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Measuring serious violence perpetration: comparison of police-recorded and self-reported data in a UK cohort

Rosaleen P. Cornish^{1,2,*}, Alison Teyhan¹, Kate Tilling^{1,2}, John Macleod^{1,3}, and Iain Brennan⁴

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¹Population Health Sciences, Bristol Medical School, University of Bristol

²MRC Integrative Epidemiology Unit at the University of Bristol

³National Institute for Health Research Applied Research Collaboration (NIHR ARC West), University Hospitals Bristol and Weston NHS Foundation Trust

⁴School of Criminology, Sociology and Policing, University of Hull

Abstract

Introduction

Determining risk factors and consequences of serious violence requires accurate measures of violence. Self-reported and police-recorded offending are subject to different sources of bias.

Objectives

To compare risk of self-reported and police-recorded serious violence perpetration in late adolescence and early adulthood using linked UK birth cohort and police data, to examine the association between cohort participation and police-recorded violence, and to use police-records to impute missing self-reported data on violence

Methods

We included individuals in the Avon Longitudinal Study of Parents and Children (ALSPAC) who had been informed about the study's use of their linked data and had not opted out of linkage to police records ($n = 12,662$). We used descriptive statistics and logistic regression to address our objectives. Multiple imputation using chained equations was used to impute self-reported violence data to examine the likely impact of missing data on estimates of prevalence.

Results

Self-reported violence perpetration in the past year ranged from 5.3% (at 25 years) to 12.9% (at 20 years) among males and 3.2% (at 17, 22, 24 and 25 years) to 6.4% (at 18 years) among females. Police-recorded serious violence was lower at all ages, peaking at 17–18 years (1.7% among males, 0.5% among females). Study participation was lower among people who had or went on to have a police record for serious violence; as a result, the prevalence of self-reported violence in the imputed data was higher (compared to observed data) at all ages.

Conclusions

Overall, our study demonstrates the difficulties in measuring violence. While we have shown that a key advantage of linkage to police records is it enables outcomes to be measured irrespective of study participation, police data undercounts serious violence. Further, observational studies may also underestimate violence perpetration as individuals with police-recorded serious violence are less likely to participate in research. Therefore, while record linkage allows the advantages of both official police records and self-reported measures to be exploited, it does not negate their limitations.

Keywords

serious violence, ALSPAC, police records, reporting bias, study participation

*Corresponding Author:

Email Address: Rosie.Cornish@bristol.ac.uk (Rosie Cornish)

Introduction

Serious violence causes significant harm to individuals and wider society. It is a major cause of injury, particularly in young males [1], and the consequences of violent victimisation are often serious and long-lasting for both victims [2, 3] and perpetrators [4]. In response to increasing rates of serious violence in England and Wales, the Home Office published its Serious Violence Strategy in 2018 [5]. Following this, eighteen Violence Reduction Units (VRUs) were funded, and the Serious Violence Duty came into force in January 2023 to ensure that relevant bodies work together to prevent serious violence [6]. The associated guidance did not define serious violence but stated that local authorities should set out their own definitions, taking account of the local context and including a focus on youth violence [6]. In addition, it identified the following “success measures”, both overall and specifically among victims aged under 25: a reduction in hospital admissions for assaults with a sharp object; a reduction in knife-enabled serious violence; and a reduction in non-domestic homicides [7]. Accordingly, VRUs indicated an intention to reduce serious violence among young people (aged under 25 years), particularly by targeting the use of knives and guns in violence [8]. The emphasis on weapon-enabled violence has resulted in weapon-carrying becoming a central feature of the “serious violence” concept due to the potential of this behaviour to facilitate violent injury and death [9].

As reflected in the Serious Violence Strategy and the guidance accompanying the Serious Violence Duty, it is increasingly recognised that the most effective ways to reduce violent crime are not directly related to policing or the criminal justice systems but, instead, take a long-term, public health approach focused on prevention [5, 6, 9]. It is important to have accurate data on serious violence in order to understand individual-level, geographical and temporal patterns in this phenomenon, to evaluate the effectiveness of interventions aimed at preventing violence and to inform policy development.

In the UK, the primary source of routinely-collected data about violence by individuals (i.e. perpetration of violence) is police records. Information about a person committing serious violence originates with a victim or a third party reporting a violent incident to the police, or it being observed directly by police. Although official statistics are not available, the likely legal consequences mean that it is safe to assume that offences are rarely reported to police by the offender themselves. Under the National Crime Recording Standard, incidents of serious violence reported to the police should be recorded as a crime [10] and the quality of crime recording is routinely audited [11]. While the quality and consistency of recording violence – once reported – is generally high, self-report studies indicate that around half of all violent incidents are not reported to the police, with the likelihood of reporting dependent on the severity of the incident as well as the relationship between victim and perpetrator [12]. Violence between acquaintances (*ibid.*), less serious violence [13], violence involving younger people [12] and violence involving alcohol [14] are under-reported as well as there being complex sociodemographic patterns in reporting [15]. Reasons for not reporting include feeling that there is little the police can do, feeling that the incident was not significant enough to report, and not

wanting to involve officials in a private matter [16]. Once an incident comes to the attention of the police, an investigation to identify and, ultimately, prosecute a perpetrator begins. In 2021/22, 7.2% of violence with injury resulted in an individual being charged or summonsed for the offence. As policing is often concentrated in more deprived communities with higher rates of crime, and there are known biases in terms of the use of stop and search among particular ethnic groups [17, 18], this results in individuals living in these communities being more likely to be arrested. Combining incidents not being reported and crimes not being solved, it is clear that a large number of violent crimes do not have a confirmed perpetrator in police records, and it is likely that a large number of perpetrators of violent crime do not appear in police records for any violent offence.

Alternative sources of routinely-collected data on violence include ambulance [19], hospital attendance [20], and hospital admissions data [21] but these only capture the most serious violence [13] and, like police data, rely on a disclosure by the victim or other party and are unlikely to include any information about the perpetrator’s identity. Although routinely-collected data heavily relies on victims reporting or observation by a third party, self-reported data on violence can be derived directly from a perpetrator (or a victim). The annual, nationally representative Crime Survey for England and Wales collects self-report data about victimisation experience, while other surveys, such as the Offending, Crime and Justice Survey, which was also nationally-representative, but last ran in 2006, focused on self-reported violence perpetration. These surveys – as with other types of observational study – have an advantage over routinely-collected data in that disclosing involvement in violence has fewer consequences, meaning that reporting in a survey is more likely than reporting to the police or hospital. However, the typically cross-sectional or short-term longitudinal nature of these surveys means that they cannot be used to examine patterns over time. Further, they are susceptible to socially desirable responding, they cannot be verified by an alternative source and, because they are rarely recorded by the individual at the time, their accuracy can be affected by cognitive processes such as ‘telescoping’ (inaccurate recollections regarding the timing of events – perceiving recent events as further back in time or vice versa). Such reporting biases may vary across different subgroups – for example, previous research has indicated that females may be less likely to self-report offending than males [22]. As well as bias due to misreporting, estimates from observational studies may suffer from selection bias, since those participating may not necessarily experience the same levels of violence as those who do not take part. For example, participation among young people in research studies is often higher among females [22] and it is probable that those involved in violence as a perpetrator are less likely to participate in research.

Although these two sources of data on violence are not measuring the same thing (violence resulting in a police record will only represent a small proportion of violent behaviour), the ability to compare these two sources of data (for the same individuals) on serious violence may help to understand the nature and extent of different biases in each and whether these biases vary according to key individual characteristics such as age and sex, as indicated previously [23]. The Avon

Longitudinal Study of Parents and Children (ALSPAC) [24–26], a UK birth cohort which aimed to study the health and development of children and their families, has been linked to local police records [24], allowing such comparisons to be made. The aims of this study were (i) to compare self-reported and police-recorded serious violence perpetration at various ages from late adolescence and early adulthood using data from a longitudinal UK birth cohort linked to local police records and (ii) to examine the risk of police-recorded serious violence perpetration according to study participation status.

Methods

Subjects were those enrolled in ALSPAC who were sent fair processing materials (documents providing information about the study's use of their personal data) and did not dissent to linkage to records relating to crime ($n=12,662$). ALSPAC is a prospective birth cohort which was set up to study health and development across the life course. It has been described in detail previously [24–26]. In brief, pregnant women living in and around Bristol, a city in the south west of England, with due dates between 1st April 1991 and 31st December 1992 were eligible to take part. Initially, 14,541 pregnancies were enrolled, resulting in 14,062 live births and 13,988 infants alive at one year. A total of 913 additional children have enrolled in subsequent waves of recruitment, resulting in a total of 14,901 who were alive at one year. Detailed data were collected during pregnancy and the children have been followed up since birth through questionnaires, clinics and linkage to external datasets. Study data were collected and managed using REDCap [27] (Research Electronic Data Capture) tools hosted at the University of Bristol. REDCap is a secure, web-based software platform designed to support data capture for research studies. [The study website contains details of all available data through a fully searchable data dictionary and variable search tool: <http://www.bristol.ac.uk/alspac/researchers/our-data/>.]

When the ALSPAC children reached legal adulthood (age 18 years), there was a postal campaign which informed participants about ALSPAC's intended use of their health and administrative records, including criminality records. Participants were sent fair processing materials which provided a clear means to consent or object via a written form. These materials took an opt-out approach – in other words, participants were informed that linkage to routine records would occur unless they specifically opted out (i.e. including in the event of non-response) [28, 29]. Data were not extracted for participants who objected, or who were not sent fair processing materials. A total of 12,959 singletons and twins who had not withdrawn from the study had been given the opportunity to opt out of the linkage, of whom 297 had explicitly dissented, leaving 12,662 included in the current study.

The linkage between ALSPAC and local police records has been described previously [30]. In summary, Avon and Somerset Police (A&SP) sent ALSPAC the forename, surname, date of birth, sex, full current and historical addresses, and a specifically generated unique offender ID of all individuals in their records born between 1st January 1991

and 31st January 1993. ALSPAC then carried out probabilistic linkage using LinXmart software [31] with forename, surname, date of birth, sex and postcode to match individuals in the A&SP records to those in ALSPAC (deterministic linkage was also carried out for comparison purposes but all individuals identified via deterministic linkage, plus just over 400 additional matches were identified via probabilistic linkage). A manual review was carried out following the linkage to remove likely false matches. This resulted in the extraction from the police data of 6,413 records (charges, cautions and other out-of-court disposals) pertaining to 1,757 ALSPAC participants.

Police-recorded serious violence

We used the same definition of serious violence as reported by the Department for Education (DfE) and Ministry of Justice (MoJ) in a recent report [32]. In summary, this includes offences classified as: (i) violence against the person, indictable only; (ii) robbery, indictable only; and (iii) possession of weapons, triable either way or indictable only. In the UK, a magistrates' court (in which there is not a jury) mainly handles more minor offences (e.g. most motoring offences, minor criminal damage), although they can also deal with some more serious offences. Indictable only offences are the most serious offences and can only be tried in a crown court (in which there is a jury); offences that are triable either way can be tried in either a crown court or a magistrates' court.

ALSPAC self-reported serious violence

ALSPAC participants were asked questions relating to antisocial behaviour and crime (in the past 12 months) in questionnaires administered or study clinics attended at ages 17, 18, 20, 22, 24 and 25 years (questionnaires at 18, 20, 22 and 25; study clinics at 17 and 24 years). The questions asked at each age are given in the Supplementary Appendix. Serious violence was defined as saying yes to: (i) Hit/kicked/punched someone else on purpose with the intention of really hurting them? or (ii) Carried a knife or other weapon for protection or in case it was needed in a fight?; in addition, at ages 17 and 24 years: (iii) Used threats or actual force or violence against the other person when you stole money or property?.

Other ALSPAC data

Using ALSPAC administrative data on contact addresses, flags were derived to denote whether an individual was living in the area covered by A&SP on each of their birthdays from age 10 years onwards. (Note that this information is not completely accurate for all individuals as contact addresses are updated opportunistically and are therefore more likely to be out of date for individuals who are less active in the study). The following baseline socio-demographic variables measured during pregnancy (when response rates were highest) and known to be associated with participation were included in our study: maternal age, parity, educational level, ethnicity (White/non-White) and smoking status; housing tenure; number of rooms in the house; family occupational social class, defined as the higher of maternal and paternal social

class and categorised as I-IIIN (professional, managerial, and non-manual skilled occupations) and IIIM-IV (manual skilled, semi-skilled and unskilled occupations); and social support score, derived from responses about ten statements relating to the mother's perceived social support from her partner, friends and family (details in Supplementary Appendix). We derived two ALSPAC participation measures: (i) study clinic attendance at 17 years and (ii) questionnaire completion at age 25 years.

Statistical analysis

We first carried out a descriptive analysis of police-recorded serious violence, then (separately) calculated the risk of police-recorded serious violence (restricted to those known to be living within the A&SP area) and self-reported serious violence at each age; this analysis was done separately for males and females. As described above, the ALSPAC questions all related to the past 12 months; thus, we included records for police-recorded serious violence occurring in the same 12-month period. Where an individual did not complete the questionnaire or attend the clinic, we included records in a 12-month period prior to the average age of completion/attendance among those who had provided ALSPAC data. We also used multiple imputation by chained equations to impute missing self-reported violence data. At each age, the imputation model included police-recorded violence in the corresponding 12-month period, a binary indicator for any police record (violence or other) during the same 12-month period and selected baseline covariates (mother's education, mother's smoking status, and number of rooms in the house); we imputed 75 datasets, separately for males and females.

It was not possible to carry out a direct comparison (by cross-tabulation) of self-reported and police-recorded serious violence at the individual time points because the majority of those with a police record relating to serious violence at each age had not completed the relevant ALSPAC data collection, so numbers were too small. However, we calculated a composite variable indicating whether an individual had ever reported perpetrating serious violence (individuals were included as long as they had data on self-reported violence for at least one of the six time points) and cross-tabulated this against police-recorded violence up to age 25.

Finally, we carried out two analyses looking at the relationship between police-recorded violence and participation in ALSPAC. First, we compared the risk of police-recorded serious violence among those providing self-reported data on violence at each of the six time points. Second, we examined participation rates in ALSPAC during adolescence and early

adulthood (at 17 and 25 years, as explained above) among those with and without a police record relating to serious violence before age 20 years. We examined this relationship with participation separately for males and females. We then used logistic regression to examine whether any observed differences in participation at each of these ages could be explained by socio-demographic and family characteristics predictive of study participation. Because some of the covariates were incomplete, we used multiple imputation by chained equations to impute missing data in these covariates. The imputation model included all baseline covariates, police-recorded serious violence before age 20 years, and the two binary participation variables (see Supplementary Table S1); we imputed 30 datasets, separately for males and females. As a sensitivity analysis, we carried out a complete case analysis. All analyses were carried out using Stata 17.0.

Results

Summary of police-recorded serious violence

There were 933 offences classified as serious violence involving a total of 530 ALSPAC participants. Among these offences, 650 (70%) involved only one suspect, 136 (15%) involved two, 78 (8%) involved three and the remaining 3% involved more than three. Four fifths of the offences were violence against the person (Table 1).

Among those classified as violence against the person, the most common offence was assault occasioning actual bodily harm (687 offences, 92% of offences classified as violence against the person, 74% of all serious violence offences). Approximately half the offences took place between 16 and 19 years (Table 2).

Comparison of self-reported and police-recorded serious violence

Overall, between 3,100 (at 18 years) and 3,988 (at 20 years) individuals completed the questions about crime and anti-social behaviour in ALSPAC. Figure 1 shows the observed and imputed prevalence of self-reported and police-recorded serious violence at each age separately for males and females. Observed self-reported serious violence in the past year was highest at age 20 years for males (12.9%) and at age 18 for females (6.4%) and lowest at 25 years for males (5.3%) and at ages 22, 24 and 25 for females (3.2%). The imputed prevalence of self-reported violence was higher at all ages, with differences (compared to the observed data) of between 3.9% (at age 24 years) and 7.8% (at 18 years) for males and between 0.5% (at

Table 1: Offence group for serious violence

Offence group	Frequency (%)
Violence against the person	744 (80%)
Robbery	100 (11%)
Possession of weapons/other ¹	89 (9%)
Total	933

¹The majority of these were possession of weapons; combined with other for disclosure control purposes.

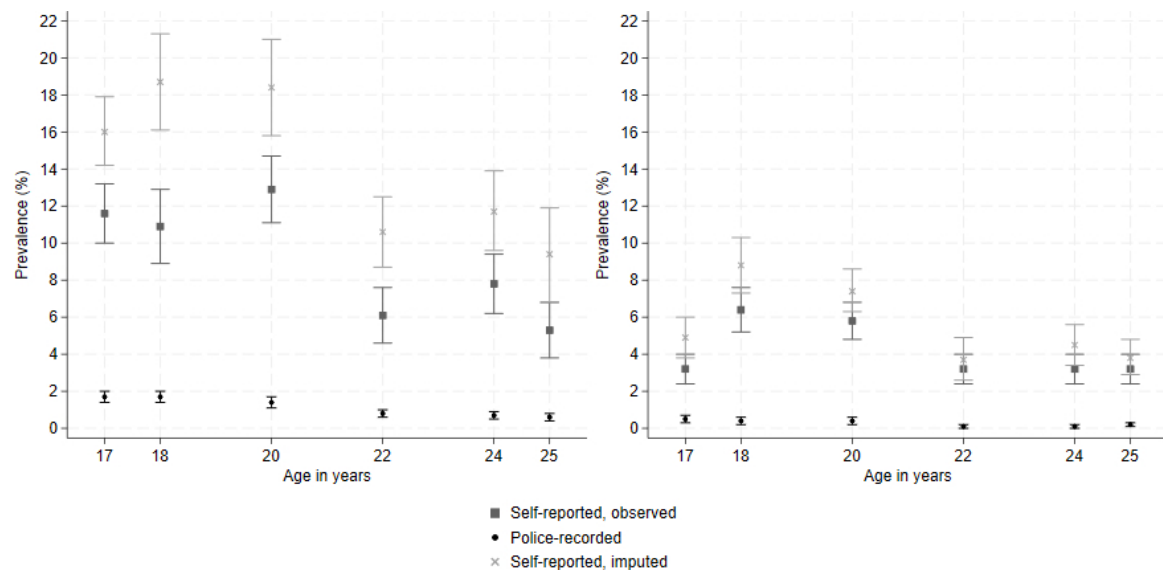
Table 2: Age at offence for police records classified as serious violence

Age (years)	Number ¹ (%)
<16 ²	72 (7.5%)
16-17	240 (24.9%)
18-19	243 (25.3%)
20-24	290 (30.1%)
25+	117 (12.2%)

¹The total adds up to more than the number of offences because some offences involved more than one ALSPAC participant.

²The majority of police records from before 2007 were not transferred to electronic form, so the number of records in this age category will be an underestimate of the true number of police records.

Figure 1: Prevalence of self-reported (observed and imputed data) and police-recorded serious violence in the past 12 months among males and females known to be living inside the Avon and Somerset Police area at the time



22 years) and 2.4% (at 18 years) for females. Police-recorded serious violence was lower at all ages and was highest at 17 and 18 years for males (1.7%) and at 17 years for females (0.5%).

Among the 5,914 individuals (2,459 males and 3,455 females) who were not living outside Avon and Somerset for the whole period from 16 to 25 and who provided self-reported violence data at one or more time point, 483 (19.6%) males and 370 (10.7%) females reported serious violence at least once. Among these 483 males, 8% had a police record relating to serious violence before age 25; the corresponding figure among the 1,976 males who did not report serious violence in ALSPAC was 1%. The corresponding percentages among females were 4% and <1%, respectively.

As explained above, the majority of those with a police record relating to serious violence had not completed the ALSPAC questionnaire or attended the study clinic at the relevant time point so it was not possible to cross-tabulate them at individual ages due to small numbers (potential risk of disclosure). The cumulative risk of police-recorded violence up to each time point was higher at all ages among those not providing ALSPAC self-reported violence data compared to those providing these data (Figure 2).

Similarly, the risk of having a police record relating to serious violence in the past 12 months was also higher among

those without self-reported data at each time point. For example, the risk was 14/4,355 (0.3%) among those for whom self-report data from the age 17 clinic was available compared to 101/6,564 (1.5%) among those where there was no self-report data. Correspondingly, participation in ALSPAC was lower among those who went on to have / had a police record for serious violence. The relationship between having a police record for serious violence and participation at 17 years was similar among males and females but the association with participation at 25 years was stronger among males than females (Table 3). Corresponding estimates from the complete case analysis are given in Supplementary Table S2; these gave similar results.

Discussion

In this study, in which we used cohort data linked to local police records, we found that the prevalence of self-reported serious violence was much higher than the prevalence of police-recorded serious violence at all ages from late adolescence to early adulthood. It was not possible to cross-tabulate the two sources of data on violence at individual ages because the majority of those with a police record relating to violence had not participated in ALSPAC in the relevant data collection

Figure 2: Cumulative risk of police recorded serious violence among ALSPAC individuals with and without self-reported data available at each time point

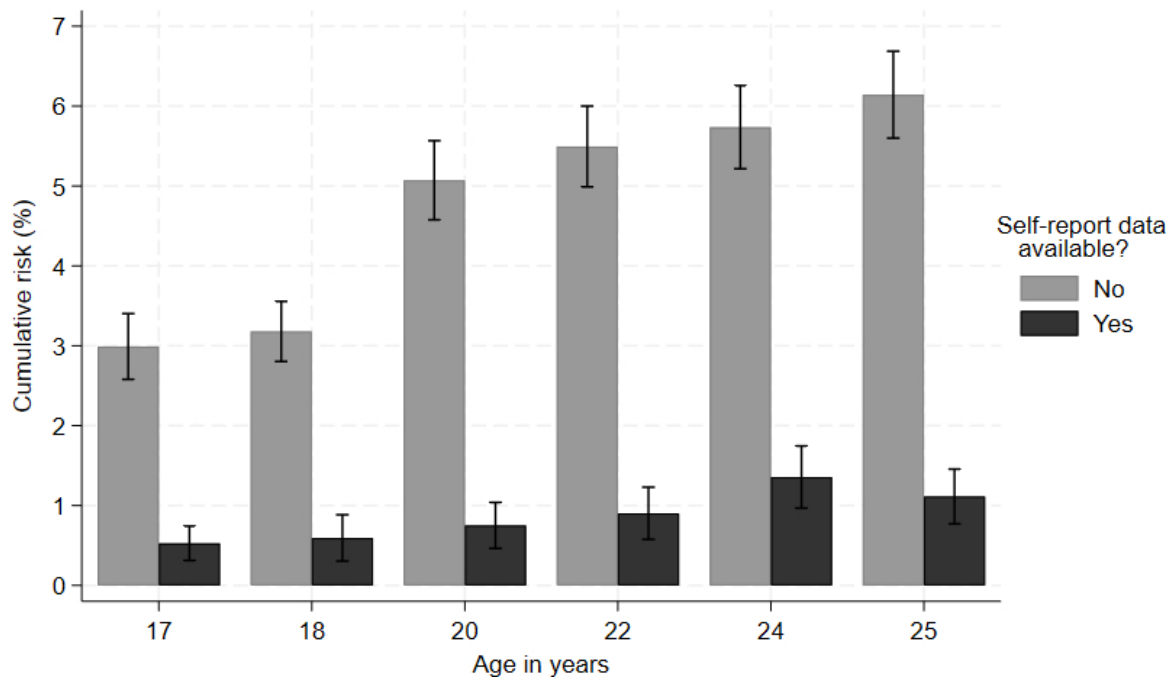


Table 3: Participation in ALSPAC at selected time points according to whether or not an individual went on to have/had a police record relating to serious violence before age 20 years: multiply imputed data (30 imputed datasets; n = 10,983)

Time point	Overall	Record of serious violence before 20 years?		Unadjusted OR (95% CI)	Adjusted ¹ OR (95% CI)
		Yes	No		
Males					
17 years ²	34%	11%	36%	0.23 (0.15, 0.35)	0.42 (0.28, 0.63)
25 years ³	21%	4%	22%	0.15 (0.08, 0.27)	0.28 (0.15, 0.52)
Females					
17 years ²	45%	17%	46%	0.24 (0.13, 0.42)	0.36 (0.20, 0.65)
25 years ³	43%	20%	43%	0.33 (0.19, 0.56)	0.50 (0.29, 0.88)

¹Adjusted for maternal: education, age at birth, smoking status, parity, ethnicity; family occupational social class, housing tenure, number of rooms in the house, social support score; stratified by sex.

²Study clinic.

³Questionnaire.

period. However, among those who had reported violence at least once between 17 and 25 years (inclusive), 8% (males) and 4% (females) had a police record relating to serious violence; the corresponding figures amongst males and females who had not reported serious violence were 1% and <1%, respectively. Finally, those with a police record relating to serious violence were less likely to be participating in ALSPAC even after taking account of socio-demographic and other factors known to be associated with study participation, indicating that the risk of self-reported violence is likely to be an underestimate. This was confirmed using multiple imputation to impute missing self-reported violence data, as the imputed prevalence was higher than the observed prevalence at all ages.

The risk of self-reported serious violence at age 17 (12% among males, 3% among females in the observed data; 16% and 5%, respectively, in the imputed data) in our study is lower

than figures of around 20% reported in other UK studies at this age [33, 34]. The first of these studies was carried out among males born in a working class area of London in the early 1950s [35]; since rates of violence are higher in London than in other parts of the UK, this may explain the difference between our figures and this study, as could period effects. Our findings also suggest that the difference may also be in part explained by bias due to selective participation in ALSPAC. This is supported by the fact that, in the Edinburgh Study of Youth Transitions and Crime (ESYTC), 3.2% had been convicted for violent crimes by the age of 19 [34], which is similar to the figures for police-recorded violence found in our study (2.6% by 18 years and 3.7% by 20 years); in contrast, however, in the ESYTC, where the self-reported risk of violence at age 17 was 21% (i.e. higher than in ALSPAC), the response rate was just over 80%, whereas the corresponding rate in

ALSPAC was only 40%. In the imputed data, our estimates were closer to those observed in the ESYTC, although still lower. Imputation using police records is likely to have reduced the bias resulting from selective participation but may not have eliminated it. The rates of police-recorded violence we observed are also similar to rates of conviction for violence seen in a cohort in New Zealand (born in 1972 and 1973) – around 2.5% by age 18 and 6.7% by age 26 [36, 37].

Our work suggests that, in ALSPAC, using self-reported data to estimate the prevalence of violence will lead to underestimates due to selective participation and this might vary by age and be worse in males than in females. Since only some incidents of violence will come to the attention of the police, using police data will also underestimate the problem. Thus, although linkage between a population-based birth cohort study to police records can provide valuable data on individuals no longer actively participating in the study, these data will only be measuring violence perpetration as recorded by the police. Researchers could potentially use multiple imputation to impute missing self-reported data, as we have done, although the success of this would be dependent on the extent of overlap between the two (i.e. if very few individuals with a police record for violence have self-reported data on violence, the former would not be useful for predicting the latter). In our case, we were able to include police records for all offences as well as for violence, which would have partially overcome this problem. A further limitation of this approach is that it would not take account of reporting bias or biases introduced via policing practice. Previous researchers have suggested that the use of more than one type of measure of offending may be beneficial and that understanding the relationship between the different measures should help to interpret findings based on these [23]. By extension, our work may be useful for researchers seeking to understand patterns in serious violence using more than one source of data. Administrative and longitudinal datasets have their respective strengths and weaknesses, such as high population coverage for administrative data and a diverse range of measures and family-level information in cohort studies. Triangulating findings from different data sources can help uncover the influence of different exposures, but only if the outcomes are similar or comparable; our findings could be a useful reference point for future studies taking this approach. Finally, a significant amount of funding has been allocated to violence prevention since the late 2010s in England and Wales, with £200m designated to be spent on violence research alone through the activity of the Youth Endowment Fund. As the interventions being evaluated tend to rely on self-report [38] or administrative data [39], but rarely both, understanding how the two data sources relate to each other, the potential biases present in each (and how some of these biases vary by key factors such as age and sex) is important when comparing observed effect sizes.

The linked data has several limitations [30]. Firstly, bias may be introduced via the linkage. At the time of linkage, not all participants had been given an opportunity to opt out (so could not be included) and a small percentage of individuals had opted out of the linkage. In addition, the linkage process itself may have introduced bias if linkage error was differential with respect to factors associated with offending. Secondly, the linked data does not capture offences that took place outside

the Avon and Somerset area. Although this can be addressed by restricting the research to those known to be still living in the area, this may exclude individuals whose contact details are unknown due to lack of study engagement. Our estimates of the risk of serious violence from both sources could thus be biased, although our conclusions relating to underestimation in both sources are very unlikely to be materially affected by these issues.

In conclusion, our work once again highlights the difficulties in measuring violence. We have shown that self-reports of violent behaviour in ALSPAC are likely to be subject to both reporting and participation bias. Further, the extent of these biases may differ across different subgroups. Linkage to police records can provide an alternative source of data on violent behaviour independent of active study participation, albeit still subject to several biases. Combining the two sources of data – for example, by using police data to impute missing self-report data – may overcome some of these issues, although careful consideration of the potential sources of bias present in each is needed. Thus, although record linkage allows the advantages of both official police records and self-reported measures to be exploited, it does not negate their limitations.

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Ethics statement

Ethical approval for the study was obtained from the ALSPAC Law and Ethics committee and local research ethics committees (NHS Haydock REC: 10/H1010/70). Informed consent for the use of data collected via questionnaires and clinics was obtained from participants following the recommendations of the ALSPAC Ethics and Law Committee at the time.

Data availability

Due to ALSPAC data access permissions, the authors do not have the authority to share the study data analysed in this study, but any researcher can apply to use ALSPAC data, including the variables used in this investigation. Information about access to ALSPAC data is given on the ALSPAC website: (<http://www.bristol.ac.uk/alspac/researchers/access/>).

Conflict of interests statement

The authors declare that they have no conflicts of interest

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Abbreviations

A&SP:	Avon and Somerset Police
ALSPAC:	Avon Longitudinal Study of Parents and Children
DfE:	Department for Education
MoJ:	Ministry of Justice
REDCap:	Research Electronic Data Capture



Supplementary Appendix

(A) Crime-related questions asked at each age (highlighted questions are those used to measure serious violence)

Study clinic at 17.5 years

During the last year, how often have you:

Bought something that you knew or suspected was stolen?

Stolen something from a shop or store?

Hurt or injured animals or birds on purpose?

Damaged or destroyed property that did not belong to you?

Hit or picked on someone because of their race or skin colour?

Broke into a car or van to try and steal something out of it?

Took or drove a vehicle without the owner's permission?

Sold an illegal drug to someone?

Broke into a house or building to try and steal something?

Hit, kicked, punched or attacked someone with the intention of really hurting them?

Started a fight?

[Separate questions about injuries caused, if any]

Sold something that didn't belong to them or knew was stolen

Stole money or property that someone was holding, carrying or wearing at the time?

Used threats or actual force or violence against the other person when stole money or property?

Set fire or tried to set fire to something on purpose?

Claimed social security benefits or housing benefits not entitled to?

Carried a knife or other weapon for protection or in case it was needed in a fight?

Actually used a weapon against somebody?

[Separate questions about injuries caused, if any]

Sold something that didn't belong to you or knew was stolen

Been loud, rowdy or unruly in a public place so that people complained or you got into trouble?

Used a cheque book, credit card or cash point card they knew or suspected to be stolen to get money out of a bank account or to purchase something?

In the past year have you been:

Told off or told to move on by a police officer?

Stopped by the police and asked to empty your pockets or bag?

Stopped by the police and asked questions about something you have done?

Picked up by the police and taken home?

Picked up by the police and taken to a police station?

Given a fixed penalty notice by the police?

Charged by the police for committing a crime?

Had contact with the police for another reason?

Been in trouble with the police?

Been on trial in court for something you have done?

Received an official police caution?

Received a fine from the court?

Been given a Community Service Order?

Been given an ASBO?

Spent some time in a secure unit?

Spent some time in a young offenders Institution or in prison?

Taken part in a mediation process as an offender?

Questionnaire at 18 years

In the past year, how often have you:

Been rowdy or rude in public place so that people complained or you got into trouble?

Stolen something from shop or store?

Bought something that you knew or suspected was stolen?

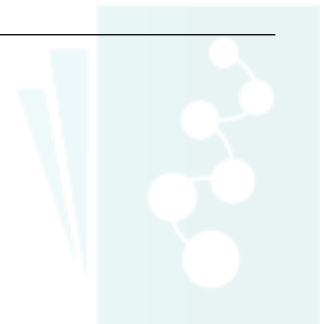
Broke into a car or van to try and steal something out of it?

Taken and/or driven vehicle without owner's permission?

Broke into a house or building to try and steal something?

Stolen money or property that someone was holding, carrying or wearing at the time?

Hit, kicked or punched someone else on purpose with the intention of really hurting them?



Deliberately damaged or destroyed property that did not belong to you?
 Hurt or injured animals or birds on purpose?
 Carried a knife or other weapon for protection or in case it was needed in a fight?
 Used cheque book, credit card or cash point card which you knew or suspected was stolen to get money out of a bank or buy something?

Questionnaire at 20 years

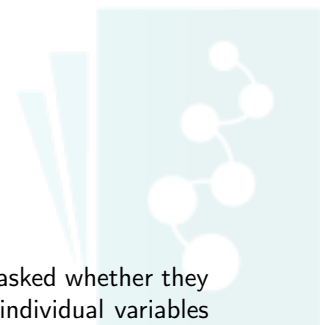
In the past year, how often have you:
 Been rowdy or rude in public place so that people complained or you got into trouble?
 Stolen something from shop or store?
 Bought something that you knew or suspected was stolen?
 Broken into a car or van to try and steal something out of it?
 Taken and/or driven vehicle without owner's permission?
 Broken into a house or building to try and steal something?
 Stolen money or property that someone was holding, carrying or wearing at the time?
 Hit, kicked or punched someone else on purpose with the intention of really hurting them?
 Deliberately damaged or destroyed property that did not belong to you?
 Hurt or injured animals or birds on purpose?
 Carried a knife or other weapon for protection or in case it was needed in a fight?
 Used cheque book, credit card or cash point card which you knew or suspected was stolen to get money out of a bank or buy something?

Questionnaire at 22 years

In the past year, how often have you:
 Been rowdy or rude in public place so that people complained or you got into trouble?
 Stolen something from shop or store?
 Bought something that you knew or suspected was stolen?
 Broken into a car or van to try and steal something out of it?
 Taken and/or driven vehicle without owner's permission?
 Broken into a house or building to try and steal something?
 Stolen money or property that someone was holding, carrying or wearing at the time?
 Hit, kicked or punched someone else on purpose with the intention of really hurting them?
 Deliberately damaged or destroyed property that did not belong to you?
 Hurt or injured animals or birds on purpose?
 Carried a knife or other weapon for protection or in case it was needed in a fight?
 Used cheque book, credit card or cash point card which you knew or suspected was stolen to get money out of a bank or buy something?
 Derived variables:
 Frequency score for all ASB (anti-social behaviour) items at age 22
 Seriousness score for all ASB (anti-social behaviour) items at age 22

Clinic at 24 years

In the past year how often have you:
 Been told off or to move on by police officer?
 Been stopped by the police and searched?
 Been stopped by the police regarding your behaviour?
 Been picked up by the police and taken home?
 Been picked up and taken to police station?
 Been given a fixed penalty notice by the police?
 Been charged by the police for committing a crime?
 Had contact with the police for another reason?
 Been in trouble with police?
 Received an official police caution?
 Received a fine from the court?
 Spent some time in a secure unit?
 Been on trial for something you have done?
 Derived variables:
 (Note that the normal set of 12 questions about specific behaviours were asked and, for each, they were asked whether they were under the influence of alcohol at the time. These were used to derive the variables below but the individual variables were not released because of the potential disclosure risk.)
 Total score for all anti-social behaviour items at age 24



Seriousness score for all anti-social behaviour items at age 24

In past 12 months, any violent crime under influence of alcohol? (includes category: violent crime but not under influence of alcohol)

In past 12 months, any non-violent crime under influence of alcohol?

In past 12 months, any crime under influence of alcohol?

Questionnaire at 25 years

In the last year how often have you:

Been loud, rowdy or unruly in a public place so that people complained or you got into trouble?

Stolen something from a shop?

Bought something that you knew or suspected was stolen?

Broken into car or van to try to steal something out of it?

Taken or driven a vehicle without the owner's permission?

Broken into a house or building to try to steal something?

Stolen money or property that the person was holding or carrying?

Hit, kicked, punched or attacked someone with the intention of really hurting them?

Hurt or injured animals or birds on purpose?

Damaged or destroyed property didn't belong to you?

Carried knife or other weapon for protection in case it was needed in a fight?

Used a cheque or card that you knew or suspected was stolen to get money or buy something?



(B) Social support score statements:

1. I have no one to share my feelings with.
2. My partner provides the emotional support I need.
3. There are other pregnant women with whom I can share my experiences.
4. I believe that in moments of difficulty my neighbours would help me.
5. I'm worried that my partner might leave me.
6. There is always someone with whom I can share my happiness and excitement about my pregnancy.

7. If I feel tired I can rely on my partner to take over.
8. If I was in financial difficulty I know my family would help if they could.
9. If I was in financial difficulty I know my friends would help if they could.

Answers were: Exactly feel, often feel, sometimes feel, never feel this, scored 3 to 0 respectively and summed to give the total score.



(C) Supplementary Tables

Supplementary Table S1: Variables used in the multiple imputation models (sample size = 10,983 individuals not living outside the Avon and Somerset area for the period from aged 16 to 20)

Variable	Type of variable (number of categories, if categorical)	Number (%) with missing data	Regression model using to predict missing data in this variable
Outcomes – participation at:			
18 months (mother questionnaire)	Binary	0	N/A
9 years (child questionnaire)	Binary	0	N/A
17 years (clinic attendance by adolescent)	Binary	0	N/A
25 years (young adult questionnaire)	Binary	0	N/A
Exposure			
Police-recorded serious violence before 20 years	Binary	0	N/A
Covariates			
Maternal age	Numerical	734 (7%)	Linear regression
Maternal ethnicity	Binary	1,877 (17%)	Logistic
Maternal smoking status	Categorical (3)	1,365 (12%)	Multinomial logistic
Maternal education	Categorical (4)	1,817 (17%)	Multinomial logistic
Paternal education	Categorical (4)	3,106 (28%)	Multinomial logistic
Parity	Categorical (3)	1,481 (13%)	Multinomial logistic
Housing tenure	Categorical (3)	1,435 (13%)	Multinomial logistic
Family occupational social class	Binary	2,503 (23%)	Logistic
Number of rooms in house	Numerical	1,526 (14%)	PMM ¹
Social support score	Numerical	2,555 (23%)	PMM ¹
Child sex ²	Binary	0	N/A

1. Predictive mean matching.

2. Separate imputation models for males and females.



Supplementary Table S2: Participation in ALSPAC at selected time points according to whether or not an individual had/ended up having a police record relating to serious violence before age 20 years: complete case analysis

Time point	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
18 months ¹	0.54 (0.43, 0.67)	1.04 (0.70, 1.55)
9 years ²	0.39 (0.32, 0.49)	0.90 (0.65, 1.25)
Males		
17 years ³	0.23 (0.15, 0.33)	0.35 (0.21, 0.60)
25 years ²	0.15 (0.08, 0.27)	0.19 (0.08, 0.48)
Females		
17 years ³	0.24 (0.13, 0.42)	0.45 (0.23, 0.88)
25 years ²	0.33 (0.19, 0.56)	0.55 (0.29, 1.07)

1. Mother-completed questionnaire; 2. Child-completed questionnaire; 3. Study clinic.

