Association between adverse childhood experiences and a combination of psychosis and violence among adults – a systematic review and meta-analysis

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Abstract

Relationships have been well established between adverse childhood experiences (ACEs) and later psychosis (29 systematic reviews) *or* violence (4 systematic reviews). To date, just one review has explored childhood maltreatment, specifically, and violence *risk* with psychosis.

We conducted a systematic review and meta-analyses of a wider range of ACEs and later psychosis with *actual violence* compared with psychosis alone, violence alone or neither, completing searches in January 2021.

Fifteen studies met inclusion criteria, but only six included all four groups of interest. Two substantial studies recorded ACEs from sources independent of those affected and probably *before* emergent psychosis or violence; others relied on retrospective recall. Meta-analyses were possible only for within-psychosis-group comparisons; histories of physical abuse, sexual abuse, having a criminal/violent parent or living with family alcohol/drug use were each associated with around twice the odds of psychosis with violence as psychosis alone. Although ACE measures in the four-way comparisons were too divergent for firm conclusions, abuse histories and parental criminality emerged as likely antecedents, one study evidencing psychosis as mediating between ACEs and violence.

Without longitudinal prospective study, pathways between ACEs and later problems remain unclear. Our findings add weight to the case for exploring ACEs in addition to abuse as possible indicators of later violence among people with psychosis and for trauma-informed interventions, important because some people are reluctant to disclose abuse histories.

Introduction

Rationale

A small but significant association has been established between psychosis and violence (Fazel et al., 2009b), but only partly explained by the features of the illness itself (e.g. Taylor and Estroff, 2014). One other explanatory candidate is a history of adverse childhood experiences (ACEs).

ACEs are defined as "potentially traumatic events that occur in childhood (0-17 years)" (Centers for Disease Control and Prevention, 2019). ACEs include experiencing violence or abuse, or neglect and other aspects of the child's environment that may affect their sense of safety, stability or bonding Felitti et al. (1998) developed the Adverse Childhood Experience Questionnaire (ACE-Q). This includes 10 ACEs and their definitions – physical abuse, sexual abuse, emotional abuse, physical neglect, emotional neglect, mental illness of a family member, exposure to domestic violence, problem drug or alcohol use in the household, parental incarceration and parental separation. This provides a useful framework for ACE measurement although, in practice, ACE measurement varies between studies.

Reports of a single ACE are not uncommon. Large population-based studies have found that at least half of adults report at least one (e.g. in England and in Wales Bellis et al., 2014; Hughes et al., 2018; in the USA Merrick et al, 2019). Nevertheless, one or more ACEs have long been associated with a range of physical, mental and behavioural disorders, with exposure increasingly evidenced as having a dose-response relationship with many seriously negative physical health outcomes (Felitti et al., 1998). With respect to mental health, earlier emphasis was on links to affective disorders (Chapman et al., 2004; Edwards et al., 2003; Lansford et al., 2002). A

narrower relationship between childhood ‘trauma’ – meaning sexual or physical assault – and psychosis was established in a number of studies (Bebbington et al., 2004; Whitfield et al., 2005), while a review by Read et al. (2005) suggested a dose-response relationship here too and argued that asking about a history of childhood abuse should be a standard part of the clinical examination for psychosis.

In preparation for our systematic review of publications linking ACEs to psychosis and violence, we conducted a search for reviews exploring links between ACEs and psychosis and ACEs and violence separately.

First, we entered terms for ACEs and psychosis into Medline, PsycINFO, EMBASE, ASSIA and Web of Science from their inception to December 2019, filtering for systematic reviews. Twenty-nine reviews were identified confirming a relationship between one or more ACEs and later psychosis. Ten of them examined causal pathways and three found a dose-response relationship (see online supplement 1 for full list). A further study, investigating six ACEs, found that, of these, only parental death was not significantly related to later psychosis; emotional abuse had the strongest association (Varese et al., 2012). Of particular interest, since the positive symptoms of psychosis have been linked with violence (Witt et al., 2013), one study found that childhood trauma was significantly correlated with severity of hallucinations or delusions but not negative symptoms (Bailey et al., 2018). Taken together, these reviews are broadly consistent in estimating the likelihood of schizophrenia or affective psychoses as two to three times as likely among people who have experienced ACEs in childhood than those who have not.

The second main part of our preparation was to conduct a similar search for systematic reviews of associations between ACE exposure and later perpetration of

interpersonal violence. This yielded only four papers (see also online supplement 1), although more reviews tested links between ACEs and self-directed violence. Among various ACEs and interpersonal violence outcomes, associations were consistently reported. Only Hughes et al. (2017) estimated a 'dose-response' relationship. They calculated that exposure to four or more ACEs compared to none was associated with an eight-fold increased risk for violence perpetration in adulthood.

Taken together, the two streams of reviews show that, while adverse experiences in childhood at least double the risk of psychosis, they increase the risk of later interpersonal violence perpetration much more. The question then arises about the combination of outcomes. If the risk of psychosis and of violence are separately increased, given the evidence for a relationship between psychosis and violence, is the risk of the combination even higher? In addition, questions arise about the nature of pathways between childhood adversity, psychosis and violence.

Just one review emerged in both searches (Green et al., 2019). This study found that childhood maltreatment was associated with approximately twice the risk of violence within samples with psychosis (OR 2.46, CI 1.91- 3.16). This finding is important but limited by three constraints: first, the only ACE measures considered were actual abuse, secondly the main potential outcome was risk of interpersonal violence rather than actual violence and, thirdly, there was no reference to the other major relevant comparison groups, namely those who had been violent to others in the absence of psychosis and those who neither had psychosis nor had committed violent acts against other people. If all relevant groups could be compared, exploration of any hierarchy of effect might be facilitated. Reliance on risk of violence rather than actual violence might possibly inflate the relationship between ACEs and later combinations of violence with psychosis. Of especial importance, however, given the recognised

reluctance to disclose childhood abuse (e.g. Halvorsen et al, 2020), it is important to know whether ACEs other than physical or sexual abuse in childhood, which may be less difficult to disclose, might also have some relationship to later psychosis with violence.

Aim

Our aim, therefore, was to investigate the extent to which the wider range of adverse childhood experiences defined in the ACE-Q, singly or collectively, are associated with a later combination of psychosis and actual interpersonal violence, compared with later psychosis alone, later violence alone, or neither.

Methods

Methodological overview

We conducted this review in accordance with York Centre for Reviews Dissemination guidance (https://www.york.ac.uk/media/crd/Systematic_Reviews.pdf).

The literature search

A systematic search of electronic databases was conducted covering the period from database inception until 20/11/2019, with a follow up search completed on 04/01/2021, entering terms for ACEs, psychosis and violence into the databases Medline, EMBASE, PsycINFO, ASSIA and Web of Science, using the following search strategy:

‘adverse childhood experience*’ OR ‘adverse childhood event*’ OR ‘childhood abuse’ OR ‘childhood trauma*’) AND (‘psychos*’ OR ‘psychotic’ OR ‘delusion*’ OR ‘hallucination*’ OR ‘schizophren*’) AND (‘violen*’ OR ‘homicid*’ OR

‘murder*’ OR ‘manslaughter’ OR ‘aggress*’ OR ‘assault*’ OR ‘kill*’ (for full details as applied to each database see online appendix 2).

Grey literature was explored in the form of national and international reports from the World Health Organisation and Public Health documentation from England, Wales and Scotland. Literature reference lists of relevant papers were also examined. Where articles made reference to but did not present eligible data, authors were contacted.

Inclusion and exclusion criteria

Studies meeting the following criteria were included:

i. any type of comparison study of people in which at least one group had psychosis and had been violent during a period of active psychosis;
ii. measurement of one or more adverse experiences before the age of 18;
iii. the diagnosis of or measured psychosis (including affective psychosis but excluding transient psychotic/confusional states) was first made after the ACE(s) at any time after age 18;
iv. onset of unequivocal physical violence to another person/other people was first noted after ACE exposure, the violence measured in a systematic way, by recognised scales and/or conviction in a criminal court;
v. data in each relevant group were extractable to compute an effect size;
vi. title and abstract were in English.

Papers were excluded if exclusively measuring self-directed violence (self-harm or suicide). Bullying as an isolated adverse childhood experience was excluded because it is not part of the standard ACE measure. Papers referring to severe mental illness were excluded if psychosis was not explicit and measurable separately from other

diagnoses. If violence could not be linked in time with a period of psychotic symptoms in at least one comparison group, the study was excluded.

Study selection

Titles and abstracts from two samples of 100 papers were first screened by three of the researchers, blind to each other, with resulting 99% and 95% agreement respectively. Discrepancies were minor and easily resolved on discussion. The main concern was about whether 'major mental illness' or 'major affective disorder' was necessarily psychosis and the paper thus includable. We resolved this by always obtaining the full text in these circumstances for checking the actual diagnoses. Insofar as the nature of the violence was ever ambiguous, again, full text was always obtained. With these safeguards, the remaining preliminary screening was done by the first author alone, always considering titles *and* abstracts rather than titles alone, and referring to the other authors if in any doubt about need to acquire the full text. Full text screening was completed by the first author and at least one other.

Quality assessment

Papers for inclusion were critically appraised by the first author using standard quality assessment tools (National Heart, Lung and Blood Institute, 2021).

Data extraction

Templates for supporting consistent extraction of papers were developed, and then completed by three researchers blind to each other (see table 1). There was 100% agreement on material extracted. Where we had agreed that the paper qualified for

inclusion but the data were not in a form that could be entered into a meta-analysis, we contacted authors to request additional data.

Analyses and synthesis of results

Relationships between a particular ACE exposure or combination of exposure and later psychosis/violence were subjected to a meta-analysis where there were three or more datasets identified for each exposure, relying on a random effects model with generic inverse variance weighting, using Stata statistical software. In analyses where a sample contributed more than once, a multi-level meta-analysis was used. Analyses required ACE exposure of each included paper to be of the same class of variable (categorical), as estimates from categorical and continuous exposures cannot be combined. Odds ratios (ORs) were extracted from each study or calculated from data when not published. Log ORs and standard error measures were entered to complete the meta-analyses. Cochran's Q statistic was used to calculate the I-square statistic and associated p-value. A narrative analytic approach was also used.

Examination for publication bias

We found that we were too limited by the small number of studies in each category analysed for sensitivity analyses to be meaningful.

Results

Outcome of study selection process

After screening 6,417 unique articles, 113 titles remained for full text screening. Of these, 10 were eligible for inclusion (Buchanan et al., 2019; Cerny et al., 2018; Engelstad et al., 2019; Fleischman et al., 2014; Gonzalez et al., 2016; Kumari et al.,

2014; Mitjans et al., 2019; Oakley et al., 2016; Spidel et al., 2010; Wang et al., 2020). Grey literature searching and review of supplementary reference lists generated 5 additional relevant studies (Fazel et al., 2009a; Monahan & Appelbaum, 2000; Schug et al., 2010; Stompe et al., 2006; Valevski et al., 1999), resulting in 15 studies in total for inclusion. Swanson et al. (2006) is also eligible, but uses the same data as Buchanan et al. (2019), so we relied on the later study. The paper selection process is shown in figure 1. The one study that had to be excluded on language grounds was in Turkish, comparing 30 people with schizophrenia who had committed homicide, 30 with schizophrenia who had not and 30 healthy controls (Taskayantan & Erol, 2019). According to our commissioned translation of the abstract alone, as a group, people with schizophrenia who had killed were more likely to have a history of emotional abuse, neglect or physical abuse than the healthy controls but not than the other people with schizophrenia.

Figure 1 about here

Included studies and critical appraisal

Table 1 shows the main characteristics of included studies. All of them were of acceptable quality (see online supplementary material 3 for details). Each had a clear research question, although just seven had a primary research question about ACEs and later violence with psychosis (Engelstad et al., 2019; Gonzalez et al., 2016; Kumari et al., 2014; Mitjans et al., 2019; Oakley et al., 2016; Spidel et al., 2010; Stompe et al., 2016). One study was from China, two were from Israel and the rest from Europe or North America. None followed prospective, longitudinal methods in respect of the ACEs, although by virtue of various population registers, in two studies (Fazel et al., 2009a; Fleischman et al., 2014), parental data were extracted from parents' records so the parental alcohol consumption and offending had been recorded

independently and without knowing violence and psychosis sample outcomes of their offspring. Included studies were variously national cohort studies, case control studies and patient convenience samples. Sample sizes varied between studies from 54 to 13,806 (mean n= 1712).

All but two studies (Cerny et al., 2018; Schug et al., 2010) included more than one ACE exposure in their analyses. Most took an actively abusive form of ACE in analyses, such as physical or sexual assault (11 studies); four of these also considered neglect; none considered neglect in isolation. Four studies considered more contextual ACE exposures, such as parental alcohol use disorders, separation, schizophrenia, violence and criminality neither suggesting that the children had ever been physically or sexually abused nor being explicit that they had not (Fazel et al., 2009a; Fleischman et al., 2014; Schug et al., 2014; Stompe et al., 2016).

Four studies had samples exclusively of men, with women in the minority in all the other samples, and making a substantial subsample in only three studies (Cerny et al., 2018; Fazel et al., 2009a; Mitjans et al., 2019). Most studies allowed for potential confounders in multivariate analyses, but five did not (Mitjans et al., 2019; Monahan & Appelbaum, 2000; Spidel et al., 2010; Stompe et al., 2006; Valevski et al., 1999) and one (Wang et al., 2020) did not report the results of their complex models analyses.

Table 1 about here

ACE exposure and later violence in the context of psychosis

As there was considerable heterogeneity in ACE measurements between the 15 included studies, we considered that it was not valid to combine them all into a single summary measure, so considered meta-analysis for each ACE separately. Only four studies had to be excluded from any meta-analysis on grounds that they had measured the ACE(s) only as a continuous variable (Oakley et al., 2016; Spidel et al., 2010; Wang et al., 2020), or violence only as a continuous measure (Oakley et al., 2016) or used only summary measures of more than one ACE and it was not possible to disentangle individual ACE associations (Cerny et al., 2018; Spidel et al., 2010). Cerny and colleagues found no difference in exposure to abuse generally between psychosis groups; Spidel and colleagues found a borderline significant relationship between childhood abuse and later violence within psychosis groups (r= 0.31 ($p<0.01$), OR 1.02 (1.00-1.05); Oakley et al. (2016) found no relationship between the combined abuse variables and later violence within the psychosis groups but did find that having witnessed domestic violence was associated over ten times the odds of violence with psychosis as psychosis alone (OR 10.47, 2.85-38.49, $p<0.001$). Wang et al. (2020), examined physical, emotional or sexual abuse and physical or emotional neglect separately and together as continuous variables; they found a significant difference in ratings of experiences only for physical neglect (mean CTQ sub-scale scores: 9.27 ± 3.80 8.31 ± 3.75, $p<0.042$).

Figures 2-6 show the results of the meta-analyses for each ACE for which there were at least three studies. Four of these five ACEs were related to subsequent violence in the context of psychosis.

Figures 2-6 about here

Having been physically abused or having had a criminal or violent parent was each associated with over twice the odds of a later violence and psychosis combination

than psychosis alone (OR 2.28 (CI 1.78- 2.92), OR 2.23 (CI 1.78- 2.80)), respectively; figures 2 and 3). All eight of the studies included in the physical abuse analysis found a significant relationship, although there was a very low level of heterogeneity (I^2 0.0%, p=0.826). One study excluded from the analysis because the only measure of physical abuse was a continuous variable, reported a marginally significant association (OR 1.52, CI 0.98- 2.37; Wang et al., 2020).

Among the seven studies of people who had had a criminal or violent parent, two found no significant relationship with a later violence-psychosis combination (Schug et al., 2010; Valevski et al., 1999), but both of these had small samples and the latter exclusively of hospitalised inpatients. At the other extreme, those studies with substantial national registry samples showed an unequivocal relationship (Fazel et al. (2009a): OR 1.88, CI 1.54- 2.28; Fleischman et al. (2014): OR 2.30, CI 1.70- 3.00). There was only one study of small sample size, in common between these two meta-analytic sets (Kumari et al., 2014); none of the other studies, however, explicitly excluded violent abuse of the child. Whether or not associated with abuse to the patient as a child, two studies examined 'witnessing domestic violence' finding at least three times the odds of being in the violence with psychosis group (Gonzalez et al. (2016) OR 3.04, CI 1.62- 5.70; Oakley et al. (2016) OR 6.23, CI 1.44- 26.92). In Gonzalez et al. there seems to have been a clear separation between observation and experience; in Oakley that is less clear.

In meta-analysis, having been abused sexually was also associated with elevated odds of later psychosis and violence (OR 1.66 (CI 1.03- 2.68); figure 4). The I^2 statistic suggested considerable heterogeneity (62.7%, p= 0.013). The strongest individual study association between experience of sexual abuse in childhood and later violence with psychosis was in the only all-female subsample (Mitjans et al. 2019), with over three times the reported odds compared with women who had experienced psychosis alone (OR 3.13, CI 1.73 – 5.66). Two of the seven studies in this analysis individually

showed no significant association. While these two had the smallest sample sizes (Kumari et al., 2014; Monahan & Appelbaum, 2000), Wang et al. (2020) using a continuous measure for sexual abuse, similarly found no significant association (OR 1.41, CI 0.91- 2.20).

According to the meta-analysis of exposure as a child to parental substance use, odds of later violence with psychosis were also significantly higher than in the absence of such exposure (OR 1.58 (CI 1.39- 1.80; figure 5), however this finding depended on the weighting of the national Swedish cohort studied, accounting for 98% of individuals included (Fazel et al. (2009a) OR 1.67, CI 1.44- 1.94). In none of the much smaller comparisons pooled in this analysis was there a statistically significant association.

There were only three studies of family psychopathology as a possible antecedent of psychosis with violence (Monahan & Appelbaum, 2000; Stompe et al., 2006; Valevski et al., 1999), covering many fewer participants individually or overall (figure 6); these showed no relationship with later violence with psychosis (OR 1.20 (CI 0.86- 1.67)).

Findings for neglect as an ACE exposure were more difficult to tease out. Only three studies examined this. One found that exposure to neglect was associated with over three times the odds of violence with psychosis than psychosis alone (OR 3.43, CI 1.31- 8.98; Gonzalez et al. (2016)). One of similar sample size but relying on continuous measures of neglect found the relationship for physical but not emotional neglect (Wang et al. (2020) OR 1.59, CI 1.02- 2.47; OR 1.46, CI 0.93- 2.27, respectively). In the smallest sample, Kumari et al. (2014) found no significant relationship (OR 2.33, CI 0.51- 10.80). A single study testing for association between

parental separation and later violence with psychosis found no association (Stompe et al. (2006) OR 1.46, CI 0.76- 2.78).

Adverse childhood experiences and later psychosis alone, violence alone, psychosis with violence or neither

Six studies had all four groups of interest – violence or psychosis alone or both or neither – within their samples (Cerny et al., 2018; Fleischman et al., 2014; Gonzalez et al., 2016; Kumari et al., 2014; Schug et al., 2010; Stompe et al., 2006). One excluded the healthy comparison group from further analyses once it was established that the people with schizophrenia were more likely to be violent than those without (Fleischman et al. 2014) and could not be considered further in this section.

In analysis across all four groups, Cerny et al. (2018) found that the only independently significant relationship was between 'childhood maltreatment' and later violence in the non-psychotic group; childhood abuse was not associated with later violence in those with psychosis in their multivariate analysis. Gonzalez et al. (2016) conducted a mediation analysis, finding that psychosis was a weak but significant mediating factor between witnessing domestic violence and later perpetration of violence but that only antisocial personality disorder mediated the association between personal experience of physical abuse and later violence perpetration. Schug et al. (2010) found that parental criminality did not distinguish between groups (X^2_3= 5.33, p= 0.255). Among 'family or social influences on offending among men with schizophrenia', Stompe et al. (2006) included only parental separation and family burden of schizophrenia or of offending as ACEs; all three ACEs significantly distinguished the four groups of interest, familial schizophrenia (X^2_3= 39.5, p<0.001), familial offending behaviour (X^2_3= 30.3, p<0.001) and parental separation (X^2_3= 13.0, p<0.01).

The remaining studies allowed us to explore the extent to which other ACEs were more likely to be associated with violence in the context of psychosis than violence alone or, separately, in healthy control groups (see table 2). The odds ratios given are our calculations from the data given. In these separate analyses there were no consistent patterns.

Table 2 about here

Discussion

Overview of findings

Adverse experiences in childhood have repeatedly been associated with a wide range of adverse health and behavioural problems in adulthood, including violence and psychosis separately, but the extent of the relationship to problems that involve both is less clear. The only previous review examining links between childhood maltreatment and later violence with psychosis confined consideration to relationships between childhood abuse alone and risk of violence within psychotic groups (Green et al., 2019). We have added to this and extended comparisons of people with psychosis who are violent to include people who are violent without psychosis and healthy use controls as well as considering a wider range of ACEs. This together with exclusion of studies where only violence risk alone, or hostility scale score had been calculated or where figures for physical violence against people was not distinguished from hitting out at property meant that there was very little overlap of studies between the two reviews – three of eleven studies in Green et al. and of 15 in ours. The broad similarity in findings adds weight to the likely importance of childhood abuse in the pathway to violence with psychosis. Taking a wider range of ACEs, however, showed that not only having such a history, often difficult to elicit, but also simply having a criminal or substance misusing parent also elevates the risk. Unfortunately, criminal

and substance misusing parents may also be directly abusive to their children and the potential for overlap was not tested. Nevertheless, these findings have additional strength because they are from studies where the parental qualities were independently recorded from those of the offspring, while the studies focussing on abuse relied on recall by the violent and/or psychotic participants. These parental qualities were also almost certainly established before their offspring became psychotic and/or violent, but there were no more explicitly longitudinal studies. The only study to explore pathways suggested psychosis as a mediator between witnessing domestic violence and later perpetration of violence (Gonzalez et al., 2016).

Pathways considered

Apart from this clue, the way in which seriously adverse childhood experiences fit into the pathways to psychosis, to violence or through psychosis to violence or through violence to psychosis remains unclear. It is hard to see how a model prospective study could be set up; when following a group of children with ACEs into adulthood, whether starting with a population-based sample or birth cohort, the base rate of schizophrenia with violence is low or non-existent (Arseneault et al., 2000; Widom et al., 2018 respectively). Read et al.'s (2005) systematic review of ACEs among people with psychosis found, overall, a strong association between reports of childhood abuse and schizophrenia, psychosis and psychotic symptoms, particularly delusions and hallucinations, with a suggestion of a 'dose-response' relationship. Scott et al. (2007), with an Australian sample of 10,641 in the National Survey of Health and Wellbeing, found evidence for 'dose response' in a different sense, in that where a diagnosis of PTSD had been made after childhood trauma, there was almost four times the rate of reporting delusions among the traumatised than when they had not reached criteria for PTSD. In neither of these studies did the researchers go on to consider violence perpetration, but one route into violence among people with psychosis is certainly

through such symptoms (e.g. Taylor, 2008). Others have gone further in suggesting plausible explanatory links through the impact of stress specifically on the dopaminergic system (e.g. Morgan and Fisher (2007)) and indeed Kumari et al. (2014) provided evidence that abnormalities in the anterior cingulate gyrus in the brains of men who had been violent while psychotic, at least in the statistical modelling, were explained by their stressful childhood experiences. More psychological theories about delusion formation (Bentall & Taylor, 2006) would also fit, for example that psychosis may arise out of an unconscious attempt to construct a model of construing the world that will improve self-esteem (Colby, 1997) or to attribute negative experiences to agents other than self (Zigler & Glick, 1988). As with all material in this field, however, it is perhaps better to consider pathway evidence as suggestive rather than conclusive.

The other often cited route from seriously adverse experiences in childhood to violence with psychosis is through interim behaviours and experiences, possibly overlapping with impact on the developing brain rather than being exclusive. In a birth cohort study, one route into violence by people with a disorder on the schizophrenia spectrum was through excessive perceptions of threat but the other was a history of conduct disorder (Arseneault et al., 2000). One concern, particularly in the adverse environment of parental substance use and/or the need to self-soothe after abuse, is the role of substance misuse. While Bebbington et al. (2011), working with the British National Survey of Psychiatric Morbidity data, found that the association between sexual abuse before age 16 and later psychosis was mediated by anxiety and depression, but not by heavy cannabis use or revictimization in adulthood, this group did not explore violence as well. Studies of people with psychosis who have also been seriously violent generally find high levels of comorbidity with substance use disorders; the small study of high security hospital patients in England identified three main groups of patients with schizophrenia – those with an unremarkable childhoods, those with evidence of early behavioural disorders without apparent primary trauma and those in highly adverse

environments for whom the behavioural problems appeared to be secondary (Heads et al., 1997). Widom et al. (2018), in their remarkable longitudinal prospective study of survivors of childhood abuse or neglect do not describe anyone with psychosis; the mental health trajectories mapped are for depression, anxiety and self-esteem, but it seems relevant that the key mediator between adverse experiences and adult problems is attachment style.

Indeed, childhood experiences of seriously adverse events may be the beginnings of lifelong patterns of such experience that may be the ultimate trigger to violence with psychosis. Swanson et al. (2002), who studied a US sample with 'severe mental illness' (including psychosis but also 'other serious mental disorders') found that, while early victimisation in men was directly associated with violence, for women factors both in mental state and environment current to the research evaluation mediated its effects. Taking psychosis/severe mental disorder as the underlying problem, it identified a hierarchy of impact of victim experiences on violent outcomes:

- people who had been a victim of physical or sexual abuse before the age of 16, but not victimised as adults, were no more likely than those who did not report childhood victim experiences to be violent as adults;
- those who reported no such childhood experience, but did report victimisation as an adult were more likely to report violence as an adult;
- those who had both childhood and adult victim experiences were the most likely to have been violent themselves.

The association of repeated victimisation with later violence was significant for both women and men, although conferring greater risk on the men. Mediating factors for the women were more serious illness (more hospitalisations and more symptoms at evaluation) and recent homelessness. In the statistical models created here, substance misuse was not an independent influence.

Limitations of study

Although we would have preferred to employ multiple, blind screening of all titles and abstracts of retrieved references, resources did not permit that. By having a template biased in favour of checking the full text if ACE, violence and particularly diagnostic measures were not explicit in the abstract we think, however, that risk of false exclusion was minimised.

Included studies were mostly of men – four exclusively so and the remainder with a higher proportion of men; while this is in part understandable because in more serious violence in the context of psychosis, men outnumber women by about four to one, for generally lesser violence to staff or other patients while a patient in hospital the sex ratio is similar (e.g. (Fottrell, 1980), UK; (Tardiff et al., 1982), USA). Similarly, although reporting of one of the ACEs is similarly distributed between men and women, passing the perhaps critical threshold of four or more is more common among women. It may thus be a problem that our findings may not be generalisable to women, although indications from those studies that did include women suggest differences in detail of experiences and their processing in the field rather than in scale of the problems. In some ways, too, the focus on men is particularly welcome as there is perhaps a greater readiness to explore trauma histories among women than among men.

The limited availability of four group comparison studies makes it difficult to understand or even formulate hypotheses about relative impact of ACEs on psychosis and violence.

We analysed only studies that included some indicator of actual violence against other people, but these measures were various. Most were of self-reported violence over a specified period before the data collection, in some cases with collateral evidence, in

some cases not; a few studies relied on criminal convictions for violence. Both approaches have their strengths, but also their weaknesses. It is generally accepted that a criminal conviction is founded in well tested evidence, but criminal convictions reflect only a minority of violent acts committed. Although multiple methods of recording actual violence are optimal, among people with mental illness self-report gives the highest yield, optimised if combined with reports from relatives or others who know the person well (Mulvey et al, 1994), so many of the included studies optimised the chance of capturing any violence committed.

Our review was only slightly limited by having to exclude papers that we did not have the facilities to translate to English. Given that we did not screen out papers in other languages and all but one of the returned titles and abstracts were in English, we were able to determine suitability for inclusion. Thus, just one study had to be excluded on these grounds (Taskaynatan and Erol, 2019); a Turkish speaking colleague confirmed that the paper was about ACEs relating to homicide in the context of psychosis, so this paper may have added weight to aspects of childhood experiences predisposing to the psychosis-violence combination.

Conclusions

We found 15 studies that evaluated ACEs within psychosis groups, six of them extending to all four groups of interest. This adds considerably to the one previous review in the field – extending the range of ACEs and comparison groups. Meta-analyses were possible only within psychosis group comparisons; histories variously of physical abuse, sexual abuse, having a criminal or violent parent or living with family alcohol or drug use were associated with around twice the likelihood of violence with psychosis as psychosis alone. In four-way comparisons, ACE history distinguished the combined group from other groups, with one study suggesting a

mediating role for psychosis between ACE and violence. While most studies relied on participants' retrospective recall, two substantial studies recorded the ACEs from sources independent of the adults studied, probably before psychosis and violence emergence. These findings add breadth and weight to the case for exploration of a wide range of ACEs among people with psychosis. As people may be reticent about their experience of physical or sexual abuse in childhood, this extra knowledge may help identify more people needing full assessment of such history and its impact with a view to informing interventions that may prevent or limit interpersonal violence, or to help those who have already been violent towards recovery. Further research to establish mediating mechanisms, current proposals including direct brain effects, attachment disorders and behavioural patterning.

Critical Findings:

- There is an extensive literature on adverse childhood events (ACEs) and later interpersonal violence (4 systematic reviews) or later psychosis (29 systematic reviews), suggesting risk of the former is very high (up to 8-fold) and the latter real but much lower (2-3 times). Psychosis and violence are associated more frequently than would be expected by chance, but the combination has received less attention in this respect.
- Just one landmark review to date has explored relationships between ACEs and the later combination of violence and psychosis, but limited adverse events to abuse or neglect, included exclusively patient samples and accepted risk of violence as well as actual violence as an outcome.
- Our review captured testing of a wider range of ACEs, all relevant samples (variously including all four groups of interest: people with psychosis, with

violence, with both or with neither) but confined the violence indicator to actual violence to another person.

- Although six studies included all four samples of interest, only studies within psychosis groups provided necessary and sufficiently homogenous data for meta-analysis, confirming that not only direct trauma in the form of abuse but also having a criminal or violent parent or living in a family with alcohol or drug use problems each doubled the risk of violence in the context of psychosis.
- While the four-sample studies must, collectively, be regarded as inconclusive, they begin to suggest mechanisms. One suggested that psychosis mediates in a pathway between ACEs and violence. One implicated differences in brain structure and function in violent men with mental disorder, including but not confined to those with psychosis, who had histories of ACEs.

Implications for Practice and Research

- The findings add weight to the importance of providing people with psychosis who have been violent to others with trauma-informed services
- The findings also increase the chance of identifying people who may be helped in such ways in that childhood experiences other than direct abuse should be taken into account too.
- A dedicated prospective study of a complex and rare outcome such as violence with psychosis would be prohibitively expensive and slow to produce results, but pooling data from existing pregnancy, birth or early childhood cohort studies could provide evidence of pathways and moderating or mediating factors.
- Resilience factors have not been investigated in this area.

- With evidence of key moderators or mediators, such as repeated trauma or brain structural of functional atypicalities, early intervention programmes could be devised and tested.

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Table 1: Systematic review of adverse childhood experiences (ACEs) and later psychosis with violence - characteristics of included studies

Authors, date and country of sample	Study design	Population and sample size	ACE measure	Psychosis measure(s)	Violence measure	Exposure in psychosis and violent group	Exposure in psychosis only group no/non-injurious violence	Exposure in violence only group	Exposure in in group neither violent nor psychotic	Outcome
Buchanan et al. 2019, USA	Secondary analysis of data from CATIE trial; cross-sectional	N= 1435 with schizophrenia, 74% male, mean age 40.5y No violence (NV) 1239 Non-injurious V (NIV) 119 Injurious violence (IV) 77	Retrospective self-reported physical or sexual abuse before age 15y	DSM-IV[1] criteria for schizophrenia ; Symptom change rating: PANSS[2]	MacArthur Community Violence Interview – violence in six months before entry, and after 6, 12, 18 months	IV = Physical abuse 24 (31.2%) Sexual abuse 29 (37.7%)	NV Physical abuse 229 (18.5%) Sexual abuse 235 (19.0%) NIV Physical abuse 33 (27.7%) Sexual abuse 25 (21.0%)	NA	NA	Injurious interpers[l] violence within 18-months of trial entry
Cerny et al. 2018, Czech Republic	Case-control study	N= 316 people in matched pairs [158 psychosis, 158 no psychosis], 59% male, mean age 39.9 years Psychosis & violence 64 Psychosis only 94 Violence only 24 Neither 134	Retrospectively self-reported, physical abuse (by mother/ father figure), sexual abuse (by anyone) when aged 5 – 17 years [CECA-Q[3] part 5 & 6 read to participants in face-to-face interviews]	ICD-10[4] schizophrenia , delusional disorder, acute polymorphic psychotic disorder, or schizo-aff. disorder; Czech translation of MINI[5]	MacArthur Community Violence Interview violence in 6 months prior to assessment [patients & collaterals]	Raw data not given Odds of childhood maltreatment in assaultive patients with a psychosis 3.27 (CI 1.670-6.405)	Raw data not given	Raw data not given Childhood maltreat[t] in assaultive patients without a psychotic disorder 4.54 (CI 1.60-12.85)	Raw data not given	Physical assault in the 6 mths prior to assess[t]
Engelstad et al. 2019, Norway	Cross-sectional two-group compar	N= 54 with schizophrenia in one hospital	Retrospective self-report of physical, sexual, emotional abuse, or physical or emotional neglect before age 17y [using	ICD-10[4] schizophrenia or schizo-affective; PANSS[2]	Violence scale of Gunn and Robertson's 'Criminal Profile'[x], all data from	CTQ medians and (ranges) Physical abuse 6.0 (5-21) Sexual abuse 5.0 (5-20)	CTQ medians & ranges Physical abuse 5.0 (5-12)	NA	NA	Sentenced for homicide or homicid

	ison study	26 convicted of homicide [attempt], 25 male, mean age 38y 28 no interpersonal violence history, 25 male, mean age 37y	CTQ[6]]		clinicians and records - lifetime	Emotional abuse 8.0 (5-24) Physical neglect 8.0 (5-19) Emotional neglect 12.0 (5-21)	Sexual abuse 5.0 (5-10) Emot[l] abuse 9.0 (5-20) Physical neglect 7.5 (5-16) Emotional neglect 10.5 (5-24)			e attempt
Fazel et al. 2009, Sweden	National registries schizophrenia inpatient discharge cohort study	N= 13,806, aged 15+ years, 64.4% male Followed for >30 years from 2nd discharge until 1st conviction for violence Census date emigration, death or 31/12/2004). Mean age @ 2nd discharge Men: 28.7y Women: 29.6y	Records data – national censuses, registers: multi-generation; hospital discharge; National Crime: Parental alcohol use disorders and violent offending	ICD-8[4] schizophrenia	Any violent crime conviction[y] during 1973-2004	*Men:* Parental alcohol use disorder (PAD) 205 (13.5%) Parental violent crime)PV) 114 (7.5%) *Women:* PAD 44 (16.1%) PV 21 (7.7%)	*Men*: PAD 668 (9.1%) PV313 (4.2%) *Women:* PAD 390 (8.4%) PV 187 (4.0%)	NA	NA	Violent crime
Fleischman et al. 2014, Israel	National registries case-control study	3,187 people with schizophrenia [15.1% violent], 54.8% male minimum age 32 years 7,535 unaffected full siblings [4.0% violent] 12,625 controls from Israeli Population Registry [5.9% violent] Matched for age & sex	Israeli court records to identify probands with a violent parent	ICD-10[4] psychosis Any psychiatric hospital admission	Israeli court records – violent crime, defined (as Fazel)	Violent parent 112 (23.3%)	Violent parent 306 (11.3%)	NA	NA	Violent crime
Gonzalez et al. 2016, UK	Cross-sectional comparative study	N= 2487, male survey, ages 21-34 years 116 psychosis & violence 118 psychosis alone 533 violence alone 1720 neither	Retrospective self-report (paper & pencil) of experiences before age 16 – bullying, witnessing domestic violence, sexual abuse/assault, physical abuse and neglect	PSQ[7] – screened positive if 3+ criteria	Response to: 'have you been in a physical fight, assaulted or deliberately hit anyone in the past 5 years?' Further details from	Physical abuse 21 (18.1%) Neglect 18 (15.5%) Witnessed domestic violence 41 (35.3%)	Physical abuse 10 (8.5%) Neglect 6 (5.0%) Witnessed domestic violence 18 (15.3%)	Physical abuse 51 (9.6%) Neglect 41 (7.7%) Witnessed domestic violence 129 (24.2%)	Phys. abuse 48 (2.8%) Neglect 44 (2.6%) Witnessed domestic violence 139 (8.1%)	Any self-reported violence

					'yes' responders					
Kumari et al. 2014, UK	Case-control	N= 57, male, mean age 33.1 Schizophrenia and violence 13 Schizophrenia alone 15, Violence alone 14, Healthy controls 15	Interview, supplemented by clinical & criminal records in patient groups: physical abuse; sexual abuse; neglect; extreme poverty; foster home; criminal parent; severe family conflict; broken home <18 years	SCID[8] for DSM IV[1] schizophrenia ; PANSS[2]	Violence scale from Gunn and Robertson criminal profile	Criminal parent 5 (38%) Sexual abuse 2 (15%) Physical abuse 8 (62%) Neglect 7 (54%) Marked deprivation 7 (54%)	Criminal parent 2 (13%) Sexual abuse 3 (20%) Physical abuse 2 (13%) Neglect 5 (33%) Marked deprivation 4 (27%)	Crim. parent 8 (57%) Sexual abuse 10 (71%) Physical abuse 12 (86%) Neglect 8 (57%) Marked deprivation 11 (79%)	Crim. parent 2 (13%) Sexual abuse 1 (7%) Phys. abuse 2 (13%) Neglect 1 (7%) Marked deprivation 0 (0%)	History of serious violence
Mitjans et al. 2019, Germany and Spain	Cross-sectional comparative study using data from 4 independent schizophrenia cohorts, 2 independent general population cohorts	*Schizophrenia samples* [Germany]: 1. Discovery - Men 134 (PA & SA analysis 134) 2. GRAS-I - Men 606 (PA analysis 606, SA = 592) 3. GRAS-II Men 320 (PA analysis 319, SA 294) 4. GRAS-I-II women - 503 (PA analysis 498, SA 494) *General population samples* [Spain]: 5. Men & women 336 6. Men & women 229 *Göttingen Research Association for Schizophrenia (GRAS)*	Semi-structured interviews (retrospective)with patients & relatives/carers, using GRAS-manual and SCID-I[8] Severe physical abuse Sexual abuse. In general population: self-report using CTQ-SV[6]	DSM-IV[1] schizophrenia or schizo-affective disorder	Forensic hosp[n] history &/or criminal cons for battery, sexual assault, homicide, other violence. Violent aggression severity score (VASS)[Z] from interviews & records General pop[n] samples – *actual* violence not measured	*Physical abuse:* Sample 1 (M) 9 (24.3%) Sample 2 (M) 22 (17.1%) Sample 3 (M) 40 (44%) Sample 4 (W) 15 (26.8%) *Sexual abuse* Sample 1 (M) 5 (13.5%) Sample 2 (M) 10 (7.8%) Sample 3 (M) 8 (9.5%) Sample 4 (W) 22 (39.3%)	*Physical abuse*: Sample 1 13 (13.4%) Sample 2 41 (8.6%) Sample 3 62 (27.2%) Sample 4 50 11.3%) *Sexual abuse* Sample 1 5 (6.2%) Sample 2 28 (6.0%) Sample 3 14 (6.7%) Sample 4 75 (17.1%)	N/A	N/A	Any criminal conviction for battery, sexual assault, m'slaughter, murder, or history of forensic hospitalis[n]
Monahan and Appelbaum,	General psychiatric inpatie	Total sample 1136, 57.3% men, mean age 29.9y	Retrospective self-reported at interview: Sexual abuse before age 20	DSM-III-R[1] schizophrenia, bipolar, other	Self-report, collateral or records evidence of	Raw data not given	Raw data not given	NA	NA	Violence to others

2000, USA	nt hospital discharge cohort - cross sectional	Relevant subsamples Schizophrenia 160 (17%), 27 violent	Seriousness of abuse as child Frequency of abuse as child Parent ever used drugs, Parent ever excess drinking Parent ever arrested Parent ever in psychiatric hospital	psychosis – screen and interview	violence to others in 20 weeks post-discharge: resulting in physical injury, sexual assaults, involving a weapon, threats with a weapon in hand					
Oakley et al. 2016, UK	Cross-sectional comparative study	N=54, men with schizophrenia from various clinical settings across England Mean age 36	Retrospective self-report at interview of pre-17y: sexual and/or physical abuse, separation from a parent for =/>6 months, exposure to domestic violence, using CECA-Q[3]	SCID[8] for DSM-IV[1] schizophrenia ; PANSS[2]	Gunn & Robertson violence scale (GRVS) to summarise lifetime violence rated from all sources - patient, family, official records	GRVS 4 At least one form of childhood adversity 15 (94%) All 3 forms of childhood adversity 5 (31%)	Raw data not given	NA	NA	GRVS score
Schug et al. 2010, China	Case-control study	N= 157, 75% male 31 homicide, no psychosis 32 homicide & psychoses 14 homicide & non-psychotic illnesses 33 nonviolent inpatients with schizophrenia 47 community controls	Retrospective self-reported psychosocial history data, including parental criminality	DSM[1]-IV and CCMD-3 (Chinese Class[n] Mental Disorders)[9] schizophrenia / psychoses, verified by 2 psychiatrists	Homicide charge and undergoing forensic psychiatric evaluation	Parental criminality 1 (4.0%)	Parental criminality 3 (9.4%)	Parental criminality 1 (4.3%)	Parental criminality 0 (0%)	Charged with/ accused of homicide
Spidel et al. 2010, Canada	Cross-sectional comparison study	N= 118, All early onset psychosis clinic attenders [consulted for psychotic symptoms in prior two years] - 64.1% men Mean age 25.14y History of physical aggression n=50	Retrospective self-report [CTQ[6]] Emotional, Physical abuse Sexual abuse	Chart review clinician diagnoses	MOAS[10] for self-reported aggression in past 12 months; lifetime arrest for violent offences measured via self-report	Raw data not separated by violent/non-violent outcome Overall: 90.4% Emotional abuse 90% Physical abuse 61%	Raw data not given – see previous column	NA	NA	MOAS self-reported physical aggression

						Sexual abuse 40%				
Stompe et al. 2006, Austria	Case-control study	N= 412, all men, age 18-62y 103 high secure patients with schizophrenia 103 non-schizophrenic prisoners 103 non-offenders with schizophrenia 103 community controls	Retrospective self-report family structures; parental sep[n], schizophrenia or offending behaviour in family members before age 18y SOREP[a]	SCID[8] DSM-III[1] schizophrenia	Gunn Robertson violence scale; crossing threshold for high security hospital	Family status separated 28 (27.2%) Familial schizophrenia 21 (20.4%) Familial offending behaviour 15 (14.6%)	Family status separated 21 (20.4%) Familial schizophrenia 11 (10.7%)	Family status sep[d] 26 (25%) Familial schizophrenia 1 (1.0%) Familial offending 13 (12.6%)	Family stat. separated 9 (8.7%) Familial schizophrenia 1 (1.0%)	Violence crosses threshold for high security hospital / prison sentence
Valevski et al. 1999, Israel	Case-control study	N= 61 33 high security hospital inpatients with schizophrenia (31 men) Mean age 45.3y 28 non-violent schizophrenic inpatients matched for age, sex, length of illness	Retrospective self-reported history of child abuse (homicide risk interview designed for study)	DSM-IV[1] schizophrenia	History of homicide and in high security hospital	History of child abuse 0 1[st] degree relative [1DR] sign[y] violent2 (6.1%) 1DR alcohol abuse 6 (18.2%) 1DR psychopathology 14 (42.4%)	History of child abuse 1 (3.5%) 1DR sign[y] violent 2 (7%) 1DR alcohol abuse 1 (3.8%) 1DR psychopath[y] 12 (42.8%)	NA	NA	History of homicide
Wang et al. 2020, Canada	Retrospective records, interview & questionn[re] comparison – cross-sectional	N= 275, 18-75-year-old patients (72% men) schizophrenia spectrum disorder; 103 (37%) violent 172 (63%) non-violent	CTQ[6] – retrospective self-report of physical, emotional, sexual abuse; physical & emotional neglect and total score	SCID -I/P[8] for DSM-IV[1] diagnosis of schizophrenia / schizophrenia spectrum disorder	Researcher rated MOAS[9] from records	CTQ means (SD) – Physical abuse 8.63 (4.92) Emotional abuse 10.68 (5.26) Sexual abuse 8.33 (4.92) Physical neglect 9.27 (3.80) Emot[l] neglect 12.46 (4.98) CTQ total 44.48 (18.44)	CTQ means (SD) Physical abuse 7.63 (3.93) Emot[l] abuse 10.79 (5.41) Sexual abuse 7.43 (4.62) Physical neglect 8.31 (3.75) Emot[l] neglect 11.37 (5.42) CTQ total 41.26 (16.20)	NA	NA	Past physical violence

[1] Diagnostic and Statistical Manual of Mental Disorders
[2] Positive and Negative Syndrome Scale - Kay SR, Fiszbein A, Opler LA: The Positive and Negative Syndrome Scale (PANSS) for schizophrenia. Schizophr Bull 1987; 13:261–276
[3] Childhood Experience of Care and Abuse Questionnaire - Bifulco A, Bernazzani O, Moran PM, Jacobs C. The childhood experience of care and abuse questionnaire (CECA.Q): validation in a com- munity series. Br J Clin Psychol. 2005;44(Pt 4):563–581.
[4] International Classification of Diseases
[5] Mini International Neuropsychiatric Interview - Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry. 1998;59(Suppl 20):34–57.
[6] CTQ Childhood Trauma Questionnaire; relevant scores for moderate/severe abuse in each category: physical abuse =/>10; sexual abuse =/>8; emotional abuse =/>13; physical neglect =/>10; emotional neglect =/>15. Bernstein DP, Stein JA, Newcomb MD, et al. Development and validation of a brief screening version of the Childhood Trauma Questionnaire. Child Abuse Negl. 2003;27:169–190.
[7] Psychosis Screening Questionnaire - Bebbington, P., & Nayani, T. (1995). The psychosis screening questionnaire. International Journal of Methods in Psychiatric Research, 5, 11–20.
[8] Structured Clinical Interview - First MB, Spitzer RL, Gibbon M, et al. (1995) Structured Clinical Interview for DSM-IV Axis I disorders, Patient Edition (SCID-P), version 2. New York: New York State Psychiatric Institute, Biometrics Research, and Spitzer RL, Williams JBW, Gibbon M, et al. (1990) Structured Clinical Interview for DSM-III-R, non-patient edition (SCID-NP, version 1.0). Washington, DC: American Psychiatric Press .
[9] Chinese Classification and Diagnostic Criteria of Mental Disorders - Chinese Society of Psychiatry (2001) The Chinese Classification and Diagnostic Criteria of Mental Disorders Version 3 (CCMD-3). Jinan (China): Chinese Society of Psychiatry.
[10] Modified Overt Aggression Scale- Kay, S. R., Wolkenfeld, F., & Murrill, L. M. (1988). Profiles of aggression among psychiatric patients: I. Nature and prevalence. Journal of Nervous & Mental Disease, 176, 539−546.
[X] Gunn and Robertson's Scale - Robertson GJ. Drawing a criminal profile. Br J Criminol. 1976;16: 156–160.
[Y] homicide, attempted homicide, aggravated assault, common assault, robbery, arson, any sexual offence or sexual harassment, illegal threats or intimidation according to Swedish National Crime Register
** Figures given for the Gonzalez et al study provided by the authors; the sample total cited in the published text is 2928; 441 cases could not be classified in these terms; figures for exposure columns also provided by the authors.
[Z] VASS – Violent aggression severity score – based on questionnaires, interviews and charts
[A]SOREP - Stompe T, Ortwein-Swoboda G, Friedmann A, Chaudhry HR. Sibling orders of schizophrenic patients in Austria and Pakistan. Psychopathology 1999; 6:281–291.
CCMD - Chinese Society of Psychiatry (2001) The Chinese Classification and Diagnostic Criteria of Mental Disorders Version 3 (CCMD-3). Jinan (China): Chinese Society of Psychiatry.

Table 2: Associations between ACEs and violence in groups with psychosis when non-psychotic violent and healthy controls are also considered.

	Association of violence within groups of people with psychosis	Association of psychosis and violence compared to violence only	Association of psychosis and violence compared to people who are neither psychotic nor violent
PHYSICAL ABUSE			
Gonzalez et al. 2016	In those with psychosis, physical abuse association with violence OR 2.39 (1.07-5.32)	In those with psychosis and violence, compared to those violent only, physical abuse association OR 2.09 (1.20-3.63)	In those with psychosis compared to those with neither psychosis nor violence, physical abuse OR 7.70 (4.43-13.38)
Kumari et al. 2014	In those with schizophrenia, physical abuse association with violence OR 10.4 (1.62-66.9)	Those with schizophrenia and violence compared to those who were violent only, physical abuse OR 0.27 (0.04-1.73)	Those with schizophrenia and violence compared to those who were neither psychotic nor violent, physical abuse OR 10.4 (1.62-66.9)
SEXUAL ABUSE			
Kumari et al. 2014	In those with schizophrenia, sexual abuse association with violence OR 0.73 (0.10-5.20)	Those with schizophrenia and violence compared to those who were violent only, sexual abuse OR 0.073 (0.01-0.49)	Those with schizophrenia and violence compared to those who were neither psychotic nor violent OR 2.55 (0.20-31.9)
NEGLECT			
Gonzalez et al. 2016	In those with psychosis, neglect association with violence OR 3.43 (1.31-8.98)	In those with psychosis and violence compared to those only violent, neglect OR 2.20 (1.22-4.00)	In those with psychosis and violence compared to those neither psychotic nor violent, neglect OR 7.00 (3.90-12.56)
Kumari et al. 2014	In those with schizophrenia, neglect association with violence OR 2.33 (0.51-10.8)	Those with schizophrenia and violence compared to those who were violent only, neglect OR 0.88 (0.19-3.40)	Those with schizophrenia and violence compared to those who were neither psychotic nor violent, neglect OR 16.3 (1.63-163.4)
CRIMINAL VIOLENT PARENT			
Kumari et al. 2014	In those with schizophrenia, criminal violent parent association with violence OR 4.06 (0.63-26.1)	Those with schizophrenia and violence compared to those who were violent only, criminal parent OR 0.47 (0.10-2.18)	Those with schizophrenia and violence compared to those who were neither psychotic nor violent, criminal parent OR 4.06 (0.63-26.1)
Schug et al. 2010	In those with schizophrenia, parental criminality and patient accusation of homicide OR 0.32 (0.03-3.28)	Those with schizophrenia and violence compared to those who	Those with schizophrenia and violence, compared to those who

		were violent only, parental criminality OR 0.97 (0.06-16.19)	were neither psychotic nor violent, parental criminality OR ∞
Stompe et al. 2006	NA	Those with schizophrenia and violence compared to those who were violent only, familial offending 1.18 (0.53-2.6)	NA
FIRST DEGREE/ PARENTAL PSYCHOPATHOLOGY			
Stompe et al. 2006	In those with schizophrenia, familial schizophrenia association with violence OR 2.14 (0.97-4.71)	In those with schizophrenia and violence, compared to those who were violent only, familial schizophrenia OR 26.12 (3.44-198.31)	In those with schizophrenia and violence, compared to those who were neither psychotic nor violent, familial schizophrenia OR 26.12 (3.44-198.31)
PARENTAL SEPARATION			
Stompe et al. 2006	In those with schizophrenia, parental separation association with violence OR 1.46 (0.76-2.78)	Those with schizophrenia and violence compared to those who were violent only, family status separated OR 1.11(0.59-2.06)	Those with schizophrenia and violence compared to those who were neither psychotic nor violent, family status separated OR 3.90 (1.73-8.77)
DOMESTIC VIOLENCE			
Gonzalez et al. 2016	In those with psychosis, witnessing domestic violence association with violence OR 3.04 (1.62-5.70)	In those with psychosis and violence, compared to those only violent, witnessing domestic violence OR 1.71 (1.11-2.63)	In those with psychosis and violence, compared to those neither psychotic nor violent, witnessing domestic violence OR 6.22 (4.09-9.45)
ACES COLLECTIVELY			
Kumari et al. 2014	In those with schizophrenia, marked deprivation association with violence OR 3.21 (0.66-15.6)	Those with schizophrenia and violence compared to those who were violent only, marked deprivation OR 0.32 (0.06-1.71)	Those with schizophrenia and violence compared to those who were neither psychotic nor violent, marked deprivation OR ∞

Figure 1: Flow diagram showing study selection process

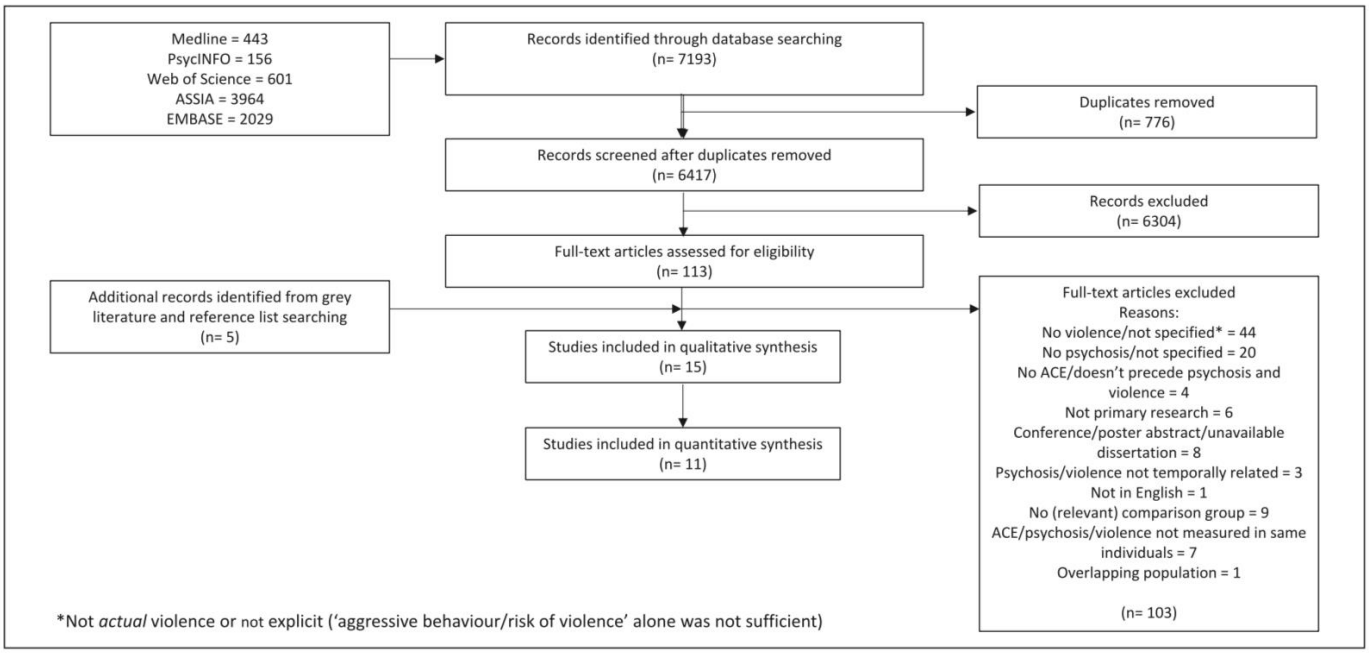


Figure 2: Forest plot of relationship between having been physically abused in childhood and later violence with psychosis compared with psychosis alone

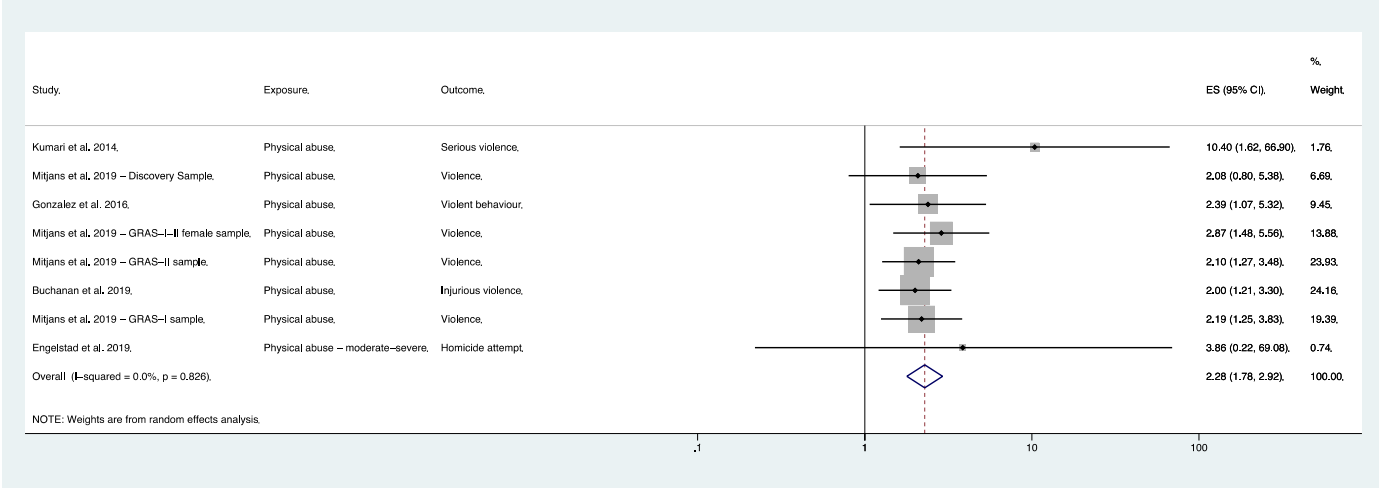


Figure 3: Forest plot of relationship between having had a criminal and/or violent parent during childhood and later violence with psychosis compared with psychosis alone

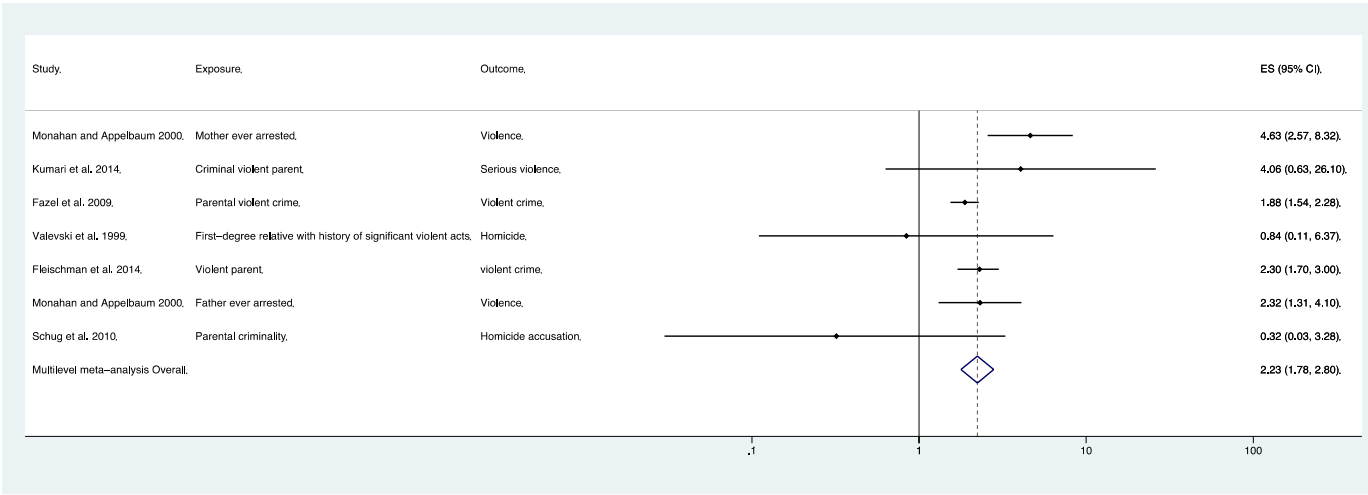


Figure 4: Forest plot of relationship between having been sexually abused in childhood and later violence with psychosis compared with psychosis alone

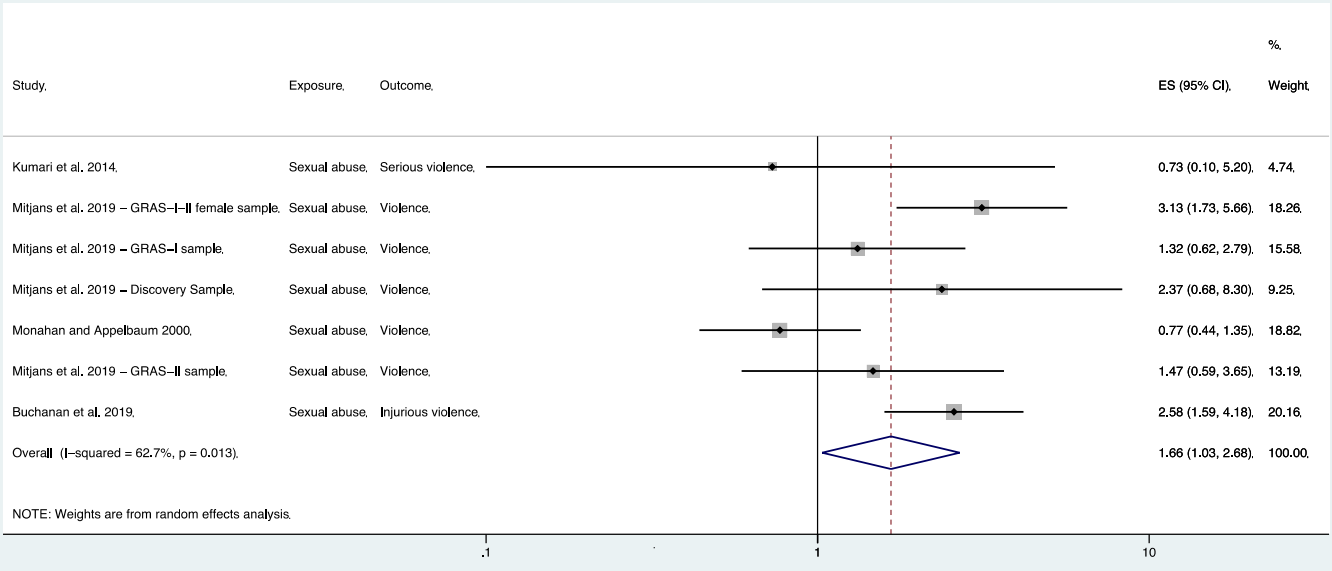


Figure 5: Forest plot of relationship between having lived with drug or alcohol misuse in the family during childhood and later violence with psychosis compared with psychosis alone

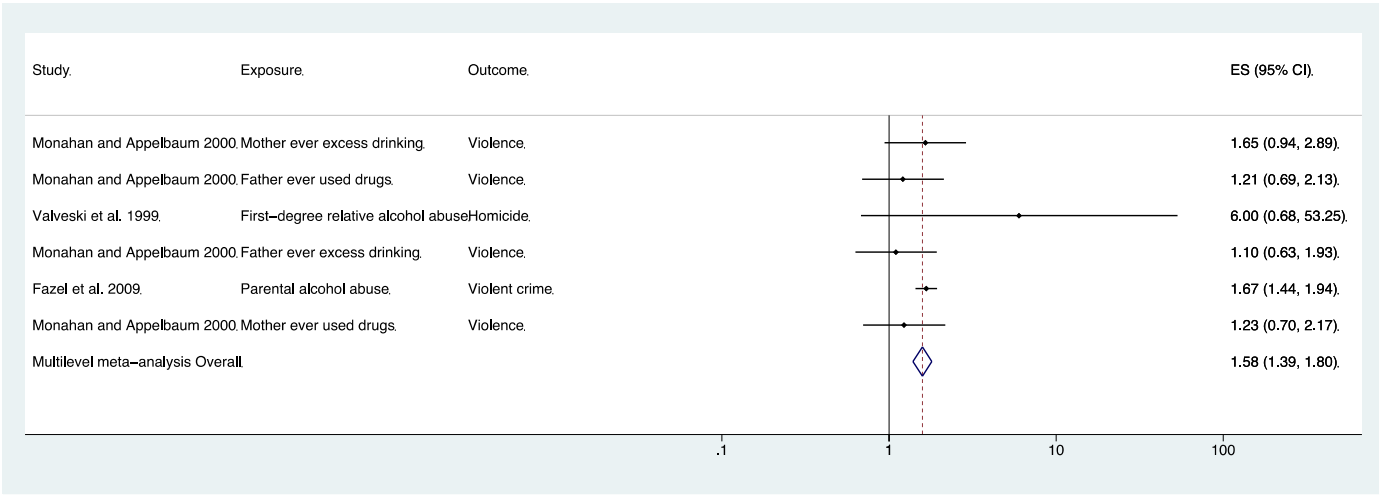
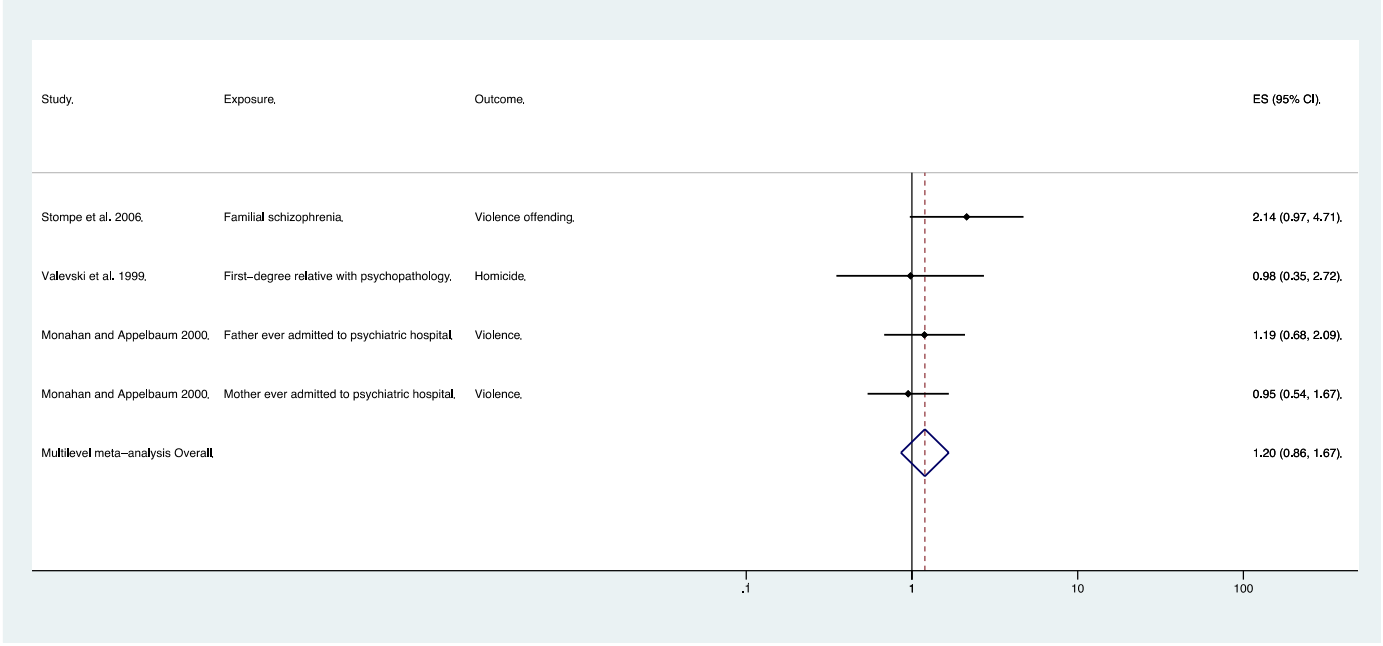


Figure 6: Forest plot of relationship between living with familial psychopathology during childhood and later violence with psychosis compared with psychosis alone



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