Adversities in Childhood and Adult Psychopathology in the South Africa Stress and Health Study: Associations with First-Onset DSM-IV Disorders

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Abstract

Extensive epidemiologic research from the United States demonstrates that childhood adversities (CAs) are predictive of several psychiatric outcomes, including depression, anxiety, substance abuse, and externalizing disorders. To date, this has not been explored in a national sample of adults in South Africa. The present study examined the joint predictive effects of 11 retrospectively reported CAs on the first onset of DSM-IV disorders in the South Africa Stress and Health Study (SASH), a nationally representative sample of adults. We utilized substantively plausible regression models of joint CA effects that account for the comorbidity between individual CAs; outcomes included DSM-IV anxiety disorders, mood disorders, substance use disorders, and externalizing disorders measured with the WHO Composite International Diagnostic Interview. The results indicated that experiences of CA varied by race, and many CAs were correlated with one another. The best-fitting model for first onset of any disorder included separate indicators for each type of CA, in addition to indicator variables for the number of other CAs reported. Results disaggregated by class of disorder showed that the majority of CAs with significant odds ratios only predicted anxiety disorder. Results disaggregated by life course stage of first onset showed that significant effects of CAs can be observed at each stage of the life course. This study contributes to a growing body of research on the social determinants of mental health in South Africa. Our findings illustrate the importance of utilizing a model that accounts for the clustering and accumulation of CAs, and suggest that a variety of CAs predict onset of mental disorders, particularly anxiety disorders, at several stages of the life course.

Keywords

South Africa; childhood adversity; stress; psychopathology; DSM-IV; life course; South Africa Stress and Health Study (SASH); mental health; race

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Over the past several decades, life course epidemiology has produced a scientific basis for the connection between childhood experiences and adult health and well-being (Shonkoff, Boyce, & McEwen, 2009). Childhood exposure to favorable or adverse conditions can have profound effects on physical and mental health over time, and research suggests that many of our most common and burdensome disorders have roots in childhood experiences (Lynch & Smith, 2005). The effect of both acute and chronic family-level childhood adversities (CAs) on mental health over the life course has received substantial research attention, and epidemiologic research from the United States demonstrates that CAs predict several psychiatric outcomes, including depression, anxiety, substance abuse, and externalizing disorders (Green, McLaughlin, Berglund, Gruber, Sampson, Zaslavsky et al., 2010; Kessler, Davis, & Kendler, 1997). The psychiatric sequelae of CAs are of critical public health importance given the early age of onset and high risk of reoccurrence for many disorders (Boland, 2002), the increased risk for physical illnesses associated with psychiatric morbidity (Kibler, Joshi, & Ma, 2009), and the vast personal and societal costs (World Health Organization, 2008).

To date, there has been little research on the impact of CAs on psychiatric illness in South Africa; this is an especially important issue to investigate in South Africa, given the history of apartheid which disadvantaged the majority of South African children (Barbarin & Richter, 2001; Dawes & Donald, 1994), and the paucity of research on this topic using nationally-representative data. The harsh circumstances during apartheid created various forms of hazardous exposures, including adversities at the family-level, which were pervasive features of life for South African children (Dawes & Donald, 1994). Political and social developments since the collapse of apartheid have instilled great promise for progress in the improvement of conditions for children in South Africa; however, the AIDS epidemic (which affects approximately one in five adults) and intractable poverty has dimmed optimism towards improved conditions for many families (UNICEF, 2008). The 2007 South African General Household Survey indicates the persistence of harmful conditions for many children (age 0 to 17 years): 68% lived in households below the poverty line (monthly per capita income below R350, adjusted for inflation since 2000); 38% lived in households without any working adults; only 35% resided with both biological parents, and 22% did not reside with either biological parent (Statistics South Africa, 2008; University of Cape Town Children's Institute, 2009). Other data indicate that intimate partner violence (S. L. Williams, Williams, Stein, Seedat, Jackson, & Moomal, 2007) is prevalent, and that child abuse is a wide-spread problem (September, 2006). These statistics emphasize that adversities permeate the lives of many children in contemporary South Africa; therefore, an understanding of the long-term risks associated with CAs within this context is important.

Social and contextual factors, such as CA, may matter for the risk of mental disorders in South Africa. The first nationally representative study of psychiatric disorders in South Africa indicated a high burden of psychiatric illness: 16.5% of the population had a disorder in the past 12-months (D. R. Williams, Herman, Stein, Heeringa, Jackson, Moomal et al., 2008), and 30.3% had a lifetime occurrence of disorder (Herman, Stein, Seedat, Heeringa, Moomal, & Williams, 2009). The 12-month prevalence in South Africa is greater than the 12-month prevalence for the majority of countries in the World Mental Health Survey Initiative (Demyttenaere, Bruffaerts, Posada-Villa, Gasquet, Kovess, Lepine et al., 2004), and is markedly higher than the 12-month prevalence observed in Nigeria (4.7%), the only other sub-Saharan country that participated.

The present analysis will address a number of methodological challenges related to estimating the effects of CAs on psychiatric outcomes in adulthood. Our analysis will examine both acute (i.e., traumatic and sudden) and chronic (i.e., long term) CAs. We evaluated the effects of multiple CAs simultaneously, given that CAs are correlated with one another (i.e., individuals who experience one type of adversity are at increased risk for experiencing another type of

adversity) (Kessler et al., 1997). By considering multiple CAs simultaneously, we avoid overestimating the effect of a single CA, as would happen if adjustment for co-occurring stressors did not occur. In addition, our analysis provides a methodological advancement relative to traditional techniques that evaluate the combined effects of multiple adversities by constructing a score that is a count of stressors that occurred (Felitti, Anda, Nordenberg, Williamson, Spitz, Edwards et al., 1998). This common approach assumes that that each CA has an equivalent effect, and that the combined effect of multiple adversities is additive; however, research indicates that these assumptions are incorrect (i.e., some CAs have stronger effects than others, and the joint effects may not be additive) (Schilling, Aseltine, & Gore, 2008).

Using data from the South African Stress and Health study (SASH), this analysis will address limitations of previous research by applying a novel modeling strategy that takes into account (1) the correlation between CAs and (2) accumulation of CAs in the prediction of psychiatric outcomes. Our investigation has four aims: first, we describe the prevalence and co-occurrence of CAs by racial group and the total sample; second, we examine several models of the association between CAs and risk for any lifetime psychiatric disorder; third, we examine the specificity of the effects by class of disorder outcome; and fourth, we consider the specificity of effects by life course stage at onset of disorder.

Study Population

The SASH is a nationally representative survey of adults ages 18 and older that took place between January 2002 and June 2005. The design and rationale are described in detail elsewhere (D. R. Williams, Herman, Kessler, Sonnega, Seedat, Stein et al., 2004; D. R. Williams et al., 2008). Respondents were selected from a multistage, area probability sample of adults residing in both households and hostel quarters. Individuals living in institutions (e.g., prisons, military bases, hospitals) at the time of the study were excluded from the sampling frame. The first stage of sampling was selection of primary sampling areas from the 2001 South African Census of Enumerations Areas (EAs; comparable to county areas in the US). Selection of EAs was stratified by province, urban/rural location, and majority racial population group; these characteristics were sampled with probabilities proportionate to the population. Our analysis uses four historically designated racial groups in South Africa (i.e., blacks or Africans, Coloureds, Indians/Asians, and Whites, assessed by respondent self-identification). Coloured, a term fraught with conflict and contradiction, refers to a heterogeneous racial group primarily consisting of persons of mixed racial ancestry (Goldin, 1987). During the apartheid era in South Africa, there was marked racial stratification with Whites at the top, Africans at the bottom and Indians and Coloureds in the middle. Along with Africans, Coloureds and Indians experienced systematic discrimination compared to Whites.

In the second stage of sampling, household units were selected within each EA; in the third stage, a single individual was randomly selected from each housing unit. Field interviewers made up to three contact attempts per respondent. A total of 4433 (87.1%) of identified respondents participated in field interviews. For the present analysis 1.6% of field interviews were excluded due to failure to administer the entire interview; therefore, the overall response rate was 85.5% and the analytic sample included 4351 adults. Face-to-face interviews were conducted in 7 languages. The University of Michigan and Harvard Medical School provided ethical approval for recruitment, consent, and survey procedures, and a single project assurance of compliance from the Medical University of South Africa was approved by the National Institute of Mental Health.

Diagnostic Interview

The World Health Organization Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) was used to assess lifetime history of mental disorders (Kessler & Ustun, 2004). The CIDI is a fully structured interview, created for use by interviewers without clinical experience. Diagnoses were based the Diagnostic and Statistical Manual of Mental Disorders – IV (DSM-IV) (American Psychiatric Association, 1994), and symptom information was collected for four classes of diagnoses: mood disorders (major depressive disorder and dysthymia), anxiety disorders (panic disorder, social phobia, agoraphobia, generalized anxiety disorder, and post-traumatic stress disorder), substance use disorders (alcohol abuse, alcohol dependence, drug abuse, drug dependence), and intermittent explosive disorder. This set of disorders represents a variety of the most common psychiatric outcomes, and intermittent explosive disorder was considered because it is the DSM disorder that is most closely associated with impulsive violent behavior, and there is limited knowledge about risk factors for this disorder (Kessler, Coccaro, Fava, Jaeger, Jin, & Walters, 2006). Organic exclusion rules and diagnostic hierarchy rules were applied; an exception was substance use disorders, where abuse could be defined as with or without dependence. Age of first onset was identified using a sequence of questions designed to improve upon standard age of onset questions by helping respondents provide accurate reports (Knauper, 1999).

Childhood Adversities

The SASH assessed exposure to family-level CAs occurring before age 18 using an 11 item measure developed by the World Mental Health Survey Initiative. This measure was based on the current literature at the time that the study was implemented. For each of the 11 CAs, respondents retrospectively reported whether or not it had occurred (yes/no). Family economic adversity was defined as no employed adult caregiver for most of childhood. Serious physical illness during childhood was defined as the presence of diabetes, epilepsy, cancer, or another chronic condition. Parental mental illness (major depression, generalized anxiety disorder, panic disorder, antisocial personality disorder) and parental substance abuse were measured using the Family History Research Diagnostic Criteria Interview (FHRDC) and an extension to improve the validity of recall (Endicott, 1978; Kendler, Silberg, Neale, Kessler, Heath, & Eaves, 1991). Family violence and physical abuse were assessed using a modified version of the Conflict Tactics Scale (Straus, 1979). Parental death, parental divorce, other loss of contact with parents (e.g., adoption, living with relatives other than parents), parent criminality, economic adversity, and sexual abuse (>3 instances) were assessed with measures created for the baseline National Comorbidity Survey (Kessler et al., 1997). Of note, sexual abuse was the only CA that did not explicitly ask about occurrence within the family (i.e., we cannot distinguish whether the perpetrator was a family member or someone else); this presents a limitation because the goal of the present study was to examine childhood family adversities, not all possible childhood adversities. Previous research with a distinction about the identity of the perpetrator (i.e., family member versus others) suggests the individuals who are victimized by a family member have more instances of victimization in comparison to individuals victimized by a stranger (Farber, Showers, Johnson, Joseph, & Oshins, 1984); on this basis, we utilized information on number of instances of childhood sexual abuse as a crude method to distinguish family versus non-family sexual abuse.

Analysis

Analyses were carried out using SUDAAN v. 8.2., which uses Taylor series linearization to adjust the variance estimates for clustering within the multistage sample design. For all analyses, data were weighted to adjust for the complex sample design and residual differences between the sample and the population profile, according to the 2001 South African Census.

First, we examined the prevalence of CAs, stratified by race and for the total sample. We then examined the correlations among the eleven CAs using tetrachoric correlations. Next, we estimated the association between CA and lifetime prevalence of DSM-IV/CIDI disorder using four different models. All models used discrete time survival analysis with person-years as the unit of analysis to model first onset of disorder (Willett, 1993); person-years began at age 1. Models were adjusted for person-year, age at interview, gender, race, and other DSM-IV disorders that had an age of onset prior to the age of onset for the outcome under investigation, and prior to age 17. By including variables for prior disorders as controls, we adjust for the effects of earlier onset disorders on secondary disorders. All models were estimated from a consolidated data file that stacked 12 separate disorder-specific person-year files and eleven indicator variables that identified each of these data files; this forced the estimated slopes of the disorders on the CAs to be equivalent across disorders. Demographic variables and CA exposures were consistent in each of the disorder-specific person-year files.

A series of multivariate models to predict lifetime risk of disorder were estimated. The first model estimated the effect of each CA independently, using eleven separate regression equations. The second model estimated the effect of all eleven adversities within a single model. The third model included a series of indicator variables for the number of CAs that the respondent experienced (e.g., one indicator variable for respondents who experienced exactly one CA, another indicator variable for individuals who experienced exactly two CAs, etc.), and did not contain information about the types of CAs experienced. In the fourth model, we included indicator variables for the eleven types of CAs, in addition to indicator variables for the number of CAs experienced. In this model, the number of CAs experienced started at exactly two rather than exactly one, because the value of the variable for exactly one CA was perfectly predicted by the eleven indicator variables for types of CAs. We compared the Akaike Information Criterion (AIC) across the multivariate models to select the model with the best fit (Burnham, 2002). The best-fitting model was then estimated again in sub-samples defined by class of disorder (i.e., mood, anxiety, substance disorder, and intermittent explosive disorder), and life course stage of onset (i.e., childhood: ages 4–12; adolescence and early adulthood: ages 13–24; adulthood: ages 25+). The estimated survival coefficients and standard errors were exponentiated to produce odds ratios (OR) and 95% confidence intervals. For ease of presentation and discussion, we have grouped the adversities into a "maladaptive family functioning" cluster, and an "other adversities" cluster, based on prior research (Green et al., 2010). Complete case analysis was performed given the small number of individuals with missing data (1.6%, N=82).

Results

Prevalence and Co-occurrence of Childhood Adversities

Of the eleven CAs that were assessed, there was considerable variation in likelihood of exposure to any CA by race (Table 1): 41% of respondents reported exposure to at least one CA: the most common CAs were physical abuse (13.2%), parental divorce (11.2%), and parental mental illness (7.3%). When the prevalences of CAs were stratified by race, 44.4% of Africans reported exposure to one or more CA, in comparison to 24.8% of Whites. There were significant differences in exposure by race for 4 of the 11 CAs (physical abuse, physical illness, parent died, and economic adversity): for these CAs, Africans consistently had the highest prevalence. For each of the CAs considered, it was common for individuals exposed to one CA to have exposure to a second: on the low end, among respondents who had experienced parental divorce, 43.5% experienced a second CA, whereas 90.8% of respondents who reported sexual abuse experienced at least one additional CA. Approximately half of the tetrachoric correlations between pairs of CAs were significantly associated in a positive direction, which illustrates that the CAs cluster together (Table 2).

Predictive Effects of Childhood Adversities on First-Onset of DSM-IV/CIDI Disorders

Our first set of discrete-time survival models examined the effects of CAs on first onset DSM-IV disorders pooled across outcomes (Table 3). In Model 1, where the effect of each CA was estimated independently, all six of the maladaptive family functioning CAs were significantly associated with disorder onset (ORs ranged from 1.4 to 3.7), and two of five "other" CAs had significant associations with disorder onset (OR=1.5 for other parent loss, and OR=1.7 for physical illness). Using this approach, parental death, parental divorce, and economic adversity were not predictive of lifetime risk of DSM-IV/CIDI disorders.

The second model in Table 3 included all CAs simultaneously. The OR for each CA estimated by this model was smaller than the OR estimated in the previous models; this is because the multivariate model corrects for the artificial inflation of the effects of individual CAs, resulting from comorbidity between the CAs. In this model, ORs for three of the six maladaptive family functioning CAs remained significant (parent mental illness, parent substance abuse, and physical abuse; ORs range from 1.6 to 1.8), and only one of the other CAs remained significant (other parent loss; OR= 1.5); of note, sexual abuse, physical illness and parental death were close to statistical significance but the p-values were greater than .05. The χ^2_{11} test for the joint effects of all CAs in this model was significant (χ^2_{11}=126.8, <.0001).

The third model included indicator variables for number of CAs, rather than types of CAs. This model indicated a general trend of increasing likelihood of disorder onset with each additional CA (ORs range from 1.3 to 2.6, relative to individuals with no CA), although the pattern was not perfectly linear. The χ^2_4 test for the joint effects of number of CAs was significant ($\chi^2_4 = 63.4$, <.0001).

In Model 4, we estimated a model that included all 11 CAs in addition to the number of CAs. Six of the 11 ORs associated with the individual CAs were significantly associated with lifetime risk of disorder (parent mental illness, parent substance abuse, physical abuse, parent died, other parent loss, and physical illness; significant ORs ranged from 1.3 to 2.0); the χ^2_{11} test for the joint effects of types of CA is significant (χ^2_{11}=73.1, <.0001). In this model, the coefficient estimates for the type of CAs were slightly higher than the ORs when indicator variables for number of CAs were not included; this demonstrates that the failure to account for number of CAs leads to a downward bias in the estimated effect of individual CAs. The coefficients for the estimated effects of number of CAs were substantially attenuated (relative to Model 3) and were no longer significantly associated with disorder onset. However, the joint effect for number of CAs was significant (χ^2_3=7.9, <.0001). For this model, the ORs associated with each CA indicator variable can be interpreted as the relative odds of psychiatric disorder among individuals with only that CA, and no other CAs, compared to individuals with no CAs. Consideration of AIC statistics indicates that the fourth model (which included indicator variables for types *and* numbers of adversities) was a better fit than the model that included only types of CAs or number of CAs. We evaluated a more elaborate model which distinguished between the number of maladaptive family functioning adversities and number of other adversities; however, this modification did not improve the fit of the model and therefore we did not proceed with this variation.

Predictive Effects by Class of DSM-IV/CIDI Disorder

We disaggregated our outcome by class of disorder in order to examine the specificity of our findings. The models presented in Table 4 showed meaningful variation by class of disorder, and indicated that the majority of the CAs with significant ORs only predicted anxiety disorder. Six of the ORs associated with individual CAs reach statistical significance for anxiety disorder: three from the maladaptive family functioning cluster (parent mental illness, parent substance abuse, and physical abuse) and three other CAs (parent divorce, other parent loss,

and physical illness). Significant ORs ranged from 1.5 to 2.2. In contrast, only two individual CAs reached statistical significance for the prediction of substance disorders and intermittent explosive disorder (parental substance abuse and sexual abuse). In the model predicting mood disorders, no individual CA reached statistical significance. Parental substance abuse was the only CA that predicted three of the four classes of disorder.

For all four classes of disorder, the χ^2_{11} test for the joint effects of types of CAs was statistically significant. For mood disorders, we observed a distinct pattern for the ORs associated with number of CAs that was not present for the other classes of disorder. The ORs associated with number of CAs show increased odds of mood disorders for individuals exposed to 2 adversities and 4 or more adversities, relative to individuals with a single adversity (OR= 1.8 and 3.5, respectively). This pattern suggests that the accumulation of CAs may present a distinct risk for mood disorders, adjusting for the types of CAs an individual has been exposed to. However, the χ^2_3 test for the joint effects of number of CAs was not statistically significant. Substance disorder was the only outcome for which the χ^2_3 test for the joint effects of number of CAs is statistically significant.

Predictive Effects by Life Course Stage of Onset

We repeated our analysis disaggregated by life course stage of first onset (Table 5). Significant effects of CAs can be observed at each stage of the life course, although significant associations were uncommon in this disaggregated analysis. Parent mental illness and parent substance abuse were significantly associated with onset of disorder in childhood (ORs= 1.7 and 2.2, respectively). ORs for other parent loss, parent mental illness and physical illness were significantly associated with onset of disorder in adolescence and early adulthood (ORs range from 1.5 to 1.9). Sexual abuse was the only CA significantly associated with increased odds of first onset of disorder in adulthood (OR=6.3). The χ^2_{11} tests for the joint effects of types of CA were statistically significant for childhood onset and adolescent/early adulthood onset, but not for adult onset of disorder. Interestingly, the χ^2_3 test for the joint effects of number of CAs was only statistically significant for onset of DSM-IV/CIDI disorder.

Discussion

To our knowledge, this is the first examination of the relationship between family-level CAs and psychiatric outcomes in a national sample of adults in South Africa. The data show that 41% of adults were exposed to one or more of the measured CAs, and individuals who experienced any single form of CA were likely to experience a second CA. Parent divorce was most likely to be independent of other CAs, while sexual abuse was the least likely to occur independently. The CAs were interrelated, but not to the extent observed in a similar US study (Green et al., 2010). The series of models to estimate the effects of CAs on lifetime risk of DSM-IV/CIDI disorders indicated several interesting findings. First, consistent with previous research (Green et al., 2010), the single CA models overestimated the effect of individual adversities; once other CAs were simultaneously included, the effect estimates were attenuated. Our multivariate model including covariates for number of CAs demonstrated that a greater number of adversities, regardless of type, is associated with increased risk of psychiatric disorder. The results from this model produced findings similar to other investigations that have utilized this approach (Felitti et al., 1998).

The model that best fit our data included covariates for both type of CAs and number of CAs; six CAs maintained significant associations with lifetime risk of DSM-IV/CIDI disorders, even after adjustment for other types of CAs and number of additional CAs. This finding shows that more than half of the CAs were associated with increased risk of disorder, even when the adversity is the only adversity that an individual has experienced. This finding importantly illustrates a single CA can have significant consequences for later psychopathology. Parental

substance abuse had the highest significant OR for risk of any disorder; this finding is of public health relevance because of the high lifetime prevalence of substance use disorders in the adult population in South Africa (13.3%) (Herman et al., 2009).

The results disaggregated by class of disorder are noteworthy. Across the four classes of disorders considered, we did not find evidence for non-specific effects of CAs: the majority of the significant ORs we observed predicted risk of anxiety disorder; and, none of the CAs predicted risk of mood disorder, which contrasts with findings from similar studies with U.S. samples (Green et al., 2010; Kessler et al., 1997). This pattern may be an issue of power to detect a statistically significant effect, given that anxiety is the most prevalent disorder in this population (Herman et al., 2009). It could also be the case that parental mental illness predicts anxiety more strongly than other conditions given that it is the most common disorder in the population and research indicates heritable components to anxiety disorders (Hettema, Neale, & Kendler, 2001). The data also indicate the possibility that there is a differential threshold at which the accumulation of CA is associated with mood and anxiety disorders, and that for mood disorders in particular, accumulation is central to risk for disorder. This possibility is supported by our data, given that in the model for mood disorders only, the number of adversities showed a significant increase in risk when controlling for types of individual CAs (see Table 4). These findings contribute to the ongoing uncertainty regarding the specificity of the effects of CAs (McMahon, Grant, Compas, Thurm, & Ey, 2003), and suggest a need for more in-depth clinical and qualitative research to generate etiologic hypotheses regarding the conditions under which specific CAs are likely to present risk for specific disorders in particular cultural and national contexts. Finally, the analysis by life course stage of onset indicated that childhood and adolescence/early adulthood were the time periods at which individuals who reported CAs experienced increased risk for first onset of disorder; sexual abuse was the exception to this pattern, and predicted first onset of disorder in adulthood. The results demonstrate that CAs predict first onset of psychiatric disorders during multiple stages of the life course.

The findings from this study should be interpreted in the context of several limitations. First, is the accuracy of the measures of CAs. Several of the CAs were measured with standard scales that have not been validated in South Africa. In light of other prevalence estimates of CAs in South Africa which find levels of adversity that are much greater than reported here (University of Cape Town Children's Institute, 2009), we suspect that our current measures underestimated the prevalences of numerous CAs. For example, one might expect that in a low to middle income country, rates of parental mental illness and substance abuse are likely underestimated. Our estimate of childhood sexual abuse by a family member may be imprecise due to our use of number of instances of sexual abuse as proxy to estimate perpetration by a family member; future studies on family-level CAs should specifically ask about perpetrator identity. In addition, our measures of economic adversity and physical illness may not capture all components of these constructs for the South African context. Related, the list of family-level CAs was not exhaustive, and we may have omitted adversities that are particularly relevant for South Africa. For example, loss of a sibling or caregiver with chronic illness (especially in the context of HIV/AIDS), or number of residential moves may be important and prevalent CAs that were not included in this study.

Second, the SASH is a cross-sectional survey; therefore, CAs were reported retrospectively. Studies indicate that retrospective reports are likely to underestimate the prevalence of occurrence (Della Femina, Yeager, & Lewis, 1990;L. M. Williams, 1995), which would create a bias towards the null. A related concern associated with retrospective data is differential recall for individuals with psychological problems; however, a review of the evidence does not support this hypothesis for retrospective reports of childhood experiences (Brewin, Andrews, & Gotlib, 1993), and a recent study shows the influence of mood states is weak for reporting

of specific childhood experiences (Yancura & Aldwin, 2009). Studies have also shown that responses to questions about CAs similar to the SASH items are generally stable over time (Dube, Williamson, Thompson, Felitti, & Anda, 2004; Yancura & Aldwin, 2009). Third, we do not know the specific ages of exposure to the various CAs which creates the potential for reverse causation; future studies should inquire about the age that the CA occurred, in order to ensure that the adversity occurred following first onset of disorder.

Fourth, our outcomes were measured using the DSM-IV/CIDI; clinical validation of this instrument in South Africa has not yet taken place. However, in other WMH studies, research comparing CIDI diagnoses to blind clinical reappraisal interviews have demonstrated good validity (Haro, Arbabzadeh-Bouchez, Brugha, de Girolamo, Guyer, Jin et al., 2006). It is also important to note that individuals living in institutions (e.g., prisons, mental institutions) were excluded from the sample; this may limit our analysis to the least severe cases. Finally, our study did not consider the timing, sequencing, or chronicity of the CAs, or the community context in which the CAs occurred; modeling approaches in future studies should be extended to take these factors into account.

The present study contributes to a growing body of research on the social determinants of mental health in South Africa. The study utilized an innovative statistical approach to estimate associations for specific adversities in relation to lifetime prevalence of DSM-IV/CIDI disorders, while taking into account co-occurring adversities. Our findings suggest that a variety of CAs predict onset of mental disorders, particularly anxiety disorders, at multiple stages of the life course. Parental substance abuse is a CA that is particularly likely to be associated with subsequent mental disorder, and with its early onset – and may be an important target for policy-makers wanting to exert an impact on mental disorder prevention. Although parental substance abuse affects only a small part of the population, as with any CA, it is prevalent in those with more than 2 adversities; thus a cluster of children at risk can readily be identified. Related, it is important for additional research to more carefully consider mechanisms for intergenerational transmission of disorders: for example, in this analysis, parental substance disorder predicted substance disorder in participants, which suggests that genetics and/or social learning may be involved.

As South Africa experiences broad social and political transformation, it is important for researchers to monitor temporal trends in the prevalence of CAs, and keep track of racial and economic disparities in exposure to CAs. While the present study focused on the impact of adversities within the family context, additional research should examine the psychological impact of the contexts that families (defined by race and geography) found themselves in during apartheid and in the decade following the fall of apartheid. Future investigations should also seek to identify risk and protective factors in childhood and beyond that serve as mediators or moderators of the effect of CAs on psychiatric disorders in the South African population.

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Table 1

Prevalence of retrospectively reported childhood adversities (n=4351)

| | Prevalence, Stratified by Racial Group | | | | | | | | | Full Sample | | | | |
| | White N=300 | | African N=3251 | | Colored N=549 | | Indian/Asian N=147 | | p-value | Prevalence | | Among those with adversity % with 2+ | | Mean number of adversities among those with 2+ |
	%	(se)	%	(se)	%	(se)	%	(se)		%	(se)	%	(se)	%	(se)
Parent mental illness	3.7	(1.3)	7.9	(1.0)	7.1	(1.3)	5.1	(2.1)	0.120	7.3	(0.7)	58.3	(3.4)	2.7	(0.1)
Parent substance	1.8	(0.9)	3.8	(0.4)	4.8	(1.1)	1.5	(1.0)	0.062	3.6	(0.4)	66.8	(5.0)	3.1	(0.1)
Parent criminal	4.4	(1.5)	4.4	(0.5)	5.7	(1.6)	4.7	(0.6)	0.671	4.5	(0.4)	60.7	(4.5)	2.9	(0.1)
Family violence	4.2	(1.7)	2.8	(0.4)	2.9	(0.9)	7.4	(1.8)	0.066	3.1	(0.3)	78.8	(4.8)	3.0	(0.1)
Physical abuse	9.3	(3.9)	14.5	(0.9)	9.8	(2.9)	5.9	(1.6)	0.000	13.2	(0.8)	51.9	(2.6)	2.5	(0.1)
Sexual abuse	0.3	(0.3)	0.1	(0.1)	0.2	(0.2)	1.7	(1.3)	0.123	0.2	(0.1)	90.8	(9.1)	3.2	(0.2)
Physical illness	1.8	(1.1)	3.9	(0.4)	1.3	(0.7)	0.9	(0.9)	0.001	3.3	(0.3)	56.7	(4.7)	2.6	(0.1)
Parent died	5.0	(1.8)	12.4	(0.6)	9.4	(1.9)	10.2	(2.0)	0.000	11.2	(0.5)	45.1	(2.6)	2.3	(0.1)
Parent divorce	4.7	(1.4)	5.6	(0.6)	6.4	(1.5)	8.0	(2.1)	0.278	5.6	(0.5)	43.5	(4.1)	2.4	(0.1)
Other parent loss	1.5	(1.1)	2.7	(0.5)	2.6	(0.9)	0.8	(0.8)	0.365	2.5	(0.4)	47.6	(5.6)	2.7	(0.2)
Economic adversity	2.1	(1.3)	6.5	(0.5)	3.9	(1.3)	4.7	(1.3)	0.013	5.7	(0.4)	67.0	(3.2)	2.3	(0.1)
Any adversity	24.8	(4.5)	44.4	(1.4)	35.2	(3.6)	33.8	(3.8)	0.000	41.0	(1.2)	34.2	(1.4)	2.4	(0.0)

Note: 104 individuals did not provide racial identity or identified as some other race, not represented by the categories noted above.

Table 2

Tetrachoric correlations of retrospectively reported childhood adversities (n=4351)

	Parent mental illness	Parent substance abuse	Parent criminal	Family violence	Physical abuse	Sexual abuse	Parent died	Parent divorce	Other parent loss	Physical illness	Economic adversity
Parent substance abuse	0.49***	1.00									
Parent criminal	0.40***	0.53***	1.00								
Family violence	0.43***	0.50***	0.39***	1.00							
Physical abuse	0.24***	0.24***	0.18***	0.47**	1.00						
Sexual abuse	0.37**	0.39*	0.16	0.17	0.06	1.00					
Parent died	0.04	−0.03	0.00	−0.05	0.06	0.27	1.00				
Parent divorce	−0.02	0.03	−0.07	0.20**	0.14**	0.28	−0.34***	1.00			
Other parent loss	−0.03	0.15	0.08	0.26**	0.04	−0.03	−0.03	−0.25*	1.00		
Physical illness	0.20**	0.11	0.18**	0.12	0.18***	0.45**	−0.10	0.14*	0.14	1.00	
Economic adversity	−0.11	0.03	−0.05	−0.06	0.00	−0.81	0.50***	0.15**	0.28***	0.07	1.00

*
  $p<.05,$

**
  $p<.01,$

***
  $p<.0001$

Table 3

Estimated effects (odds-ratios) of childhood adversities on lifetime risk of DSM-IV/CIDI disorders in single predictor, multivariate additive, and interactive survival models [a] (n=4351)

	Model 1 [b]		Model 2 [c]		Model 3 [d]		Model 4 [e]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Maladaptive family functioning								
Parent mental illness	1.9*	(1.5, 2.5)	1.6*	(1.2, 2.1)	-	-	1.6*	(1.2, 2.1)
Parent substance	2.3*	(1.7, 3.0)	1.8*	(1.3, 2.5)	-	-	2.0*	(1.3, 3.1)
Parent criminal	1.5*	(1.0, 2.0)	1.1	(0.8, 1.5)	-	-	1.1	(0.7, 1.5)
Family violence	1.4*	(1.0, 1.9)	0.8	(0.5, 1.2)	-	-	1.0	(0.6, 1.5)
Physical abuse	1.7*	(1.4, 2.1)	1.6*	(1.3, 1.9)	-	-	1.6*	(1.3, 1.9)
Sexual abuse	3.7*	(1.7, 7.8)	2.2	(1.0, 5.1)	-	-	2.1	(0.9, 5.0)
II. Other childhood adversities								
Parent died	1.2	(1.0, 1.5)	1.2	(1.0, 1.5)	-	-	1.3*	(1.0, 1.6)
Parent divorce	1.1	(0.8, 1.5)	1.1	(0.8, 1.5)	-	-	1.1	(0.8, 1.5)
Other parent loss	1.5*	(1.1, 2.1)	1.5*	(1.0, 2.1)	-	-	1.6*	(1.2, 2.2)
Physical illness	1.7*	(1.2, 2.4)	1.4	(1.0, 2.1)	-	-	1.5*	(1.0, 2.2)
Economic adversity	1.0	(0.7, 1.3)	0.9	(0.7, 1.2)	-	-	1.0	(0.6, 1.4)
			$\chi^2_{11} = 126.8^*$				$\chi^2_{11} = 73.1^*$	
Number of childhood adversities								
1	-	-	-	-	1.3*	(1.2, 1.6)	-	-
2	-	-	-	-	2.0*	(1.6, 2.5)	1.2	(0.9, 1.7)
3	-	-	-	-	2.6*	(1.9, 3.7)	1.1	(0.7, 1.8)
4+	-	-	-	-	2.3*	(1.5, 3.7)	0.6	(0.2, 1.6)
					$\chi^2_4 = 63.4^*$		$\chi^2_3 = 7.9^*$	

*
Significant at the .05 level, two-sided test.

[a]
Based on discrete-time survival models with person-year the unit of analysis pooled across 12 DSM-IV/CIDI disorders. All models control for person-year, age-at-interview, gender, race, and controls for prior onset of comorbid conditions that began prior to age 17. In addition, models included 11 indicator variables for the outcome disorder category (i.e., for the 12 disorders in the stacked dataset).

[b] 11 separate models were estimated (one for each CA) in addition to the controls noted in the previous footnote.

[c] A single model was estimated with all 11 indicator variables for types of adversity, in addition to the controls noted in the footnote above.

[d] A single model was estimated with 4 indicator variables for number of childhood adversities experienced by the respondent, in addition to controls describe in the footnote above.

[e] A single model was estimated with 11 indicators variables for types of adversities plus 3 indicator variables for number adversities experienced by the respondent (2, 3, or 4). An indicator variable for exactly 1 adversity was not included because the value of the variable for exactly one adversity is perfectly predicted by the series of 11 indicator variables for specific types of adversity. The controls used in the previous models were also included.

Table 4

Estimated effects (odds-ratios) of types and disaggregated numbers of childhood adversities on lifetime risk of four classes of DSM-IV/CIDI disorders[a] (n=4351)

	Mood		Anxiety		Substance		Intermittent Explosive		Significance Test χ^2_3
	OR	(95 % CI)	OR	(95 % CI)	OR	(95 % CI)	OR	(95 % CI)	
I. Maladaptive family functioning									
Parent mental illness	1.1	(0.7, 1.9)	2.2	(1.6, 2.9)*	1.3	(0.8, 2.1)	1.3	(0.6, 2.8)	10.9*
Parent substance	0.9	(0.5, 1.6)	1.7	(1.1, 2.6)*	2.7	(1.4, 5.3)*	4.5	(1.6, 12.5)*	5.4
Parent criminal	0.8	(0.5, 1.3)	1.1	(0.7, 1.7)	1.1	(0.7, 1.8)	1.3	(0.5, 3.2)	1.6
Family violence	0.8	(0.4, 1.4)	1.1	(0.6, 2.0)	0.9	(0.5, 1.6)	0.7	(0.2, 2.6)	1.1
Physical abuse	1.2	(0.8, 1.8)	1.9	(1.5, 2.3)*	1.4	(1.0, 2.1)	1.1	(0.5, 2.5)	3.6
Sexual abuse	0.5	(0.1, 4.2)	2.2	(0.6, 7.6)	4.9	(2.0, 12.1)*	7.0	(1.1, 46.3)*	15.4*
II. Other childhood adversities									
Parent died	1.2	(0.7, 1.8)	1.2	(0.9, 1.7)	1.1	(0.7, 1.6)	1.4	(0.6, 3.6)	0.9
Parent divorce	0.7	(0.5, 1.2)	1.5	(1.0, 2.2)*	0.8	(0.5, 1.2)	0.9	(0.4, 2.0)	11.3*
Other parent loss	1.5	(0.8, 2.6)	1.7	(1.1, 2.7)*	1.0	(0.5, 1.9)	3.0	(1.0, 8.8)	4.3
Physical illness	1.8	(0.9, 3.3)	1.9	(1.2, 3.0)*	0.9	(0.5, 1.6)	1.5	(0.4, 5.5)	5.1
Economic adversity	0.4	(0.2, 0.8)	0.9	(0.7, 1.3)	1.1	(0.6, 1.9)	0.6	(0.1, 2.0)	4.6
χ^2_{11}	23.8*		80.0*		27.9*		41.4*		
Number of adversities									
2	1.8	(1.0, 3.1)*	0.9	(0.6, 1.4)	1.5	(0.9, 2.5)	0.6	(0.2, 1.5)	
3	2.1	(0.8, 5.3)	1.0	(0.6, 1.7)	1.0	(0.4, 2.3)	1.1	(0.2, 6.0)	
4+	3.5	(1.1, 11.2)*	0.3	(0.1, 1.1)	0.6	(0.1, 2.8)	0.2	(0.0, 2.0)	
χ^2_3	6.5		5.7		9.7*		6.1		

*
Significant at the .05 level, two-sided test.

[a]
Based on discrete-time survival models with person-year the unit of analysis pooled across 12 DSM-IV/CIDI disorders. All models control for person-year, age-at-interview, gender, race, and controls for prior onset of comorbid conditions that began prior to age 17. In addition, models included 11 indicator variables for the outcome disorder category (i.e., for the 12 disorders in the stacked dataset). The present model was estimated with indicator variables for types of adversities and number of adversities.

Table 5

Multivariate associations (odds ratios) between childhood adversities and first onset of DSM-IV disorders in three life course stages[a] (n=4351)

	Childhood (Ages 4–12)		Adolescence and Early Adulthood (Ages 13–24)		Adulthood (Ages 25+)		Significance Test
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	
I. Maladaptive family functioning							
Parent mental illness	1.7	$(1.2, 2.5)^*$	1.5	$(1.0, 2.1)^*$	1.1	(0.5, 2.5)	0.3
Parent substance	2.2	$(1.4, 3.6)^*$	1.7	(1.0, 3.0)	1.4	(0.6, 3.1)	0.9
Parent criminal	1.0	(0.7, 1.5)	1.2	(0.7, 2.0)	1.2	(0.5, 2.8)	2.5
Family violence	0.9	(0.5, 1.5)	0.8	(0.4, 1.3)	1.8	(0.8, 3.8)	9.8^*
Physical abuse	1.9	$(1.5, 2.5)^*$	1.1	(0.8, 1.7)	1.0	(0.6, 1.8)	8.9^*
Sexual abuse	2.1	(0.9, 5.1)	1.2	(0.2, 6.9)	6.3	$(1.4, 27.9)^*$	10.1^*
II. Other childhood adversities							
Parent died	1.2	(0.9, 1.6)	1.2	(0.9, 1.6)	0.9	(0.4, 1.9)	0.3
Parent divorce	1.0	(0.7, 1.3)	1.2	(0.8, 1.9)	1.0	(0.4, 2.5)	1.6
Other parent loss	1.2	(0.8, 2.0)	1.9	$(1.0, 3.5)^*$	1.4	(0.7, 2.9)	1.4
Physical illness	1.4	(0.9, 2.4)	1.9	$(1.2, 3.1)^*$	0.9	(0.3, 2.6)	1.2
Economic adversity	0.9	(0.6, 1.4)	0.9	(0.5, 1.6)	0.5	(0.2, 1.4)	0.2
χ^2_{11}	28.2^*		50.0^*		18.3		
Number of Adversities							
2	1.1	(0.8, 1.7)	1.2	(0.8, 1.8)	1.9	(0.8, 4.5)	
3	0.8	(0.4, 1.7)	1.6	(0.8, 3.1)	2.8	(0.6, 12.7)	
4+	0.6	(0.2, 1.8)	0.4	(0.1, 2.1)	1.3	(0.2, 9.7)	
χ^2_3	5.8		3.2		10.1^*		

*
Significant at the .05 level, two-sided test.

[a]
Based on discrete-time survival models with person-year the unit of analysis pooled across 12 DSM-IV/CIDI disorders. All models control for person-year, age-at-interview, gender, race, and controls for prior onset of comorbid conditions that began prior to age 17. In addition, models included 11 indicator variables for the outcome disorder category (i.e., for the 12 disorders in the stacked dataset). The present model was estimated with indicator variables for types of adversities and number of adversities.