Childhood Sexual Abuse and Suicidal Behavior: A Meta-analysis

BACKGROUND AND OBJECTIVE: Self-inflicted injuries are one of the major causes of disease burden and death globally. Understanding the extent to which this is associated with childhood sexual abuse (CSA) exposure can help inform prevention strategies. We aimed to quantify to what extent CSA was associated with incident suicide attempts in men and women.

METHODS: We searched 20 health and social science databases from first record until February 2009 and updated the search in Medline from February 2009 to February 1, 2013. Longitudinal studies and cotwin analyses from twin studies in any population from any year were eligible for inclusion. Of 22,235 abstracts screened as part of a series of reviews, 9 studies met the inclusion criteria for this review. Characteristics, effect estimates, and quality data were extracted. Random-effects meta-analysis was used to generate pooled odds ratios (ORs).

RESULTS: Seven longitudinal and 2 twin studies with 8,733 participants met the inclusion criteria. The overall pooled estimate for longitudinal studies was OR = 2.43 (95% confidence interval: 1.94–3.05), I² = 87.5%, P < .0001. The pooled OR from cotwin analysis was 2.65 (95% confidence interval: 0.82–4.49, I² = 0%, P = .867). Studies adjusted for a range of confounders, but baseline suicidal behavior was not well-controlled. Too few studies met the inclusion criteria to quantitatively examine sources of heterogeneity.

CONCLUSIONS: CSA exposure is associated with suicide attempts when a range of different confounders are controlled for, but the temporality of the association is not well established, and the association is highly heterogeneous. Pediatrics 2014;133:e1331–e1344
Self-inflicted injuries were responsible for 4.8% of all deaths in women and 5.7% of deaths in men aged 15 to 49 years in 2010, and rank as one of the top 20 contributors to disease burden globally. Childhood sexual abuse (CSA) is a well-known risk factor for suicidal behaviors and is prevalent in every region of the world, with various reviews finding up to ~20% of women and 8% of men reporting experience of CSA. Although suicidal behaviors are heritable, environmental factors are also important. It is thought that CSA exposure could increase risk of suicide via the physical and psychological effects of exposure to traumatic stress. In addition to immediate physical effects, evidence suggests that over the longer term, exposure to trauma may alter stress response systems and cognitions around how to cope with subsequent stress and traumatic events. Studies have revealed that CSA experience increases risk of postraumatic stress disorder and major depressive disorder, both of which carry important. It is thought that CSA exposure could increase risk of suicide via the physical and psychological effects of exposure to traumatic stress. In addition to immediate physical effects, evidence suggests that over the longer term, exposure to trauma may alter stress response systems and cognitions around how to cope with subsequent stress and traumatic events.

Several recent systematic “reviews of reviews” have highlighted serious limitations in existing systematic reviews and meta-analyses on CSA and suicidal outcomes. No reviews critically examine whether primary studies adequately control for key confounders to rule out spurious longitudinal associations, and do not consider whether analyses adequately establish the temporal order of events. Usually twin studies provide the best means of examining the independent contributions of specific early life environmental exposures, while controlling for genetic contributions and other childhood adversities. Twin studies examining CSA exposure and the development of major depressive disorders provide general support for the traumatic stress pathway and specific contributions of CSA to mental illness, but to our knowledge no systematic reviews have included cotwin analyses examining CSA and suicide. As part of the Expert Working Group on Violence, for the Global Burden Disease Study 2010, we conducted a systematic review and meta-analysis to examine (1) the magnitude of the association between women’s and men’s experience of CSA and incident suicidal behavior; (2) the consistency of association; and (3) whether confounders were adequately controlled.

METHODS

Searches and Screening

We searched 20 health and social science databases from first record to February 2009. We then updated the search in Medline until February 1, 2013. The first search was conducted as part of a larger set of systematic reviews on topics besides CSA and suicidality, and returned 21,600 records; the update search returned 635 records. The records were initially screened in each case by 1 reviewer. In the original search, full text articles were obtained and initially screened by 1 reviewer, and obviously irrelevant articles were removed. Full-text articles were then formally assessed for inclusion by 2 reviewers. For the update, Dr Devries performed all steps. This process is described in Fig 1. A list of databases and an example search strategy are in Appendix 1.

Inclusion Criteria

Longitudinal and twin studies were eligible for inclusion. For this review, we defined longitudinal studies as any which followed the same participants over time and provided measurement of exposure to CSA or suicide attempts at least 2 time points at least, or measured completed suicides. Studies that used data from cohorts but performed cross-sectional analyses were excluded. Case-control designs were eligible if they provided longitudinal measurements. If twin studies were cross-sectional (that is, assessed exposure and outcome at the same wave), only cotwin analyses were included. All author definitions of CSA were accepted. All measures of suicide attempts or completed suicides were accepted, but studies focusing on suicidal thoughts or plans were excluded. Both male and female populations were included.

Screening and Data Extraction

For the original search, abstracts were screened by 1 reviewer; full text articles...
were appraised by Ms Mak, Ms Child, Ms Falder, or Dr Bacchus and reappraised by Dr Devries. Information about study population, exposure and outcome definitions, length of follow-up, effect estimates and uncertainty, analysis and control for confounding, and study quality were extracted by Ms Mak, Ms Child, Ms Falder, or Dr Bacchus and checked by Dr Devries. For the update, all steps were performed by Dr Devries.

Quality Assessment

The quality of each effect estimate was appraised. Opinions differ about whether self-reported versus officially substantiated cases of CSA provide better measures of exposure. We considered whether CSA exposure was measured by using self-reports of experience of a list of specific acts, as third party reports underestimate CSA prevalence compared with retrospective self-reports. Although test–retest reliability of CSA reports is only moderate, recent analysis of cohort data suggest that measurement errors in self-reported data did not affect validity of results. For ethical reasons, prospective studies measuring incident CSA experience are extremely rare (because in most countries receiving a report would necessitate intervention), so we documented the period of exposure to CSA and the age at which CSA exposure was assessed.

Information on suicide outcomes was appraised. Because individuals may attempt suicide >1 time, even if suicide attempts are incident over the study period, they still may be a continuation of previous suicidal behavior. For completed suicides, it is clear that they are incident to CSA, but again not necessarily to the onset of suicidal behavior. We documented the period over which suicide attempts were measured, the age at which this was assessed, if suicide attempts were incident over the study period, and whether baseline suicidal behavior was controlled.

We extracted information about length of follow-up, attrition rates, and whether studies adjusted for baseline suicidal behavior, other abuse and traumatic events in childhood and adulthood, and other mental disorders. The causal pathways involved are complex, and there is debate over whether some factors are confounders or mediators, so we did not define a minimum set of confounders. Instead we recorded whether key variables were adjusted for and examined results in light of these.

Analysis

All analyses were conducted by using Stata 12.0 (Stata Corp, College Station, TX). Study characteristics and quality are described. We used a random-effects meta-analysis to produce a pooled estimate of effect. Higgins’ I² was used as measure of heterogeneity, with values of $P < .10$ taken to indicate significant heterogeneity. All studies revealed binary measures of both CSA experiences and suicide outcomes; where odds ratios (ORs) were not provided as a measure of effect, we calculated these so all studies could be included in the meta-analyses. Only 1 estimate per study was included in the meta-analysis; where >1 was reported, we selected the estimate least prone to bias as described above in the quality assessment section. Publication bias was assessed visually by using a contour funnel plot.

We computed population attributable risk (PAR) under various scenarios of prevalence and strength of association by using the formula:

\[
PAR = \frac{P(\text{RR} - 1)}{1 + P(\text{RR} - 1)}
\]

where $P$ is the prevalence of CSA and $\text{RR}$ is the relative risk of suicidal behavior in those exposed versus unexposed to CSA. We used the formula of Zhang and Yu to convert our OR to a relative risk:

\[
\text{RR} = \frac{\text{OR}}{(1 - P_0) + P_0\text{OR}}
\]

where $\text{OR}$ is the odds of suicidal behavior in those exposed to CSA versus not, and $P_0$ is the prevalence of suicidal behavior in the group not exposed to CSA. All PAR calculations assume that the relationship between CSA exposure and suicide outcomes is causal.

RESULTS

Characteristics of Studies

Nine studies with 8733 participants (plus 1 record linkage study that included 12 810 754 people, the whole population of Victoria, Australia) met...
the inclusion criteria. Seven were cohort studies and 2 were twin studies. One cohort was from the United States,1 was from Canada,3 one was from New Zealand,4 were from Australia including the 2 twin studies, and one was from Switzerland, and one was from the Netherlands.37 Three of the studies provided 3 estimates for women, 2 studies provided 2 estimates for men, and 6 studies provided 12 relevant estimates for samples with both male and female samples combined. There was no suggestion of publication bias (Appendix 2).

Quality of Cohort Studies
Sample sizes ranged from 102 to 4848 participants, plus the 12,810,754 participant study from Australia.29 All of the studies followed participants prospectively, except for the large record linkage study from Australia.29 Follow-up times ranged from 3 to 44 years, median 18 years (interquartile range: 10–25 years). The studies had between 3 and 5 waves of data collection. Attrition rates ranged from 5% to 46.5% over the period of data collection, median 31.5% (interquartile range: 21%–44%).

The 2 Australian cohort studies29,33 that included completed suicide as an outcome both used coroner records to verify deaths; the remainder of the studies used suicide attempts as an outcome. One study used scales to measure a range of suicidal behaviors (Suicidal Intent Scale31), the remainder used a single question,29 or did not describe the specific questions used.32,37 All studies measured suicide attempts as a binary variable; some studies also included measures of repeat attempts or attempts over specific age intervals.31,32 Only 1 study assessed suicide attempts starting in childhood; the remainder first asked participants at ages 18 or older.

The large record linkage study29 relied exclusively on hospital or service records to code sexual abuse cases; the Plunkett et al study recruited cases from a hospital unit for the treatment of CSA but also employed a self-report questionnaire. The remaining 5 studies used self-reported measures to assess CSA experience. Fergusson et al employed a comprehensive measure based on a range of specific acts ranging from exposure to unwanted penetration; Brezo et al used the “childhood sexual abuse scale,” which is based on measures of experiencing specific acts of fondling and vaginal, anal, or oral intercourse; the other 3 studies employed a single question or set of several questions asking about unwanted or forced sexual contact or touching.30,36,37 Studies used different periods of assessment for CSA exposure; 1 study included abuse to age 15,29 2 studies to age 16,32,37 3 to age 18,31,34 1 did not define childhood,36 and 1 did not specify.29 Two studies revealed restricting their definition of perpetrator to include “older perpetrators” only30,34; the remainder did not restrict the perpetrator or did not report doing so.

Three studies provided unadjusted estimates,29,33,36 and Brezo et al adjusted for disruptive behavior only. The other 3 studies controlled for a range of factors, including mental health difficulties or comorbidities, or for a range of parental variables indicative of an unsupportive early home environment and later adjustment difficulties (low attachment, low maternal self-esteem, low parental involvement, parental drug use, and so on).30,32 Only 2 studies31,37 attempted to fully address baseline levels of suicidal behavior; to ensure that participants with incident suicide attempts did not have a history of suicidal behavior. Brezo et al report separate estimates for association of CSA (defined in their sample as occurring before age 18) with “late onset suicidal behavior” (after age 18), and find statistically significant, positive associations between CSA and attempts for both young women and men. Enns et al specifically excluded participants with suicidal attempts or ideation at baseline; however, because of the time period of CSA measurement specified, the authors note that this drastically reduced their sample size and that they likely excluded a large number of participants who had still experienced CSA preceding an earlier suicide attempt. They note that 35% of their sample was excluded, and after redoing analysis posthoc to include these participants, there was a statistically significant positive association between CSA and suicide attempts (however, in the new analysis, it may be that some CSAs occurred after suicide attempts). Fergusson et al use incident attempts over specific age intervals after CSA would have occurred, but they do not report controlling for baseline levels of suicidal ideation or behaviors or excluding those with previous suicide attempts. Brown et al also do not control for baseline levels of suicidal behaviors or exclude those with previous suicide attempts.

Summary Estimates From Longitudinal Data
The overall pooled estimate for all studies was OR = 2.43 (95% confidence interval [CI]: 1.94–3.05; Fig 2). There was high heterogeneity, I² = 87.5%, P < .0001. Estimates for men, women, and both genders combined were not significantly different. Removing Cutajar, the large registry study that had completed suicides as an outcome, did not substantially alter heterogeneity estimates (after removal, I² = 67.9%, P = .005). Despite heterogeneity around the value of association, all estimates were in the direction of increased risk of suicide outcomes except one, which likely overadjusted for baseline suicidal behavior.
Twin Studies

Two twin studies from different cohorts of the Australian Twin Registry met the inclusion criteria. These studies measured CSA and suicide attempts retrospectively at the same wave of data collection. One used 1 item to assess CSA exposure, the other used a measure of CSA that included items based on specific acts. Both studies revealed a positive association between CSA exposure and suicide attempts; however, both had relatively small sample sizes, and only 1 reached statistical significance. The pooled OR for this association was 2.65 (95% CI: 0.82–4.49, \( \tau^2 = 0\% \), \( P = .867 \)).

Population Attributable Risk

Assuming the relationship between CSA and suicidal behavior is causal and unconfounded, calculations suggest that between 20.1% and 22.3% of suicidal behavior in women could be attributed to CSA exposure (Table 2). In men, between 9.6% and 10.8% of suicidal behavior could be attributed to CSA exposure.

DISCUSSION

Longitudinal studies reveal evidence of an association between CSA exposure and incident suicide attempts or completed suicides, but high levels of heterogeneity in the magnitude of the association. Studies have not comprehensively controlled for key confounders, including baseline levels of suicidal behavior, which means the temporality of the association is not well-established. However, a twin study has revealed an association between CSA and suicide attempts in CSA-discordant twin pairs, providing strong evidence for an effect of CSA controlling for both genetic and early family environmental factors. Too few longitudinal studies examined effects separately by sex to determine if the odds of association differ.

Strengths and Limitations

We searched global literature in multiple languages, but due to the large volume of search results generated, we were unable to employ double-screening of abstracts, and for our update search, double data extraction. We also did not contact study authors for further information. Based on our initial search experiences, we decided to update the search in Medline because all initially relevant studies were indexed there. The main limitations of this review are related to the limitations of the included studies. The main
limitations of included longitudinal studies relate to lack of comprehensive control for confounding, and in particular, lack of control for baseline suicidal behaviors. However, it is important to note that there were no clear differences in the magnitude of association, and generally a positive direction of association regardless of which key confounders were controlled for in analyses, so it is likely that the relationship between CSA and suicidal outcomes is not entirely accounted for by shared risk factors. Although it seems probable that in most cases, CSA exposure will precede suicide attempts, suicide attempts among adolescents are not rare. A review of cross-sectional studies of US adolescents aged 12 to 18 revealed that up to one-quarter of female adolescents reported a suicide attempt. Only Brezo et al. fully measured incident attempts and controlled for baseline levels of suicidal behavior: they used the Diagnostic Interview Schedule (DISC) to identify adolescents reporting a suicide attempt, and controlled for the presence of comorbidities.

Similarly, most studies measured CSA experiences in these adolescents, but not in all cases. CSA exposure was defined to have occurred before age 18 by 14% to 32% of adolescents, and the definition of CSA exposure varied across studies. Some studies only considered CSA experiences occurring before age 15 or 16, while others included experiences occurring up to age 18. We know that adolescent dating violence is common, reported across both high and lower income settings, but it is much more common in lower income settings and is reported at higher rates in lower income settings. Consequently, the prevalence of CSA is higher among children from lower income settings, and the impact on mental health is greater. In particular, younger children are more vulnerable to the effects of CSA due to their developing brain and longer exposure to CSA.

TABLE 1 Quality of Included Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>CSA Measure</th>
<th>Period of CSA Exposure, Age in Years</th>
<th>Further Restriction of CSA Exposure, Definition</th>
<th>Age at CSA Ascertainment, y</th>
<th>Suicide Attempts Measure</th>
<th>Period of Suicide Attempts, Age in Years</th>
<th>Age at Suicide Ascertainment</th>
<th>Length of Follow-up, y</th>
<th>Waves of Data Collection</th>
<th>Attributed at Last Wave in Analysis</th>
<th>Baseline Suicidal Behavior</th>
<th>Early Family Environment</th>
<th>Disruptive Behavior</th>
<th>Other Abuse/Trauma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brezo et al 31</td>
<td>Y</td>
<td>0–18</td>
<td>N</td>
<td>18</td>
<td>DISC-2</td>
<td>0–18</td>
<td>18</td>
<td>3</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Brown et al 30</td>
<td>N</td>
<td>0–18</td>
<td>Y</td>
<td>17</td>
<td>DISC</td>
<td>18+</td>
<td>27</td>
<td>17</td>
<td>4</td>
<td>—</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Cutajar et al 29</td>
<td>N</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Death record</td>
<td>—</td>
<td>36</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Dinwiddie et al 35</td>
<td>N</td>
<td>0–18</td>
<td>N</td>
<td>Adult</td>
<td>SSAGA</td>
<td>—</td>
<td>18+</td>
<td>3</td>
<td>3</td>
<td>31.5%</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Enns et al 27</td>
<td>N</td>
<td>0–16</td>
<td>N</td>
<td>18+</td>
<td>1 item</td>
<td>18+</td>
<td>3</td>
<td>10</td>
<td>5</td>
<td>—</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Ernst et al 36</td>
<td>N</td>
<td>Child or adolescent</td>
<td>—</td>
<td>—</td>
<td>29</td>
<td>SPIKE</td>
<td>20–29</td>
<td>20–29</td>
<td>10</td>
<td>5</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Ferguson et al 32</td>
<td>N</td>
<td>0–16</td>
<td>Y</td>
<td>18</td>
<td>1 item</td>
<td>18–25</td>
<td>18–25</td>
<td>7</td>
<td>3</td>
<td>20%</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Nelson et al 34</td>
<td>Y</td>
<td>0–18</td>
<td>Y</td>
<td>30</td>
<td>SSAGA</td>
<td>—</td>
<td>30</td>
<td>1</td>
<td>1 NA</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Plunkett et al 33</td>
<td>N</td>
<td>0–15</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>15–24</td>
<td>15–24</td>
<td>9</td>
<td>—</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

— denotes not reported or unclear from report; DISC, Diagnostic Interview Schedule-Children; N, no; NA, not applicable; SIS, Suicidal Intent Scale; SSAGA, Semi-Structured Assessment for the Genetics of Alcoholism; SPIKE, Structured Diagnostic Interview for Psychopathologic and Somatic Syndromes; Y, yes.
dating violence, yet studies reveal that who the perpetrator is affects the subsequent likelihood of suicide attempts.³¹

Other mental disorders were not well controlled for; yet a review of research in family studies indicates important associations with suicidal behavior.⁴⁰ Relationships between CSA, suicide attempts, and other mental disorders are likely to be complex, and CSA exposure could give rise to multiple disorders, which could be on the causal pathway between CSA exposure and suicide attempts. Conversely, other mental disorders could arise from causes unrelated to CSA, which would make it important to adjust for them in analyses. Only 2 studies in this review revealed exploring the effects of adjusting for any other psychiatric comorbidities,³¹,³⁷ and none for major depression. Approximately two-thirds of patients with suicide attempts have received a diagnosis of major depressive disorder (MDD) at the time of the attempt,⁴¹ and MDD onset in 1 representative cohort study peaks in adolescence between age 15 and 18,⁴² making this an important variable to explore. However, some research also indicates that depression may be less important in the etiology of early suicide attempts. “Impulsivity, aggression, and novelty seeking” phenotypes are related to earlier completed suicide attempts; conversely, “neuroticism,” which is associated with depression and anxiety, is thought to be a more important explanatory factor in completed suicides for persons of older ages.⁴⁰ In our review, Brezo et al³⁷ did control for disruptive behavior and still found an independent effect of CSA exposure on suicide attempts; Enns et al³⁷ controlled for psychiatric comorbidities; however, other studies did not.

Experiences of childhood trauma are correlated. Children who experience CSA are also more likely to report physical abuse, neglect, and other adversities such as having a parent with a mental illness.⁴³ Cross-sectional³⁸ and retrospective cohort studies⁴⁵ indicate a dose-response relationship between the number of childhood adversities experienced and increased risk of adverse psychosocial outcomes. In our review, Fergusson et al³² adjusted for other childhood trauma and found CSA was an increased risk of suicide attempts; Enns et al³⁷ also adjusted for “other adversities” but likely overcontrolled for baseline suicidal behaviors. Both of these estimates were lower than most other studies that did not adjust for other forms of child adversity, but there were too few studies to make a quantitative assessment of this as a source of heterogeneity. Experience of childhood trauma and CSA are also associated with increased risk of adult experiences of intimate partner violence and other forms of assault;¹⁴ however, these may be on the causal pathway between CSA experience and eventual suicide attempts. In our review, no studies adjusted for adult experiences of violence.

Considering family environment and genetic factors, 1 twin study that met the inclusion criteria provided strong evidence from a cotwin analysis, accounting for shared early family environment and genetic factors. Brown et al,⁵⁰ Fergusson et al,³² and Nelson et al³⁴ did control for some early life factors, but there was no clear difference in the magnitude of the association.

**Comparison With Other Studies**

Our results are consistent with results of other reviews, in that all revealed evidence of an association between CSA and increased risk of suicide attempts or ideations.¹⁹,⁴⁵ A more recent review of cross-sectional data from student samples that examined sex differences in suicide attempts also revealed an increased odds of suicide in both young men and women who had experienced CSA.¹⁴ In all cases, they found that CSA was more common in female populations within studies, but that the odds of association between CSA experience and suicide attempts were higher in male populations. We found only 2 longitudinal studies that performed analyses separately for male and female samples: 1 study examining suicide attempts as an outcome also revealed a higher OR in males versus females; the other record linkage study revealed higher odds of completed suicides in females versus males. Although both analyses were subject to various biases, it could be that the gender differences observed in studies of CSA and suicide attempts do not generalize to the relationship between CSA and completed suicides.

Those who complete suicide may differ in important ways from those who attempt. Only approximately one-third of those who complete suicide have a previous attempt recorded.⁴⁶ One

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**TABLE 2 Population Attributable Risk**

<table>
<thead>
<tr>
<th></th>
<th>Higher RR PAR, %</th>
<th>Lower RR PAR, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSA prevalence (19.7%)²</td>
<td>22.3</td>
<td>20.1</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSA prevalence (7.9%)²</td>
<td>10.8</td>
<td>9.6</td>
</tr>
</tbody>
</table>

RR, relative risk. Prevalence estimates for CSA exposure before age 18 taken from a recent meta-analysis;² higher and lower RR taken from pooled estimates for twin and longitudinal studies in this review. We did not use pooled estimates for men and women as these were based on only 2 studies and were not statistically different from the overall estimate. Average prevalence in the non-exposed groups was calculated based on data from studies reporting RR,²⁰,³⁰,³³,³⁵
study revealed those who completed were more likely to have been intoxicated with alcohol or drugs, and others have revealed that certain affective psychiatric comorbidities such as anxiety disorders are more common among those who attempt suicide rather than those who completed suicide. We had too few studies to make an analysis stratified by completed versus attempted suicides meaningful, but further research may reveal that exposure to CSA effect completed and attempted suicides differently.

Implications for Prevention
Although it is clear that CSA is associated with suicide attempts and completed suicides, further research is needed in several areas. One, the type of violence captured by most measures is likely to include a substantial amount of dating violence, that is, violence perpetrated by peers in romantic relationships. This form of violence is common in adolescent populations, and strategies to prevent this form of violence may be different from strategies to prevent sexual abuse by other types of perpetrators.

It is clear that both young women and men who are experience CSA are at increased risk of suicidal outcomes. PAR calculations underline that CSA exposure may be a major contributor to suicidal behavior in both male and female populations. At a population level, the prevalence of CSA is much higher among women that disease burden of suicide caused by CSA is likely to be higher in females; however, at the individual level, it may be that young men who have experienced CSA need increased attention to avoid suicidal outcomes.

CONCLUSIONS
CSA is associated with increased odds of incident suicide attempts and after controlling for genetic risk factors, early family environment and other risk factors. Prevention strategies that take into account who perpetrates violence against children are needed, and interventions for suicidal patients must be sensitive to histories of violence.

ACKNOWLEDGMENTS
We thank Claudia Garcia Moreno, Christina Pallitto, Naeemah Abrahams, Max Petzold, and anonymous reviewers for helpful comments.

REFERENCES
### APPENDIX 1 Detailed Characteristics of Included Studies

<table>
<thead>
<tr>
<th>Data Source</th>
<th>CSA Measure</th>
<th>Suicide Measure</th>
<th>Association</th>
<th>Covariates</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brezo et al 2008 (^{31})</td>
<td>Assessed at wave 3 by using childhood sexual abuse scale. Measures sexual violence before age 18, used items fondling or sexual intercourse, vaginal, anal, oral, any perpetrator.</td>
<td>Wave 2: DISC-2</td>
<td>Men: Single attempt: aOR = 6.8 (2.0–23.3)</td>
<td>Disruptive behavior</td>
<td>Large cohort but high attrition (44% lost to follow-up), multiple waves of data collection, validated measures of both CSA and suicide attempts. CSA measure is any time before age 18 (use late onset only for meta-analysis), we know attempt occurred after CSA.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wave 3: Suicidal intent scale, 20 items; “Have you already attempted suicide?” and number of attempts. Early onset: attempt before age 18 Late onset: attempt after age 18</td>
<td>Repeated attempt aOR = 3.7 (1.5–9.5) Early onset aOR = NA, n = 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Late onset aOR = 8.2 (2.3–28.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown et al 1999 (^{30})</td>
<td>CSA from records of child protection agency or self-report in 1992 (when aged 17), “Did any older person (not an boy/girlfriend) ever touch them or play with them sexually or force them to touch the older person before age 18?” “Sexual abuse was considered to have been experienced when 2 or more such experiences were reported.”</td>
<td>DISC, DSMIII criteria for diagnoses Suicide attempt questions not described.</td>
<td>Women: Single attempt: aOR = 1.5 (0.8–3.0) Repeated attempt aOR = 3.3 (1.4–7.9) Early onset aOR = 1.7 (0.8–3.5) late onset aOR = 2.8 (1.2–5.9) Any suicide attempt</td>
<td>Gender, ethnicity, IQ, difficult childhood temperament, low maternal education, low maternal self-esteem, maternal alienation, anger, dissatisfaction, external locus of control, sociopathy, serious maternal illness, low maternal and parental involvement, low parental warmth, low religious participation, teenage mother when youth was born, single parenthood, welfare support, low family income, large family size, poor marital quality.</td>
<td>Not clear if suicide is onset at young adult age, and whether this occurred after the CSA measurement. Not controlled for baseline suicide attempts.</td>
</tr>
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<td>Any suicide attempt</td>
<td>OR = 5.71 (1.94–16.74)</td>
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<td>In adolescents: OR = 3.54 (0.90–13.88)</td>
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<td>In young adults: OR = 6.15 (1.48–25.81)</td>
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<td>Repeated suicide attempts OR = 8.40 (1.86–38.06)</td>
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<td>In adolescents: OR = 15.76 (2.14–116.65)</td>
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<td>In young adults: OR = 3.34 (0.30–37.37)</td>
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<td>Cutajar et al 2010 (^{39})</td>
<td>CSA cases documented between 1984 and 1995 by Victorian Institute of Forensic Medicine (provides forensic examination for all of Victoria).</td>
<td>Deaths from 1991 to 2008 certified by coroner’s office in Victoria state to “have resulted from the deliberate action of the deceased to end his or her own life.”</td>
<td>Female: RR = 40.38 (24.97–65.31); 6 of 2201 CSA+ OR = 40.48 (14.76–88.37) Male: RR = 14.20 (4.37–40.61), 2 of 558 CSA+ OR = 14.24 (1.71–51.81)</td>
<td>Unadjusted</td>
<td>ORs were calculated. Compared risk in CSA+ from records to national population data. Deaths in Victoria only from 1991 to 2000; nationally from 2000 to 2008. Possible some earlier</td>
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<td>Data Source</td>
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<td>Covariates</td>
<td>Comments</td>
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| Dinwiddie et al 2000<sup>15</sup>    | CSA assessed with 1 item:                        | MDD, SSAGA, telephone interview; DSM-III-R criteria  | Serious suicide attempt in 107 female twins: OR = 2.33 (0.60–9.02)          | Unadjusted              | deaths outside Victoria were missed. Small sample size for cotwin analysis.
| 107 females, 25 male twins,        | “Before age 18, were you ever forced into sexual activity, including intercourse?” | Serious suicide attempt defined as an attempt where the respondent reported either a definite intent to die, or a method classified as of at least moderate lethality. | Serious suicide attempt in 107 male twins: OR = could not be computed       | Unadjusted              | Retrospective assessment of CSA and MDD at the same data collection point. |
| Australia, from Australian Twin Registry. Recruited in 1978. Separate to Nelson. Cross-sectional assessment, 1992–1993 Participation rate = 72.3% to 84.4% (for different subsamples) Attrition rate = NA |                                                                 |                                                                                       |                                                                         |                          |                                                                 |
| Enns et al 2006<sup>17</sup>        | Time of assessment not specified.                | Suicide attempts were new cases at follow-up, presumably at T3 but not specified. | In people with no baseline suicide ideation: | Age, gender, marital status, education, work status, and urbanicity, Axis I mental disorders, comorbidity, other categories of adversities. | Those with baseline suicidal ideation excluded from first analysis (resulted in exclusion of 55.5% of sexually abused respondents). May also not be appropriate to control for comorbidities. Authors checked interactions with gender and none were significant. |
| NEMESIS cohort, representative of the Netherlands. Ages 18 to 64. T1 = 1996, n = 7076 T2 = +1 y, n = 5618 T3 = +3 y, n = 4848 Participation rate = 69.7% Attrition rate = 31.5% | Before you reached the age of 16, were you ever sexually abused? | Assessed by using 1 item: “Have you ever attempted suicide?” | aOR = 0.32 (0.05–3.01) | In full sample-with or without baseline suicide ideation: aOR = 2.92 (1.36–5.03) |
| Ernst et al 1993<sup>36</sup>       | Assessed at T5 with a single item and probe: “When you were a child or adolescent, did you ever have a sexual experience that you found distressing?” Then a short narrative description of these experiences was obtained and classified. | SPIKE interview, using DSM-III-R criteria. Suicide attempts assessed in 1979–1988. | OR = 12.19 (2.36–65.19) | Unadjusted               | OR was calculated. |
| 591 male conscripts age 19 and women were first time voters age 20, Switzerland. T1 = 1978 T2 = 1979 T3 = 1981 T4 = 1986 T5 = 1988 |                                                                 |                                                                                       |                                                                          |                          | 25 CSA cases; 199 controls. Underpowered. Likely to underestimate CSA occurrence because of single item first question. Suicide attempts were incident but baseline suicidal behavior not controlled. |
### APPENDIX 1 Continued

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<tr>
<td>Ferguson et al 2008</td>
<td>CSA before age 16 reported at age 18 or 21. Fifteen items included: (a) noncontact episodes involving indecent exposure, public masturbation, or unwanted sexual propositions; (b) episodes involving sexual contact in the form of sexual fondling, genital contact, or attempts to undress the respondent; and (c) episodes involving attempted or completed vaginal, oral, or anal intercourse.</td>
<td>Assessed at age 18, 21, and 25: &quot;did you attempt suicide&quot; (over previous age interval).</td>
<td>Suicide attempts</td>
<td>Childhood physical punishment, paternal education, family standard of living, changes of parents by age 15, parental attachment at age 15, parental history of illicit drug use, IQ, gender.</td>
<td>OR was calculated. Both genders combined.</td>
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<td>Nelson et al 2002</td>
<td>CSA-assessed as yes to any condition below:</td>
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<td>1991 twins, 58.2% female from Australian Volunteer Twin Registry, born between 1964 and 1971</td>
<td>Before 18 y: “Ever forced into sexual intercourse or any other form of sexual activity?”</td>
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<td>Appears that both assessments done at the same time point, retrospectively. Participants were asked about timing of events but are subject to recall bias.</td>
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<td>Cotwin analysis:</td>
<td>Before 16 y: “Any sexual contacts between you and (a) anyone other than a family member who was 5 or more years older than you were and contact was forced?”; (b) “Any family members like a parent or step-parent, grandparent, uncle, aunt, brother or sister, or cousin, and contact was forced by child or any contact by adult?”</td>
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<td>N = 283 pairs, 41 discordant for CSA and suicide</td>
<td>Data collected between February 1996 and September 2000, mean age 29.9 y</td>
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<td>Sexual contact defined as “their touching your sexual parts, you touching their sexual parts, or sexual intercourse.”</td>
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<td>Ever raped: “Someone had sexual intercourse with you when you did not want to, by threatening you or using some degree of force.”</td>
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<tbody>
<tr>
<td>Participation rate = not reported</td>
<td>Ever sexually molested: &quot;Someone touched you or felt your genitals when you did not want them to.&quot;</td>
<td>Suicide deaths:</td>
<td></td>
<td>In sexually abused cases (cohort 1 and 2) = 179 per 100 000 person-years (95% CI: 19–267)</td>
<td>Unadjusted</td>
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<td>Attrition rate = analysis cross-sectional</td>
<td>Plunkett et al 2001, 33 cases from hospital records, controls matched on age, gender, SES recruited from schools in same geographic area</td>
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<td>Actually has completed suicides as an outcome, but small numbers and cases in cohort 1.</td>
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<td>Cohort 1: 5 y follow-up, n cases = 55, n controls = 67</td>
<td>Cohort 1: at age 15 children and parents asked about sexual abuse experiences; for those under age 15, only parents asked.</td>
<td>Searched death certificates in Australian Institute of Health and Welfare National Death Index</td>
<td>Australian national rate for 1988 through 1996 ranged from 13.8 to 18.7 per 100 000 per year.</td>
<td>Article reports on 2 cohorts, but they are at least partially overlapping, therefore including only cohort 2 with longest follow-up.</td>
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<td>Cohort 2: 9 y follow-up, n cases = 36, n controls = 66</td>
<td>Cohort 2: controls given questionnaire</td>
<td>Suicide attempt: questionnaire, item not specified, time period was in 9 y since study began.</td>
<td>Cohort 1 (5 y): RR = 4.9, 95% CI: 1.7–13.7 Cohort 2 (9 y): RR = 1.9, 95% CI: 1.2–3.0 OR = 1.3 (0.50–3.32)</td>
<td>Note the RR reported in the article appeared to have incorrect CIs.</td>
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aOR, adjusted OR; DISC, Diagnostic Interview Schedule–Children; DSM-III, Diagnostic and Statistical Manual of Mental Disorders, Third Edition; RR, relative risk; SES, socioeconomic status; SSAGA, Semi-Structured Assessment for the Genetics of Alcoholism.
APPENDIX 2
Publication bias: Contour funnel plot, all included estimates. Note that studies are missing from the left side of the plot, but over both areas of high and low statistical significance. This suggests that publication bias is not a likely cause of funnel plot asymmetry.
Childhood Sexual Abuse and Suicidal Behavior: A Meta-analysis
Karen M. Devries, Joelle Y. T. Mak, Jennifer C. Child, Gail Falder, Loraine J. Bacchus, Jill Astbury and Charlotte H. Watts
Pediatrics originally published online April 14, 2014;

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