

## Environmental Factors in Schizophrenia: Childhood Trauma—A Critical Review

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**There is renewed interest in the relationship between early childhood trauma and risk of psychosis in adulthood. There are a large number of studies of psychiatric inpatients, and of outpatients in which a majority have a psychotic disorder, that suggest the prevalence of childhood trauma in these populations is high. However, these are generally small studies of diagnostically heterogeneous and chronic samples and, as such, can tell us very little about whether childhood trauma is of etiological importance in psychosis. A small number of recent population-based studies provide more robust evidence of an association, and there are now plausible biological mechanisms linking childhood trauma and psychosis. However, there remain a number of conceptual and methodological issues, which mean much more research is needed before firm conclusions can be drawn about whether childhood trauma is a cause of psychosis.**

*Key words:* childhood trauma/abuse/psychosis/schizophrenia

### Introduction

The term childhood trauma has been used to capture a range of severe adverse experiences, including sexual, physical, and emotional abuse, and neglect. A recent survey in the United Kingdom estimated the prevalence of childhood sexual abuse at around 11% and physical abuse at around 24%.<sup>1</sup> In the United States, estimates tend to be higher.<sup>2</sup> The adverse long-term consequences of childhood sexual and physical abuse have been well documented and include increased risk of adult depression,<sup>3</sup> personality disorders,<sup>4,5</sup> suicide,<sup>6,7</sup> posttraumatic stress disorder (PTSD),<sup>8</sup> and drug and alcohol depen-

dence.<sup>9</sup> It is possible, moreover, that specific forms of abuse are linked to particular disorders. For example, sexual abuse shows strong correlations with later depression<sup>3</sup> and borderline personality disorder<sup>4</sup> and physical abuse with antisocial personality disorder.<sup>10,11</sup>

This review is concerned with the question of whether childhood trauma increases the risk for adult psychosis or, more specifically, schizophrenia. Our aim is to provide an overview of the most relevant and robust research and, from this, to highlight a number of conceptual and methodological issues that need to be taken into account in future research.

### A Gathering Storm

Interest in this issue has reemerged in recent years and has coalesced around a recent review article by Read et al,<sup>12</sup> in which the authors claim that the evidence shows: “child abuse is a causal factor for psychosis and ‘schizophrenia.’”<sup>(p330)</sup> This led one UK psychologist and journalist to write of this review as providing “tectonic plate-shifting evidence.”<sup>13</sup> Are these claims warranted?

### The Prevalence of Childhood Trauma in Clinical Populations

It is necessary to begin on a critical note. The overall impression created by the review of Read et al<sup>12</sup> is that there is a wealth of evidence suggestive of a causal relationship between childhood trauma and psychosis. For example, Read et al<sup>12</sup> produce weighted averages for females and males of reported child sexual abuse (48% females, 28% males), incest (29% females, 7% males), and child physical abuse (48% females, 50% males) from 51 studies of psychiatric inpatients and of outpatients when half or more were diagnosed with a psychotic illness. In terms of understanding the relationship between childhood trauma and psychosis, however, these estimates are misleading.

Of the 51 studies included, 8 are of children and adolescent samples, 14 are of inpatient or ex-inpatient samples, in which only a minority, if any, have a diagnosis of psychosis, and 9 are of outpatient samples in which over 50% have a diagnosis of psychosis. In other words, 31 of the 51 studies are of diagnostically heterogeneous samples in which the numbers with a psychotic disorder are often unclear. Read et al<sup>12</sup> reason that this is acceptable

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**Table 1.** Childhood Trauma Among Inpatients and Outpatients With a Psychotic Disorder

	<i>n</i>	CSA		CPA		CSA or CPA		CSA and CPA	
		Female	Male	Female	Male	Female	Male	Female	Male
Freidman and Harrison <sup>49</sup>	20	12 (60%)	—	—	—	—	—	—	—
Goff et al <sup>50</sup>	61	—	—	—	—	10 (48%)	17 (42%)	—	—
Greenfield et al <sup>15</sup>	38	8 (42%)	3 (16%)	8 (42%)	9 (47%)	10 (53%)	10 (53%)	6 (32%)	2 (11%)
Ross et al <sup>51</sup>	81	8 (32%)	17 (30%)	8 (32%)	13 (23%)	12 (48%)	24 (43%)	4 (16%)	6 (11%)
Trojan <sup>52</sup>	96	12 (25%)	13 (27%)	—	—	—	—	—	—
Darves-Bornos et al <sup>53</sup>	89	30 (34%)	—	—	—	—	—	—	—
Miller and Finnerty <sup>54</sup>	44	16 (36%)	—	—	—	—	—	—	—
Goodman et al <sup>55</sup>	50	23 (78%)*	9 (45%)*	—	—	—	—	—	—
Lysaker et al <sup>26</sup>	52	—	18 (35%)	—	—	—	—	—	—
Friedman et al <sup>2</sup>	22	7 (78%)	0 (0%)	—	—	—	—	—	—
Holowka et al <sup>56</sup>	26	4 (57%)	9 (47%)	1 (17%)	4 (21%)	4 (47%)	10 (53%)	1 (17%)	3 (16%)
Offen et al <sup>57</sup>	26	5 (71%)	5 (26%)	—	—	—	—	—	—
Resnick et al <sup>25</sup>	47	14 (47%)	3 (18%)	—	—	—	—	—	—
Compton et al <sup>14</sup>	18	2 (100%)	5 (31%)	2 (100%)	12 (75%)	2 (100%)	12 (75%)	2 (100%)	5 (31%)
Lysaker et al <sup>58</sup>	37	—	14 (38%)	—	21 (57%)	—	23 (63%)	—	12 (32%)
Kilcommons and Morrison <sup>59</sup>	32	1 (14%)	3 (12%)	1 (14%)	8 (32%)	—	—	—	—
Schenkel et al <sup>60</sup>	40	7 (47%)	4 (16%)	7 (47%)	6 (24%)	8 (53%)	10 (40%)	6 (40%)	0 (0%)
Lysaker et al <sup>61</sup>	65	—	18 (28%)	—	—	—	—	—	—
Shafer et al <sup>62</sup>	30	11 (37%)	—	6 (20%)	—	12 (41%)	—	4 (13%)	—
Bowe et al <sup>63</sup>	22	5 (62%)	5 (36%)	6 (75%)	8 (57%)	6 (75%)	8 (57%)	5 (62%)	5 (36%)
<b>Total</b>		<b>165/389</b>	<b>126/446</b>	<b>39/113</b>	<b>81/211</b>	<b>64/127</b>	<b>114/226</b>	<b>28/106</b>	<b>33/186</b>
Weighted average (%)		<b>42</b>	<b>28</b>	<b>35</b>	<b>38</b>	<b>50</b>	<b>50</b>	<b>26</b>	<b>18</b>
Read et al <sup>12</sup> Weighted average (%)		<b>48</b>	<b>28</b>	<b>48</b>	<b>50</b>	<b>69</b>	<b>59</b>	<b>36</b>	<b>19</b>

Note: CSA, child sexual abuse; CPA child physical abuse.

\*Mid-point of two measures.

because, they claim, the prevalence of childhood trauma in those with a psychotic disorder is likely to be higher than in other groups.<sup>(p334)</sup> However, when the weighted prevalences are recalculated, using only those studies ( $n = 20$ ) in which all subjects were diagnosed with a psychotic mental illness, the estimates reduce for all but one form of abuse (sexual abuse in males, which remains the same) (see table 1).

This analysis notwithstanding, there remain doubts about whether calculating a weighted prevalence from even this more restricted list of studies is meaningful. Combining data to produce a single estimate of prevalence carries an implicit assumption that the samples and the measures of exposure across the studies are comparable. However, the samples used in these studies were invariably small, highly selected and heterogeneous, and the definitions and measures of abuse varied widely. Furthermore, all but 2 of these studies<sup>14,15</sup> was of chronic

samples, such that, even if the rates of childhood trauma were higher than in comparable population samples, this may reflect the impact of abuse on illness severity and chronicity or the presence of comorbid affective, substance use, personality, or post-traumatic stress disorders, all of which have been linked to earlier abuse and all of which are common in those with a psychotic mental illness.<sup>16</sup> In a recent study, for example, of 124 outpatients with a diagnosis of schizophrenia, Scheller-Gelkey et al<sup>17</sup> report a 37% prevalence of sexual abuse in those with a comorbid substance misuse problem compared with 16% in those with no substance misuse problem.

### Population-Based Studies

This critical note aside, in recent years, there has been a small number of large population-based studies that

**Table 2.** Summary of Recent Population-Based Studies of Childhood Trauma and Psychosis

	Study Design	Sample	Measure of Childhood Trauma	Measure of Outcome	Number Exposed	Number With Outcome	Measure of Effect
Spataro et al <sup>5</sup> (Australia)	Prospective cohort	1612 children (1327 female, 285 male) who had been sexually abused; 3 139 745 population controls.	Records from Victorian Institute of Forensic Medicine of medical examinations confirming sexual abuse.	Cases registered on Victorian Psychiatric Case Register.	1612 subjects identified as having been sexually abused.	113 907 had contacts with psychiatric services (113 707 controls; 200 cases); 20 805 with a schizophrenic disorder diagnosis (20 792 [0.7%] controls; 13 [0.8%] cases).	Relative risk of schizophrenic disorder in controls vs schizophrenic disorder in cases who had been abused: RR 1.2 (0.7–2.1)
Bebbington et al <sup>18</sup> (United Kingdom)	Cross-sectional survey	8580 adults aged 16–74 recruited to the second British National Survey of Psychiatric Morbidity.	Respondents shown cards with a list of stressful life events, including sexual abuse, and asked if they had experienced any in their lifetime. Presence or absence only rated.	A 2-stage approach was adopted to assess presence of psychotic disorder: (1) Psychosis Screening Questionnaire <sup>64</sup> was administered to all participants; (2) those who screened positive, and a proportion who screened negative were interviewed with the SCAN. <sup>65</sup>	2982 (3.5%) with no disorder responded positively to the question on sexual abuse; 21 (34.5%) with a probable psychotic disorder responded positively.	60 with a probable or definite psychotic disorder.	Sexual abuse vs none: Adj. OR <sup>a</sup> 2.9 (1.3–6.4)
Janssen et al <sup>19</sup> (Netherlands)	Prospective cohort	4045 adults aged 18–64 recruited to the Netherlands Mental Health and Incidence Study.	At baseline, subjects were asked about experiences of any kind of emotional, physical, psychological or sexual abuse before age 16, using a 4-item semistructured interview designed for the study. Presence or absence, and frequency of events rated.	CIDI <sup>66</sup> for screening followed by 2 items of the BPRS <sup>67</sup> and need for care assessed using CAN. <sup>68</sup> 3 outcome groups: 1. BPRS any psychosis 2. BPRS pathology level psychosis 3. Need-based disorder	423 (10.5%) reported childhood abuse; 260 (61.5%) were women	Psychosis outcome at follow-up: BPRS any psychosis: <i>n</i> = 38 (0.94%) BPRS pathology level: <i>n</i> = 10 (0.25%) Need-based disorder: <i>n</i> = 7 (0.17%)	Abuse vs no abuse: BPRS any psychosis Adj. OR <sup>b</sup> 2.5 (1.1–5.7) BPRS pathology level Adj. OR <sup>b</sup> 9.3 (2.0–43.6) Need-based disorder Adj. OR <sup>b</sup> 7.3 (1.1–49.0)

Table 2. Continued

	Study Design	Sample	Measure of Childhood Trauma	Measure of Outcome	Number Exposed	Number With Outcome	Measure of Effect
Whitfield et al <sup>20</sup> (United States)	Cross-sectional	17 337 subjects (mean age 57) recruited to the Adverse Childhood Experiences study	Self-report postal questionnaire comprising questions from other scales and studies. Presence or absence and frequency before the age of 19 were noted	A single question used to determine lifetime history of hallucinations ("Have you ever had, or do you have, hallucinations (seen, smelled, or heard things that were not really there?").	Emotional abuse: 13%  Physical abuse: 27%  Sexual abuse: 25%	Lifetime history of hallucinations: 2%	Risk of ever having had a hallucination:  Emotional abuse: Adj. OR <sup>c</sup> 2.3 (1.8–3.0)  Physical abuse: Adj. OR <sup>c</sup> 1.7 (1.4–2.1)  Sexual abuse: Adj. OR <sup>c</sup> 1.7 (1.4–2.1)
Spauwen et al <sup>21</sup> (Germany)	Prospective cohort	2524 subjects aged 14–24 recruited to the Early Developmental Stages of Psychopathology study	Lifetime exposure to 9 traumatic events were measured at baseline using a module from the CIDI	Ratings from the 15 M-CIDI core psychosis items were used to assess presence of psychotic symptoms. Psychosis outcome was defined as "broad" (one or more psychotic symptom), "medium" (2 or more psychotic symptoms), or "narrow" (3 or more psychotic symptoms).	Any trauma <i>n</i> = 491 (19.5%)  Sexual abuse <i>n</i> = 39 (1.5%)	Psychotic symptoms broad <i>n</i> = 441 (17.5%); medium <i>n</i> = 183 (7.3%); narrow <i>n</i> = 85 (3.4%)	Narrow psychosis  Any trauma: Adj. OR 1.89 <sup>d</sup> (1.16–3.08)  Sexual abuse: Adj. OR <sup>d</sup> 1.55 (0.47–5.08)  Physical threat: Adj. OR <sup>d</sup> 2.14 (1.18–3.89)  Rape: Adj. OR <sup>d</sup> 2.26 (0.55–9.21)

Note: CIDI, Composite International Diagnostic Interview; BPRS, Brief Psychiatric Rating Scale; CAN, Camberwell Assessment of Need; SCAN, Schedules for Clinical Assessment in Neuropsychiatry.

<sup>a</sup>Adjusted for interrelationship between other adverse events and depression.

<sup>b</sup>Adjusted for a range of variables, including an other psychiatric diagnosis and psychosis in first-degree relatives.

<sup>c</sup>Adjusted for age, sex, race, and educational attainment.

<sup>d</sup>Adjusted for gender, socioeconomic status, urbanicity, cannabis use, time 0 *DSM-IV* mental disorders and time 0 psychosis proneness.

provide data more relevant to this question,<sup>5,18–21</sup> and these are summarized in table 2.

Using data on 8580 subjects aged 16–74 from the British National Survey of Psychiatric Morbidity, Bebbington et al<sup>18</sup> found that those who met criteria for a definite or probable psychotic disorder ( $n = 60$ ) were over 15 times more likely to have been sexually abused at some point in their lifetime (not restricted to childhood). When the inter-relationship between other negative life events and level of depression were controlled, the odds ratio was markedly reduced, though still significant (Adj. OR 2.9). However, the measure of sexual abuse was crude (a single question), no account was taken of timing, duration, or severity of abuse, and childhood and adult exposure were not distinguished.

In their analysis of data on 4045 subjects aged 18–64 drawn from the Netherlands Mental Health Survey and Incidence Study, Janssen et al<sup>19</sup> found that those who had experienced emotional, physical, or sexual abuse or neglect before the age of 16 were more likely to report experiencing psychotic symptoms during a 3-year follow-up period. The effect was strongest for the most severe psychosis groups and held after adjusting for a range of potential confounding variables (eg, need for care level psychosis: Adj. OR 7.3). However, the number of subjects with psychotic symptoms was very small, particularly those with the most severe symptoms ( $n = 7$ ), meaning the confidence intervals for each odds ratio were very wide, and while there was evidence that the risk of developing psychosis increased in a dose-response fashion with increasing severity of abuse, no formal test for trend across levels of abuse severity was reported. In a more recent study using a similar design, Spauwen et al,<sup>21</sup> using data on 2524 subjects aged 14–24 from the Early Developmental Stages of Psychopathology study, found that the experience of any lifetime trauma (from a list of 9 events, not restricted to childhood) was associated with the development of 3 or more (but not fewer) psychotic symptoms during an average follow-up period of 42 months (Adj. OR 1.9). The trauma exerting the strongest independent effect was natural catastrophe (Adj. OR 15.1) followed by physical threat (Adj. OR 2.1). The risk of developing 3 or more psychotic symptoms was elevated in those who reported sexual abuse (Adj. OR 1.6) but not significantly and by much less than in the studies by Bebbington et al<sup>18</sup> and Janssen et al.<sup>19</sup> However, as in the study by Bebbington et al,<sup>18</sup> the measure of trauma was relatively crude, again with no account taken of timing, duration, or severity.

In the only study in which the occurrence of sexual abuse was determined using contemporaneous records, Spataro et al<sup>5</sup> compared rates of subsequent hospital admissions in those who had been sexually abused before the age of 16 ( $n = 1612$ ), according to official records, with admission rates in a large population-based control sample ( $n = 3\ 139\ 745$ ). They found no association between

child sexual abuse and later admission to hospital with a diagnosis of schizophrenia (relative risk 1.2). However, as the majority of cases of sexual abuse go unrecognized, meaning many cases of sexual abuse will have been included in the control sample, the potential for this study to detect a difference was limited. Further, by definition, the cases of abuse included were the subject of some form of state intervention, and this may have had protective effects on later risk of psychopathology.

In another recent large population-based study ( $n = 17\ 337$ ), Whitfield et al<sup>20</sup> found that respondents reporting a history of hallucinations were more likely to have been both physically (Adj. OR 1.7) and sexually (Adj. OR 1.7) abused during childhood. The sample size is a strength, but the study is cross-sectional and the measure of hallucinations extremely limited (ie, a single question, see table 2). Nonetheless, this is in line with findings from a number of previous (much smaller) studies, which have reported higher rates of hallucinations in patients with a psychotic illness (or in clinical populations more generally) who had experienced various forms of trauma in childhood compared with those who had not.<sup>22–24</sup> The evidence regarding delusions is more equivocal. Janssen et al,<sup>19</sup> for example, reported higher rates of both hallucinations and delusional ideation in those who had experienced childhood abuse, but others have found no association between early trauma and delusions.<sup>16</sup> Only a small number of studies have investigated other symptoms, such as negative symptoms,<sup>25,26</sup> and no clear patterns emerge.

The findings from the recent, more robust, studies of childhood trauma are suggestive of a link with adult psychosis. However, the findings have not been altogether consistent and a number of complicating conceptual and methodological issues remain.

## Conceptual and Methodological Issues

### *Diagnostic Conundrums*

In the main, the recent studies of childhood trauma have focused on psychotic symptoms in the general population, at varying levels of severity, and whether reported associations will extend to those with symptom clusters meeting criteria for specific psychotic diagnoses remains unclear. Further, positive psychotic symptoms are reportedly common among those with a primary diagnosis of PTSD<sup>27</sup> (and those with dissociative symptoms<sup>28,29</sup>), and recent studies suggest there is a high prevalence of PTSD (much of it unrecognized) in patients with a diagnosed psychotic disorder.<sup>30</sup> A key issue for future research is, consequently, the question of whether any link between childhood trauma and psychosis is diagnosis specific. It may be, as Read et al<sup>12</sup> suggest, that Kapur's<sup>31</sup> notion of "psychosis-in-schizophrenia" is relevant here. That is, childhood trauma may be associated with positive psychotic symptoms in schizophrenia, and as such understanding this link may "... have more implications for



understanding the occurrence of psychosis in other illnesses (eg, manic psychosis) than it does for understanding the nonpsychotic (ie, negative and cognitive) symptoms in schizophrenia.”<sup>(p18)</sup> This further ties in with recent movements in cognitive psychology toward a focus on individual symptoms rather than diagnoses.<sup>32</sup> Disentangling these complex issues is essential if the relationship between childhood trauma and psychosis is to be fully understood.

### *Defining and Measuring Childhood Trauma*

Childhood trauma is a broad term, encompassing a range of adverse experiences. The nature, timing, severity, and duration of trauma are likely to influence its impact on future mental health. As already noted, it is possible that different forms of trauma increase risk for distinct pathological outcomes. In the studies summarized in table 2, there were notable differences in how trauma was defined and measured. This makes it difficult to directly compare these studies and indeed may explain some of the variability in the findings.

Any estimate of the impact of childhood trauma on risk of psychosis is dependent on accurate assessment of early traumatic experiences. In the absence of contemporary records, information has to be collected retrospectively. This is particularly problematic if having psychotic experiences or a psychotic disorder differentially impacts on recall compared with others, for example, because of an effort after meaning or, more rarely, delusions of abuse. Instruments have been developed and used in the study of other disorders (eg, depression), which employ a number of strategies to overcome the potential problem of recall bias (eg, use of life history calendar, use of multiple sources of information, assurances of confidentiality).<sup>3</sup> However, this issue has not been addressed in the major studies of childhood trauma and psychosis to date and the use of relatively crude measures of traumatic experiences, as was the case in the studies discussed above, increases the risk of systematic information bias.

### **Mechanisms: Some Tentative Speculations**

In the past, the proposition that socioenvironmental factors are of etiological importance in psychosis has been weakened by the lack of any clearly formulated mechanisms linking the two. One consequence of the recent rapid advances in the neurosciences and genetics is that we are beginning to understand how social experience across the life course interacts with genes, and impacts on biological development, to shape adult outcomes. These insights are now being used to produce biological models linking adverse social experiences, including childhood trauma, and adult psychosis.

Dopamine continues to be implicated in the etiology of psychosis, particularly in the formation of persecutory delusions due to its perceived role in the interpretation of threat-related stimuli.<sup>33</sup> Spauwen et al<sup>21</sup> have specu-

lated that extended exposure to trauma may increase risk for psychosis through direct effects on dopamine function. There is accumulating evidence from animal studies that negative and threatening events (eg, maternal deprivation in neonatal rats,<sup>34</sup> “social defeat” in mice<sup>35</sup>) can produce dopaminergic hyperactivity in the mesocorticolimbic system and that prolonged exposure to such aversive environments can lead to sensitization of this system.<sup>36</sup> In humans, elevated dopamine metabolism has been found in girls who have been sexually abused compared with nonabused controls.<sup>37</sup> This poses the intriguing question of whether early trauma increases risk of later psychosis through sensitization of the dopaminergic system. Along similar lines, Read et al<sup>12</sup> have suggested that early, prolonged, and severe trauma may increase risk for later psychosis through lasting effects on the hypothalamic-pituitary-adrenal (HPA) axis. There are studies that have found HPA dysregulation in abused girls<sup>38</sup> and in women who were physically or sexually abused in childhood.<sup>39</sup> Heightened sensitivity to stress has been considered a central feature of schizophrenia,<sup>40</sup> and recent research has found patients with a first episode of psychosis to have enlarged pituitary glands compared with normal controls,<sup>41</sup> independent of antipsychotic treatment.<sup>42</sup>

It may be, moreover, that some individuals are more prone to develop psychosis following prolonged childhood trauma because of an underlying genetic susceptibility. Recent research has provided strong evidence that the impact of environmental factors on risk of adult psychopathology is mediated by an individual’s genotype (eg, cannabis and catechol-o-methyltransferase<sup>43</sup>), and data from the Finnish adoption study<sup>44</sup> provides some evidence that the effect of problematic family relationships on risk of later schizophrenia is mediated by genetic risk. There are currently no reported data testing potential gene-trauma interactions in psychosis. Nevertheless, it is possible to propose, as potential candidates for interaction with childhood trauma in the etiology of psychosis, genes involved in HPA regulation<sup>45-47</sup> and dopamine levels in the brain.<sup>48</sup> Of course, at this stage, this is highly speculative.

### **Conclusions**

The evidence that childhood trauma causes psychosis is controversial and contestable. Child abuse certainly causes prolonged suffering, and it may increase the distress experienced by those who develop a psychotic mental illness in adulthood and lead to worse outcomes. The implications of this for clinical practice require careful consideration. There is not, in our view, a large body of research supporting a causal connection, contrary to the impression gained from the review of Read et al.<sup>12</sup> There are a modest number of recent population-based studies that suggest the risk of experiencing psychotic symptoms

is increased in those exposed to early trauma. The plausibility of proposed biological mechanisms add some weight to these data. The findings from such studies, however, have not been wholly consistent, and a number of methodological limitations mean we should be cautious in overinterpreting these. That said, this issue is one that certainly merits more sustained and systematic research.

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