Title: Racial Differences in the Relationship between Childhood Adverse Events and Mental Health Disorders among a Nationally Representative Sample of Adolescents

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## Background and motivation

In the United States (US), disparities by race and ethnicity are evident across a wide range of health conditions.[1] Non-Hispanic Blacks and Hispanics suffer elevated rates of onset and mortality from cardiovascular disease, HIV and other infections, and homicide, among many others.[1, 2] These disparities are caused by the combined effects of experiences and conditions that negatively impact minority racial/ethnic groups in the US including socioeconomic status, stress, discrimination, social environment (e.g. neighborhood poverty, segregation), and health care access/coverage.[3-9]

Despite the disparities in myriad health conditions and observed adversities that would presumably impact all health domains, mental health conditions do not demonstrate disparities by race/ethnicity in the United States.[10-14] In an adult sample compared with non-Hispanic whites, non-Hispanic blacks had slightly lower risk of psychiatric disorders.[15] Risk of psychiatric disorders during adolescence also appears to be to be similar across racial/ethnic groups.[13]

Childhood adversities are stressors that have been documented to have substantial health impacts throughout the life course, and may play a key role in the onset of mental health disorders in adolescence and early adulthood. [16, 17] Research with adults finds that adverse events and stressors have a weaker relation with mental health disorders among racial/ethnic minorities.

Stressors and mental health disorders by race has not been examined among adolescents. A recent analysis of childhood adversities found associations with onset of mental health conditions in adolescents.[17] The authors allude to differences by race/ethnicity, yet do not explicitly examine this topic.

It is important to understand how the causal process for mental health conditions may be different across racial groups in US, so that risk factors, services and preventative mechanisms can be identified.  We examine the racial/ethnic differences in the relation between early childhood adversities and mental health disorders in the National Comorbidity Survey–Adolescent Supplement (NCS-A). Motivated by a life course perspective, we test the hypothesis suggested in the literature that the relation of early childhood adversities is stronger among non-Hispanic white adolescents than among non-Hispanic black and Hispanic adolescents. We apply marginal modeling to examine how the distribution of mental health disorders among non-Hispanic white, non-Hispanic black and Hispanic youth would be different if intervention could remove individual and group childhood adversity experiences. [18]  This technique allows for estimation of population level parameters on the additive scale, which are most relevant for public health interventions.

## Methods

*Data*

NCS-A is a nationally representative survey of 10,123 adolescents aged 13 to 18 years.[19] The racial/ethnic composition of the sample is 5,634 Non-Hispanic White, 1,953 Non- Hispanic Black, 1,914 Hispanic, and 622 of other racial/ethnic groups. The

NCS-A data includes diagnostic assessment of a wide range of psychiatric disorders, including the lifetime-to-date and current prevalence, age-of-onset distributions, course, and comorbidity of DSM-IV disorders. Face-to-face interviews with adolescents and from a household and school based sample. Parents or guardians were asked to complete a self-administered questionnaire with questions concerning the adolescent's mental health. Sampling weights correct for variation in within-household probability of selection in the household sample and to adjust sociodemographic and geographic distribution. The weights adjust for design effect and relative sample sizes of the household and school samples.[19]

*Mental Health Conditions*
The NCS-A data includes diagnostic assessment of a wide range of psychiatric disorders, including the lifetime-to-date and current prevalence, age-of-onset distributions, course, and comorbidity of DSM-IV disorders. Data collection involved a modified version of the World Health Organization Composite International Diagnostic Interview (CIDI) to assess the presence of mental health conditions. [20] Consistent with previous literature on DSM-IV disorders from the sample, we group mental health conditions into four categories :[17]
1. Fear disorders: social phobia, specific phobia, intermittent explosive disorder, panic disorder with and without agoraphobia, and agoraphobia without a history of panic disorder
2. Distress disorders: separation anxiety disorder, generalized anxiety disorder, posttraumatic stress disorder(PTSD), and major depressive disorder and dysthymia
3. Behavior disorders: conduct disorder, oppositional defiant disorder and attention deficit/hyperactivity disorder
4. Substance use disorders: alcohol abuse with or without dependence and drug use with or without dependence

Diagnoses are included if either parent or adolescent endorsed the related symptoms, and are not limited to parent-adolescent pairs.

*Childhood adversity measures*
We examine 10 childhood adversities (CAs) reported in the NCS-A adolescent and parent sample: parental death, parental divorce, other parental loss (including one parent absent from the home for over 6 months or the child absent for foster care of adoption), parental crime, family violence, physical abuse, emotional abuse, sexual abuse, neglect, family economic adversity. We selected adversity measures largely based on the work of McLaughlin and colleagues. [17] Unlike McLaughlin, our exposure measures did not include parental mental health history, as we consider this to be a confounder of the relationship between adversities and adolescent mental health conditions. Adolescents who had a single parent were not coded as experiencing divorce or parental loss. Juvenile detention and running away from home were not included in other parental loss.

*Analysis*
We assess the association of childhood adversities to mental health conditions for non-Hispanic white, non-Hispanic Black, and Hispanic adolescents using a marginal approach

to arrive at a race-specific population average effect. For each CA, this marginal parameter is specified as the difference in the proportion of the population with the mental health disorder that would have been observed if there had been an intervention to prevent the childhood adversity, with all else being equal[18]. Logistic modeling provides results on the multiplicative scale, and this method allows for relations on the additive scale, which is relevant to public health and intervention [21]. Additionally it allows us to think about the population effect of manipulating exposure to adverse childhood circumstances.

The first step is the estimate logistic models, adjusting for confounding variables to estimate the outcome for each individual had he or she experienced the CAs. Individual demographic variables of respondent gender, age at time of interview, and parental education, as well as parental mental health history of anxiety, depression and substance abuse are considered confounders of the relationship between CAs and mental health disorders and included in multivariate analyses.

Next, the individual outcome probabilities are imputed by manipulating each binary CA exposure and ''setting'' it to the null value. We set each adversity measure to 0, to create a counterfactual outcome had the youth not been exposed to the CA.

Next the probabilities are averaged within each racial group to estimate the prevalence of each mental health disorder with the experienced levels of CAs compared the counterfactual prevalence in the absence of CA exposure. We arrive at a parameter for each CA in each stratum specific mental health disorder model. For example the parameter for parent death and fear disorder is as follows:

$$\theta(A_a) = E_W\{E[Y|A = a, W]\}, \; \theta(A_0) = E_W\{E[Y|A = 0, W]\},$$
$$\text{and } \theta(A_a - A_0) = E_W\{E[Y|A = a, W] - E[Y|A = 0, W]\}$$

where $A$ is parent death set to a (the values naturally occurring in the data) or to 0 (as if no one experienced parent death), $W$ is the vector of confounders, and $Y$ is the outcome of fear disorder.

Finally, we will bootstrap estimates to arrive at 95% confidence intervals.

## Results

As expected we find a similar prevalence of DSM-IV mental health conditions across non-Hispanic white, non-Hispanic black and Hispanic adolescents (Table 1). Non-Hispanic black adolescents have a lower prevalence of substance abuse.

Examination of childhood adversities by race reveals that non-Hispanic black and Hispanic youth have higher prevalence of all identified childhood adversities than non-Hispanic whites in the sample (Table 2). This is especially apparent for family economic adversity. There are no meaningful differences in number of additional CAs among respondents reporting any one CA across racial/ethnic groups. While non-Hispanic black and Hispanic youth may be more likely to experience a CA, those who experience CAs have a similar burden of co-occurrence across racial groups.

Multivariate logistic regression models (not shown) including 10 binary adversity measures reveal 7 significant effects for non-Hispanic whites, 5 significant effects for non-Hispanic blacks, and 5 significant effects for Hispanics across the four mental health conditions.

The marginal model parameters are presented in table 3a-d. For the completed paper, we plan to use bootstrap estimates of the 95% confidence intervals, however normal

based estimates are presented at this time. We can interpret the first parameter: the difference between the prevalence of fear disorder in the non-Hispanic white population with the observed distribution of parent death versus a distribution of no parental death is .04%. Looking across the parameters we see that family economic adversity appears to have the strongest effect on to population prevalence of mental health disorders across racial groups.

Table 4 displays the marginal differences between the observed levels of adversity compared to manipulating all CAs to 0. These estimates can be interpreted as the effect on mental health disorders in each racial group in the absence of all negative events during childhood.

## Discussion

Our interpretation of the results is ongoing. We find that higher prevalence of mental health disorders is associated with experience of childhood adversities among non-Hispanic white, non-Hispanic black and Hispanic adolescents. We believe our results indicate that despite higher prevalence of childhood adversity measures among Hispanic and non-Hispanic Black adolescents than white adolescents, these exposures do not appear to lead to greater incident mental health disorders. These results may be consistent with the observed absence of racial/ethnic disparities in mental health conditions. Family economic adversity appears to have the strongest relationship with mental health disorders in our analysis.

Multiple exposures pose methodological challenges. Our logistic regression models adjust for all 10 CAs, and therefore do not allow for examination about the relationship between co-occurring adversities and mental health conditions. For the paper, we will further explore the complexity in how different stressors and their distinct combinations may shape mental health disorders.

The estimation of marginal effects is unique to this analysis and allows us to consider the potential effect of interventions in early childhood to prevent subsequent mental health disorder occurrence. This work can assist practitioners and researchers to understand the relative importance of adverse experiences in childhood among different racial groups.

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**Table 1: Prevalence of DSM-IV disorder classes among 10,123 adolescents**

| | Prevalence of mental health condition | | |
| --- | --- | --- | --- |
| | Non-Hispanic white | Non-Hispanic black | Hispanic |
| Fear Disorders | 38.15% | 41.42% | 34.02% |
| Distress Disorders | 21.56% | 20.13% | 19.27% |
| Behavior Disorders | 31.78% | 32.33% | 29.57% |
| Substance Use Disorders | 13.42% | 5.20% | 12.64% |

**Table 2: Racial differences in prevalence of childhood adversities among 10,123 adolescents**

| | Non-Hispanic white | | Non-Hispanic black | | Hispanic | |
| --- | --- | --- | --- | --- | --- | --- |
| | Prevalence of CA | Mean no. of other CAs among those with CA | Prevalence of CA | Mean no. of other CAs among those with CA | Prevalence of CA | Mean no. of other CAs among those with CA |
| Parental death | 2.70% | 1.88 (.13) | 5.70% | 2.20 (1.8) | 3.90% | 2.15 (.25) |
| Parental divorce | 26.80% | 1.65 (.05) | 35.60% | 1.81 (.07) | 28.20% | 1.92 (.08) |
| Other parental loss | 4.10% | 2.33 (.12) | 8.70% | 2.42 (.12) | 5.90% | 2.73(.20) |
| Parental criminality | 10.10% | 2.42 (.10) | 17.70% | 2.64 (.10) | 19.50% | 2.2 (.06) |
| Family violence | 1.70% | 3.47 (.23) | 4.10% | 3.59 (.32) | 3.00% | 3.4 (.24) |
| Physical abuse | 1.60% | 3.92 (.21) | 3.60% | 4.07 (.38) | 4.70% | 3.68 (.21) |
| Emotional abuse | 5.10% | 2.85 (.19) | 10.00% | 3.10 (.23) | 8.20% | 3.15 (.20) |
| Sexual abuse | 2.80% | 2.28 (.18) | 4.80% | 2.19 (.12) | 3.00% | 2.42 (.37) |
| Neglect | 2.10% | 3.04 (.24) | 4.10% | 3.48 (.41) | 3.10% | 3.25 (.25) |
| Family economic adversity | 15.50% | 2.21 (.05) | 37.90% | 2.26 (.09) | 30.00% | 2.25 (.12) |

**Table 3a: Differences in prevalence of fear disorder that would have existed in the absence of each childhood adversity, estimated using a marginal approach.**

| | Non-Hispanic white | | Non-Hispanic black | | Hispanic | |
| --- | --- | --- | --- | --- | --- | --- |
| | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI |
| Parental death | 0.0004 | (.0005, .0003) | -.0042 | (-.0050, -.0033) | -.0069 | (-.0085, -.0053) |
| Parental divorce | .0065 | (.0062, .0068) | -.0129 | (-.0138, -.0120) | -.0069 | (-.0075, -.0064) |
| Other parental loss | .0012 | (.0010, .0014) | .0021 | (.0018, .0025) | .0043 | (.0035, .0052) |
| Parental criminality | -.0010 | (-.0010, -.0009) | -.0011 | (-.0012, -.0010) | .0008 | (.0007, .0009) |
| Family violence | -.0009 | (-.0011, -.0007) | .0046 | (.0033, .0058) | -.0036 | (-.0046, -.0026) |
| Physical abuse | -.0003 | (-.0003, -.0002) | .0125 | (.0089, .0161) | .0055 | (.0040, .0070) |
| Emotional abuse | .0041 | (.0026, .0046) | -.0074 | (-.0086, -.0063) | .0078 | (.0065, .0090) |
| Sexual abuse | .0029 | (.0023, .0035) | .0010 | (.0007, .0013) | .0046 | (.0032, .0061) |
| Neglect | .0016 | (.0012, .0019) | -.0004 | (-.0005, -.0003) | .0007 | (.0005, .0009) |
| Family economic adversity | .012 | (.0115, .0133) | .0292 | (.0273, .0312) | .0088 | (.0082, .0010) |

**Table 3b: Differences in prevalence of distress disorder that would have existed in the absence of each childhood adversity, estimated using a marginal approach.**

| | Non-Hispanic white | | Non-Hispanic black | | Hispanic | |
|---|---|---|---|---|---|---|
| | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI |
| Parental death | .0004 | (.0003, .0004) | .0085 | (.0068, .0103) | -.0014 | (-.0017, -.0010) |
| Parental divorce | .0151 | (.0143, .0158) | .0017 | (.0016, .0019) | .0051 | (.0047, .0056) |
| Other parental loss | -.0002 | (-.0003, -.0002) | .0035 | (.0030, .0042) | .0027 | (.0021, .0032) |
| Parental criminality | .0029 | (.0026, .0031) | -.0031 | (-.0035, -.0027) | -.0060 | (-.0067, -.0053) |
| Family violence | .0017 | (.0013, .0021) | -.0002 | (-.0003, -.0001) | -.0001 | (-.0001, -.0001) |
| Physical abuse | .0005 | (.0004, .0006) | .0035 | (.0025, .0046) | .0044 | (.0032, .0056) |
| Emotional abuse | .0021 | (.0019, .0024) | -.0009 | (-.0010, -.0007) | .0190 | (.0160, .0222) |
| Sexual abuse | .0067 | (.0053, .0080) | -.0009 | (-.0012, -.0006) | .0034 | (.0023, .0044) |
| Neglect | .0032 | (.0025, .0039) | -.0022 | (-.0028, -.0017) | .0019 | (.0013, .0025) |
| Family economic adversity | .0018 | (.0017, .0020) | .0118 | (.0110, .0126) | .0117 | (.0108, .0127) |

**Table 3c: Differences in prevalence of behavior disorder that would have existed in the absence of each childhood adversity, estimated using a marginal approach.**

| | Non-Hispanic white | | Non-Hispanic black | | Hispanic | |
|---|---|---|---|---|---|---|
| | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI |
| Parental death | -.0001 | (-.0001, -.0001) | .0065 | (.0052, .0078) | .0038 | (.0029, .0047) |
| Parental divorce | .0228 | (.0217, .0239) | -.0209 | (-.0022, -.0195) | .0026 | (.0024, .0029) |
| Other parental loss | .0038 | (.0032, .0043) | .0069 | (.0057, .0080) | .0120 | (.0096, .0144) |
| Parental criminality | .0078 | (.0071, .0085) | .0084 | (.0075, .0094) | .0138 | (.0123, .0153) |
| Family violence | .0007 | (.0006, .0009) | -.0011 | (-.0014, -.0008) | .0014 | (.0011, .0019) |
| Physical abuse | .0009 | (.0007, .0012) | .0041 | (.0029, .0052) | .0013 | (.0010, .0018) |
| Emotional abuse | .0091 | (.0079, .0102) | .0164 | (.0139, .0188) | .0184 | (.0154, .0215) |
| Sexual abuse | .0030 | (.0024, .0036) | .0035 | (.0024, .0047) | .0014 | (.0010, .0019) |
| Neglect | .0018 | (.0014, .0022) | -.0020 | (-.0025, -.0015) | .0016 | (.0012, .0020) |
| Family economic adversity | .0131 | (.0121, .0140) | .0198 | (.0185, .0211) | .0144 | (.0132, .0155) |

**Table 3d: Differences in prevalence of substance use disorder that would have existed in the absence of each childhood adversity, estimated using a marginal approach.**

| | Non-Hispanic white | | Non-Hispanic black | | Hispanic | |
|---|---|---|---|---|---|---|
| | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI | $\theta(A_a - A_0)$ | 95% CI |
| Parental death | .0004 | (.0002, .0005) | -.0014 | (-.0018, -.0009) | -.0047 | (-.0061, -.0033) |
| Parental divorce | .0131 | (.0124, .0139) | -.0027 | (-.0030, -.0024) | .0111 | (.0100, .0122) |
| Other parental loss | .0019 | (.0016, .0023) | .0109 | (.0086, .0132) | .0136 | (.0106, .0165) |
| Parental criminality | .0042 | (.0038, .0046) | .0061 | (.0050, .0071) | .0111 | (.0098, .0124) |
| Family violence | .0030 | (.0023, .0037) | .0002 | (.0001, .0003) | .0005 | (.0004 .0007) |
| Physical abuse | .0001 | (.0001, .0001) | .0022 | (.0014, .0030) | .0063 | (.0044, .0082) |
| Emotional abuse | .0013 | (.0011, .0015) | -.0001 | (-.0002, -.0001) | -.0002 | (-.0002, -.0001) |
| Sexual abuse | .0014 | (.0010, .0016) | .0012 | (.0007, .0018) | .0002 | (.0001, .0002) |
| Neglect | .0012 | (.0009, .0015) | .0013 | (.0009, .0018) | -.0019 | (-.0025, -.0013) |
| Family economic adversity | .0063 | (.0058, .0069) | .0112 | (.0099, .0125) | .0042 | (.0038, .0045) |

| Table 4: Differences in prevalence of mental health disorders that would have existed in the absence of 10 childhood adversities of all adolescents, estimated using a marginal approach. | | | |
|---|---|---|---|
| | Prevalence of mental health condition | | |
| | Non-Hispanic white | Non-Hispanic black | Hispanic |
| Fear Disorders | .0261 (.0247, .0276) | .0237 (.0194, .0280) | .0156 (.0121, .0191) |
| Distress Disorders | .0335 (.0314, .0356) | .0218 (.0195, .0240) | .0401 (.0357, .0445) |
| Behavior Disorders | .0631 (.0602, .0661) | .0426 (.0380, .0473) | .0728 (.0672, .0783) |
| Substance Use Disorders | .0301 (.0283, .0319) | .0238 (.0204, .0277) | .0381 (.0338, .0424) |