reported the household member incarceration ACE, 62.3% reported that they had served a sentence in a YOI. Furthermore, 63.5% of the overall sample reported that they had children, and these children would therefore also have been exposed to the ACE type of family incarceration. It is vital that justice-involved individuals and their families are supported when their lives have been affected by ACEs to prevent subsequent intergenerational offending and the transfer of ACEs from parent to child. These findings add to the evidence on the cycles of family incarceration and the importance of attention to prisoners' family relationships, highlighting the need for early intervention which supports families at the earliest stage possible to break such intergenerational cycles. One intervention which takes a whole family approach to reduce reoffending and break intergenerational offending is that of Invisible Walls Wales (IWW). Early evaluations of IWW have demonstrated evidence of a positive change for the prisoners and families involved [57]. However, research of a longitudinal scale is needed to further explore the effectiveness of such interventions on intergenerational cycles of offending.

4.3.2. YOI incarceration

Almost half of the sample (45.9%) reported that they had served a sentence in a YOI, the proportion of which was higher for younger participants and those with low educational attainment. ACEs significantly increased the odds of having spent time in a YOI. In comparison to prisoners who had experienced no ACEs, prisoners with four or more ACEs were 4.2 times more likely to have had YOI incarceration. More than nine in 10 (91.2%) prisoners who had served a sentence in a YOI had also experienced at least one ACE. These findings are consistent with a large body of international research that has found juvenile or youth offenders at increased risk of becoming adult offenders [58-59]. The high prevalence of ACEs in those with YOI incarceration highlights the need for early intervention which may both prevent initial offending and stop reoffending in justice-involved youth.

4.3.3. Prolific offending and recidivism

Strong associations were found between ACEs and prolific offending, with prisoners who reported four or more ACEs being 3.4 times more likely to have been a prolific offender and almost nine in 10 (89.4%) prolific offenders reporting at least one ACE. Thus, ACEs were shown to present a risk for youth offending, recidivism and prolific offending. These findings are in line with research that has highlighted the increased risk of offending when ACEs are present, with an increased mean number of convictions being associated with ACE count [16]. Preventing ACEs is therefore likely in turn to prevent crime and lessen the associated costs of ACEs on the criminal justice system. Those with a history of childhood abuse, neglect or household dysfunction are likely to be in need of additional treatment and intervention [60]. The importance of the provision of trauma-informed services (i.e. services which recognise the relationships between a history of trauma and offending related issues) within the criminal justice system is well recognised [15,53]. These findings evidence the need for the criminal justice workforce to understand the life experiences of the individuals they work with, and the complexities of their needs. Small studies in the prison setting have indicated that there is a poor level of understanding of ACEs among the prison workforce [61]. *Prosperity for All: the national strategy* [27] sets out the commitment by the Welsh Government to create ACE-informed public services that support the prevention of ACEs.

As a result, a programme of work in the criminal justice sector is ongoing to create a whole system approach to vulnerable individuals, including those who are at risk of, or who have suffered ACEs. This includes the development of a trauma- or ACE-informed approach across policing, prisons, youth justice, probation and other partner organisations [28,62-64]. Within the prison and youth justice setting in Wales this comprises supporting individuals, their families and criminal justice staff to feel enabled in addressing their ACEs or supported in managing them.

Furthermore, the findings here indicate that individuals who had been to prison more than once reported a higher prevalence of ACEs. The prevalence of four or more ACEs increased from 25.4% among those in prison for the first time, to 42.6% among those in prison for the second time and 58.9% of those in prison ≥7 or more times. Compared to prisoners with no ACEs, prisoners with four or more ACEs were 4.9 times more likely to have been in prison 3-6 times and 4.5 times more likely to have been in prison ≥7 times (reference category those in prison the first time). The strong relationships between ACE count and YOI incarceration, prolific offending and the number of times in prison indicates the importance of early intervention for those at risk of suffering childhood adversity and ensuring that those who have experienced ACEs are responded to appropriately. Early intervention the first time that someone enters the criminal justice system may prevent subsequent incarceration, particularly for those who have experienced multiple ACEs. Routine enquiry for ACEs, where professionals are equipped with the skills and confidence to proactively and sensitively enquire about past childhood experiences and tailor support accordingly within the criminal justice system, may help to identify individuals who are at risk of future recidivism. ACE enquiry could potentially provide an opportunity to identify those at increased risk of future engagement within the criminal justice system. However, the evidence base for routine enquiry is currently limited, with no published studies examining the outcomes for routine enquiry within this setting [65]. Furthermore, it is essential that routine ACE enquiry, if implemented within justice systems, is accompanied by the development of evidence-based, tailored services for those identified as in need [4,60].

4.4. Association of ACEs with crime types

ACEs were found to be associated with violent crime, with prisoners who had experienced four or more ACEs three times more likely to have been convicted of violence against the person than individuals with no ACEs. Previous research has shown an association between violent criminal behaviour and childhood adversity including child sexual abuse [66]. Unlike other studies [67], this study found no association between ACEs and sexual offending. Despite recruiting in areas of the prison which houses individuals convicted of sexual offences, only a small number of participants (n=69) reported this type of crime. As crime types were self-reported (see Section 4.6), it may be that the prevalence of sexual offences found here is an underestimate due to issues of vulnerability associated with this admission in a prison setting and/or stigma associated with this crime type.

4.5. Violence involvement

Participants in this study reported a high prevalence of violence involvement. Almost one in five (19.5%) reported that they had perpetrated violence two or more times in the last year. Toxic stress on the brain as a result of childhood trauma impacts early brain development, affecting the regulation of emotion and impacting how an individual interprets events [68,69]. Correspondingly, ACEs have been associated with both aggressive behaviour and violence perpetration [9,12]. In this study, strong associations were found between high ACE counts and both violence perpetration and victimisation. The risk of violence perpetration was three times higher for prisoners with four or more ACEs in comparison to those with none. Although odds of both violence perpetration and victimisation for individuals with one ACE were lower than those with no ACEs, these associations were not significant and could be indicative of the high levels of violence in the prison setting (see below). A strong evidence base identifies child maltreatment and trauma as a determinant of violence and aggression [5], including within offender populations [70]. In this sample, seven in 10 (69.5%) of those who reported that they had perpetrated violence also reported that they had been a victim of violence. Being a victim of

violence was significantly associated with having experienced all individual ACE types except having a household member incarcerated.

Although this study measured violence perpetration and victimisation within the last year and not violence exposure within the prison setting (see Section 4.6), for some respondents this will correspond with a period of incarceration. Given that violence within custody is an offence, the self-reported levels of violence involvement seen here may also be an underestimate. Other research has identified that those who have experienced childhood trauma are more likely to engage in violent behaviours while in prison [71]. The associations between ACEs and violent behaviour can probably be extended to within the prison setting. Thus, individuals with four or more ACEs, who show a propensity for violence, may also be more likely to perpetrate violence within the prison environment. In England and Wales, levels of violence within prisons (i.e. assaults or fighting between prisoners and/or staff) have increased in recent years, with 31,025 assaults recorded between April 2017-March 2018, a 16% increase in incidents from the previous year [72]. There are many potential factors associated with the increase in violence within prisons including challenging behaviour, exacerbating features of the prison environment, and interactions between staff and prisoners [73]. However, given that ACEs are associated with maladaptive coping skills and impact the ability to adapt to new environments [19], it is likely that those with ACEs may find it difficult to adapt to prison settings, and potentially could perpetrate violence as a result. This finding further highlights the option of trauma-informed approaches within prison settings, especially when responding to violent behaviour. Future research could further explore the relationships between ACEs and violence, or other disruptive behaviour within the prison setting.

4.6. Limitations

Several study limitations should be considered in the interpretation of these findings. The respondents do not constitute a representative sample of prisoners in HMP Parc, nor the prison population in England and Wales as a whole. However, recruitment was organised to maximise the inclusion of all eligible prisoners. There are a number of prison characteristics that should also be considered. For example, HMP Parc is a privately run prison with a large sex offender population, whose characteristics may differ from those of the general prison population. However, at the time of data collection, HMP Parc represented the largest prison population in Wales.

All data collected (including the ACE data) were self-reported and retrospective, and thus, may be affected by accuracy of reporting, subjectivity and recall capacity. However, ACE prevalence levels identified in this study are similar to those found amongst offender populations elsewhere [4,31]. Furthermore, participation in the survey was voluntary, so we are unable to identify or exclude any bias created by refusal to participate, but anecdotally some individuals did decline to participate because they reported that their childhoods were traumatic (further information on the completion rate can be found in Appendix 1). In recording educational attainment, we did not differentiate between qualifications gained in school and those attained within a prison setting, thus, despite the low level of educational attainment identified, these figures are likely to be an overestimate of qualifications gained through traditional community schooling. We were unable to measure residential deprivation and instead relied on educational attainment. When recording violence involvement, this was restricted to the past year, thus, we are unable to differentiate between violence in and outside of prison.

Due to length restrictions on the questionnaire, we were unable to collect information on date of offences, or the age of the offender at the time of the conviction. This had implications as to how prolific offending was calculated as we could not identify how many offences an individual had received as a youth offender. We did not include cautions and instead only focused on convictions. Receiving a caution may affect an individual's ability to gain employment. However, every participant had at least one criminal conviction, with a large proportion of the sample having multiple convictions and thus categorised as prolific offenders. As YOIs were established approximately 30 years ago, there may be a number of participants in our sample who would not have been able to be incarcerated in a YOI, thus, the prevalence of YOI incarceration may be an underestimate and may mask past

youth offending and criminality. However, a high prevalence of YOI incarceration was identified in the study. We did not exclude prisoners on remand from participation in the survey. Additionally, our sample did not include women, or individuals currently located in Category A prisons (i.e. maximum security). However, HMP Parc does hold some Category A prisoners who were not excluded from participation. Prisoners on an ACCT were also excluded from participation. These individuals are by definition the most vulnerable inmates with high self-harm and suicide risk who may have been exposed to multiple ACEs. Finally, despite strong associations found between ACEs and criminal justice outcomes, causality between outcomes cannot be established.

4.7. Conclusion

In this report we have sought to explore the prevalence of ACEs in a male offender population and the associations between ACEs, offending histories, crime types and involvement in violence. Findings identify far higher levels of ACEs among male prisoners than among males in the general population. The strong relationships found between ACEs and youth, prolific and violent offending indicate that the prevention of ACEs could provide a significant opportunity to reduce crime. Work needs to be undertaken to identify effective primary prevention approaches and ways to respond to individuals at risk of or exposed to ACEs, and prevent justice-involvement. The high prevalence of ACEs in this population and the strong associations between multiple ACEs and more than one period of incarceration, indicates the potential for the implementation of effective trauma-informed strategies to prevent offending and recidivism. Work is on-going in Wales to deliver a trauma-informed youth justice service both in community and secure settings but evaluation of its effectiveness is still underway. Further, the associations between multiple ACEs and violence involvement add weight to the need for the development of trauma-informed services, which should ensure that those who have ACEs are supported to cope with their ACEs and are not re-traumatised by prison. ACEs are one of a range of risk factors that contribute to offending and may be associated with other risk factors for justice-involvement. However, preventing ACEs and supporting those affected by them may be a vital step in lowering offending levels, while breaking the intergenerational cycles of ACEs and offending is a critical part of ensuring that individuals can enjoy safe and nurturing childhoods and crime free lives. Interventions to break intergenerational cycles must be explored and where implemented evaluated longitudinally. While the prevention of all ACEs is a long-term aspiration, early intervention in prison and with families who have a household member incarcerated is vital to support those affected by ACEs and help prevent the intergenerational transmission of ACEs and crime.

Options to tackle ACEs and their consequences in prisons and prison populations

- **The criminal justice system could consider the provision of trauma-informed services.** The creation of a trauma-informed criminal justice service (see Sections 4.2, 4.3 and 4.5) may enable its workforce to understand the life experiences of the individuals they work with, the complexities of their needs, and support individuals affected by ACEs and trauma. This would also enable staff to support individuals with ACEs who may find it difficult to adapt to prison settings and might be at increased risk of violence involvement (see Sections 3.5 and 4.5). Early intervention the first time that someone enters the criminal justice system may prevent subsequent incarceration, particularly for those who have experienced multiple ACEs (see Sections 3.3 and 4.3). Education provision in prisons should also consider a trauma-informed approach as this may help to further improve educational attainment and employment outcomes for individuals on release and could potentially act as a protective factor (see Sections 3.1 and 4.2). The development of a trauma-informed service and any implementation in this setting would require a rigorous evaluation. The implementation of routine enquiry for ACEs may help to identify individuals who are at greater risk of future recidivism (see Sections 3.3 and 4.3), but care must be taken to not allow this information to stigmatise individuals. The evidence base for routine enquiry is currently limited, so outcomes from this would need to be extensively explored from both a workforce and prisoner perspective.

- **Interventions to prevent recidivism could support individuals and their families.** ACEs present a risk for youth offending and recidivism and are transmitted across generations (see Sections 3.3 and 4.3). Support for justice-involved individuals where their lives have been affected by ACEs could also extend to their families. Working with individuals and their families may further prevent subsequent offending, the transfer of ACEs from parent to child and increase resilience at the familial level (see Section 4.2).
- **A focus should also remain on the primary prevention of ACEs in future generations.** Although interventions for those involved within the criminal justice system could be considered, the prevention of ACEs in future generations is critical and a key factor in the prevention of crime (see Sections 3.1, 3.2 and 4.3.1). Attention should continue to be placed on early intervention for those at risk of suffering childhood adversity. This includes strengthening the early years and the provision of parenting and family programmes known to be effective in reducing child maltreatment.
- **There are a number of areas that future research could explore.** These include: the prevalence of ACEs, associations with offending and intergenerational cycles within other UK populations, including female offenders, those on probation and justice-involved youth; the protective factors that may moderate the relationship between ACEs and offending; and relationships between ACEs and violence, or other disruptive behaviour within the prison setting (see Section 4).

References

1. Bellis MA, Ashton K, Hughes K, Ford K, Bishop J, Paranjothy S. Adverse childhood experiences and their impact on health-harming behaviours in the Welsh population. Cardiff: Public Health Wales; 2015.
2. Hughes K, Ford K, Davies AR, Homolova L, Bellis MA. Sources of resilience and their moderating relationships with harms from adverse childhood experiences. Cardiff: Public Health Wales; 2018.
3. Godet-Mardirossian H, Jehel L, Falissard B. Suicidality in male prisoners: Influence of childhood adversity mediated by dimensions of personality. J Forensic Sci 2011;56(4):942–9.
4. Naramore R, Bright MA, Epps N, Hardt NS. Youth arrested for trading sex have the highest rates of childhood adversity: A statewide study of juvenile offenders. Sexual Abuse 2017;29(4):396–410.
5. Ramirez SR, Jeglic EL, Calkins C. An examination of the relationship between childhood abuse, anger and violent behavior among a sample of sex offenders. Health Justice 2015;3(1):14.
6. Ashton K, Bellis MA, Davies AR, Hardcastle K, Hughes K. Adverse childhood experiences and their association with chronic disease and health service use in the Welsh adult population. Cardiff: Public Health Wales; 2016.
7. Felitti VJ, Anda RF, Nordenberg D, Wiliamson DF, Spitz AM, Edwards V, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. Am J Prev Med 1998;14(4):245–58.
8. Grey HR, Ford K, Bellis MA, Lowey H, Wood S. Associations between childhood deaths and adverse childhood experiences: An audit of data from a child death overview panel. Child Abuse Negl 2019;90;22-31.
9. Bellis MA, Hughes K, Ford K, Edwards S, Sharples O, Hardcastle K, et al. Does adult alcohol consumption combine with adverse childhood experiences to increase involvement in violence in men and women? A cross-sectional study in England and Wales. BMJ Open 2018;8:e020591.
10. Ford K, Butler N, Hughes K, Quigg Z, Bellis MA. Adverse childhood experiences in Hertfordshire, Luton and Northamptonshire. Liverpool: Centre for Public Health; 2016.
11. Hardcastle K, Bellis MA, Ford K, Hughes K, Garner J, Ramos Rodriguez G. Measuring the relationships between adverse childhood experiences and educational and employment success in England and Wales: Findings from a retrospective study. Public Health 2018;165:106-16.
12. Hughes K, Bellis MA, Hardcastle KA, Sethi D, Butchart A, Mickton C, et al. The effect of multiple adverse childhood experiences on health: A systematic review and meta-analysis. Lancet Public Health 2017;2(8):e356–e366.
13. Lasford JE, Miller-Johnson S, Berlin LJ, Dodge KA, Bates JE, Pettit GS. Early physical abuse and later violent delinquency: A prospective longitudinal study. Child Maltreatment 2007;12(3):233-45.
14. Teague R, Mazerolle P, Legosz M, Sanderson J. Linking childhood exposure to physical abuse and adult offending: Examining mediating factors and gendered relationships. Justice Quarterly 2008;25(2):313-348.
15. Baglivio MT, Epps N. The prevalence of adverse childhood experiences (ACE) in the lives of juvenile offenders. J Juvenile Justice 2014;3(2):1-23.
16. Craig JM, Piquero AR, Farrington DP, Ttofi MM. A little early risk goes a long bad way: Adverse childhood experiences and life-course offending in the Cambridge study. J Crim Justice 2017;53:34–45.
17. Fox BH, Perez N, Cass E, Baglivio MT, Epps N. Trauma changes everything: Examining the relationship between adverse childhood experiences and serious, violent and chronic juvenile offenders. Child Abuse Negl 2015;46:163-73.
18. Wolff KT, Baglivio MT. Adverse childhood experiences, negative emotionality, and pathways to juvenile recidivism. Crime Delinq 2016;63(12):1495–1521.
19. Skarupski KA, Parisi JM, Thorpe R, Tanner E, Gross D. The association of adverse childhood experiences with mid-life depressive symptoms and quality of life among incarcerated males: Exploring multiple mediation. Aging Ment Health 2016;20(6):655–66.
20. Carnie J, Broderick R, Cameron J, Downie D, Williams G. Prisoner Survey 2017: 16th Series Research Strategy and Innovation. Scottish Prison Service; 2017.
21. Baglivio MT, Jackowski K, Greenwald MA, Howell J. Serious, violent, and chronic juvenile offenders: A statewide analysis of prevalence and prediction of subsequent recidivism using risk and protective factors. Criminology & Public Policy 2014;13(1):83-116.
22. Baglivio MT, Epps N. The interrelatedness of adverse childhood experiences among high-risk juvenile offenders. Youth Violence and Juv Justice 2016;14(3):179–198.
23. Fox BH, Perez N, Cass E, Baglivio MT, Epps N. Trauma changes everything: Examining the relationship between adverse childhood experiences and serious, violent and chronic juvenile offenders. Child Abuse Negl 2015;46:163-73.
24. Lê-Scherban F, Wang X, Boyle-Steed KH, Pachter LM. Intergenerational associations of parent adverse childhood experiences and child health outcomes. Pediatrics 2018;141(6):e20174274.
25. Williams K, Papadopoulou V, Booth N. Prisoners' childhood and family backgrounds: Results from the Surveying Prisoner Crime Reduction (SPCR) longitudinal cohort study of prisoners. London: Ministry of Justice Research Series; 2012;4:12.

26. Murray J, Farrington DP. The effects of parental imprisonment on children. In: Tonry M, editors. Crime and Justice. Chicago: University of Chicago Press; 2008.133-206.

27. Welsh Government. Prosperity for all: The national strategy. 2017. Available from: http://gov.wales/about/programme-for-government/?lang=en [Accessed 6th Oct 2017].

28. Welsh Government and Her Majesty's Prison and Probation Service. A Framework to support positive change for those at risk of offending in Wales 2008-2023. Welsh Government. 2017.

29. Gov.uk. Prolific Offenders - Defining a Prolific Offender. 2017 Available from: https://assets.publishing.service.gov.uk/government/.../prolific-offenders-2017.pdf [Accessed 5th Jan 2019].

30. Craig JM, Baglivio MT, Wolff KT, Piquero AR, Epps N. Do social bonds buffer the impact of adverse childhood experiences on reoffending? Youth Violence and Juv Justice 2017;15(1):3–20.

31. Friestad C, Åse-Bente R, Kjelsberg E. Adverse childhood experiences among women prisoners: Relationships to suicide attempts and drug abuse. Int J Soc Psychiatry 2014;60(1):40-6.

32. Reavis JA, Looman J, Franco KA, Rojas B. Adverse childhood experiences and adult criminality: How long must we live before we possess our own lives? Permanente J 2013;17(2):44-8.

33. Bellis MA, Hardcastle K, Ford K, Hughes K, Ashton K, Quigg Z, et al. Does continuous trusted adult support in childhood impart life-course resilience against adverse childhood experiences – a retrospective study on adult health-harming behaviours and mental well-being. BMC Psychiatry 2017;17(1):110.

34. Krischer MK, Sevecke K. Early traumatization and psychopathy in female and male juvenile offenders. Int J Law Psychiat 2008;31(3):253–62.

35. Creese B. An assessment of the English and maths skills levels of prisoners in England. London Review of Education; 2016.

36. Stempel H, Cox-Martin M, Bronsert M, Dickinson LM, Allison MA. Chronic school absenteeism and the role of adverse childhood experiences. Acad Pediatrics 2017;17(8):837-843.

37. Topitzes J, Pate DJ, Berman ND, Medina-Kirchner C. Adverse childhood experiences, health, and employment: A study of men seeking job services. Child Abuse Negl 2016;61:23–34.

38. Ministry of Justice. Education and employment strategy. London: HM Stationery Office; 2018.

39. Ellison M, Szifris K, Horan R, Fox CA. Rapid evidence assessment of the effectiveness of prison education in reducing recidivism and increasing employment. Probation Journal 2017;64(2):108–128.

40. Ministry of Justice and Department for Education. Exploring the outcomes of prisoner learners: Analysis of linked offender records from the Police National Computer and Individualised Learner Records. London: Ministry of Justice; 2017.

41. Plumb JL, Bush KA, Kersevich SE. Trauma-sensitive schools: An evidence-based approach. Sch Soc Work J 2016;40(2):37–60.

42. Smith T, Noble M, Noble S, Wright G, McLennan D, Plunkett E. The English indices of deprivation 2015. London: Department for Communities and Local Government; 2015.

43. Bellis MA, Hughes K, Wood S, Wye S, Perkins C. National five-year examination of inequalities and trends in emergency hospital admission for violence across England. Inj Prev 2011;17(5):319–25.

44. Piotrowska PJ, Stride CB, Croft SE, Rowe R. Socioeconomic status and antisocial behaviour among children and adolescents: A systematic review and meta-analysis. Clin Psych Review 2015;35:47-55.

45. Joseph Rowntree Foundation. Understanding and preventing youth crime. Soc Policy Research. 1996;93.

46. Bellis MA, Lowey H, Leckenby N, Hughes K, Harrison D. Adverse childhood experiences: Retrospective study to determine their impact on adult health behaviours and health outcomes in a UK population. J Public Health 2014;36(1): 81–91.

47. Lin N. Inequality in social capital. Contemporary Sociology 2000;29(6):785-95.

48. Baglivio MT, Wolff KT, Epps N, Nelson R. Predicting adverse childhood experiences: The importance of neighborhood context in youth trauma among delinquent youth. Crime & Delinq 2015:1-23.

49. Carr MB, Vandiver TA. Risk and protective factors among youth offenders. Adolescence 2001;36(143):409-26.

50. Shader M. Risk factors for delinquency: An overview. Washington DC: US Department of Justice; 2004.

51. Ellis WR, Dietz WH. A new framework for addressing adverse childhood and community experiences: The building community resilience model. Academic Pediatrics 2017;17(1):S86–S93.

52. Ungar M. Community resilience for youth and families: Facilitative physical and social capital in contexts of adversity. Children and Youth Services Review 2011;33(9):1742-8.

53. Krammer S, Eisenbarth H, Hügli D, Liebrenz M, Kuwert P. The relationship between childhood traumatic events, social support, and mental health problems in prisoners. J Forens Psychiatry Psychol 2018;29(1):72–85.

54. Besemer S, Ahmad SI, Hinshaw SP, Farrington DP. A systematic review and meta-analysis of the intergenerational transmission of criminal behavior. Aggress Violent Behav 2017;37:161–78.

55. Bridgett DJ, Burt NM, Edwards ES, Deater-Deckard K. Intergenerational transmission of self-regulation: A multidisciplinary review and integrative conceptual framework. Psychol Bull 2015;141(3):602-654.

56. Woods-Jaeger BA, Cho B, Sexton CC, Slagel L, Goggin K. Promoting resilience: Breaking the intergenerational cycle of adverse childhood experiences. Health Education & Behavior 2018;45(5):772-80.

57. Clancy A, Maguire M. Prisoners and their children: An innovative model of 'whole family' support. Eur J Probat 2017;9(3):210-30.

58. Kempf-Leonard K, Tracy PE, Howell JC. Serious, violent, and chronic juvenile offenders: The relationship of delinquency career types to adult criminality. Justice Q 2001;18(3):449–78.

59. Rhoades KA, Leve LD, Eddy JM, Chamberlain P. Predicting the transition from juvenile delinquency to adult criminality: Gender-specific influences in two high-risk samples. Crim Behav Ment Health 2016;26(5):336-51.

60. Hoeve M, Colins OF, Mulder EA, Loeber RJ, Stams GJ, Vermeiren RR. Trauma and mental health problems in adolescent males: Differences between childhood-onset and adolescent-onset offenders. Crim Justice Behav 2015;42(7):685–702.

61. Newbury A, Ford K, Roderick J. Understanding the awareness of adverse childhood experiences (ACEs) in the criminal justice workforce. Cardiff: Public Health Wales; 2018

62. Ford K, Evans J, Newbury A, Meredith Z, Roderick J. Understanding the response to vulnerability by South Wales Police Force and other agencies. Cardiff: Public Health Wales; 2017.

63. HM Government. Serious Violence Strategy; 2018.

64. Ford K, Newbury A, Meredith Z, Evans J, Roderick J. An evaluation of the Adverse Childhood Experience (ACE) Informed Approach to Policing Vulnerability Training (AIAPVT) pilot. Cardiff: Public Health Wales; 2017.

65. Ford K, Hughes K, Hardcastle K, Di Lemma LCG, Davies AR, Edwards S, et al. The evidence base for routine enquiry into adverse childhood experiences: A scoping review. Child Abuse Negl 2019;91:131-46.

66. Brewer-Smyth K, Cornelius ME, Pickelsimer EE. Childhood adversity, mental health, and violent crime. J Forensic Nurs 2015;11(1):4–14.

67. Levenson JS, Willis GM, Prescott DS. Adverse childhood experiences in the lives of female sex offenders. Sexual Abuse 2015;27(3):258–83.

68. Pechtel P, Pizzagalli DA. Effects of early life stress on cognitive and affective function: an integrated review of human literature. Psychopharmacology 2011;214(1):55-70.

69. Teicher MH, Samson JA, Anderson CM, Ohashi K. The effects of childhood maltreatment on brain structure, function and connectivity. Nat Rev Neurosci 2016;17(10):652-66.

70. Sarchiapone M, Carli V, Cuomo C, Marchetti M, Roy A. Association between childhood trauma and aggression in male prisoners. Psychiatry Res 2009;165(1-2):187–92.

71. Martin MS, Eljdupovic G, McKenzie K, Colman I. Risk of violence by inmates with childhood trauma and mental health needs. Law Hum Behav 2015;39(6):614–23.

72. Ministry of Justice. Safety in custody statistics, England and Wales: Deaths in prison custody to June 2018 assaults and self-harm to March 2018; 2018.

73. McGuire. Understanding prison violence: A rapid evidence assessment. HM Prison & Probation service; 2018.

74. Meinck F, Steinert JI, Sethi D, Gilbert R, Bellis MA, Mickton C, et al. Measuring and monitoring national prevalence of child maltreatment: A practical handbook. Copenhagen: World Health Organization Regional Office for Europe; 2016.

Appendix 1: Full research methodology

Data collection was undertaken between February and June 2018 by researchers from the Public Health Collaborating Unit (Bangor University) and Public Health Wales. All interviewers received interview training drawn from previous Adverse Childhood Experience (ACE) studies in Wales, were vetted by both the National Offending Management Service (NOMS) and G4S, and completed relevant G4S security and safety training provided by the prison. Approval for the research was granted by the Public Health Wales Research and Development Office and Her Majesty's Prison & Probation Service (HMPPS; formerly NOMS) National Research Committee (NRC). Ethical approval was obtained from Bangor University's Healthcare and Medical Sciences Ethics Committee and the National Health Service (NHS) Research Ethics Committee (Reference 17/WA/0249).

Sample selection and recruitment

To prioritise the inclusion of Welsh offenders residing in closed conditions, HMP Parc, a Category B prison in South Wales, was selected as the research site. The prison is run by G4S and holds convicted male adult offenders, and convicted and remand sex offenders and young offenders. A convenience sampling method was used to recruit males aged 18-69 years to the study. All participants could participate regardless of their security category (A, B, C or D), residential location (e.g. vulnerable units) or status within the prison (e.g. basic or enhanced). A target sample size of 451 was set, reflecting a third of the prison population capacity, with an achieved sample size of 470. Cases were excluded if they could not be assigned an ACE count due to missing data (n=2), resulting in a final sample of 468 for analysis.

Recruitment was targeted equally across all prison residences excluding the Youth Offender Institution (YOI) block (all prisoners were ineligible due to being aged under 18 years). An advert for the study was placed onto prisoner electronic information points within the prison in advance of the fieldwork, and leaflets advertising the study were distributed on each unit. Further to this, researchers spent time on units during association (i.e. free time) to speak with prisoners, inform them of the study and ask if they would be interested in taking part. All study materials clearly outlined the purpose of the study: to explore participants' childhood experiences, family structure, experiences of their children, health, substance use, well-being and prison experience. Data collection was designed to minimise disruption to the prison regime, maximise safety for the research team and ensure that appropriate ongoing care would be available for participants following completion of the interview. Following agreement with the prison, researchers collected data on selected Mondays - Thursdays during the study period and ensured that they were available between 8:00am - 6:30pm so that individuals who worked or were in education were able to take part in the research if they wished to with minimal disruption.

The study inclusion criteria were:

- Aged 18-69 years
- Cognitively able to participate
- Not currently managed under the Assessment, Care in Custody & Teamwork (ACCT) procedures.

To ensure informed consent for participation, potential participants were presented with an information sheet on contact, which outlined the purpose of the study, what the results would be used for and the confidentiality and anonymity of the research. Recognising high levels of illiteracy within the prison population, all materials were provided in an easy to read format. Researchers took time to go through the information sheet with all potential participants to ensure they were fully informed of what participation entailed. It was emphasised to all potential participants that participation was voluntary and that they were able to withdraw at any point during the interview. Names and prisoner identification numbers were collected during the recruitment stage so that researchers could find study volunteers within the prison and assess their eligibility (i.e. age and ACCT status) but these were not held with the data, or used to check offence histories. Written consent to take part in the study was taken from all participants.

All study materials, including recruitment advertisements and the study questionnaire, were available in English and Welsh.

Participation rate

When approached by the research team to participate, 529 individuals agreed to participate in an interview (including 100 who had expressed an interest in participation in response to research advertisements) and 167 declined participation. Of those who volunteered to participate, 12 were ineligible (n=6, not meeting eligibility criteria; n=6, deemed too vulnerable to participate), 26 left the prison during the study period before they were able to complete a questionnaire and 21 decided to withdraw at a later time. Of those approached to participate (n=696), the completion rate was 71.4%.

The total prison population changed during the study period but on the final day of data collection, 1,566 individuals were residing in HMP Parc, of which 1,448 were in the age range eligible to participate and not on an ACCT. Thus, of the total prison population at the end of study, the research team approached 48.1% of the eligible prison population.

Questionnaire

ACE questions

The study used a revised version of the questionnaire from previous Welsh ACE studies [1,2]. This included 13 questions covering exposure to 11 different ACEs during childhood (i.e. under the age of 18 years; Table Ai). Questions were taken from the United States Centers for Disease Control and Prevention established ACE tool, and the World Health Organization's Short Child Maltreatment Questionnaire [74].

Data were also collected on participant demographics (i.e. age, nationality, ethnicity, education, employment and marital status), family structure (e.g. number of biological children and each child's: age, gender, residency, childhood experiences, prison visitation), participant health (including: self-reported health status, mental health and well-being), offending background and prison experience (including: youth offending, total time spent in prison, type and number of criminal convictions [see Table Aii], and contact with family while in prison).

The interview was completed by the researcher using pen and paper, with the participant self-completing the more sensitive sections of the questionnaire. In some instances, at the request of the participant, the researcher completed the whole questionnaire on behalf of the participant. It was made clear to all participants that any questions could be declined.

On completion, individuals were provided with a thank you leaflet which contained details for available support services in the prison and telephone contact details for relevant help-lines such as the Samaritans. We estimate that on average interviews took 25 minutes to complete, including time to take consent. However, this varied due to participant literacy skills and the number of children they had fathered, which in some instances lengthened the time to complete the questionnaire.

Sample characteristics

Table Aiii shows the demographics of participants in the sample in comparison to the HMP Parc prison, and England and Wales male prison population.

Table Ai: ACEs enquired about in the study

ACE	Question All questions were preceded by the statement: "While you were growing up, before the age of 18…"	Response indicating ACE
Parental separation	Were your parents ever separated or divorced?	Yes
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
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
Sexual abuse	How often did anyone at least 5 years older than you (including adults) ever touch you sexually? 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)?	Once or more than once to any of the three questions
Physical neglect	Did your parent/caregiver for long periods of time not provide you with enough food or drink, clean clothes or a clean and warm place to live when they could have?	Once or more than once
Emotional neglect	Were there times when there was no adult living with you who made you feel loved?	More than once
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 offenders' institution?	Yes

Data analysis

Data entry and analysis was undertaken using IBM SPSS Statistics v24. Analyses used chi-squared to measure unadjusted relationships between ACEs, demographics, crime types and recidivism, and logistic regression to identify associations between ACEs and crime types after controlling for age, ethnicity and level of educational attainment (used as a measure of deprivation). It should be noted that findings are associations and do not imply causality.

Calculation of ACE count

For each different type of ACE an individual reported experiencing, an ACE score was counted (range 0 to 11), this was then used to calculate an individual's ACE count. The ACE count does not account for reoccurring events, their timing or duration. Consistent with other surveys completed in Wales and internationally, ACE counts were classified into four cohorts:

- No ACEs (n =74)
- One ACE (n =83)
- Two to three ACEs (n =98)
- Four or more ACEs (n =213).

Table Aii: Crime types enquired about in the study

Crime type categories included in questionnaire	Examples of crimes included in category	Collapsed category for analysis
Homicide	Murder, manslaughter, corporate manslaughter, infanticide	Violence against the person (VAP)
Violence with injury	Attempted murder, ABH, GBH	
Violence without injury	Threats to kill, harassment, cruelty to and neglect of children, assault without injury	
Possession of weapons	Possession of weapons e.g., knives, firearms	
Sexual offences	Rape, indecent assault, sexual grooming	Sexual offences
Driving offences	Driving while unlicensed, disqualified or uninsured	Driving offences
Theft	Robbery, burglary, attempted burglary, shoplifting, theft from a vehicle, blackmail, making off without payment	Theft
Criminal damage	Damage to the home, other property or vehicles and includes graffiti	Criminal damage
Drugs offences	Possession, consumption, supply of or the intent to supply illegal drugs	Drugs offences
Public order	Violence disorder, riot	Public order
Arson	The act of deliberately setting fire to property, including buildings and vehicles	Other
Crimes against society	Immigration offences, perverting the course of justice	
Fraud offences	Intentional deception in most occasions for monetary gain	
Other	Crime types unclassifiable into other types above	

Table Aiii: Prisoner ACE Study sample demographics and comparison to HMP Parc and Male Prisoners in England and Wales

		Prisoner ACE Survey (N=468)		HMP Parc Prison (N=1,502*)		England and Wales prisoner population (N=76,668**)	
		n	%	n	%	n	%
Age group (years)	18-20	43	9.2	128	8.5	4,109	5.4
	21-29	168	35.9	484	32.2	23,454	30.6
	30-39	131	28.0	442	29.4	23,868	31.1
	40-69	126	26.9	448	29.8	25,237	32.9
Ethnicity	White	394	84.2	1,329[+]	85.9[+]	57,130[++]	72.8[++]
	Other	74	15.8	237[+]	15.1[+]	21,358[++]	27.2[++]

*Data for July 2018 limited to those aged 18-69; **Age limited to 18-69; [+]Ethnicity breakdown not available by age, thus, reported for whole prison sample, N=1,566. [++§]Ethnicity breakdown not available by age, thus reported for full male population, excluding not stated and unrecorded (n=482), N=78,488; Data for England and Wales for 30 June 2018. Available from **www.gov.uk/government/statistics/offender-management-statistics-quarterly-july-to-september-2018**

Appendix 2: Data tables

Table A1: Participant demographics and association with ACE count and individual ACE types

			ACE count				Individual ACEs										
								Child abuse			Household dysfunction					Neglect	
		All (%)	0	1	2-3	≥4	Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse	Emotional neglect	Physical neglect
All (%)			15.8	17.7	20.9	45.5	57.8	50.0	40.8	17.6	28.4	40.0	30.6	32.9	32.3	19.1	11.5
Age group (years)	18-20	9.2	14.0	20.9	25.6	39.5	69.0	41.9	14.0	14.0	23.3	25.6	18.6	48.8	37.2	16.3	9.3
	21-24	16.2	11.8	21.1	18.4	48.7	61.8	60.5	36.8	13.3	36.8	40.8	34.2	38.2	35.5	23.7	10.5
	25-29	19.7	14.1	20.7	19.6	45.7	68.5	48.9	35.9	14.1	32.6	35.9	25.0	34.8	29.3	15.2	7.6
	30-39	28.0	16.8	11.5	25.2	46.6	57.3	48.9	45.8	16.2	29.0	42.7	34.4	33.6	38.2	22.1	11.5
	40-69	26.9	19.0	19.0	17.5	44.4	44.4	48.4	50.8	25.4	21.4	44.8	32.5	22.2	24.6	16.8	15.9
	X^2					9.315	16.220	4.747	20.815	7.570	7.057	6.008	5.834	12.581	6.682	3.368	3.999
	p					0.676	0.003	0.314	<0.001	0.109	0.133	0.199	0.212	0.014	0.154	0.498	0.406
Ethnicity	White	84.2	16.2	18.0	21.1	44.7	57.3	49.2	40.1	18.1	28.4	39.2	33.0	32.5	30.7	19.6	11.7
	Other	15.8	13.5	16.2	20.3	50.0	60.8	54.1	44.6	14.9	28.4	44.6	17.6	35.1	40.5	16.2	10.8
	X^2					0.816	0.323	0.578	0.521	0.453	<0.001	0.759	6.988	0.198	2.754	0.460	0.046
	P					0.846	0.570	0.447	0.471	0.501	0.993	0.384	0.008	0.656	0.097	0.497	0.831
Nationality	Welsh	68.6	15.0	16.8	22.4	45.8	57.9	51.1	41.4	19.4	29.3	40.0	33.0	33.3	32.7	21.6	10.9
	Other	31.4	17.7	19.7	17.7	44.9	57.5	47.6	39.5	13.6	26.5	40.1	25.2	32.0	31.3	13.6	12.9
	X^2					2.057	0.007	0.486	0.163	2.359	0.376	0.001	2.929	0.085	0.093	4.134	0.404
	p					0.561	0.934	0.486	0.686	0.125	0.540	0.978	0.087	0.771	0.761	0.042	0.525
Highest educational qualification gained	No qualifications	31.0	11.0	17.2	26.2	45.5	62.5	50.3	40.7	17.2	29.0	40.3	29.0	37.9	33.1	21.5	11.7
	Secondary	36.5	12.9	17.5	17.5	52.0	62.6	53.8	42.1	17.5	28.7	45.0	32.7	36.8	38.0	22.8	14.6
	Further	25.0	22.2	16.2	17.9	43.6	53.0	48.7	40.2	21.7	30.8	35.0	33.3	28.2	29.9	15.4	9.4
	Higher	7.5	28.6	25.7	25.7	20.0	31.4	34.3	37.1	5.7	17.1	31.4	17.1	8.6	8.6	2.9	2.9
	X^2					21.552	13.991	4.529	0.334	4.782	2.531	4.074	3.953	13.417	11.917	9.106	4.703
	p					0.010	0.003	0.210	0.953	0.188	0.470	0.254	0.267	0.004	0.008	0.028	0.195
Employment status before prison	Employed	48.5	20.3	17.2	25.6	37.0	54.2	40.5	36.6	16.3	25.1	36.6	23.8	25.1	23.8	12.8	6.2
	Unemployed	36.1	10.7	16.6	18.3	54.4	63.1	62.1	45.6	20.2	30.2	42.9	36.7	44.4	45.0	28.0	16.6
	LTSD	11.1	9.6	17.3	15.4	57.7	61.5	57.7	48.1	13.7	40.4	48.1	40.4	30.8	34.6	23.1	21.2
	Other[$]	4.3	25.0	35.0	5.0	35.0	45.0	35.0	30.0	20.0	20.0	35.0	30.0	30.0	15.0	5.0	5.0
	X^2					26.350	4.789	21.123	5.379	1.679	5.835	3.308	10.263	16.508	22.805	17.577	16.152
	p					0.002	0.188	<0.001	0.146	0.642	0.120	0.346	0.016	0.001	<0.001	0.001	0.001

ACE = Adverse childhood experience; LTSD = Long-term sick or disabled; [$]Includes: Carer including those not working for domestic reasons (e.g. at-home parent), retired, student.

Table A2: ACE prevalence for the 11 ACEs measured in the 2017 Welsh ACE and Resilience Study* and the 2018 Prisoner ACE Survey

	ACE count					Child abuse			Household dysfunction					Neglect	
	0	1	2-3	≥4	Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse	Emotional neglect	Physical neglect
Welsh ACE and Resilience Study*	53.7	18.9	15.5	11.9	21.2	19.9	17.0	3.8	14.2	15.6	10.6	3.9	5.7	6.7	3.2
Prisoner ACE Survey	15.8	17.7	20.9	45.5	57.8	50.0	40.8	17.6	28.4	40.0	30.6	32.9	32.3	19.1	11.5

ACE = Adverse childhood experience; *Unadjusted prevalence limited to males (N=1,132 [2]).

Table A3: Bivariate relationships between offending history, crime types and violence outcomes with participant demographics and ACE count

			% reporting outcome										
			Offending history		Crime types							Violence	
			YOI incarceration	Prolific offending	VAP	Sexual offences	Theft	Criminal damage	Drugs	Public order	Driving	Violence perpetration	Violence victimisation
All (%)			45.9	38.5	67.7	14.7	54.9	45.5	53.4	33.8	46.6	37.3	34.5
Age group (years)	18-20		65.1	41.9	60.5	7.0	60.5	46.5	48.8	18.6	37.2	55.8	39.5
	21-24		36.8	22.4	57.1	11.8	48.7	44.7	50.0	26.3	35.5	52.6	43.4
	25-29		50.0	32.6	72.8	9.8	51.1	43.5	52.2	32.6	50.0	34.8	34.8
	30-39		55.0	48.9	73.3	9.9	64.1	55.7	63.4	42.0	57.3	32.2	31.5
	40-69		32.5	40.5	61.1	27.8	50.0	36.5	47.6	35.7	42.9	28.6	30.2
		X^2	22.914	16.052	6.519	23.825	7.986	9.819	7.682	10.532	12.379	19.689	4.719
		p	<0.001	0.003	0.164	<0.001	0.092	0.044	0.104	0.032	0.015	<0.001	0.317
Ethnicity	White		44.7	41.6	69.0	15.7	57.6	47.2	50.5	35.8	48.5	37.8	34.5
	Other		52.7	21.6	60.8	9.5	40.5	36.5	68.9	23.0	36.5	34.2	34.2
		X^2	1.619	10.531	1.928	1.953	7.335	2.888	8.487	4.574	3.600	0.336	0.002
		p	0.203	0.001	0.165	0.162	0.007	0.089	0.004	0.032	0.058	0.562	0.964
Highest educational qualification gained	No qualifications		54.5	41.4	73.1	11.0	63.4	51.7	55.2	37.2	54.5	44.8	36.6
	Secondary		51.5	42.7	70.2	12.9	63.2	50.9	52.6	36.3	47.4	37.6	36.5
	Further		36.8	35.9	64.1	17.1	44.4	41.9	58.1	34.2	40.2	34.2	35.0
	Higher		14.3	14.3	45.7	31.4	14.3	5.7	34.3	5.7	31.4	14.3	14.3
		X^2	24.458	10.781	10.850	10.333	37.474	27.218	6.410	13.583	8.842	11.938	6.909
		p	<0.001	0.013	0.013	0.016	<0.001	<0.001	0.093	0.004	0.031	0.008	0.075
ACE count	0		25.7	25.7	55.4	12.2	41.9	28.4	47.3	23.0	47.3	23.0	21.6
	1		25.3	18.1	56.6	19.3	39.8	24.1	41.0	20.5	41.0	20.5	19.3
	2-3		46.9	35.7	63.3	13.3	50.0	42.9	50.0	29.6	53.1	40.8	25.5
	≥4		60.6	52.1	78.4	14.6	67.6	61.0	62.0	44.6	45.5	47.2	49.1
		X^2	44.851	36.772	21.823	1.926	27.581	45.080	13.011	23.349	2.814	25.893	37.339
		p	<0.001	<0.001	<0.001	0.588	<0.001	<0.001	0.005	<0.001	0.421	<0.001	<0.001

ACE = Adverse childhood experience; VAP = Violence against the person; YOI = Young offender institution.

Table A4: Associations between number of times and total length of time in prison with participant demographics and ACE count

			Number of times in prison				Total length of time in prison		
			First time	Once before	3-6 times	≥7 times	Less than 1 year	>1 but <3 years	>3 years
All (%)			29.5	14.5	29.5	26.5	21.6	24.6	53.8
Age group (years)	18-20		46.5	20.9	25.6	7.0	41.9	48.8	9.3
	21-24		39.5	23.7	25.0	11.8	25.0	48.7	26.3
	25-29		21.7	14.1	40.2	23.9	14.1	22.8	63.0
	30-39		18.3	7.6	32.8	41.2	13.0	13.0	74.0
	40-69		34.9	14.3	22.2	28.6	27.0	15.1	57.9
		X^2				55.954			95.663
		p				<0.001			<0.001
Ethnicity	White		29.4	15.0	26.9	28.7	20.8	24.9	54.3
	Other		29.7	12.2	43.2	14.9	25.7	23.0	51.4
		X^2				10.469			0.876
		p				0.015			0.645
Highest educational qualification gained	No qualifications		22.8	17.2	28.3	31.7	20.0	28.3	51.7
	Secondary		23.4	12.9	33.9	29.8	16.4	22.2	61.4
	Further		35.0	16.2	27.4	21.4	27.4	23.9	48.7
	Higher		68.6	5.7	20.0	5.7	34.3	22.9	42.9
		X^2				38.442			11.285
		p				<0.001			0.080
ACE count	0		45.9	13.5	18.9	21.6	33.8	17.6	48.6
	1		48.2	15.7	24.1	12.0	37.3	32.5	30.1
	2-3		29.6	16.3	28.6	25.5	17.3	35.7	46.9
	≥4		16.4	13.6	35.7	34.3	13.1	18.8	68.1
		X^2				47.945			51.908
		p				<0.001			<0.001

ACE = Adverse childhood experience.

Table A5: Adjusted odds ratios for young offender institution (YOI) incarceration and prolific offending in demographic and ACE count groups

		Prolific offender			YOI incarceration		
		AOR	95% CIs	p	AOR	95% CIs	p
Age group (years)	18-20	1.087	0.510-2.317	0.830	3.811	1.735-8.370	0.001
	21-24	0.348	0.174-0.696	0.003	1.064	0.560-2.024	0.850
	25-29	0.637	0.346-1.172	0.147	1.990	1.094-3.620	0.024
	30-39	1.401	0.815-2.411	0.223	2.564	1.475-4.457	0.001
	40-69	Ref			Ref		
Ethnicity	White	3.243	1.707-6.163	<0.001			ns
	Other	Ref			Ref		
Highest educational qualification gained	No qualifications	3.769	1.305-10.881	0.014	5.210	1.808-15.068	0.002
	Secondary	4.151	1.452-11.870	0.008	4.445	1.551-12.735	0.005
	Further	3.154	1.076-9.243	0.036	2.589	0.879-7.632	0.085
	Higher	Ref			Ref		
ACE count	0	Ref			Ref		
	1	0.673	0.304-1.490	0.329	0.892	0.418-1.903	0.768
	2-3	1.630	0.809-3.285	0.172	2.241	1.124-4.469	0.022
	≥4	3.432	1.840-6.402	<0.001	4.179	2.246-7.776	<0.001

ACE = Adverse childhood experience; AOR = Adjusted odds ratio; CIs = Confidence intervals; Ref = Reference category; ns = not significant.

Table A6a: Adjusted odds ratios for crime types in demographic and ACE count groups

		Violence against the person			Sexual offences			Theft			Criminal damage			Drugs		
		AOR	95% CIs	p	AOR	95% CIs	p	AOR	95% CIs	p	AOR	95% CIs	p	AOR	95% CIs	p
Age group (years)	18-20			ns	0.195	0.057-0.671	0.010	1.324	0.624-2.810	0.464			ns			ns
	21-24				0.349	0.157-0.775	0.010	0.812	0.435-1.517	0.514						
	25-29				0.282	0.128-0.622	0.002	0.889	0.493-1.603	0.696						
	30-39				0.286	0.143-0573	<0.001	1.830	1.051-3.189	0.033						
	40-69	Ref			Ref			Ref			Ref			Ref		
Highest educational qualification gained	No qualifications			ns			ns	9.214	3.226-26.319	<0.001	14.154	3.206-62.488	<0.001			ns
	Secondary							9.063	3.205-25.626	<0.001	13.757	3.131-60.449	0.001			
	Further							4.086	1.421-11.749	0.009	10.082	2.259-44.990	0.002			
	Higher	Ref			Ref			Ref			Ref			Ref		
Ethnicity	White			ns			ns	2.371	1.352-4.159	0.003	1.740	1.001-3.037	0.050	0.470	0.273-0.799	0.005
	Other	Ref			Ref			Ref			Ref			Ref		
ACE count	0	Ref			Ref			Ref			Ref			Ref		
	1	1.051	0.559-1.976	0.878				0.836	0.421-1.662	0.610	0.722	0.346-1.505	0.385	0.764	0.404-1.446	0.408
	2-3	1.386	0.749-2.565	0.298				1.180	0.612-2.275	0.622	1.750	0.895-3.423	0.102	1.101	0.599-2.026	0.756
	≥4	2.922	1.665-5.129	<0.001			ns	2.563	1.426-4.606	0.002	3.489	1.922-6.334	<0.001	1.783	1.041-3.054	0.035

ACE = Adverse childhood experience; AOR = Adjusted odds ratio; CIs = Confidence intervals; Ref = Reference category; ns = not significant.

Table A6b: Adjusted odds ratios for crime types in demographic and ACE count groups

		Public order			Driving		
		AOR	95% CIs	p	AOR	95% CIs	p
Age group (years)	18-20	0.355	0.147-0.855	0.021	0.651	0.314-1.352	0.250
	21-24	0.535	0.277-1.034	0.063	0.688	0.377-1.256	0.223
	25-29	0.783	0.429-1.427	0.424	1.224	0.705-2.126	0.472
	30-39	1.241	0.723-2.130	0.433	1.785	1.076-2.962	0.025
	40-69	Ref			Ref		
Highest educational qualification gained	No qualifications	9.993	2.251-44.363	0.002	3.004	1.340-6.738	0.008
	Secondary	8.775	1.989-38.718	0.004	2.046	0.925-4.524	0.077
	Further	8.565	1.910-38.400	0.005	1.556	0.682-3.547	0.293
	Higher	Ref			Ref		
Ethnicity	White	1.954	1.057-3.612	0.033			ns
	Other	Ref			Ref		
ACE count	0	Ref			Ref		
	1	0.908	0.413-1.996	0.810			
	2-3	1.389	0.674-2.863	0.373			
	≥4	2.596	1.379-4.888	0.003			ns

ACE = Adverse childhood experience; AOR = Adjusted odds ratio; CIs = Confidence intervals; Ref = Reference category; ns = not significant.

Table A7: Violence outcomes and association with ACE count and individual ACE types

			ACE count				Individual ACEs										
								Child abuse			Household dysfunction					Neglect	
		All (%)	0	1	2-3	≥4	Parental separation	Verbal	Physical	Sexual	Mental illness	Domestic violence	Alcohol abuse	Incarceration	Drug abuse	Emotional neglect	Physical neglect
Victim of violence in last 12 months	No	65.5	19.0	21.9	23.9	35.3	51.0	40.8	35.6	10.1	21.2	32.5	22.5	30.4	24.8	14.4	7.2
	Yes	34.5	9.9	9.9	15.5	64.6	70.6	67.1	50.3	32.1	41.6	54.0	45.3	37.9	46.0	27.3	19.3
	X^2					37.339	16.615	29.035	9.433	34.691	21.595	20.458	25.899	2.682	21.595	11.453	15.263
	p					<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.101	<0.001	0.001	<0.001
Perpetrator of violence in last 12 months	No	62.7	19.5	22.5	19.8	38.2	50.5	41.6	37.5	12.7	23.9	35.3	23.9	29.7	25.6	13.7	9.2
	Yes	37.3	9.8	9.8	23.0	57.5	69.9	63.8	46.0	26.0	35.6	47.7	41.4	38.5	43.1	27.6	14.9
	X^2					25.893	16.828	21.434	3.218	13.311	7.423	7.021	15.779	3.836	15.345	13.728	3.560
	p					<0.001	<0.001	<0.001	0.073	<0.001	0.006	0.008	<0.001	0.050	<0.001	<0.001	0.059

ACE = Adverse childhood experience.

Table A8: Adjusted odds ratios for violence outcomes in demographic and ACE count groups

		Violence perpetration			Violence victimisation		
		AOR	95% CIs	p	AOR	95% CIs	p
Age group (years)	18-20	3.406	1.617-7.174	0.001			ns
	21-24	2.841	1.534-5.260	0.001			
	25-29	1.322	0.729-2.397	0.358			
	30-39	1.099	0.635-1.903	0.736			
	40-69	Ref			Ref		
Ethnicity	White			ns			ns
	Other	Ref			Ref		
Highest educational qualification gained	No qualifications			ns			ns
	Secondary						
	Further						
	Higher	Ref			Ref		
ACE count	0	Ref			Ref		
	1	0.758	0.348-1.653	0.486	0.886	0.398-1.883	0.716
	2-3	2.240	1.122-4.470	0.022	1.241	0.607-2.540	0.554
	≥4	2.959	1.594-5.493	0.001	3.491	1.886-6.460	<0.001

ACE = Adverse childhood experience; AOR = Adjusted odds ratio; CIs = Confidence intervals; Ref = Reference category; ns = not significant.

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