

Mental and sexual health outcomes following adolescent sexual assault: a prospective cohort study

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## **Abstract**

**Background:** Young people are disproportionately affected by sexual assault, yet longitudinal data are sparse. This paper examines the characteristics of adolescents presenting to sexual assault services and mental and sexual health outcomes post-assault.

**Methods:** Design: Prospective cohort study. Population: Adolescents aged 13–17 years attending the Sexual Assault Referral Centres serving Greater London, UK over two years. Assessments: Baseline interviews (T0) <6 weeks post-assault with follow-up interviews (T1) 4–5 months post-assault. Data collection: Socio-demographic and assault-related characteristics; longitudinal psychological symptom data (using validated scales); outcomes at T1. Primary outcome: T1 prevalence of any psychiatric disorder, evaluated using the Development and Wellbeing Assessment. Secondary outcomes: T1 rates of specific and multiple psychiatric disorders and sexual health outcomes.

**Findings:** 141/491 (29%) eligible young people participated (134 females; mean [SD] age: 15.59 [1.27] years), with 75% retention at T1 (n=106; 99 females). Participants had high levels of deprivation and pre-existing vulnerability. T0 psychological symptom scores indicated 89%, 71% and 91% of females to be at risk for depressive, anxiety or post-traumatic stress disorders, respectively, with symptoms largely persisting at T1. Prevalence of any psychiatric disorder among females was 80% at T1, with multiple disorders in 55%. Anxiety, post-traumatic stress and major depressive disorders were the commonest diagnoses. Presence of psychiatric disorder was associated with baseline psychosocial vulnerability (previous social services involvement, mental health service use, self-harm or sexual abuse), but not assault characteristics. Rates of pregnancy since assault (4%) and sexually transmitted infection among females (12%) at T1 were

comparatively low. 8% reported re-victimisation by T1.

**Interpretation:** Vulnerable adolescents experience the double disadvantage of being at risk for both sexual assault and associated psychiatric disorders, highlighting the need for comprehensive support post-assault. Feasibility and effectiveness of prevention programmes should be investigated.

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## **Research in context**

### *Evidence before this study*

Young people are the most likely to be sexually assaulted. The health outcomes of sexual violence appear poor, although this has not been systematically studied. The existing adolescent literature is largely cross-sectional. Longitudinal reviews and meta-analyses have tended to combine studies of survivors of different ages or types of trauma. The limited representation of adolescent survivors of sexual violence reduces the applicability and generalisability of these studies.

### *Added value of this study*

This large prospective study of outcomes in a predominantly female cohort of adolescents recruited soon after sexual assault highlights their pre-existing demographic and social vulnerabilities and the very high rate of psychological symptoms (90%) at recruitment (within six weeks of assault). Longitudinal data show persistently elevated rates of psychological symptoms among adolescent females, in the context of high rates of psychiatric disorder (80%) and co-morbidity (55%) medium term (4–5 months). Young women surviving sexual assault appear doubly disadvantaged: their vulnerability placing them at high risk of both sexual assault and psychiatric disorders, in addition to other sequelae. Psychosocial characteristics appear more important than assault characteristics as predictors of later distress.

### *Implications of all the available evidence*

Young people require comprehensive support following sexual assault to address high levels of pre-existing vulnerability and psychological co-morbidity, and to prevent re-victimisation. There should be greater recognition of these issues within health and social services and the criminal justice system. A clearer understanding is needed of outcomes for male adolescents and those from wider ethnic groups. Access to and evaluation of interventions to prevent or treat psychiatric disorder following sexual violence in adolescence is a priority. Feasibility and effectiveness of targeted prevention programmes for those at risk of assault should also be investigated.



## Introduction

Interpersonal violence and child sexual abuse are leading risk factors for disability-adjusted life-years and mortality among adolescents globally.<sup>1</sup> The Lancet Commission on Adolescent Health and the World Health Organisation (WHO) have called for increased efforts by health services to contribute both to the primary prevention of sexual assault and to follow-up care and support,<sup>2,3</sup> and in 2017 the WHO provided guidelines on the direction these should take for children and young people.<sup>4</sup> Understanding the factors associated with adolescent sexual assault is essential to informing these efforts. More than one in three women globally has experienced intimate partner violence or non-partner sexual violence,<sup>5</sup> with one in five British women estimated to experience attempted rape and one in ten, completed rape, during their lifetime.<sup>6</sup> Young people are disproportionately affected by sexual assault,<sup>6-9</sup> with those with pre-existing vulnerabilities, such as disability, socioeconomic disadvantage, mental health difficulties, previous experience of abuse and low sexual self-efficacy likely to be at increased risk.<sup>9-</sup>

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Associations have been shown between adolescent sexual assault and a range of adverse outcomes including depression,<sup>9,15,20-22</sup> Post-Traumatic Stress Disorder (PTSD),<sup>15,21</sup> suicide risk,<sup>9,20</sup> substance use,<sup>15,20,21,23</sup> teenage pregnancy,<sup>9,23,24</sup> risky sexual behaviour,<sup>9,15,23-25</sup> poorer educational outcomes,<sup>9,15,20,26</sup> and poorer self-rated health.<sup>15,24</sup> Largely, these studies have been cross-sectional, retrospective, not limited to adolescents or have focused on specific groups such as college students. Longitudinal data mapping the trajectories of young people in the aftermath of sexual assault are sparse, except where adolescents have been subsumed into adult or paediatric follow-up studies.<sup>27-29</sup>

The lack of prospective longitudinal data for adolescents has been noted in several reviews.<sup>4,15</sup>

Prospective studies are essential for assessing the causal direction of associations between sexual assault and risk behaviours and mental health status, describing duration of effect, and charting the trajectory of psychological disorders following trauma and the degree of co-morbidity in order to guide intervention. They are also necessary for the accurate measurement of take-up of support services and rates of follow up.

This paper reports findings from a prospective longitudinal study of adolescent sexual assault undertaken through the Sexual Assault Referral Centres (SARCs) serving Greater London, UK, examining the characteristics of adolescents accessing these services and the trajectory of their health and well-being following sexual assault.

## **Methods**

We undertook a prospective cohort study examining the characteristics of adolescents experiencing sexual assault, associated outcomes and potential moderators in a community sample from a large metropolitan area (London, UK). The study was conducted according to a pre-specified protocol (Haven Study Protocol v1.5 2<sup>nd</sup> September 2013, Institute of Child Health, <https://www.ucl.ac.uk/ich/research/population-policy-practice/research/studies/adolescent-sexual-assault>), aligned to STROBE reporting guidelines.

### *Population and recruitment*

We aimed to recruit all males and females aged 13–17 years attending the London Sexual Assault Referral Centres (three SARCs known as the Havens) between 15<sup>th</sup> April 2013 – 20<sup>th</sup> April 2015 and within six weeks of a sexual assault, excluding only those living outside Greater London, for resource reasons. The Havens are co-funded by the National Health Service (NHS) England and the Mayor’s Office for Policing and Crime in London. They provide all forensic medical examinations for victims of sexual assault in Greater London (estimated population 8.6 million<sup>30</sup>), in addition to acute (emergency contraception, Hepatitis B vaccination and HIV post-exposure prophylaxis) and follow-up medical care, advocacy, and psychological support. Referrals are from the police (in 90% of cases), other statutory or voluntary services, or individuals may self-refer. There are over 2,000 referrals into the Havens per year, across all ages and genders. Nearly 75% of cases present within seven days of sexual assault, with the remainder presenting up to a year afterwards.

A stepped recruitment process with a recruitment window of six weeks was chosen to allow sufficient time to contact young people following assault and for them to consider whether to take part. The process began with provision of a study information leaflet via a clinician at all young people's first Havens attendance, inviting them to participate in the study. We included young people who were unsure about what had happened to them due to the influence of alcohol and/or drugs, those with moderate or severe learning disability and those requiring language assistance (through provision of interpreters). A Havens Youth Advocate or clinician sought permission from young people for initial

contact by the study team via a preferred method (generally phone, text or email). The study researcher (VC) then contacted those giving permission to provide further explanation. Young people were advised that their decision to participate or not would not affect their routine clinical care. Those agreeing to participate provided written, informed consent. Parents or carers were involved in the consent and more widely in the project at the discretion of the young person. Where potential participants lacked capacity, consent was obtained from parents or carers for those under the age of 16, and a consultee was appointed for those aged 16 or over in accordance with guidance on the Mental Capacity Act.<sup>31</sup>

#### *Interview schedule and outcomes*

Baseline interviews (T0) were conducted within six weeks of an assault taking place. Follow-up interviews took place four to five months post-assault (T1). Interviews were held at a convenient time and place for the participant and their carer(s), including at home if preferred. Travel expenses were reimbursed, and high street vouchers offered in appreciation. Participants were interviewed by a study researcher (VC) trained in sensitive interviewing techniques and with relevant experience of data protection, consent, confidentiality and safeguarding (child protection) procedures. Participants completed a standardised questionnaire and mental health instruments at both time points, with support from parents/carers or the researcher if needed. Routine safeguarding procedures were followed where concerns (including new disclosures) were highlighted. Referrals for practical or psychological support were made where indicated.

The primary outcome was the prevalence of any psychiatric disorder at T1. Secondary mental health outcomes at T1 included the prevalence of specific and multiple psychiatric disorders. Secondary sexual health outcomes at T1 included: history of sexually transmitted infection (STI), pregnancy or re-victimisation since the assault, and uptake of sexual health screening since assault.

### *Data collection*

1. Socio-demographic data: Age, ethnicity, postcode and routinely collected vulnerability indicators were obtained from Havens' clinical notes and compared with data for non-participants. Havens attendees consent at presentation to use of anonymised data for research purposes. Postcodes were used to determine small area deprivation score using the England Index of Multiple Deprivation 2015 (IMD),<sup>32</sup> categorised by decile from 1 (most deprived) to 10 (least deprived). Those with no fixed abode at the time of assault were assigned the lowest IMD decile. Those living in foster care were assigned the average decile score for the cohort.

Study participants provided additional information at T0 and T1 through direct questioning regarding family structure, educational/employment status, any prior history of abuse and other psychosocial characteristics, including details of services accessed for mental health difficulties in the 12 months pre-assault (categorical options and free text).

2. Assault characteristics: Participants were not asked to recount details of the assault for the study for ethical and judicial reasons. Systematically collected data on the assault and

assailant characteristics were obtained from participants' Havens clinical and forensic records .

3. Psychological symptom levels: The following symptom questionnaires were used at T0 and T1 to identify young people who may be *at risk for* (i.e. have a higher likelihood of) depression, PTSD or other anxiety disorders at assessment, and to identify those with general psychological difficulties:

a) Child Revised Impact of Events Scale (CRIES)<sup>33</sup>: A 13-item, self-report adapted from the adult Impact of Events Scale assessing the frequency of post-traumatic stress symptoms over the last week. A score of 30 out of 65 was used to identify children and adolescents at risk for PTSD.<sup>33</sup>

b) Short Mood and Feelings Questionnaire (S-MFQ)<sup>34</sup>: A 13-item self-report assessing the severity of depressive symptoms over the last two weeks. A score of 8 out of 26 was selected as an optimal cut-off point for identifying children and adolescents at risk for depressive disorder.<sup>35</sup>

c) Screen for Child Anxiety Related Disorder (SCARED)<sup>36</sup>: A well-validated self-report 41-item questionnaire measuring anxiety symptoms. A total score of 30 out of 82 was used to indicate children and adolescents at risk for an anxiety disorder.<sup>36</sup>

d) Strengths and Difficulties Questionnaire (SDQ)<sup>37</sup>: A well-validated 25-item questionnaire used at T0 to provide a *retrospective* measurement of general psychological difficulties during the six months *prior to* the assault and then at T1, to measure symptoms in the interval between assault and T1. The SDQ has robust psychometric properties<sup>37,38</sup> and generates scores for each of five sub-scales (hyperactivity/inattention, conduct problems, emotional symptoms, peer problems and pro-social behaviour). A total difficulties score (0–40) is generated from the sum of the first four sub-scale scores, with a score of 20 and over indicative of problems.

4. Mental health outcomes: The Development and Wellbeing Assessment (DAWBA)<sup>39</sup> was used cross-sectionally to determine the primary outcome (prevalence of *any* psychiatric disorder at T1), and secondary mental health outcomes (prevalence of specific and multiple psychiatric disorders at T1). The DAWBA is a reliable and valid structured diagnostic interview that has provided excellent discrimination between community and clinical samples. Participants completed the DAWBA interview online at a single time point (T1) with support from a trained lay interviewer (VC). Parents were invited to complete a parent DAWBA where participating with the young person's assent. Disorder-specific modules were completed in a standardised order focusing on key disorders of interest in this study including PTSD and other anxiety disorders (excluding separation anxiety), mood, eating and conduct disorders. The interview included structured questions as well as open-ended verbatim accounts of reported problems. Experienced clinicians (two child psychiatrists and a clinical psychologist) blind to the nature of the assault reviewed all information and assigned DSM-IV-TR<sup>40</sup> diagnoses

based on reported symptoms and their impact, incorporating parent-reported data where available. They were overseen by a senior child psychiatrist (TK), who reviewed all assigned diagnoses as the sample included many complex and co-morbid presentations. Where there was any disagreement, a second independent senior child psychiatrist was consulted, and final diagnoses agreed.

Prevalence of any or multiple disorders was calculated from amongst those completing any one or more DAWBA modules. The prevalence of each specific disorder was calculated from amongst those completing the relevant module(s) for that disorder.

5. Sexual health outcomes: Patient-reported rates of sexual health screening, STIs, pregnancy and re-victimisation between the assault and TI were determined. Rates of sexual health screening were verified with consent with STI results verified where possible from Havens or sexual health clinic lab reports. It was possible to include data for a number of participants lost to follow-up at T1 who had had a post-assault STI screen prior to entry into the study at T0 (n=21) or who provided information retrospectively after T1 (n=10).

#### *Sample size and power*

We estimated a likely sample of 200 over a 24-month recruitment period, based on historical data suggesting the Havens saw 300 adolescents annually and assuming 30% recruitment. Given a 10% prevalence of psychiatric disorders in the general adolescent population,<sup>41</sup> a sample of 200 would identify a prevalence of 10% with precision of  $\pm$



4.2% with 95% confidence, a prevalence of 20% with precision of  $\pm 5.66\%$  and a prevalence of 30% with precision of  $\pm 6.48\%$ ).

### *Analyses*

Analyses were undertaken using SPSS Statistics 24 (IBM Analytics) and STATA 14 (StataCorp, College Station TX). We examined differences between the sample and eligible non-recruited young people. Demographic, assault-related, and baseline psychosocial characteristics of the recruited sample were described using simple statistics. Outcome data and longitudinal symptom data are shown for all participants alongside data for female participants. Further analysis was only undertaken for females due to their predominance in the sample and potential differences in outcomes.

Missing data for individual variables is indicated in the results tables by a change in denominator for the variables in question. There were variable amounts of missing data in the psychological symptom questionnaires and DAWBA interviews, reflecting high levels of complexity among participants and the difficulties vulnerable young people had completing questionnaires despite researcher support. The primary and secondary mental health outcomes are reported for those with complete and incomplete DAWBA interviews, thus producing conservative estimates of prevalence of psychiatric disorders. The frequency of missing data within the symptom questionnaires (from amongst those who started them) was <0.3% for the CRIES, <0.2% for the S-MFQ, <0.5% for the SDQ and <1.7% for the SCARED, following exclusion of SCARED data for three participants with >30% missing data at one or both time points. Following sensitivity analyses, all

other missing item responses in the S-MFQ, SCARED and CRIES were treated as negative, again producing conservative estimates of symptoms. SDQ scores were generated using standardised scoring syntax<sup>42,43</sup> accommodating up to 40% missing data per sub-scale by generating a score based on the mean of the remaining responses for that sub-scale. Differences in scores were examined at T0 and T1 among those completing symptom questionnaires at both time points, limiting testing to full scales rather than sub-scales to reduce statistical comparisons.

Logistic regression was used to examine associations of key mental health outcomes among female participants at T1 with baseline demographic factors (ethnicity, age and deprivation), previous service access for mental health difficulties, other potential indicators of baseline vulnerability, and sexual assault characteristics. Mental health outcomes examined included any psychiatric disorder, PTSD, any anxiety disorder and any depressive disorder. Models for vulnerability factors were adjusted for demographic factors (ethnicity, age and deprivation) where these were significantly associated with the outcome. Pseudo R<sup>2</sup> were calculated where associations were significant as an estimate of the proportion of outcome variance explained.

### *Ethics*

The study was approved by National Research Ethics Service Oxford A Committee on 14<sup>th</sup> March 2013 (ref no. 12/SC/0339).

### *Role of the funding source*

This paper reports on independent research commissioned and funded by the National Institute for Health Research Policy Research Programme (Prospective Evaluation of Follow-up and Outcomes Following Adolescent Sexual Assault, 115/0001). The funders had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The views expressed in this publication are those of the author(s) and not necessarily those of the NHS, the National Institute for Health Research or the Department of Health and Social Care. The corresponding author had full access to all study data and had final responsibility for the decision to submit for publication.

## **Results**

583 young people aged 13–17 years presented to the Havens following a sexual assault during the recruitment period. Ninety-two (16%) were ineligible or excluded: one aged 12, two referred with possible historical female genital mutilation, six already participating, 71 presenting more than 6 weeks post-assault and 12 from outside Greater London.

Of 491 eligible young people, 141 were recruited (29%) as clinical staff missed opportunities to approach 70 (14%), 182 (37%) were uncontactable after initial approach or did not respond within the 6-week window, 77 (16%) declined participation, and 21 (4%) were interested but a T0 interview could not be arranged in time. T0 assessments took place at a median (interquartile range (IQR)) of 27 (20–37) days post-assault.

Demographic, psychosocial and assault-related characteristics of the T0 sample are shown in Table 1. The participants were largely female (134, 95%), with six males and one transgender young person. They were predominantly socially deprived (72% from the bottom two quintiles). Forty-nine percent were of non-white ethnicity, 50% living with only one parent, and 19% had had a Statement of Special Educational Needs. Most participants had been raped (92%), with over half reporting use of physical violence or weapons during the assault. Stranger assaults were alleged in nearly two fifths of cases. Compared with 350 non-participants, participants were more likely to have presented aged 13–15 years ( $p < 0.05$ ); less likely to be of Asian ethnicity ( $p < 0.05$ ); and less likely to have reported previous domestic violence to Havens staff ( $p < 0.05$ ) (Supplementary Table 1). Other socio-demographic and vulnerability factors were comparable.

There were 106 T1 interviews (75% retention, 99 females), of which 91 (86%) took place as planned at four or five months post-assault, six (6%) at three months and nine (9%) at six months, with the median (IQR) interval 152 (143–163) days.

#### *Psychological symptom levels at T0 and T1*

Levels of psychological symptoms are shown for all participants and all female participants assessed at T0 and T1, and the sub-sample with data at both time-points, in Tables 2a (proportions above threshold) and 2b (median questionnaire scores).

Proportions above cut-offs used to distinguish possible cases from non-cases at T0 were very high, with nine in ten female participants at risk for PTSD; nine in ten, for

depressive disorder; and over two thirds, for anxiety disorder. Over a third of adolescent girls reported general psychological difficulties (including behavioural disturbance) in the six months prior to the assault, as measured retrospectively in the SDQ.

Proportions of female participants at risk for PTSD and anxiety disorder remained at similar levels at T1 (despite a significant reduction in median CRIES score), persisting from T0 in most cases. By contrast, proportions of female participants at risk for depressive disorder decreased over time and those at risk of general psychological difficulties at T1 increased relative to the proportion who had (retrospectively) reported difficulties in the six months prior to the assault. These changes were significant amongst those with data for both time points, as were corresponding changes in median S-MFQ and SDQ scores between T0 and T1.

#### *Primary and secondary mental health outcomes at T1*

Ninety-one participants (85 females) completed one or more DAWBA module at T1, with additional data from parent DAWBAs in 12 cases. Some participants and parents were unable to complete all diagnostic modules. Four in five young women had at least one psychiatric disorder at T1, and 55% had two or more (Table 3). Qualitative comments from participants indicate that some disorders were longstanding (i.e. pre-dated the assault) while others developed following the assault. Anxiety disorders, PTSD and depression were the most common diagnoses.

#### *Secondary sexual health outcomes at T1*

The majority of participants (92%) could be verified to have had an STI screen between assault and T1 (Table 4). Fourteen girls tested positive for an STI; 12 confirmed and two unconfirmed self-reports. The STI rate was 12% (14/119) among girls screened, with diagnoses including *Chlamydia* (n=10, 8%), *Gonorrhoea* (n=5, 4%) and chronic *Hepatitis B* (n=1, 1%) infection. Two female participants had more than one STI diagnosis. One male participant tested positive for *Gonorrhoea* (confirmed).

At T1, the reported pregnancy rate for females since assault was 4% (4/105) despite a minimum observed 61% (82/134) uptake of emergency contraception. The reported re-victimisation rate among girls was 8% (9/107).

#### *Factors associated with psychiatric disorder at T1*

Associations of baseline demographic, vulnerability and assault factors with key mental health outcomes for adolescent girls are shown in Table 5.

*Any psychiatric disorder:* Psychiatric disorder among adolescent girls at T1 was associated with pre-existing vulnerability including lifetime social services involvement (p=0.01), self-harm in the 12 months prior to assault (p=0.01) and previous sexual abuse (p=0.03), as well as a history of accessing mental health help in the 12 months prior to the assault (p=0.002). After controlling for the latter, only lifetime social services involvement (p=0.04) and self-harm in the 12 months prior to assault (p=0.05) remained significant.

*Anxiety disorders including PTSD:* Young women from black ethnic groups were at lower risk of any anxiety disorder ( $p=0.02$ ) and PTSD ( $p=0.01$ ) than young white women. A reversed social gradient was seen for any anxiety disorder ( $p=0.01$ ) and PTSD ( $p=0.01$ ), with young women from less deprived areas having a 5-fold increase in odds for these conditions. Age increased the risk for PTSD ( $p=0.01$ ). Psychosocial vulnerability was associated with prevalence of an anxiety disorder (but not PTSD) including a history of foster care, ( $p=0.02$ ), self-harm in the 12 months prior to assault ( $p=0.01$ ) and past history of sexual abuse ( $p=0.03$ ).

*Any depressive disorder:* No associations were found between vulnerability factors and depression other than a history of accessing services for mental health help ( $p=0.05$ ).

Assault characteristics were largely not associated with mental health outcomes; only substance use around the time of assault was associated with any psychiatric disorder ( $p=0.05$ ).

## **Discussion**

This large longitudinal study describes the vulnerabilities and subsequent mental health needs of adolescents recruited soon after sexual assault, and the inter-relationship between psychosocial vulnerability and psychiatric morbidity following assault, with implications for the service provision and responses needed for this group.

Adolescents who presented after sexual assault had very high levels of deprivation and pre-existing vulnerability, and exceptionally high rates of psychiatric disorder (80%) and comorbidity (55%) medium term (4–5 months). Nearly three-quarters were from the two most deprived quintiles (compared with 40% expected for the general population); half lived with only one parent (compared with 22% of children and young people in England in 2016<sup>45</sup>); a fifth had had a Statement of Special Educational Needs (found in only 2.8% of young people across England<sup>46</sup>); over a half had had previous involvement with Social Services; and over half had sought mental health help in the 12 months before assault (compared with an estimated 10% of children aged 5–15 in the general population accessing specialist services for mental health problems).<sup>47</sup> Few studies have examined vulnerability within an exclusively adolescent context,<sup>10,11,48</sup> although poverty and social vulnerability are well-recognised risk factors for sexual assault.<sup>49,50</sup> It is possible that more affluent and less vulnerable young people are less likely to report assault or present to SARCs, though this could only be determined through community-based studies.

There were higher levels of general psychological distress among young women at T1 than in the six months prior to the assault, as reported retrospectively at T0 in the SDQ. Young women had extremely high levels of depressive, anxiety and post-traumatic stress symptoms within the first six weeks of assault, largely persisting at 4–5 months follow up when 80% had at least one psychiatric disorder, and 55% had multiple disorders. At T1, nearly two-thirds of young women were diagnosed with an anxiety disorder, almost half met diagnostic criteria for PTSD and 40% met diagnostic criteria for major depressive disorder. Psychiatric disorder was associated with psychosocial vulnerability at



presentation (previous social services involvement, mental health service use, self-harm or sexual abuse), but not with assault characteristics, despite the seriousness of the assaults experienced and associated physical violence in more than half of cases.

Pregnancy post-assault was uncommon but the rate (4%) was high relative to population estimates for young women (1.8% among 15–17 year olds and 0.4% in under 16s).<sup>51</sup> Female STI rates were higher than expected (12%) relative to population estimates for new STIs in women aged 15–19 in London (3.8%) or nationally (3.3%),<sup>52</sup> although it is not possible to determine when these were acquired. There was high uptake of sexual health services post-assault.

These findings emphasise the 'double disadvantage' of young women suffering sexual assault. Their vulnerability places them at higher risk of initial assault, with one in twelve suffering re-victimisation within 4–5 months. Additionally, many of these vulnerability factors are also risk factors for psychiatric disorders, placing them at higher risk of psychiatric sequelae, in particular anxiety disorders. Personal characteristics were more important than assault characteristics as predictors of later distress.

#### *Strengths and limitations*

Strengths of this study include a pre-specified protocol; prospective and inclusive recruitment; comprehensive assessment and retention of a highly vulnerable population; verification of sexual health outcome data; use of validated methods and clinical expertise to evaluate psychopathology; and longitudinal perspective thus improving

reliability and minimising recall bias. Use of higher threshold cut-offs, and assumptions about negative missing data, means the estimates are conservative, including for the DAWBA. Limitations affecting precision include low recruitment rate; under-representation of South Asians and males; variation in timing of assessments; possible over- or under-estimation of the mental health burden; absence of psychological evaluation prior to assault or a comparable control group limiting assessment of causality; and generalisability as this was a population of mostly police-reported cases presenting to the three SARCs in one metropolitan city, with a higher prevalence of stranger assault than in UK-wide estimates.<sup>6,7</sup> and a high prevalence of violent assaults. Presentation to the SARC, participation in the study and retention are likely to be related to the main outcomes under study. Completion rates of all the modules of the DAWBA – which had not been piloted in this population – were variable, reflecting very high levels of disturbance, co-morbidity and complexity, and the length of time taken to complete the assessment. Rates of emotional disorders (anxiety, depression and PTSD) are likely to be more reliable than behavioural (conduct disorders) since it was not possible in most cases to include a second informant. Although many relevant potential vulnerability factors were included, information on family mental health history was lacking, a key indicator of genetic and environmental vulnerability to prevalence of psychiatric disorder.

*Interpretation compared to previous work evaluating mental health post-assault*

Previous studies have tended to be cross-sectional, smaller retrospective or longitudinal studies; or to have studied a wider age range (i.e. not limited to adolescence) or participants experiencing many different types of trauma. Only six prospective or

comparative studies were found,<sup>53-58</sup> all of which were narrower in their assessment of mental health outcomes and their associations than the present study and only one of which focused on adolescents.

*Psychological symptom levels over time:* In keeping with some<sup>57,58</sup> but not all<sup>55-57</sup> studies, we observed reductions in median depressive and post-traumatic stress (but not anxiety) symptom scores for young women over time. However, despite the changes observed, many participants' symptom levels remained above cut-offs indicative of risk of disorder at T1. A meta-analysis of longitudinal studies evaluating PTSD symptoms in 5- to 18-year-olds following various trauma concluded that after an initial decline, there was little evidence of further change in symptom severity after six months,<sup>59</sup> highlighting the need for early intervention and ongoing support beyond this period.

*Presence of psychiatric disorder:* The present study demonstrates the range of psychiatric disorders observed in young women post-assault, and high numbers with multiple disorders, whereas previous studies have limited their focus to evaluating rates of PTSD,<sup>53,54,56</sup> anxiety<sup>53,55</sup> or depressive disorders.<sup>55</sup> Some disorders may have been pre-existing in all studies. Rothabaum and colleagues<sup>54</sup> observed PTSD rates of 47% at three months post-assault, broadly similar to this sample, while Darves and colleagues<sup>53</sup> reported rates of 71% and 65% at three and six months. Mouliso *et al.*<sup>56</sup> observed substantially lower rates of PTSD in their college-set study of re-victimised students (10.5% at four months), which could reflect lower baseline psychopathology or higher functioning in the study population. Oshodi *et al.*<sup>55</sup> evaluated baseline (“pre-assault”)

rates of depression and anxiety less than two weeks post-assault, precluding direct comparison with our diagnostic assessment four to five months post-assault.

#### *Associations with presence of psychiatric disorder*

The association of higher socio-economic status with PTSD and other anxiety disorders among females was from a largely deprived sample with relatively small numbers from higher socio-economic groups, and the significance of this finding is unclear. Trickey *et al.*<sup>60</sup> reported contrasting findings in their meta-analysis of risk factors for PTSD in 6–18 year olds following various trauma although effect sizes were small. Present results also raise the possibility of links between ethnicity and age and the likelihood of PTSD following sexual assault, which should again be interpreted with caution. Whilst others<sup>21</sup> have reported increasing rates of PTSD with age, Trickey *et al.*<sup>60</sup> observed no relationship with age or ethnicity, although this latter meta-analysis of 64 studies incorporated only four studies involving survivors of sexual abuse. Large scale community studies are needed into demographic risk factors for psychiatric disorder following sexual assault.

In this study, a history of accessing services for mental health help, and previous sexual abuse, self-harm and social services involvement were all associated with a higher likelihood of psychiatric disorder in young women following sexual assault. Others<sup>60</sup> have observed links between PTSD following various trauma and pre-existing psychopathology and low social support. However, Darves and colleagues<sup>53</sup> found no association between self-harm or pre-existing psychiatric disorder and risk for PTSD a year post-sexual assault, possibly reflecting small numbers.

Perhaps surprisingly, we found no evidence to support a role for assault characteristics in increasing subsequent risk of psychiatric disorder among young women. Previous studies of various trauma<sup>60</sup> or involving a wider age range<sup>53,60</sup> have reported associations with trauma severity,<sup>60</sup> perceived life threat<sup>60</sup> and violent rape.<sup>53</sup> These findings might not hold in adolescents and need further investigation.

### **Implications and conclusions**

Sexual assault services need to provide comprehensive support for adolescents, addressing both the high prevalence of vulnerability factors such as deprivation and special educational needs and the very high levels of psychiatric comorbidity seen afterwards. Traditionally, sexual health follow-up has been the primary focus, perhaps reflecting the historical origin of many SARC's within sexual health services. This study suggests that take-up of sexual health screening is high (>90% in this sample), and that SARC services need to reorient support to address the broader burden, particularly the management of psychiatric comorbidity. There should be effective joint working between SARC's and child and adolescent mental health services (CAMHS) to ensure all assault victims are offered timely assessment and support. Support pathways post-assault need to consider the use of novel workforce roles such as care navigators with expertise in reaching harder-to-engage populations. Psychological services should ensure access to empirically supported therapies for the prevention or treatment of PTSD and other conditions following sexual assault,<sup>61,62,63</sup> and that support is sufficiently skilled to address the high levels of psychiatric multi-co-morbidity, particularly in a population

with high levels of wider social vulnerability. Within the criminal justice system (police, lawyers, juries and general public) more attention should be given to the mental injuries suffered by adolescents (both before and after sexual assault). High re-victimisation rates emphasise the need for services to improve support provided to young people following sexual assault.

Our findings also have implications for prevention. Young people who have received social services support, accessed services for mental health difficulties or who have a history of self-harm or special educational needs may be at higher risk of sexual assault and/or at increased risk of psychiatric disorder afterwards. The feasibility and effectiveness of targeted prevention programmes should be investigated. Additionally, professionals in these settings require training around detection of, and response to, disclosures of sexual assault. Ready access to mental health evaluation and early intervention is indicated following sexual assault.

### **Implications for future research**

This work should be replicated in other settings and populations, including male adolescents and wider ethnic groups experiencing sexual assault. Longitudinal population cohort studies may help to delineate further the antecedents for sexual assault and associated outcomes. Further research is needed on prevention of adolescent sexual assault,<sup>64</sup> including the impact of vulnerability on violence prevention outcomes<sup>65</sup> and responses to this. Further research is also needed into the potential benefit of brief

interventions administered in acute (e.g. Emergency or SARC) settings in improving outcomes following adolescent sexual assault.<sup>66</sup>

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## Tables

Table 1. Demographic, psychosocial and assault-related characteristics of adolescents reporting to a sexual assault referral centre within 6 weeks of sexual assault

Table 2a. Rates of adolescents at high risk of disorder <6 weeks (T0) and at 4–5 months (T1) post sexual assault

Table 2b. Psychological symptom levels in adolescents <6 weeks (T0) and at 4–5 months (T1) post sexual assault

Table 3. Psychiatric disorder rates in adolescents at 4–5 months post sexual assault (T1)

Table 4. Sexual health outcomes in adolescents at 4–5 months post sexual assault (T1)

Table 5. Adjusted associations between baseline demographic and vulnerability factors and mental health outcomes for adolescent girls

Supplementary Table 1. Characteristics of participants compared with non-participants

**Table 1.** Demographic, psychosocial and assault-related characteristics of adolescents reporting to a sexual assault referral centre within 6 weeks of sexual assault

	n	N <sup>a</sup>	%
<b>Gender</b>			
Female	134	141	95.0%
Male	6	141	4.3%
Male to female transgender	1	141	0.7%
<b>Age at assault</b>			
Mean (SD) age	15.59 (1.27)	141	
13-15 years	87	141	61.7%
16 -17 years	54	141	38.3%
<b>Ethnicity</b>			
White	72	141	51.1%
Black	40	141	28.4%
South Asian	4	141	2.8%
Mixed	23	141	16.3%
Other	2	141	1.4%
<b>Index of Multiple Deprivation (IMD) quintile (2015)</b>			
IMD Deciles 1-2 (most deprived)	49	141	34.8%
IMD Deciles 3-4	53	141	37.6%
IMD Deciles 5-6	23	141	16.3%
IMD Deciles 7-8	9	141	6.4%
IMD Deciles 9-10 (least deprived)	7	141	5.0%
<b>Living with</b>			
Both parents	33	141	23.4%
1 parent	71	141	50.4%
Other living arrangement <sup>b</sup>	37	141	26.2%
<b>Education or employment status pre-assault</b>			
Attending school	119	138	86.2%
Non-mainstream (special) school or unit <sup>c</sup>	20	119	16.8%
Employed	15	140	10.7%
Not in education or employment	16	138	11.6%
<b>Psychosocial Characteristics</b>			
Current/previous extra help with learning at school (1:1 or small group)	52	138	37.7%
Current/previous statement of Special Education Needs (SEN)	25	132	18.9%
Mental health help sought in the 12 months prior to the assault <sup>d</sup>	71	140	50.7%

Self-harm in the 12 months prior to the assault	57	140	40.7%
Social Services involvement prior to or at the time of the assault	68	132	51.5%
In foster care prior to or at the time of the assault	27	137	19.7%
Previous sexual abuse or assault	43	136	31.6%
History of running away	55	138	39.9%
Ever used alcohol	104	124	83.9%
Binge drinking on at least one occasion in the last month <sup>e</sup>	47	116	40.5%
Ever use of recreational drugs	63	140	45.0%
<b>Referral Pathway</b>			
Police referral	128	141	90.8%
<b>Assailant Characteristics</b>			
Stranger assault	51	133	38.3%
Multiple assailant assault	29	137	21.2%
Assailant(s) aged < 20yrs <sup>f</sup>	76	121	62.8%
Assailant(s) aged > 20yrs <sup>f</sup>	48	121	39.7%
<b>Assault Characteristics</b>			
Substance use around the time of the assault	47	125	37.6%
Violent assault (weapons or physical violence)	63	114	55.3%
Rape	116	126	92.1 %
Vaginal rape	97	119	81.5%
Anal rape	19	117	16.2%
Oral rape	52	122	42.6%
>1 type of rape	46	118	39.0%
Penetration, digital or by an object	38	110	34.5%
Other sexual assault <sup>g</sup>	73	112	65.2%
Type of assault not known or no recollection of events	13	141	9.2%

<sup>a</sup> Denominator is all those from the sample with available data unless otherwise specified

<sup>b</sup> Other living arrangements include in foster care, living independently, with friends or other family

<sup>c</sup> Denominator is those attending school

<sup>d</sup> Options included General Practitioner (GP), mental health professional, counsellor, other health professional (e.g. Emergency Department), Social Services or voluntary agency

<sup>e</sup> 5 or more drinks on one occasion<sup>44</sup>

<sup>f</sup> Takes into account single and multiple assailant assaults

<sup>g</sup> Other sexual assault included: touching, kissing, biting, cunnilingus, attempted rape/penetration, felatio or vaginal sex forced on male victim

**Table 2a:** Rates of adolescents at risk of disorder <6 weeks (T0) and at 4–5 months (T1) post sexual assault

	<b>Sample at T0 (n=134)</b>	<b>Sample at T1 (n=99)</b>	<b>Subsample with data T0 and T1 (n=99)</b>		<b>Difference in % above cut-off between T0 and T1</b>		
Psychological Symptom Questionnaires	n above cut- off / N <sup>a</sup> (%)	n above cut- off / N <sup>a</sup> (%)	n above cut-off / N <sup>a</sup> at T0 (%)	n above cut-off / N <sup>a</sup> at T1 (%)	McNemmar test p value	Difference in % above cut-off	95% Confidence Intervals
<b>Post-traumatic stress: CRIES-13<sup>b</sup></b>							
All participants	121/135 (89.6%)	87/105 (82.9%)	90/103 (87.4%)	85/103 (82.5%)			
Females	116/128 (90.6%)	83/99 (83.8%)	86/97 (88.7%)	81/97 (83.5%)	0.3	5.2%	(-4.1%, 14.5%)
<b>Depressive symptoms: S-MFQ<sup>c</sup></b>							
All participants	120/137 (87.6%)	72/105 (68.6%)	91/104 (87.5%)	71/104 (68.3%)			
Females	115/130 (88.5%)	69/99 (69.7%)	86/98 (87.8%)	68/98 (69.4%)	<b>0.001</b>	18.4%	(7.4%, 29.3%)
<b>Anxiety symptoms: SCARED<sup>d</sup></b>							
All participants	95/133 (71.4%)	62/102 (60.8%)	69/99 (69.7%)	60/99(60.6%)			
Females	90/126 (71.4%)	58/96 (60.4%)	65/93 (69.9%)	56/93 (60.2%)	0.09	9.7%	(-1.3%, 20.6%)
<b>Psychological distress:</b>							

**total SDQ<sup>e</sup>**

All participants	46/123 (34.8%)	44/102 (43.1%)	30/99 (30.9%)	43/99 (43.4%)			
Females	45/126 (35.7%)	43/96 (44.8%)	29/94 (30.9%)	43/94 (45.7%)	<b>0.02</b>	-14.9%	(-27%, -2.8%)

<sup>a</sup>Denominator is number filling out a questionnaire at the respective time point; <sup>b</sup>CRIES-13: Children's Revised Impact of Event Scale-13 (cut-off used: 30/65); <sup>c</sup>S-MFQ: Short version of the Mood and Feelings Questionnaire (cut-off used: 8/26); <sup>d</sup>SCARED: Screen for Child Anxiety Related Disorders (cut-off used: 25/82); <sup>e</sup>SDQ: Strengths and Difficulties Questionnaire (cut-off used: 20/40). P-values <0.05 were considered significant and are in bold.

**Table 2b:** Psychological symptom levels in adolescents <6 weeks (T0) and at 4–5 months (T1) post sexual assault

Psychological Symptom Questionnaires	Sample at T0 (n=134)	Sample at T1 (n=99)	Subsample with data T0 and T1 (n=99)		Difference in symptom levels between T0 and T1
	Median scores (IQR) <sup>a</sup>	Median scores (IQR) <sup>a</sup>	Median scores (IQR) <sup>a</sup> at T0	Median scores (IQR) <sup>a</sup> at T1	Difference in median scores Wilcoxon (p value)
<b>Post-traumatic stress: CRIES-13<sup>b</sup></b>					
All participants	49 (40,57)	43 (34,53)	47 (39,57)	43 (34,55)	
Females	49 (40,57)	43 (34,55)	47 (39,57)	42 (34,53)	Z=3.2 ( <b>0.002</b> )
<b>Depressive symptoms: S-MFQ<sup>c</sup></b>					
All participants	16 (10,21)	12 (7,18)	15 (10,20)	12 (7,18)	
Females	16 (11,21)	12 (7,18)	15 (10,20)	12 (7,18)	Z=4.2 ( <b>&lt;0.0001</b> )
<b>Anxiety symptoms: SCARED<sup>d</sup></b>					
All participants	37 (27,52)	34 (22,47)	35 (27,50)	34 (22,47)	
Females	37 (28,52)	34 (22,47)	35 (27,50)	34 (22,47)	Z=1.4 (0.16)
<b>Psychological distress: total SDQ<sup>e</sup></b>					
All participants	17 (11,22)	17 (11,23)	17 (11,21)	17 (11,23)	
Females	17 (11,22)	17 (11,22)	17 (11,21)	17.5 (12,23)	Z=-2.4 ( <b>0.02</b> )

<sup>a</sup>IQR: Interquartile range; <sup>b</sup>CRIES-13: Children's Revised Impact of Event Scale-13 (cut-off used: 30/65); <sup>c</sup>S-MFQ: Short version of the Mood and Feelings Questionnaire (cut-off used: 8/26); <sup>d</sup>SCARED: Screen for Child Anxiety Related Disorders (cut-off used: 25/82); <sup>e</sup>SDQ: Strengths and Difficulties Questionnaire (cut-off used: 20/40). P-values <0.05 were considered significant and are in bold

**Table 3: Psychiatric disorder rates in adolescents at 4–5 months post sexual assault (T1)**

DSM-IV Disorders	All participants		Females	
	n/N completed the respective diagnostic module(s) (%)	95% Confidence Interval	n/N completed the respective diagnostic module(s) (%)	95% Confidence Interval
<b>Any Disorder<sup>a</sup></b>	72/91 (79.1%)	69.1 - 86.7	68/85 (80%)	69.6 - 87.6
<b>Anxiety Disorders</b>				
Any Anxiety Disorder <sup>a</sup>	59/91 (64.8%)	54.1 - 74.4	55/85 (64.7%)	53.5 - 74.6
PTSD	44/89 (49.4%)	38.8 - 60.2	40/83 (48.2%)	37.2 - 59.4
Panic	13/88 (14.8%)	8.4 - 24.3	13/82 (15.9%)	9.0 - 26.0
Generalised Anxiety	15/83 (18.1%)	10.8 - 28.4	12/77 (15.6%)	8.7 - 26.0
Specific Phobia	7/87 (8%)	3.6 - 16.4	7/81 (8.6%)	3.8 - 17.5
Social Phobia	8/88 (9.1%)	4.3 - 17.6	7/82 (8.5%)	3.8 - 17.4
Agoraphobia	6/88 (6.8%)	2.8 - 14.8	6/82 (7.3%)	3.0 - 15.8
OCD	5/83 (6%)	2.2 - 14.1	5/77 (6.5%)	2.4 - 15.2
Anxiety NOS	7/91 (7.7%)	3.4 - 15.7	7/85 (8.2%)	3.7 - 16.8
<b>Depressive Disorders</b>				
Any Depressive Disorder <sup>a</sup>	39/91 (42.9%)	32.7 - 53.7	38/85 (44.7%)	34.1 - 55.9
Major Depression	31/79 (39.2%)	28.6 - 50.9	30/75 (40%)	29.1 - 52.0
Depression NOS	8/91 (8.8%)	4.2 - 17.1	8/85 (9.4%)	4.4 - 18.2
<b>Bipolar I-II disorders</b>	4/71 (5.6%)	1.8 - 14.5	4/66 (6.1%)	2.0 - 15.6
<b>Eating disorders<sup>b</sup></b>	3/76 (3.9%)	1.0 - 11.9	3/71 (4.2%)	1.1 - 12.7
<b>Conduct disorder</b>	15/68 (22.1%)	13.3 - 34.1	15/63 (23.8%)	14.4 - 36.5
<b>Number of Disorders<sup>a</sup></b>				
0	19/91 (20.9%)	13.3 - 30.9	17/85 (20%)	12.4 - 30.4
1	22/91 (24.2%)	16.1 - 34.5	21/85 (24.7%)	16.3 - 35.5
2	26/91 (28.6%)	19.8 - 39.2	25/85 (29.4%)	20.3 - 40.4
3	12/91 (13.2%)	7.3 - 22.3	10/85 (11.8%)	6.1 - 21.0
4	5/91 (5.5%)	2.0 - 12.9	5/85 (5.9%)	2.2 - 13.8
5	6/91 (6.6%)	2.7 - 14.3	6/85 (7.1%)	2.9 - 15.3
6	1/91 (1.1%)	0.1 - 6.8	1/85 (1.2%)	0.1 - 7.3
Multiple (≥2 disorders)	50/91 (54.9%)	44.2 - 65.3	47/85 (55.3%)	44.2 - 66.0

<sup>a</sup>Denominator is number completing any one or more of the respective diagnostic modules (n=85)<sup>b</sup>Eating Disorders include: Anorexia Nervosa, Bulimia Nervosa and Eating Disorder Not Otherwise Specified

**Table 4.** Sexual health outcomes in adolescents at 4–5 months post sexual assault (T1)

	n	N	%	95% Confidence Interval
<b>All participants (n=141)</b>				
Re-victimisation by T1 (reported)	9	114 <sup>a</sup>	7.9%	3.9 – 14.9%
Pregnancy by T1 (reported)	4	105 <sup>a,b</sup>	3.8%	1.2 – 10.0%
Sexually transmitted infection (STI) screen <sup>c</sup> by T1 (verified with consent)	126	137 <sup>d</sup>	92.0%	85.8 – 95.7%
Positive STI result by T1 (reported, verified where possible) <sup>e</sup>	15	126 <sup>f</sup>	11.9%	7.0 – 19.2%
<b>All females (n=134)</b>				
Re-victimization by T1 (reported)	9	107 <sup>a</sup>	8.4%	4.2 - 15.8%
Pregnancy by T1 (reported)	4	105 <sup>a</sup>	3.8%	1.2 - 10.0%
Sexually transmitted infection (STI) screen <sup>c</sup> by T1 (verified with consent)	119	130 <sup>d</sup>	91.5%	85.0 - 95.5%
Positive STI result by T1 (reported, verified where possible) <sup>e</sup>	14	119 <sup>f</sup>	11.8%	6.8 - 19.3 %

<sup>a</sup>Denominator is those assessed at T1 plus n=8 female participants who provided data after T1

<sup>b</sup>Denominator is female participants only

<sup>c</sup>Testing for one or more sexually transmitted infections

<sup>d</sup>Denominator is all those who could be verified to have had an STI screen at any time point between their assault and T1

<sup>e</sup>Reported STIs included: Chlamydia, Gonorrhoea, and Hepatitis B Virus

<sup>f</sup>Denominator is those who undertook an STI screen



**Table 5.** Adjusted associations between baseline demographic and vulnerability factors and mental health outcomes for adolescent girls

		Any psychiatric disorder					Any anxiety disorder					PTSD					Any depressive disorder									
		n	% (n) with outcome	OR <sup>a</sup>	p	95 <sup>th</sup> low	95 <sup>th</sup> high	n	% (n) with outcome	OR	p	95 <sup>th</sup> low	95 <sup>th</sup> high	n	% (n) with outcome	OR	p	95 <sup>th</sup> low	95 <sup>th</sup> high	n	% (n) with outcome	OR	p	95 <sup>th</sup> low	95 <sup>th</sup> high	
<b>Demographics</b>																										
Age	contin.	85		1.38	0.14	0.90	2.12	85		1.20	0.31	0.85	1.70	83	1	1.63	<b>0.089</b>	1.13	2.36	85		1.29	0.14	0.92	1.81	
Ethnicity	White	85	86.1 (37)	1	0.11			85	76.7 (33)	1	0.02			83	61.0 (25)	0.00	64			85	48.8 (21)	0.5				
	Mixed South Asian		83.3 (10)	0.81		0.14	4.65	85	58.3 (7)	0.42		0.11	1.63		58.3 (7)	0.90		0.24	3.31		41.7 (5)	0.75		0.21	2.73	
	Black		50 (1)	0.16		0.01	2.96		50.0 (1)	0.30		0.02	5.29		0	0.00		0.00	.		0	0.00				
	Total		71.4 (20)	0.41		0.12	1.33		50.0 (14)	0.30		0.11	0.84		28.6 (8)	0.26		0.09	0.72		42.9 (12)	0.79		0.30	2.05	
	Total		80.0 (68)						64.7 (55)						48.2 (40)						44.7 (38)					
IMD	1 (most deprived)	85	72.4 (21)	1	0.16			85	55.2 (16)	1	0.01	7		83	32.1 (9)	0.05	2			85	48.3 (14)	0.4	4			
	2		80.7 (25)	1.59		0.47	5.31	85	54.8 (17)	0.99		0.36	2.73		43.3 (13)	1.61		0.55	4.72		29.0 (9)	0.44		0.15	1.27	
	3-5 (less deprived)		88.0 (22)	2.79		0.65	11.97		88.0 (22)	5.96		1.45	24.43		72.0 (18)	5.43		1.67	17.66		60.0 (15)	1.61		0.54	4.74	
	Total		80.0 (68)						64.7 (55)						48.2 (40)						44.7 (38)					
<b>Vulnerability factors</b>																										
Looked after young person (lifetime)	No	84	62.1 (41)	1				84	62.1 (41)	1				82	46.9 (30)	1				84	48.5 (32)	1				
	Yes		77.8 (14)	10.45	0.13	0.83	131.55		77.8 (14)	8.34	<b>0.022</b>	1.36	51.31		55.6 (18)	1.66	0.46	0.44	6.30		33.3 (6)	0.53	0.26	0.18	1.58	
Social services involvement (lifetime)	No	84	70 (28)					84	62.5 (25)					82	45.0 (18)					84	37.5 (15)					
	Yes		95.1 (39)	8.36	<b>0.0082</b>	1.73	40.32		70.7 (29)	1.75	0.33	0.56	5.41		53.9 (21)	1.39	0.55	0.47	4.14		53.7 (22)	2.59	7	0.94	7.17	
Special Educational Needs (SEN) statement	No	82	77.9 (53)					82	64.7 (44)					80	46.3 (31)					82	44.1 (30)					
	Yes		85.7 (12)	1.70	0.52	0.34	8.44		64.3 (9)	0.81	0.78	0.19	3.52		53.9 (7)	1.04	0.96	0.25	4.24		57.1 (8)	1.69	0.46	0.53	5.40	
Self-harmed in 12m before assault	No	85	69.8 (37)					85	52.8 (28)					83	43.4 (23)					85	39.6 (21)					
	Yes		96.9 (31)	13.41	<b>0.014</b>	1.68	106.86		84.4 (27)	4.61	<b>0.014</b>	1.36	15.55		56.7 (17)	1.20	0.75	0.40	3.59		53.1 (17)	1.73	0.23	0.71	4.19	

Sexual abuse history (lifetime)	No	84	74.1 (43)					84	60.3 (35)					82	50.0 (29)					84	46.6 (27)				
	Yes			<b>0.03</b>																					
			92.3 (24)	6.27	<b>3</b>	1.16	34.00		73.1 (19)	3.95	<b>0.026</b>	1.18	13.28		41.7 (10)	0.95	0.93	0.29	3.05		42.3 (11)	0.84	0.72	0.33	2.14
<b>Mental health history</b>																									
Mental health help sought in 12m before assault	No	85	64.1 (25)					85	53.9 (21)					83	41.0 (16)					85	33.1 (13)				
	Yes			<b>0.00</b>																			<b>0.05</b>		
			93.5 (43)	8.03	<b>23</b>	2.10	30.68		73.9 (34)	2.45	0.11	0.83	7.25		54.6 (24)	1.46	0.48	0.51	4.22		54.4 (25)	2.38	<b>4</b>	0.98	5.76
<b>Assault characteristics</b>																									
Violent assault: physical violence or weapons	No	73	73.3 (22)					73	63.3 (19)					72	46.7 (14)					73	46.7 (14)				
	Yes																								
			86.1 (37)	2.24	0.18	0.69	7.32		62.8 (27)	0.57	0.34	0.18	1.81		47.6 (20)	0.37	0.12	0.11	1.29		46.5 (20)	0.99	0.99	0.39	2.53
Multiple assailants	No	84	79.4 (50)					84	63.5 (40)					83	45.2 (28)					84	46.0 (29)				
	Yes																								
			81.0 (17)	1.11	0.88	0.32	3.85		66.7 (14)	2.02	0.30	0.54	7.61		57.1 (12)	2.35	0.19	0.65	8.54		42.9 (9)	0.88	0.80	0.32	2.38
Substance use around time of assault	No	79	74.0 (37)					79	62.0 (31)					77	41.7 (20)					79	44.0 (22)				
	Yes			<b>0.05</b>																					
			93.1 (27)	4.74	<b>2</b>	0.99	22.78		72.4 (21)	1.05	0.94	0.33	3.30		58.6 (17)	1.11	0.85	0.36	3.43		48.3 (14)	1.19	0.71	0.47	2.97
Assault by stranger (single or multiple)	No	82	73.9 (34)					82	65.2 (30)					81	48.9 (22)					82	43.5 (20)				
	Yes																								
			86.1 (31)	2.19	0.18	0.69	6.92		63.9 (23)	0.78	0.66	0.26	2.33		27.2 (17)	0.54	0.27	0.18	1.62		50.0 (18)	1.30	0.56	0.54	3.12

<sup>a</sup> OR: Adjusted odds ratio. OR are adjusted for demographic factors (ethnicity, age and deprivation) where these were significantly associated with the outcome in question. P-values <0.05 were considered significant and are in bold.

**Supplementary Table 1.** Characteristics of participants compared with non-participants

	Participants (n=141)			Non-participants (n=350)			P value	Difference (95 % CI)
	n	N <sup>a</sup>	%	n	N <sup>a</sup>	%		
<b>Gender</b>							0.39	
Female	134	141	95.0%	334	350	95.4%		0.39% (-3.62 to 6.08)
Male	6	141	4.3%	16	350	4.6%		0.32% (- 5.18 to 4.18)
MTFT	1	141	0.7%	0	350	0.0%		
<b>Age at assault</b>								
Mean age (SD)	15.59 (1.27)	141	-	15.78 (1.35)	350	-	0.15	-0.19 (-0.45 to 0.07)
13-15 years	87	141	61.7%	181	350	51.7%	<b>&lt;0.05</b>	9.99% (-0.12 to 19.57)
16 -17 years	54	141	38.3%	169	350	48.3%		
<b>Ethnicity</b>							<b>&lt;0.05</b>	
White	72	141	51.1%	175	343	51.0%		0.04% (-10.4 to 10.09)
Black	40	141	28.4%	70	343	20.4%		7.96% (-0.58 to 17.21)
South Asian	4	141	2.8%	32	343	9.3%		6.49% (1.02 to 10.67)
Mixed	23	141	16.3%	56	343	16.3%		0.01% (-8.22 to 7.07)
Other	2	141	1.4%	10	343	2.9%		1.50% (-2.88 to 4.31)
<b>Index of Multiple Deprivation (IMD) Quintile (2015)</b>							0.41	
IMD Deciles 1-2	49	141	34.8%	98	350	28.0%		6.8% (-2.5 to 16.44)
IMD Deciles 3-4	53	141	37.6%	153	350	43.7%		6.13% (-3.93 to 15.68)
IMD Deciles 5-6	23	141	16.3%	47	350	13.4%		2.88% (-3.98 to 10.96)

IMD Deciles 7-8	9	141	6.4%	31	350	8.9%		2.47% (-3.86 to 7.32)
IMD Deciles 9-10	7	141	5.0%	21	350	6.0%		1.04% (-4.76 to 5.24)
<b>Referral Pathway</b>								
Reported to police	128	141	90.8%	321	347	92.5%	0.52	1.73% (-3.55 to 8.52%)
<b>Vulnerability Indicators<sup>b</sup></b>								
History of mental health difficulties	40	140	28.6%	129	349	37.0%	0.08	8.39% (-1.36 to 17.31)
History of self-harm	68	139	48.9%	158	339	46.6%	0.65	2.31% (-7.81 to 12.44)
Learning disability/difficulties	12	138	8.7%	27	344	7.9%	0.76	0.85% (-4.41 to 7.65)
Other special needs	19	140	13.6%	58	349	16.6%	0.40	3.05% (-4.91 to 9.72)
Domestic violence	28	127	22.0%	105	306	34.3%	<b>&lt;0.05</b>	12.27% (2.36 to 21.01)
Child Protection Plan in place at presentation	4	55	7.3%	20	144	13.9%	0.20	6.62% (-5.61 to 15.16)
Under care of Local Authority at time of assault	15	141	10.6%	43	337	12.8%	0.52	2.12% (-5.24 to 8.14)
Other identified vulnerability <sup>c</sup>	10	141	7.1%	19	349	5.4%	0.48	1.65% (-2.97 to 7.9)
<b>Number of Vulnerability Indicators</b>							0.19	
0	40	141	28.4%	90	350	25.7%		2.65 % (-6.02 to 12.07)
1	45	141	31.9%	84	350	24.0%		7.91% (-1.0 to 17.4)
2	32	141	22.7%	94	350	26.9%		4.16% (-4.99 to 12.33)
3 or more	24	141	17.0%	82	350	23.4%		6.41% (-2.18 to 13.83)

<sup>a</sup>N = Denominator is number with available data in Havens clinical notes

<sup>b</sup>Vulnerability Indicators: Data collected routinely by the Havens. Figures may vary when compared to Study data due to differences in variable definitions and information available

<sup>c</sup>No fixed abode, homeless, living alone in a hostel, trafficked, identified as at risk of sexual exploitation, involved with gangs, repeatedly reported as missing

Significance tests: Independent samples T-Test for continuous data. Chi Square or Fisher's Exact Test (if expected cell counts < 5) for categorical data.

P-values <0.05 were considered significant and are in bold