ORIGINAL ARTICLE

Schizophrenia and Other Psychotic Disorders in a Cohort of Sexually Abused Children

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Context: The evidence for an association between child sexual abuse and subsequently developing psychotic disorders, including the schizophrenias, remains inconclusive.

Objective: To explore whether child sexual abuse is a risk factor for later psychotic disorders.

Design: Case-control study.

Setting: Sample drawn from all notified cases of child sexual abuse over a 30-year period in Victoria, Australia.

Participants: A cohort of 2759 individuals ascertained as having been sexually abused when younger than 16 years had their subsequent contacts with mental health services established by data linkage. They were compared with a community-based control group matched on sex and age groupings whose rates of disorder were established using identical methods.

Main Outcome Measures: Rates of psychotic and schizophrenic illnesses.

Results: Rates were significantly higher among child sexual abuse subjects compared with controls for psychosis in general (2.8% vs 1.4%; odds ratio, 2.1; 95% confidence interval, 1.4-3.1; $P < .001$) and schizophrenic disorders in particular (1.9% vs 0.7%; odds ratio, 2.6; 95% confidence interval, 1.6-4.4; $P < .001$). Those exposed to penetrative abuse had even higher rates of psychosis (3.4%) and schizophrenia (2.4%). Abuse without penetration was not associated with significant increases in psychosis or schizophrenia. The risks were highest for those whose abuse involved penetration, occurred after age 12 years, and involved more than 1 perpetrator, the combination producing rates of 8.6% for schizophrenia and 17.2% for psychosis.

Conclusions: Child sexual abuse involving penetration is a risk factor for developing psychotic and schizophrenic syndromes. The risk is greater for adolescents subjected to penetration. Irrespective of whether this statistical association reflects any causal link, it does identify an at-risk population in need of ongoing support and treatment.

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An association between giving a history of child sexual abuse (CSA) in adulthood and increased rates of some mental health problems is now well established on the basis of a range of methodologically robust studies.[1-3] Studies based on the follow-up of those with documented abuse, including sexual, during childhood have broadly confirmed an increased incidence of depressive, anxiety, substance abuse, borderline, and posttraumatic disorders, as well as suicidality.[4-10] The possibility of a link between CSA and later psychotic disorders, however, remains unresolved[2,11,12] despite the claims of some that a causal link has been established to schizophrenia.[13]

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There have been a large number of clinical studies, of widely differing methodological sophistication, based on the frequency with which patients with either schizophrenic syndromes or psychotic symptoms retrospectively report CSA, the results of which, though inconsistent, predominantly support an association.[14-18] The ability and willingness to recall CSA as an adult can be effected by a range of factors leading to both overreporting and underreporting.[1,19] Among the influences is current mental health.[19,20] Trauma in general and CSA in particular have become a culturally sanctioned explanation for distress and disorder. Those with mental health problems may well be more prone to reinterpret and reconstruct childhood memories in the hope of making sense of their current state, even without the encouragement of well-meaning profession-

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als. Further, recalled histories of CSA in people with acute psychosis may sometimes be a manifestation of their illness. At best, clinical studies, therefore, can only establish a possibility worthy of further study.

Given the low prevalence of psychotic disorders, most population studies have focused on reports of delusional and hallucinatory experiences rather than the presence of a syndromal diagnosis. The association of psychotic symptoms has also been predominately studied in relation to trauma in general or sexual assault across the life span. Two large US studies noted a significant albeit modest association between giving histories of CSA involving penetration and the endorsing of having experienced hallucinations, and in 1 study, delusions.[21,22] Studies from Australia and Europe have produced similar findings.[23-27] An association between CSA and schizophrenic syndromes specifically was also suggested in 1 study.[28] Population-based studies that clarified the relationship between CSA and the more common mental disorders have, to date, generated only suggestive results regarding psychosis. A prior attempt by our own group to examine rates of schizophrenic spectrum disorders among cohorts identified in childhood as victims of sexual abuse produced negative results.[5]

In short, the current literature raises a possibility that CSA and other forms of child maltreatment may have a statistical association with psychotic symptoms and schizophrenic syndromes in adult life. A number of potential explanations for this have been advanced, but until a clear statistical relationship is established, such theorizing is premature.

This study is an extension of our previous study[5] but uses a larger sample and a matched comparison group. Data linkage was used to examine the rates of psychotic and schizophrenic illnesses in a large cohort of those ascertained during childhood as having been sexually abused. Rates were compared with a matched group drawn from a community sample in which the rates of mental disorders were established using identical methods and definitions as for the subjects.

METHODS

CSA COHORT

Child sexual abuse cases were identified using the records of the Police Surgeon's Office and the Victorian Institute of Forensic Medicine, which since 1957 has provided medical examinations in the state (population, 5 million) of cases of suspected CSA. Referrals from the police and child protection services in Victoria, Australia, were made whenever the possibility of sexual penetration was suspected. In the older records, dates of the alleged abuse were not always recorded. The referrals were, however, on the basis that physical evidence of abuse might still be evident. As such, the alleged abuse typically last occurred in the preceding days or weeks in almost all cases, but this does leave open when it first occurred. Cases were identified as contact abuse or penetration on the basis of the history provided by the child or other informants, together with examination findings and laboratory analysis. All investigated cases of sexual abuse prior to age 16 years between 1964 and 1995 were included. Identifying information of child's name, date of birth, date of examination, medical opinion on evidence of penetration, and abuse characteristics were collated. The sample of 2759 CSA subjects overlapped with 1612 cases from our prior analysis completed in 2002.[5]

COMPARISON GROUP

The comparison group was drawn from a random sample of 4938 Victorian residents on the electoral role. Voting and voter registration is compulsory, and as a result, more than 93% of those older than 18 years appear on the roles.[29] Identifying information for the comparison group consisted of name and age range within a 2-year band. Abuse victims were matched to a control subject drawn from this population using sex and age band. No matched comparisons were found for 82 subjects; therefore, the analyses compared the 2759 CSA subjects with 2677 peers from the general population.

MENTAL HEALTH HISTORIES

Psychiatric information was gathered from a statewide register colloquially known as the Victorian Psychiatric Case Register. The register has existed in various forms for more than 40 years, beginning life as a research tool but for more than 20 years operating primarily as a service management tool. There are considerable incentives for clinical services to maintain full data entry because aspects of their funding are dependent on this. All contacts with public mental health services, as an inpatient, community patient, general hospital patient, or in emergency departments, including one-off assessment, are recorded.

The Victorian Psychiatric Case Register records the date, nature of the contact, duration of contact, diagnosis if made, and treatment, if any, that was provided. Mental disorders are recorded according to *International Classification of Diseases, 10th Revision*, though clinicians in Victoria predominantly use *DSM* categories, which are translated by records clerks into the relevant *International Classification of Diseases* code.

The case register reflects the realities of an Australian public mental health service whose priority is major mental illness. The private services do not provide for compulsory admissions, or manage community treatment orders, and make a restricted contribution to ongoing rehabilitation and support services for those with a schizophrenic disorder. As a result, almost all people with a schizophrenic illness or other psychotic condition receive all or part of their care in the public services.

DATA LINKAGE

The data-matching procedures involved first a determinist then a probabilistic approach, extracting exact and potential matches based on iterations of key identifying information taken from the source database (eg, surname, first names, date of birth, sex). When a data match was made, information was collected on mental health variables, including the dates and nature of the contacts and diagnosis entered. Once matched and checked for accuracy, identifying variables were permanently deleted.

Assigning a diagnosis was complicated in some cases where a psychotic illness was diagnosed on some occasions but not others. Cases where at least 2 of 3 contacts resulted in a diagnosis of schizophrenia or other psychosis were included, whereas a number of cases with widely varying diagnostic categorization but an occasional entry of a psychosis were excluded. For the purposes of this analysis, included in the definition of schizophrenic disorders were schizophrenia, schizoaffective disorder, and delusional disorders. Affective psychosis, brief psychosis, drug-induced psychosis, and nonspecific psychosis were added to make up a general psychosis category.

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Table 1. Comparisons Between CSA Subjects and the General Population Comparisons: Their Rates of Contact With Public Mental Health Services and of Receiving a Psychotic or Schizophrenic Spectrum Diagnoses

Psychiatric History	Total			Males			Females		
	Controls (n=2677)	Cases (n=2759)		Controls (n=622)	Cases (n=558)		Controls (n=2055)	Cases (n=2201)	
	No. (%)	No. (%)	OR (95% CI)	No. (%)	No. (%)	OR (95% CI)	No. (%)	No. (%)	OR (95% CI)
Service contact	206 (7.7)	698 (25.3)	4.1 (3.4-4.8)[a]	55 (8.8)	165 (29.6)	4.3 (3.1-6.0)[a]	151 (7.3)	533 (24.2)	4.0 (3.3-4.9)[a]
Schizophrenia	20 (0.7)	53 (1.9)	2.6 (1.6-4.4)[a]	8 (1.3)	12 (2.2)	1.7 (0.7-4.1)	12 (0.6)	41 (1.9)	3.2 (1.7-5.9)[a]
Other psychosis	17 (0.6)	25 (0.9)	1.4 (0.8-2.7)	2 (0.3)	9 (1.6)	5.1 (1.3-20.2)[b]	15 (0.7)	16 (0.7)	1 [Reference]
All psychosis	37 (1.4)	78 (2.8)	2.1 (1.4-3.1)[a]	10 (1.6)	21 (3.7)	2.3 (1.1-4.9)[b]	27 (1.3)	57 (2.6)	2.0 (1.3-3.2)[c]

Abbreviations: CI, confidence interval; CSA, child sexual abuse; OR, odds ratio.
[a] $P<.001$.
[b] $P<.05$.
[c] $P<.01$.

STATISTICAL ANALYSIS

The rate and age at first diagnosis of psychotic-related diagnoses and number and duration of admissions among the study cohort were compared between the CSA subjects and the comparison group. Groups were initially compared using *t* tests and χ^2 tests of association, with univariately significant differences converted into odds ratios and 95% confidence intervals, considering a standard significance of $P=.05$ to facilitate interpretation. Multivariate logistic regression was used to determine abuse characteristics associated with psychosis. Interaction terms were fitted to the models for both sex and penetration, with differences ascertained using the ratio likelihood test.[30,31] Data analyses were undertaken using SPSS version 16 for Windows (SPSS Institute, Chicago, Illinois) and Stata version 10 (StataCorp, College Station, Texas).

ETHICS

This study involved accessing information without consent from a large number of people who had been sexually abused during childhood, as well as random citizens from the general population. Approaching the victim group for consent would have involved the researchers becoming aware that this particular person had been sexually abused, negating all confidentiality. In addition, it would have inevitably involved confronting the victim with memories, or lack of recall, of the abuse. This we believe to be unacceptable. Attempts to obtain consent from controls for access to mental health records produces a low response rate and potentially a skewed sample. We therefore approached the issues of confidentiality by a design that broke any connection between names and register data as soon as linkage had occurred. Only anonymous group data were used in the analysis and preparation of the article. This method was considered appropriate and approved by 3 independent ethics committees: the Monash University Standing Committee on Ethics in Research Involving Humans and the Human Research Ethics committees of the Department of Human Services and the Victorian Institute of Forensic Medicine.

RESULTS

SAMPLE DESCRIPTION

The CSA population comprised 2759 children, of whom 2201 (79.8%) were female. The mean (SD) age of the CSA subjects when examined following sexual abuse allegations was 10.22 (4.4) years. Almost two-thirds (1732; 63%) involved completed, partial, or attempted penetration of an orifice by a penis, finger, or object. The remaining cases (37%) were classified as nonpenetrative sexual contact. The rate of abuse involving penetration was significantly higher for females than for males (64.9% vs 55.2%; $\chi^2=18.06$; $P<.001$). The age of the CSA group at follow-up ranged from 14.56 to 57.86 years (mean [SD], 33.68 [11.05] years), with the mean (SD) age for males being 30.78 (9.26) years and females, 34.64 (11.33) years. The follow-up period ranged from 13 to 44 years (mean [SD], 23.64 [8.17] years).

ASSOCIATION BETWEEN CSA AND PSYCHOSIS

A lifetime record of contact with the public mental health services was present for 206 control subjects (7.7%) and 698 CSA subjects (25.3%) (**Table 1**). The rate of psychotic disorders was significantly higher among CSA subjects than their general peers (78 [2.8%] vs 37 [1.4%]; odds ratio, 2.12; 95% confidence interval, 1.4-3.08; $P<.001$). Among the CSA cohort, 53 (1.9%) received a diagnosis of a schizophrenic illness compared with 20 control cases (0.7%) (odds ratio, 2.6; 95% confidence interval, 1.6-4.4; $P<.001$) (Table 1). The nonschizophrenic psychotic disorders were predominantly affective (n=11), with few (n=4) drug-related psychotic reactions among CSA subjects. When only the 1737 cases involving penetration were considered, rates of subsequently being diagnosed with a psychosis increased to 3.4% and for schizophrenia, to 2.4% (**Table 2**). Child sexual abuse not involving penetration did not have a significant association with either subsequent psychosis (18 [1.7%] vs 37 [1.4%]; $P=.25$) or schizophrenia (11 [1.0%] vs 20 [0.7%]; $P=.12$) (Table 2).

When males and females were examined separately, the rates for psychosis were significantly higher in both, but only the female rates of schizophrenic disorders remained significantly elevated (Table 1). However, when only cases involving penetration were considered, both males and females had significantly elevated rates of both psychosis and schizophrenia (Table 2). No significant differences were found in the rate of schizophrenia between males and females either among CSA subjects ($P=.66$) or among comparisons ($P=.08$).

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Table 2. Comparison of Chances of CSA Subjects Developing Either Schizophrenic Disorders or Any Psychotic Disorder as Aggravating Factors Accumulate[a]

	Total		Males		Females	
	No. (%)	OR (95% CI)	No. (%)	OR (95% CI)	No. (%)	OR (95% CI)
Risk of Schizophrenia						
All CSA subjects (n=2759)	53 (1.9)	2.6 (1.6-4.4)[b]	12 (2.1)	1.7 (0.7-4.1)	41 (1.8)	3.2 (1.7-5.9)[b]
Cases without penetration (n=1022)	11 (1.0)	1.4 (0.7-2.7)	1 (0.4)	0.3 (0.1-2.3)	10 (1.2)	2.2 (0.9-4.9)
Penetration (n=1737)	42 (2.4)	3.3 (2.0-5.5)[b]	11 (3.5)	2.8 (1.2-6.8)[c]	31 (2.1)	3.8 (2.0-7.1)[b]
Penetration and >12 y (n=990)	32 (3.2)	4.4 (2.6-7.4)[b]	7 (5.5)	4.5 (1.7-11.6)[d]	25 (2.9)	5.1 (2.7-9.5)[b]
Penetration and >12 y and >1 abuser (n=58)	5 (8.6)	12.5 (3.4-45.3)[b]	2 (16)	15.4 (4.4-53.9)[b]	3 (5.6)	11.9 (4.3-32.8)[b]
Risk of Any Psychosis						
All CSA subjects (n=2759)	78 (2.8)	2.1 (1.4-3.1)[b]	21 (3.7)	2.3 (1.1-4.9)[c]	57 (2.6)	2.0 (1.3-3.2)[d]
Cases without penetration (n=1022)	18 (1.7)	1.3 (0.7-2.4)	4 (1.6)	1.0 (0.4-2.7)	14 (1.8)	1.4 (0.7-2.7)
Penetration (n=1737)	60 (3.4)	2.6 (1.7-3.9)[b]	17 (5.5)	3.6 (1.7-7.6)[d]	43 (3)	2.3 (1.4-3.7)[b]
Penetration and >12 y (n=990)	41 (4.1)	3.1 (2.0-4.8)[b]	9 (7)	4.7 (2.0-11.0)[b]	32 (3.7)	2.9 (1.8-4.8)[b]
Penetration and >12 y and >1 abuser (n=58)	10 (17.2)	14.9 (8.4-26.3)[b]	2 (16.6)	14.3 (4.4-46.1)[b]	8 (17.3)	15.8 (8.4-29.8)[b]

Abbreviations: CI, confidence interval; CSA, child sexual abuse; OR, odds ratio.
[a] Aggravating factors are abuse involving penetration, being older than 12 years when victimized, and having been abused by more than 1 perpetrator.
[b] $P<.001$.
[c] $P<.05$.
[d] $P<.01$.

THE PSYCHOSIS

On average, 15.30 years had passed following CSA subjects coming to attention and receiving a diagnosis of a schizophrenic disorder. The mean (SD) age at first receiving a diagnosis of schizophrenia among comparison cases was 30.44 (10.22) years (range, 18.49-52.84 years). The CSA subjects were younger with a mean (SD) age of 27.36 (8.95) years (range, 10.51-45.22 years). Those with schizophrenic disorders among CSA subjects and comparisons were equally likely to be admitted to the hospital (82.6% vs 80%), and no differences emerged for mean age at first admission (29.44 vs 30.11 years; $P=.84$). The total number of hospital admissions ranged up to 36 among the schizophrenic CSA cohort relative to 14 among the schizophrenic comparison cohort, but there was no difference in the mean number of admissions (4.58 vs 3.5; $P=.47$). The total length of admissions ranged up to 2343.59 days (mean [SD], 121.156 [347.331] days) among CSA subjects with schizophrenia, compared with up to 262.64 days (mean [SD], 62.156 [75.426] days) among subjects in the general population with schizophrenia; however, the mean lengths of stay were not statistically different.

SEXUAL ABUSE VARIABLES

The mean (SD) age at abuse for those who later developed schizophrenia was 12.27 (3.81) years, which was significantly older than those victims who did not develop schizophrenia (mean [SD], 10.18 [4.45] years; $t=3.40$; $P<.001$). Victims, both male and female, older than 12 years who were subjected to CSA involving penetration were particularly vulnerable to later psychotic developments (41 [4.1%] vs 37 [1.4%]), including the schizophrenias (32 [3.2%] vs 20 [0.7%]) (Table 2). There were no significant interaction effects between CSA and sex and psychosis ($\chi^2=0.16$; $P=.69$) and sex, penetration, and psychosis ($\chi^2=1.50$; $P=.22$). There were 109 victims abused by more than 1 offender. This group contained 6 cases (5.5%) of schizophrenia, which was significantly higher than those abused by a single offender (odds ratio, 4.05; 95% confidence interval, 1.63-10.05; $P<.001$). After controlling for penetration and number of offenders, for every 1-year increase in age, victims were 1.11 (95% confidence interval, 1.01-1.22; $P=.04$) times more likely to develop schizophrenia. When age at abuse and penetration were controlled for, those assaulted by more than 1 offender were 2.92 (95% confidence interval, 1.13-7.34; $P<.05$) times more likely to develop schizophrenia. The combined effect of penetrative abuse occurring at age 12 years or later increased the risks of subsequent psychosis 4-fold (Table 2). The combination of penetration, being older than 12 years, and having more than 1 abuser resulted in a 15-fold increase in risk of psychosis to rates in excess of 17% (Table 2).

COMMENT

This study establishes a clear statistical relationship between CSA and an increased rate of psychotic disorders, including schizophrenic syndromes, in later life. Child sexual abuse emerges as a robust risk factor for the development of these disorders in cases where the abuse has involved penetration. The risks of subsequently developing a schizophrenic syndrome were greatest in victims subjected to penetrative abuse in the peripubertal and postpubertal years from 12 to 16 years and among those abused by more than 1 perpetrator. Children raped in early adolescence by more than 1 perpetrator had a risk of developing psychotic syndromes 15 times greater than for the general population.

These results contradict a previous study by our group.[5] The differences reflect the use in the study of a larger sample, a longer follow-up period, and a match com-

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parison design. These methodological improvements both increased ascertainment and provided a more appropriate comparison population.

The methods used have advantages and disadvantages. A large sample of CSA victims whose abuse had been ascertained not only by police and child welfare inquiries, but for penetrative abuse by medical examination, enabled associations with low-prevalence disorders to be explored uncontaminated by problems of selective recall and postdisorder reconstructions. The method of ascertaining schizophrenia and other psychosis depended on diagnoses of practicing clinicians rather than standardized assessment tools. We excluded drug-induced psychosis from the schizophrenic group but did include it in the overarching psychosis group. The established association between CSA and substance abuse provides a potential explanation for this particular group. The use of a comparison group matched on sex and age groupings in whom an identical process of ascertainment of schizophrenic illness was used reduces, but does not remove, all the potential problems in comparing the 2 groups. There was no way to exclude in the region of 5% of subjects among the comparison group who are likely to have experienced CSA involving penetration.[1] This introduces a bias against finding a difference between CSA subjects and nonabused peers. Another bias against finding a positive association is the loss of mental health data for the CSA subjects. They may have either moved out of the state or changed their names between childhood and adult life as a result, for example, of their mothers moving to new relationships or their own marriage. This does not apply to the controls, whose names were obtained at much the same time as the data linkage occurred. The use of clinician diagnosis rather than interviewer-applied research criteria might have increased the risk of severe posttraumatic syndromes being mislabeled as schizophrenia. Some reassurance is provided by the pattern of illness being similar in cases and peers from the general population for age at onset, chances and length of hospitalizations, and chronicity. Any tendency by clinicians to misdiagnose posttraumatic syndromes as psychosis could have been balanced, or even outnumbered, by missing an underlying psychotic process by focusing on the feature of borderline and antisocial traits, substance abuse disorders, and posttraumatic stress disorder, which were diagnosed at significantly higher rates in this CSA cohort.[10] Given the biases against finding significant differences between cases and comparisons, the correlations reported between CSA and subsequent psychosis are likely to be underestimates of the actual relationship.

One problem with the methods is that, though powerful for establishing whether CSA is a risk factor for subsequent mental disorders, they have limited powers in elucidating why there is that statistical relationship and whether such factors could reflect a causal connection. Another limitation is that the study population is not a random sample of CSA victims but one selected by contact with police and child protection services. They represent a small and potentially atypical subsample of all CSA victims. They are more likely than the comparison group to come from the type of disrupted and dysfunctional families that attract the particular attention of such services. Coexisting physical and emotional abuse would have been commonplace, as were histories of disorganized and disadvantaged childhoods. Information on the mental health of carers was limited. The type of information available in population and birth cohort studies on cases and comparisons that allows account to be taken of such potentially confounding variables was not available in this study. The possibility that CSA was simply acting as a marker for social deprivation in a particularly disadvantaged group rather than as a specific trauma cannot therefore be excluded.

The information available on the nature of the CSA was in contrast more detailed and reliable than that usually available from population and clinical studies. There are, however, limitations. Perhaps the most significant is that the age at which the abuse was ascertained is used in our analysis, not the age when the abuse began. Though in most cases they are likely to be proximate, this will not always be so, leaving a degree of doubt over the associations we report between age at abuse and outcome. The association with penetrative abuse but not with less intrusive forms of CSA is important because it indicates that not all CSA is a risk factor for later psychotic disorders. The greater impact of CSA on pubertal and postpubertal children is open to various interpretations. It could bolster an argument that because abuse variables appear to modulate the outcome in terms of psychosis then CSA must have some causal role. Conversely, the preponderance of adolescent rape victims could support the hypothesis that the prodromal features of a developing schizophrenic process leave these children less able to protect themselves from predatory peers and adults. Another possibility is that CSA may be particularly damaging when it occurs to a child at this critical stage of sexual and social development. The older victim's ability to understand the nature and implications of the abuse may further compound the trauma.

This study establishes that severe and intrusive forms of CSA are a risk factor for developing in later life psychotic illness, including schizophrenic disorders. This does not necessarily translate into CSA increasing the risk of developing a psychotic illness. A risk factor is a statistical association but to increase a risk assumes a causal connection. This semantic confusion currently bedevils the interpretation of much risk factor research. Many of us are guilty on occasion of making the unthinking transition from an established statistical association in the form of a risk factor to the language of causality. The cohort of CSA subjects studied had all come to official notice. They are the visible tip of the CSA iceberg who may differ from the hidden majority on a range of social, economic, and personal variables. This study cannot distinguish between CSA being a risk factor for psychosis because of a causal relationship in either direction or because it acts as a marker for a range of family and social disadvantage. That question must await further studies.

Establishing that severe CSA is a risk factor for schizophrenia does have important clinical implications irrespective of questions of causality and irrespective of whether those whose abuse is revealed are typical. Children who come to attention following CSA involving pen-

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etration, particularly in the peripubertal and postpubertal period, should receive ongoing clinical and social support in the knowledge that they are at greater risk of developing a psychotic illness. Such treatment in our opinion should focus on improving their current functioning and adaptation to the demands of the transition from adolescent to adult roles rather than primarily on the abuse experience itself. Such an approach should benefit all victims, irrespective of whether they have the potential to develop a psychotic illness. For those who, despite help, do develop psychosis, then early identification and intervention will be more immediately available. The evidence for early intervention in schizophrenia is accumulating; what is lacking are well-established risk factors that enable a more effective focus on at-risk populations. This study establishes one such risk factor.

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