

Describing the role of the exposome to explain variance in youth suicide attempts: individual level psychosocial exposome

Abstract

Background: Suicide is the second leading cause of death among youth in America, yet the reasons for variance in suicide attempts are not clear. The network of environmental exposures and social determinants of health is termed the "exposome", and has major contributions to mental health burden and suicide risk specifically. Here, we looked at the exposome and its effects on explaining suicide attempts in two large diverse samples of US youth.

Methods: We analyzed data from the Adolescent Brain Cognitive Development (ABCD) Study that includes N=11,876 youth of whom >3% (n=354) reported history of suicide attempt by age 12. The ABCD study collected data on n=598 individual-exposome measures. We also looked at the data from the Children's Hospital of Philadelphia emergency department (CHOP-ED) dataset which includes N=19,879 youth of whom n=2,025 reported past suicide attempt, and this comes out to around 10.2% of the dataset.

Results: Of the 598 individual level exposures in the ABCD study, over 300 were significantly associated with suicide attempt after correcting for multiple comparisons. The CHOP-ED dataset showed that endorsement of both sexual and physical abuse was most correlated with suicide attempts. Both the ABCD study and the CHOP-ED dataset showed that endorsement of experiences that involved assault were the most associated with suicide attempts.

Discussion: Our findings further support the fact that individual-level adverse exposures in adolescence are associated with suicide attempts. The results highlight the role of the exposome in explaining variability in youth suicidal behavior, and we stress the importance of comprehending more exposome trends.

Introduction

Suicide is a major health problem among youth in America, and there are developmental effects during adolescence as suicidal behavior rises. This steady increase seen in suicide is correlated with a variety of factors including biological and environmental factors. Since the etiology of suicide is still not fully understood, it is important to examine the multifactorial nature of this behavior. The exposome looks at the intersection between social determinants of health and environmental factors, and it has been shown to have influence on the mental health of adolescents. The exposome is key to comprehending suicide risk, and differences at an individual level can explain disparities in suicide attempts. Here we ask the question: How do exposome factors shape trends in suicide attempts in youth? The use of longitudinal data with the ABCD study will eventually put this work here at a unique position to help predict future suicide attempts rather than just explain them.

Methods

The ABCD Study:

Data from this study has been utilized to assess environmental risks and protective factors regarding suicide in youth, so it was in a suitable position to continue our work looking into specific individual exposures that could help explain suicide attempts. This study provided a sample that is large and diverse including N=11,876 youth with n=354 participants endorsing suicide attempt by the age of 12 which makes about 3.4% of the sample. Individual-level exposome measures (n=598) were collected from the data.

Methods

Total Sample N=11,876	Mean/n	SD/%
Age, y	9.9	0.6
Sex, Male	6,195	52.2%
Sex, Female	5,681	47.8%
Race, American Indian or Alaska Native	410	3.5%
Race, Asian	751	6.3%
Race, Black	2,518	21.2%
Race, Multiple Races	1,434	12.1%
Race, Native Hawaiian/Other Pacific Islander	74	0.6%
Race, Other	800	6.7%
Race, White	8,804	74.1%
Ethnicity, Hispanic	2,411	20.6%

Table 1: Demographics of the ABCD Study at baseline assessment.

The CHOP-ED Dataset:

This dataset includes data from youth at the Children's Hospital of Philadelphia emergency department (CHOP-ED) between 2014-2019 (N=19,879). Using behavioral health surveys, data on their individual-level exposures to adversity were analyzed from the electronic health record. These surveys are routinely administered and also provided information on their endorsement of suicide attempts at any point in their lives. In this sample, n=2,025 youth reported past suicide attempts which is about 10.2% of this dataset.

Total sample N=19,879	Mean/n	SD/%
Age, y	15.3	1.53
Sex, Male	6883	34.60%
Sex, Female	12,996	65.40%
Race, American Indian or Alaska Native	10	0.10%
Race, Asian	510	2.60%
Race, Black	11,175	56.20%
Race, Multiple Races	218	1.10%
Race, Native Hawaiian/ Other Pacific Islander	11	0.10%
Race, Other	1,440	7.20%
Race, White	6,512	32.80%
Ethnicity, Hispanic	1,393	7.00%

Table 2: Demographics of the CHOP-ED Dataset.

Results

Associations of Individual-Level Exposome with Suicide Attempt – ABCD Study

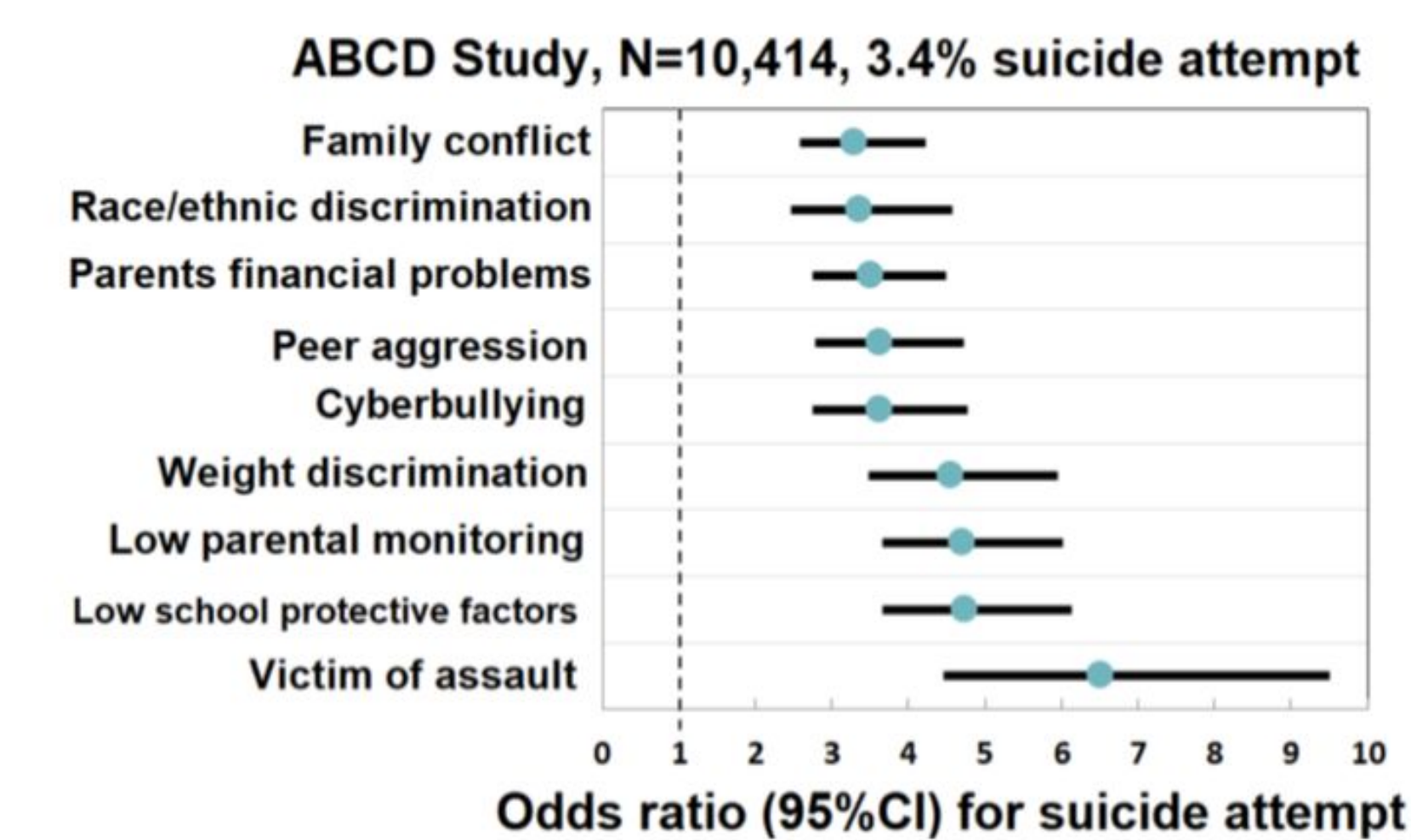


Figure 1: Associations of individual-level adverse exposures with suicide attempt in ABCD Study (suicide attempt reported by the 3rd assessment, mean age 12). Exposures were included in logistic regression models separately. The logistic regression included the environmental exposure as the independent variable and suicide attempt as the dependent variable. Models co-varied for age, sex and race, site, and family relatedness.

In the ABCD dataset, endorsement of "victim of assault" is the most correlated with suicide attempt with endorsements of family conflict, race/ethnic discrimination, parental financial problems, peer aggression, cyberbullying, weight discrimination, low parental monitoring, and low school protective factors among the other few of the more significantly correlated measures. More than 300 individual-level exposures were found to be significantly associated with suicide attempts out of the 598 measures analyzed with this study.

Associations of Individual-Level Exposome with Suicide Attempt – CHOP-ED Dataset

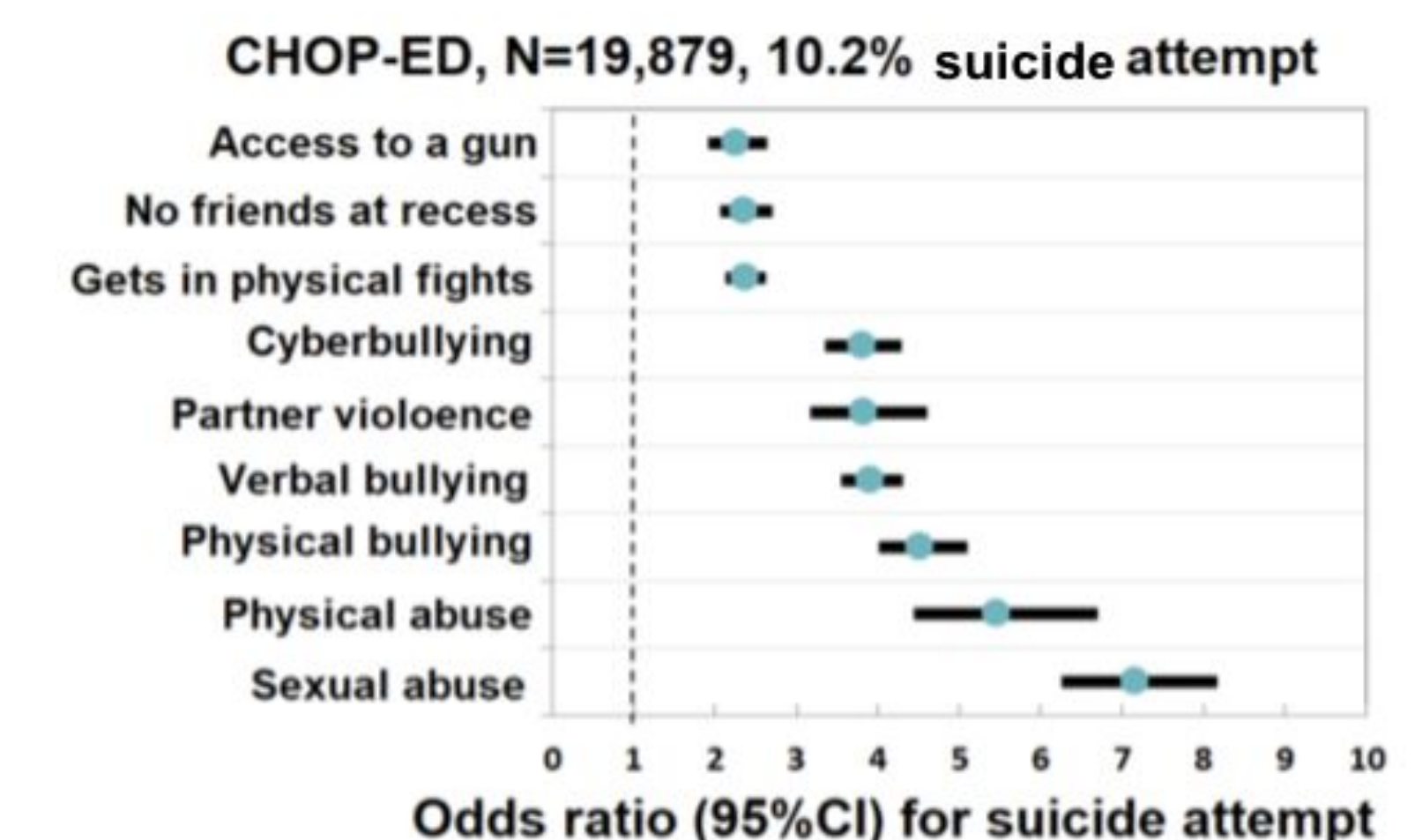


Figure 2: Associations of individual-level adverse exposures with suicide attempt in CHOP-ED dataset (mean age 15). Exposures were included in logistic regression models separately. The logistic regression included the environmental exposure as the independent variable and suicide attempt as the dependent variable. Models co-varied for age, sex and race.

In the CHOP-ED dataset, endorsement of "sexual abuse" is the most correlated with suicide attempts with endorsements of physical abuse, physical bullying, verbal bullying, partner violence, cyberbullying, getting in physical fights, no friends at recess, and access to a gun among the other few measures that are more significantly associated.

Discussion

Seen in both the ABCD and CHOP-ED studies, there are a number of key exposures that help to explain future suicide attempts. As previous literature has shown, endorsement of factors related to assault, both sexual and physical, have been the most correlated with suicide attempts. Generally, our findings here further support the fact that individual-level adverse exposures in adolescence are associated with suicide attempts and add to an individual's exposome. The exposome is a unique tool that will continue to help build on reasonings for various aspects of adolescent mental health. In 2019, suicide was the second leading cause of death in American adolescents with the eventual pandemic only making mental health statuses worse across the board. Explanation of the variation in suicide attempts is yet to be understood fully, and it is crucial that we work to comprehend the trends more comprehensively. Considering this, it is critical that we continue to find new ways to help explain suicide attempts and eventually help predict them as well.

Future Prospects

After analyzing these datasets preliminarily, we are excited about the ways in which the individual-level measures can help to predict future suicide attempts. The ABCD study is projected to last until 2027, by which all participants who endorsed suicide attempts before 12 will reach the age of 17. The CHOP-ED dataset will increase by about 3,000 youth per year which will strengthen the sample and provide more data to investigate the exposome further. We have been looking into structural-level exposures using geocoded data, and we have started to see that the general socioeconomic level and vulnerability of the community in the face of disaster are important measures when considering suicide attempts among their youth. Geo-coded measures are also associated with suicide attempt, and they may be useful to explain variance in suicide attempt more than individual-level exposures. Environmental stressors based on zip code have not been studied in great detail, so the geo-coded data will be helpful in starting to explain these relationships.

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