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Unique roles of childhood poverty and adversity in the development of lifetime co-occurring disorder

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ABSTRACT

Gender differences in stressors that affect the development of co-occurring psychiatric and substance use disorders (COD) have been given inadequate attention, despite evidence that women and men commonly develop different types of both psychiatric disorder and substance use disorders and have different experiences of illness and treatment. This paper assesses early life antecedents of COD, specifically childhood poverty and childhood adversity, and how they vary by gender. Weighted multinomial logistic regressions were conducted with the National Epidemiologic Survey of Alcohol and Related Conditions-III (NESARC-III) (n = 33,676) nationally representative data from 2014-2015 to assess whether antecedents of COD are conditional on gender. Results demonstrate that overall nearly one in five people (17.5%) have lifetime COD, and disorder prevalence differs for males and females (COD: 18.0% vs 16.4%; psychiatric disorder: 8.5% vs. 20.9%; substance use disorder: 5.6% vs. 13.0%, respectively). Males with childhood poverty are more likely than males without to have COD but poverty does not affect COD risk for females. For both males and females, increases in number of adversities are associated with increased probability of COD, however, the magnitude of this association is stronger for males. To understand COD risk, conditional relationships between early poverty, early adversity and gender must be considered. With this knowledge, prevention and treatment efforts have the potential to be targeted more effectively.

Introduction

Co-occurring disorder (COD) refers to concurrent psychiatric disorder and substance use disorder (SUD) (Drake, Mercer-McFadden, Mueser, McHugo, & Bond, 1998) within an individual, and can affect as many as 50% of those who develop a single disorder (Kessler et al., 2005). Compared to those with a single disorder, individuals with COD often require more complex treatment, have poorer health outcomes, and incur higher treatment costs, accounting for over $360 billion in national health care expenditures (Tiet & Mausbach, 2007). Gender differences in factors that affect the development of COD have been given inadequate attention, despite evidence that women and men commonly develop different types of both psychiatric disorder and SUD and have different experiences of disorder and treatment (Korsgaard, Torgersen, Wentzel-Larsen, & Ulberg, 2016; Wu, Kouzis, & Leaf, 1999). The primary aim of this study is to assess the differential roles of childhood poverty and childhood stressors for males and females in the development of COD.

Gender Differences in Psychiatric, Substance Use, and Co-occurring Disorder. Men are significantly more likely to develop SUD as well as personality/conduct disorders, whereas women are more likely to develop mood and anxiety disorders, such as depression (Kessler et al., 2005). Gendered patterns in COD prevalence are less clear due to a lack of recent, population-based studies on COD. A systematic review of the literature found that COD is more commonly associated with being male than female (Najt, Fusar-Poli, & Brambilla, 2011), a conclusion based on studies that mostly rely on clinical samples and are disorder-specific (Goldberg, Garno, Leon, Kocsis, & Portera, 1999) which are not necessarily representative of the population or generalizable across all disorders. There are even fewer studies that look for differences in the way social factors like childhood poverty and adversity affect development of COD for males and females.

In addition to gendered patterns in disorder prevalence, there are other variations in the experience of COD for males and females. Although COD is more likely to be present in males overall, when it is present for females, it has been described as more severe (Korsgaard et al., 2016). Females are more likely to seek help than males when they have COD (Wu et al., 1999), although it is unclear if this is because of

disorder severity, because of increased likelihood to access to healthcare services generally, or for a different reason altogether. It is possible that the order and timing of the disorders that comprise COD differ by gender, and for different types of disorders (e.g., mood disorders, personality disorders), though these possibilities have not been investigated. This body of research suggests that there are gender differences underlying the pathways to COD that are currently underexamined. More conclusive studies that are representative of the population are required to determine how risk factors affect men and women uniquely.

Childhood Poverty and Co-occurring Disorder. Exposure to economic hardship in childhood has been linked to increased odds of experiencing psychiatric disorder (Costello, Compton, Keeler, & Angold, 2003), problematic substance use (Buu et al., 2009; Ensminger, Juon, & Fothergill, 2002; Najman et al.,), and the co-occurrence of both types of disorder (Banducci, Hoffman, Lejuez, & Koenen, 2014) when compared to those with no such exposure. The impact that childhood poverty has on mental health and substance use at the individual level may operate at least partially through increased exposure to other childhood adversities such as abuse, harmful substance use in the household, parental psychiatric disorder or suicidality, and low levels of parental warmth (Menard, Bandeen-Roche, & Chilcoat, 2004) although this has not been tested thoroughly. Poverty in childhood may also hinder access to resources that can ameliorate stressors such as parental support, positive peer networks, mentorship, and so on, allowing stressors to impact psychiatric outcomes (Umberson, Williams, & Thomas, 2014). Or, it may be that childhood poverty leads to the accumulation of economic adversity over time which produces risk of poor mental health in adulthood (Strohschein, 2005). There are also hypothesized connections between childhood poverty and neighborhood effects such as income inequality (Vilhjalmsdottir, Gardarsdottir, Bernburg, & Sigfusdottir, 2016), housing quality (Berger & Waldfogel, 2009), perceptions of relative deprivation (Kearns, Whitley, Bond, Egan, & Tannahill, 2013; Pearson, Griffin, Davies, & Kingham, 2013), and discrimination (Pearson et al., 2013) that are associated with poor mental health.

In an investigation of the life course chains between economic hardship in childhood, economic hardship in adulthood, and poor mental health in adulthood, Lindstrom and colleagues confirmed that both childhood and adulthood poverty are independently associated with adult mental health (Lindström, Fridh, & Rosvall, 2014). This study also found that all experiences of childhood poverty (even those that were shorter or less severe) were significantly associated with poor psychological health for men but only the most severe instances of poverty were significant for women (Lindström et al., 2014). While there is evidence that childhood poverty affects COD, and preliminary evidence about gendered differences in childhood poverty and adult psychiatric health, whether poverty has the same effect on COD for males and females is not yet known.

Childhood Adversity and Co-occurring Disorder. Dose-response type relationships between stressors during childhood and mental health and substance use outcomes later in life have been clearly established (Dube et al., 2003; Edwards, Holden, Felitti, & Anda, 2003; Pilowsky, Keyes, & Hasin, 2009). The population-attributable risk proportion is 28.2% for childhood adversity and onset of any psychiatric disorder (McLaughlin et al., 2012). Previous research with the NESARC I and II datasets confirm that childhood adversities are highly prevalent and highly correlated with psychiatric disorder (Cavanaugh, Petras, & Martins, 2015) as well as substance use disorder (Evans, Grella, & Upchurch, 2017) in the population.

The mechanisms driving the influence of childhood adversity on COD can be understood through a stress-coping model of psychiatric and substance use disorder. Growing up exposed to multiple childhood adversities often also indicates being in an environment where there are few positive examples of healthy, adaptive coping but many exposures to negative events and circumstances. The exposure to negative events increases risk for COD by elevating stress, inhibiting even minimal support or reinforcement for healthy coping and adaptation from the

social network, and ultimately, decreasing ability to withstand mental hardship while simultaneously increasing desire to cope through substance use (Wills et al., 1996).

Adversities in childhood, much like psychiatric disorder and SUD are gendered experiences, even occurring at different rates depending on one's gender (Ali, Dean, & Hedden, 2016; Duhig et al., 2015; Muenzenmaier et al., 2014; Rosenberg, Lu, Mueser, Jankowski, & Cournos, 2007). Existing work in this area points to gender differences in the way adversities may be impacting substance use and psychiatric disorders separately (Fisher et al., 2009) but has not yet looked at differences for males and females in the impact of childhood stressors on COD. Childhood stressors are tied to family structure and familial events, and include experiences like parental psychiatric disorder, parental SUD, and criminality; family violence; physical abuse; sexual abuse, and neglect. When mothers have COD, there is a stronger correlation with their adolescent children exhibiting SUD than when fathers have COD (Ali et al., 2016), and similar trends exist in the dominant impact of mother's psychiatric disorder on children's mental health when compared to father's psychiatric disorder (Fitzsimons, Goodman, Kelly, & Smith, 2017). Additionally, mothers' COD may be more impactful for their daughters than their sons in terms of likelihood of SUD in the children (Ali et al., 2016). Child sexual abuse is more strongly associated with psychiatric disorder for females than males, while parental incarceration is more strongly associated with psychiatric disorder for males than females (Muenzenmaier et al., 2014; Rosenberg et al., 2007). Exposure to childhood trauma, generally, is correlated with psychosis, depression, and anxiety more strongly for females than males (Duhig et al., 2015). Thus, it is apparent that gender differences in the connection between types of adversity and psychiatric disorder and SUD exist, but the findings require further confirmation for these trends to be extended from single disorder types to COD.

Theory

The Theory of Fundamental Causes suggests that people with advantaged socioeconomic positions have a host of flexible resources (knowledge, money, power, prestige, and beneficial social connections) that they can source to mitigate a range of risks and to access a range of protective factors, resulting in a health advantage (Link & Phelan, 1995). Individuals growing up in poverty are likely to experience clusters of disadvantage throughout the life course (DeNavas-Walt & Proctor, 2015, p. P60) and thus possess a continual diminished ability to access resources that could be protective against COD. Does this experience of childhood poverty produce the same chain of disadvantage with respect to COD regardless of one's gender? Are males and females equally resilient to the stresses of adverse childhood experiences? These are the unanswered questions this paper aims to address with an investigation of the connection between early social and economic environments and COD.

Hypotheses. Using the Theory of Fundamental Causes (Link & Phelan, 1995) in combination with the literature presented above, this paper tests the following hypotheses about the connections between vulnerability in childhood and COD in adulthood.

1. Childhood poverty is associated with COD in the population.
2. Childhood poverty has a stronger association with COD for males than females.
3. Childhood adversities are correlated with COD in the population.
4. Childhood adversities are more strongly associated with COD for females than for males.

With a sample size sufficient to study these intersecting social factors, and using a large, recently collected, nationally-representative survey, this paper presents the results of a study that connects the historically siloed psychiatric and substance use research arenas and brings clarity to the relationships between childhood social environment,

gender, and co-occurring psychiatric disorder and SUD that are often treated as unrelated in the literature.

Methods

Dataset. This paper uses data from the National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III): a cross-sectional survey conducted with a nationally representative sample of the civilian non-institutionalized population of the United States aged 18 years and older in 2014 (n = 36,309) (Grant et al., 2018, p. 60). The sample was derived using multi-staged probability sampling to randomly select persons from the eligible population and overall response rate was 60.1% (Grant et al., 2018, p. 60). Participants were assessed for alcohol, drug and mental disorders according to diagnostic definitions in the *Diagnostic and Statistical Manual of the American Psychiatric Association,* 5th *Edition (DSM-5)* (American Psychiatric Asso, 2017). An Institutional Review Board reviewed and approved this research study.

Variables. Lifetime Co-occurring Psychiatric Disorder and Substance Use Disorder. The focal dependent variable is a categorical variable indicating lifetime COD status by using lifetime diagnosis of *DSM-5* for both SUD and psychiatric disorder. Regarding the former, lifetime diagnoses include alcohol use disorder, and all other drug use disorders except tobacco use disorder. For psychiatric disorders, lifetime diagnoses include at least one of the following conditions: major depressive disorder, mania, specific phobia, social phobia, panic disorder, agoraphobia, generalized anxiety disorder, posttraumatic stress disorder, anorexia nervosa, bulimia nervosa, antisocial personality disorder, conduct disorder, borderline personality disorder, and schizotypal personality disorder. The focal dependent variable of lifetime COD is operationalized using a definition of lifetime occurrence of at least one psychiatric disorder and one SUD: meaning that the two types of disorders do not necessarily need to occur at the same time for the person to have lifetime COD in this analysis. While some definitions of COD require at least two disorders to be *simultaneously* present, this study does not require explicit temporal overlap for several reasons: 1) There is no established standard as to how close disorders need to be to each other in time to be considered overlapping, or what constitutes a period of remission. 2) Looking at co-occurrence over the life course is consistent with the theoretical underpinnings of this study that point to the long reach of childhood stressors and the interplay of social factors throughout the lifetime that interact to affect risk. 3) NESARC-III does not collect time and duration information for all disorders (only recent disorders) and thus not all episodes of temporal co-occurrence can be identified in this dataset. Therefore, the lifetime COD variable contains four possible categories of lifetime experiences: "COD," "psychiatric disorder only," "SUD only," and "no disorder." A sensitivity test with temporally overlapping disorders in the past year is conducted to determine whether the results found in this study are applicable to disorders that have recent temporal co-occurrence, rather than lifetime co-occurrence.

Childhood Poverty. Childhood poverty is dichotomous (yes = 1/no = 0) and indicates if before age 18 the respondent's family received money from government assistance programs.

Childhood Adversities. Respondents are asked about childhood stressors in a set of twenty-four questions about frequency of experiences before age 18 (from 0 = never to 4 = very often), which include questions about sexual abuse, verbal abuse, physical abuse, neglect, domestic violence, parental imprisonment, problematic parental alcohol or drug use, parental hospitalization for psychiatric disorder, and parental suicide. The childhood adversity questions in NESARC-III are adaptations from those used in the Centers for Disease Control-Kaiser ACE Study (Felitti et al., 2019) and the Centers for Disease Control Behavioral Risk Factor Surveillance System ACE studies (Centers for Disease Preve, 2020). Original adversity questions in these studies were adapted from the Childhood Trauma Questionnaire (Bernstein, Fink, &

Handelsman, 1994; Fink, Bernstein, Handelsman, Foote, & Lovejoy, 1995), the Conflict Tactics Scale (Straus, 2017), and questionnaires used in other research (Wyatt, 1985). The operationalization of these childhood adversity variables in this study is partially based on the results of a latent class analysis (LCA), described briefly below.

The LCA was conducted to assess the potential that discrete adverse experiences are clustered or patterned in the population according to underlying latent variables. There were 18 childhood adversity variables treated as continuous in the model (abuse, neglect, and domestic violence events) and six categorical (present/absent) variables in the model (parental events). An LCA was performed with 20 random starts and the best loglikelihood value (−577643.725) was replicated at least twice. Variables adjusting for complex survey design and sample weights were added the model. The Vuong-Lu-Mendell-Rubin likelihood ratio test for two versus three classes was performed and three classes were preferred (H0 Loglikelihood Value = −627333.648, p > 0.05). The three latent classes that emerged can be described, generally, as 1) Class 1: those exposed to sexual abuse, 2) Class 2: those exposed to violence, and 3) Class 3: low-exposure individuals.

The LCA highlighted the importance of isolating sexual abuse, especially, from the experience of other childhood adversities. However, since the LCA yielded one group with only 3% of the sample in it and reduced all 24 adversities into just three classes (representing significant information loss), it is not ideal to keep the LCA predicted class memberships as the main operationalization of childhood adversity. The LCA also highlighted the importance of verbal abuse which co-occurred with physical abuse for Class 2 (those exposed to violence). Finally, independent of the LCA, the count of the number of adverse events before the age of 18 has the advantage of including all measures of adversity together in a single variable, with a good range and distribution in the population.

To summarize the final operationalization for the three childhood adversity variables for use in the analyses, there is: 1) a summative score of number of experiences that ever occurred during childhood (range 0–20; truncated at 15); 2) sexual abuse frequency (the average of the frequencies reported for the sexual abuse questions); and 3) verbal and physical abuse frequency (the average of the frequencies reported for each of the verbal/physical abuse questions). This operationalization considers the independent effects of both frequency of different types of abuse as well as the total number adverse experiences in all models, and results are interpreted accordingly.

Family History of Psychiatric Disorder, SUD, and COD. The family history variables include 4 binary variables each coded as yes = 1/no = 0 for any maternal or paternal lifetime history of each condition. The four variables are: 1) SUD only history; 2) psychiatric disorder only history; 3) COD history; 4) unknown family history.

Demographics. Nativity status is included to capture whether respondents were born in the United States or not (yes = 1/no = 0). Age is included in the analyses as a continuous variable ranging from 18-90. The gender variable is inferred from the only question asked about gender/sex in the NESARC-III questionnaire, which is a dichotomous question phrased, "what is your sex?" Variables remain labelled "male" and "female" (male = 1/female = 0) in this paper in recognition of the way the question was asked and gender is assumed to be congruent with reported sex. The family structure variable for the composition of the respondent's childhood home has 4 categories: two biological parents, single parent, reconstituted families (biological parent with a step-parent), and all other arrangements. Race/ethnicity has four categories: White, non-Hispanic; Black, non-Hispanic; Asian/Native Hawaiian/Other Pacific Islander, non-Hispanic; Hispanic, any race. American Indian/Alaska Native respondents were excluded due to sample size issues (n = 511).

Family Support. Family support is a dichotomous (yes = 1/no = 0) variable where "yes" includes any respondents that scored "very often" on any one of five questions that ask how often before the age of 18 the respondent felt there was someone in the family: who wanted them to be

a success, believed in them, etc. Frequency for these questions is asked on a scale from 0 ("never") to 4 ("very often"). A family support score was first created by calculating the mean responses for all five questions to capture the level of family support perceived by participants before age 18; however, there were high levels of support and as a result substantial skew on this variable with few responses in the tail, and family support was ultimately dichotomized. The theoretical model for this investigation hypothesizes that family support operates as a confounding variable and it is introduced to control for association between the focal variables and the outcome that is due to family support. Sensitivity tests are conducted with the mean family support variable in addition to the dichotomous variable to determine if operationalization of this variable changes the findings substantially.

Alcohol and Substance Use Initiation. The earliest age cited of all the questions asking about initiation of alcohol or drug use is used to produce a continuous variable for age of first substance use. For those who never drank alcohol or never used any drugs (n = 3927), current age is used to avoid excluding them from the analysis. The theoretical model for this investigation hypothesizes that substance use initiation operates as a confounding variable.

Treatment of Missing Data. Age was imputed by NESARC for 1.13% of responses using both assignment and allocation. Data are missing on only three other variables used in the study: family support (n = 156), childhood adversity (n = 1373), and childhood poverty (n = 781) and missing is handled with listwise deletion, because missing data comprised only 5% of the sample (Bennett, 2001). The final sample size is n = 33,767.

Analysis. Multinomial logistic regression is used to determine the association between the focal variables, covariates and the nominal dependent variable. Sample weights, strata, and clustering variables were used to account for the design effects of NESARC-III. All coefficients produced in this model are relative to a base category and exponentiating the coefficients allows for the generation of relative risk ratios (RRR), representing lifetime COD compared to each other disorder outcome (psychiatric disorder only, SUD only, and no disorder). All analyses are conducted using Stata® version 14 (Stata Version 14, 2016). The Adjusted Wald test is used to determine the significance of covariates in the multivariate model, and significant differences in predicted probabilities are assessed using estimated marginal effects of included variables. To test conditional relationships, interaction terms

Table 1
Sample characteristics by gender and race/ethnicity, proportion or Mean/SD, NESARC-III, 2014, United States.

Unweighted		Whole sample	Gender		Race/ethnicity			
	N†	Total	Males	Females	NH White	NH Black	NH Asian American	Hispanic
Characteristic	33,767		n = 15,862	n = 20,447	n = 19,194	n = 7766	n = 1801	n = 7037
Overall Proportion	33,767	N/A	47.8%	52.2%	67.4%	10.7%	5.7%	14.8%
Age (years)	33,767	46.140/ 17.530	45.510 /17.232	46.720/ 17.752	48.330/ 18.154	43.070/ 16.259	42.720/16.988	39.880/ 15.318
Nativity (US-Born)	29,896	84.0%	83.7%	84.4%	95.6%	90.7%	26.3%	47.8%
Childhood family structure								
Two biological parents	22,176	70.0%	71.0%	69.1%	72.8%	49.6%	85.9%	67.4%
Reconstituted families	6284	14.2%	13.3%	15.1%	14.3%	18.5%	4.8%	13.5%
Single parent	6643	14.7%	14.9%	14.6%	12.0%	30.3%	8.6%	17.8%
Other	1206	1.0%	0.8%	1.2%	0.9%	1.6%	0.6%	1.2%
Family history								
Only COD in family	6380	17.4%	15.6%	19.1%	19.1%	15.6%	5.2%	15.7%
Family history unknown	2189	5.0%	5.8%	4.4%	4.7%	7.1%	7.8%	3.9%
Only psychiatric disorder in family	11,346	33.4%	30.7%	35.9%	36.5%	25.5%	23.4%	29.0%
Only SUD in family	6365	16.4%	15.9%	16.9%	16.1%	19.5%	8.0%	18.6%
Childhood Poverty								
Present	6921	15.4%	14.9%	15.7%	12.7%	31.3%	6.9%	17.9%
Childhood Adversity								
Early adversity (count, range 0–15)	33,767	3.409/3.872	3.134/3.760	3.306/4.215	3.216/3.948	3.395/4.017	2.384/3.433	3.284/4.223
Early neglect (count, range 0–4)	33,767	0.650/1.149	0.702/1.208	0.602/1.200	0.623/1.165	0.618/1.150	0.628/1.178	0.768/1.327
Early physical abuse (count, range 0–2)	33,767	0.521/0.754	0.549/0.767	0.494/0.759	0.535/0.759	0.539/0.767	0.427/0.715	0.481/0.765
Early sexual abuse (count, range 0–4)	33,767	0.251/0.815	0.128/0.617	0.367/1.021	0.251/0.858	0.313/0.938	0.127/0.577	0.256/0.885
Early verbal abuse (count, range 0–3)	33,767	0.903/1.158	0.937/1.174	0.872/1.163	0.933/1.118	0.902/1.115	0.729/1.111	0.838/1.170
Early domestic violence exposure (count, range 0–4)	33,767	0.400/0.960	0.346/0.926	0.441/1.063	0.365/0.939	0.496/1.087	0.266/0.832	0.482/1.096
Early parental events (count, range 0–7)	33,767	0.550/0.945	0.506/0.934	0.591/1.002	0.562/0.982	0.595/0.984	0.250/0.713	0.543/0.585
At least one adverse experience	24,245	69.4%	70.6%	68.2%	70.4%	70.8%	61.5%	66.7%
Family support	28,591	81.1%	81.2%	81.0%	80.3%	84.9%	83.8%	81.3%
Age of first alcohol/substance use	33,767	21.881/ 12.882	19.617/ 10.984	23.986/ 14.984	21.150/ 13.467	22.819/ 13.038	27.692/16.444	22.198/ 11.889
Own Substance Use disorder								
Alcohol use disorder	10,001	29.2%	36.1%	22.8%	32.6%	22.7%	14.7%	22.6%
Other drug use disorder	3548	9.9%	12.4%	7.5%	10.8%	9.8%	3.8%	7.2%
Own Psychiatric disorder								
Internalizing disorder	11,524	31.8%	24.7%	38.4%	35.3%	25.5%	17.6%	25.1%
Externalizing disorder	1754	4.7%	6.8%	2.7%	4.6%	5.6%	2.7%	4.4%
Post-traumatic stress disorder	2339	6.1%	4.2%	7.9%	6.4%	6.3%	2.1%	5.4%
Personality disorder	5010	13.1%	14.3%	12.0%	13.5%	14.1%	6.1%	12.0%
Eating disorder	617	1.8%	0.8%	2.7%	2.0%	1.0%	1.3%	1.4%
Own Co-occurring disorder								
No disorder	18,066	48.9%	48.2%	49.5%	44.3%	55.8%	68.3%	58.5%
Co-occurring disorder	6158	17.2%	18.0%	16.4%	19.2%	13.6%	5.9%	13.4%
Psychiatric disorder only	7313	19.6%	13.0%	25.6%	20.7%	18.3%	15.7%	16.9%
Substance use disorder only	4772	14.4%	20.9%	8.5%	15.8%	12.4%	10.1%	11.3%

Note: NA = not applicable, † Analytic *N*, variation is due to item missing data.

are created as products of the two variables included in the moderation (e.g. gender × child poverty).

Results

Sample Characteristics. The population is roughly balanced in gender, and Non-Hispanic Whites (hereafter: Whites) make up the majority, followed by Hispanics, Non-Hispanic Blacks, and Non-Hispanic Asian Americans. A summary of these characteristics can be seen in Table 1. The majority are born in the US (84.0%). Over two-thirds grew up with two biological parents, and the rest are equally split between reconstituted step-parent families and single parent families. Family history with at least one disorder is common. Fewer than one in five have a biological mother or father with SUD only, and the same proportion have a parent with COD. One-third of the sample have a parent with psychiatric disorder only. Only 15.4% of the population reports poverty before age 18. Both support and adversity are common experiences in childhood homes. Over 80% of people report family support in childhood and the majority also experience at least one adversity before age 18 (70.7%).

Half of the population has no lifetime disorder of any type, while one in five have a psychiatric disorder only, nearly one in five have lifetime COD, and just under 15% have SUD only. Disorder prevalence is different by gender with the most marked differences being males who are more likely to have SUD only (20.9% vs. 8.5%) and females who are more likely to have psychiatric disorder only (25.6% vs. 13.0%). COD prevalence is similar but remains more common among males (18.0% vs. 16.4%).

Gender Differences in Childhood Social and Material Environment. Access to environments that provide resources, or conversely, placement in environments that induce stress happen at different frequencies according to one's gender. Having at least one adversity is more common among males than females (70.6% vs. 68.2%) but the mean number of adversities experienced before age 18 is higher for females than males (mean count = 3.306 vs. 3.134). The number and frequency of types of adversity also differ for males and females. The mean counts of verbal and physical abuse exposures is higher for males than females (mean count physical abuse 0.549 vs. 0.494, verbal abuse 0.937 vs. 0.872), while sexual abuse exposures are higher for females (mean count 0.367 vs. 0.128). Childhood poverty also varies by gender being more common for females than males (15.7% vs. 14.9%).

Bivariate Relationships between Childhood Variables and COD. Because lifetime COD is a categorical outcome with four possible categories, all three comparisons are given to highlight COD as a disorder status that is different not only from no disorder but also from psychiatric disorder only or SUD only. These comparisons allow conclusions to be drawn about the antecedents of lifetime COD in relation to the different possible disorder outcomes. Using bivariate multinomial logistic regression, experiencing childhood poverty is significantly associated with COD with an RRR of 2.609 (95% CI: 2.373–2.869) compared to no disorder: a large difference (bivariate models not shown). When comparing bivariate relative risk associated with childhood poverty there is 1.675 times the risk (95% CI: 1.501–1.869) of COD compared to psychiatric disorder only, and 1.798 times the risk compared to SUD only (95% CI: 1.597–2.025).

Using bivariate multinomial logistic regression, number of childhood adversities is associated with lifetime COD with an RRR of 1.269 (95% CI: 1.256–1.282), compared to no disorder, an RRR of 1.079 compared to those who have only psychiatric disorder (95% CI: 1.069–1.089) and a 1.159 greater RRR compared to SUD only (95% CI: 1.146–1.174). Childhood sexual abuse frequency is associated with COD compared to no disorder, compared to psychiatric disorder only, and compared to SUD only (RRR = 3.302, 95% CI: 2.898–3.763; RRR = 1.141, 95% CI: 1.070–1.218; and RRR = 2.741, 95% CI: 2.318–3.242, respectively). Childhood physical/verbal abuse frequency is also associated with lifetime COD compared to no disorder, psychiatric disorder only, and SUD

only (RRR = 2.743, 95% CI: 2.593–2.901; RRR = 1.311, 95% CI: 1.256–1.369; and RRR = 1.839, 95% CI: 1.754–1.929, respectively).

Social Antecedents of Lifetime COD in Multivariate Models. A main-effects multivariate multinomial logistic regression was estimated to investigate the association between COD, childhood poverty, childhood adversity (three variables), demographic variables (gender, race/ethnicity, nativity, age) family characteristics variables (family history, childhood family composition) and childhood experience variables (age of first substance use, family support).

With all covariates in the model, there is no longer a direct association between poverty and all disorder outcomes at the conservative $p < 0.01$ level, accounting for multiple comparisons (Model 1, $F(3,111) = 3.56$, $p = 0.017$; results not shown). This association is seen between childhood poverty and COD relative to SUD but not relative to psychiatric or no disorder, and not overall. In the main effects model, all three childhood adversity variables are significantly associated with disorder outcomes (adversity count variable $F(3,111) = 22.37$, $p < 0.001$; sexual abuse frequency $F(3,111) = 27.46$, $p < 0.001$; and physical/verbal abuse frequency $F(3,111) = 24.48$, $p < 0.001$; results not shown). The magnitude of the association for each of these adversity measures with COD depends on the outcome being compared. The main effects model (Model 1, not shown) assumes by default that the relationships between childhood poverty and disorder as well as childhood adversity and disorder are operating in the same manner for males and females. Interaction terms testing these assumptions are introduced first into separate models, each with the full set of covariates. Both conditional relationships are present ($F(3,111) = 6.60$, $p < 0.001$ for the interaction term poverty × gender; and $F(3,111) = 6.79$, $p < 0.001$ for adversity count × gender, not shown).

To reconcile the findings between adversity and gender and poverty and gender, a model that includes both sets of significant interactions (childhood poverty × gender and childhood adversity count × gender) along with the other covariates was constructed, and both sets of interactions remain significant ($F(3,111) = 5.62$ $p = 0.001$ for poverty × gender; and $F(3,111) = 5.23$, $p = 0.002$ for adversity × gender). The model showing these two conditional relationships together is given in Model 2, Table 2. Covariates are controlled for but not shown in the table. Model 2 comparisons A, B, and C are all obtained from the same multinomial logistic regression, and each model presents the risk ratios for COD relative to the other three disorder categories. Model 2 in Table 2 shows that both childhood poverty and the count of childhood adversities are associated with lifetime COD, controlling for alternative explanations, however their relationship with disorder outcomes depends on gender.

Predicted Probability of COD, SUD, Psychiatric Disorder, and No Disorder. In Table 2, lifetime COD risk is interpreted relative to *one* other outcome at a time. The predicted probabilities, however, look at the likelihood of each disorder outcome relative to *all* of the other disorder outcomes simultaneously. The predicted probabilities presented in Fig. 1 are generated using the margins command in Stata with other covariates at their means and based on Model 2 in Table 2. Only statistically significant differences in predicted probabilities (assessed via dy/dx comparisons of estimated marginal effects in Stata) are presented.

Fig. 1a shows the predicted probability of having no disorder across the count of childhood adversities, for males and females with and without poverty. The probability of having no disorder decreases for both genders as the number of childhood adversities increase (males: dy/dx = −0.021, SE = 0.003, $p < 0.001$; females: dy/dx = −0.015, SE = 0.002, $p < 0.001$). There is no difference in the predicted probability for either gender with/without childhood poverty exposure. With predicted probability of lifetime COD (Fig. 1b), for males and females, more adversities in childhood are associated with a higher probability of COD (males: dy/dx = 0.008, SE = 0.001, $p < 0.001$ for males; females: dy/dx = 0.006, SE = 0.001, $p < 0.001$). Males with childhood poverty are more likely than all other groups to have lifetime COD, including males without poverty. For females with and without childhood poverty, the

Table 2
Multinomial logistic regression of COD with childhood poverty conditional on gender and childhood adversity conditional on gender model, NESARC-III, 2014, United States.

	Model 2: Co-occurring Disorder Risk Relative to:								
	A:No Disorder			B:Psychiatric Disorder only			C:Substance Use Disorder only		
Characteristic	RRR		95% CI	RRR		95% CI	RRR		95% CI
Male (/female)	0.924		0.813–1.050	1.942	***	1.701–2.217	0.442	***	0.377–0.518
Childhood Poverty × Male	1.213		0.963–1.528	1.120		0.920–1.363	1.610	***	1.269–2.042
Childhood Poverty (/no)	0.977		0.836–1.142	0.919		0.779–1.083	0.899		0.749–1.080
Childhood Adversity Count × Male	1.030	**	1.003–1.058	0.986		0.966–1.006	1.014		0.985–1.044
Childhood Adversity Count	1.072	***	1.047–1.097	1.050	***	1.028–1.073	1.051	**	1.016–1.086
Other Childhood Adversity Variables									
Early Sexual Abuse (Freq)	1.613	***	1.396–1.865	0.981		0.887–1.085	1.554	***	1.330–1.816
Early Physical Abuse (Freq)	1.444	***	1.309–1.593	1.036		0.950–1.129	1.283	***	1.144–1.439

Model Statistics: Design df = 113, F (63,51) = 119.13, p < 0.001.

Note: Model is estimated with each comparison relative to COD as the reference group, RRR are re-parameterized to show COD relative to the comparison outcome, model controls for age, gender, race/ethnicity, nativity status, childhood family composition, family history variables, family support, childhood poverty, and age at first substance use.

CI = confidence interval, RRR = relative risk ratio,/= omitted reference category.

‡ p < 0.05; **p < 0.01; ***p < 0.001, Analytic significance level is set to p = 0.01 to account for multiple comparisons.
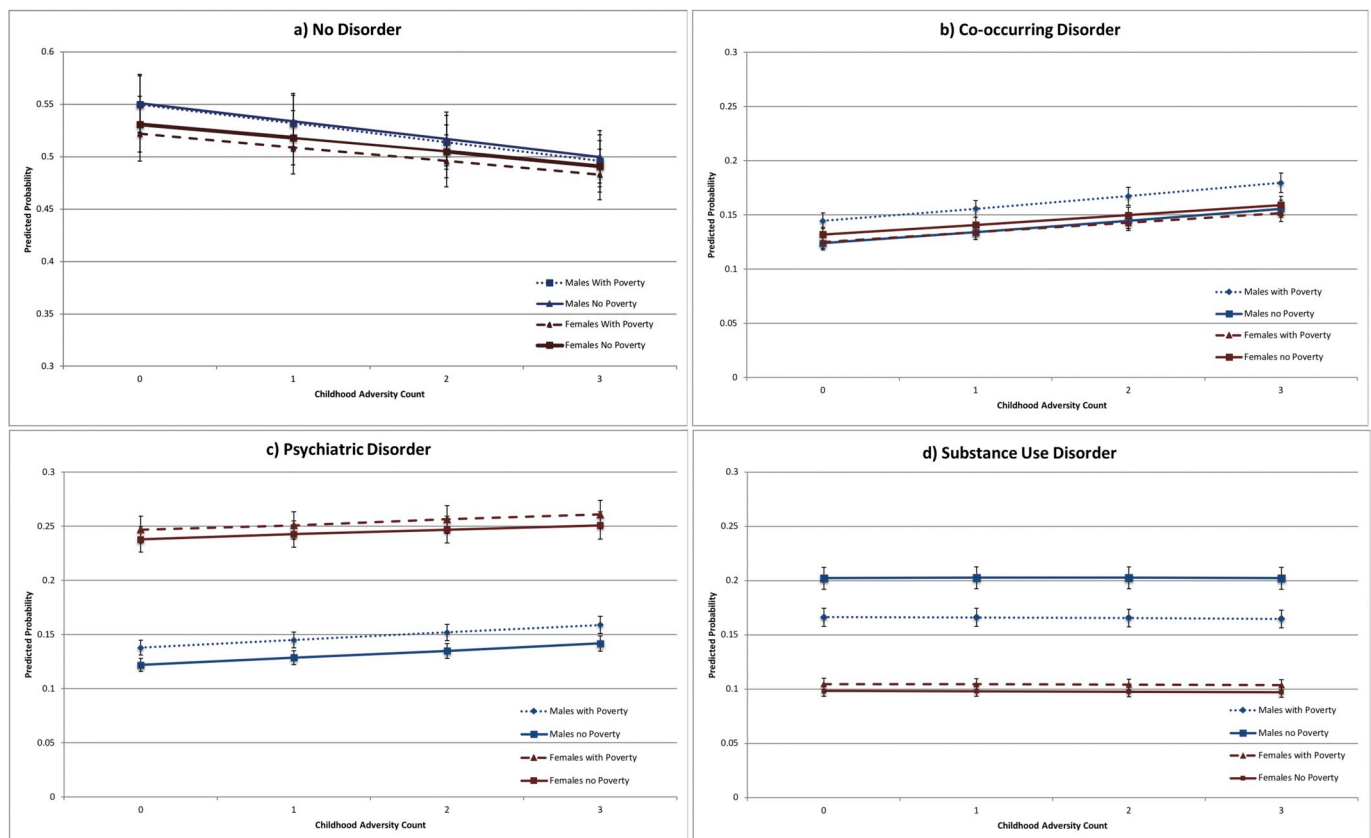

Fig. 1. Predicted Probability of a) No Disorder, b) COD, c) Psychiatric Disorder Only, and d) Substance Use Disorder Only by Gender, Childhood Poverty, and Number of Adversities. Note: All predicted probabilities are on plotted the same scale (0.0–0.3), except the predicted probability of no disorder, which is instead depicted on a scale of 0.3–0.6 to be displayed optimally.

predicted probability of COD is not statistically distinct. For psychiatric disorder (Fig. 1c), poverty does not make a difference for either gender in predicted probability of lifetime disorder. Overall, females are much more likely to have psychiatric disorder only than males and likelihood of psychiatric disorder for males (dy/dx = 0.010, SE = 0.001, p < 0.001) and females (dy/dx = 0.008, SE = 0.002, p < 0.001) increases as the number of adversities increases. For SUD, number of adversities does not make a difference for either gender, but poverty does. Males with no

poverty have the highest predicted probability of this event, overall, and males with childhood poverty have the next highest predicted probability of SUD (dy/dx = −0.029, SE = 0.009, p = 0.004 respectively). Childhood poverty is not associated with SUD for females.

Antecedents of Lifetime COD for Males. Due to the gendered nature of psychiatric disorders, it is possible that disorder development occurs differently for males and females: a possibility allowed for by stratifying the analyses by gender. Model 3a in Table 3 estimates a multinomial

logistic regression for disorder outcomes, with covariates, restricted to males and Model 3b in Table 4 does the same, restricted to females.

As shown in Table 3, for males, COD relative to no disorder and psychiatric disorder only, the experience of childhood poverty does not change the relative risk of COD. However, for the difference between acquiring COD and SUD, childhood poverty has an association: males who grow up in households receiving government assistance are more likely to have COD as an outcome than SUD only (RRR = 1.411, 95% CI: 1.185–1.679), net of other factors. An Adjusted Wald test shows that overall childhood poverty has an effect on disorder outcomes for males (F(3, 111) = 5.12, p = 0.002). Compared to no disorder, with each adversity experienced, the risk of COD becomes 10.4% higher for males (RRR = 1.104, 95% CI: 1.068–1.143), net of other variables in the model. For the outcome of COD compared to psychiatric disorder it is 5.8% (RRR = 1.058, 95% CI: 1.026–1.092), and compared to SUD, 7.1% (RRR = 1.071, 95% CI: 1.032–1.111) controlling for frequency of abuse and other covariates. Holding number of adverse events constant, sexual abuse frequency is associated with increased risk of COD for males when compared to no disorder and SUD but not psychiatric disorder and frequency of physical/verbal abuse is associated with the COD vs. no disorder comparison.

Age of first substance use for males is negatively associated with the development of COD, relative to all other comparisons. Race/ethnicity differences are observable in several of the comparisons with White males having a higher relative risk of COD than other racial/ethnic groups. Age is negatively associated with COD risk for males, when compared to both no disorder and SUD. Being born in the US is associated with a higher RRR for COD than being born elsewhere, when compared to no disorder only, and several types of family disorder history are associated with higher relative risk of COD in multiple comparisons while family structure and family support are not.

Antecedents of Lifetime COD for Females. Model 3b in Table 4 estimates a multinomial logistic regression for disorder outcomes restricted to females in the sample for COD relative to no disorder, psychiatric disorder only, and SUD only.

The experience of childhood poverty does not change the risk of COD

for females overall determined by a post-estimation Adjusted Wald test for poverty and all disorder possibilities, (F (3,111) = 0.51, p = 0.678), although it is associated with a difference between COD and SUD only. Increases in the number of adversities females are exposed to are associated with increased risk of COD as an outcome relative to no disorder and psychiatric disorder: with each adversity experienced, the risk of COD is 7.2% (RRR 1.072, 95% CI: 1.043–1.102) and 3.7% higher (RRR = 1.037, 95% CI: 1.013–1.062), respectively. Sexual abuse frequency and physical/verbal abuse frequency are both associated with increased risk of COD compared to no disorder and SUD, while controlling for the number of events. Family support is associated with increased risk of COD for females compared to no disorder, but not overall at the p < 0.01 level used to account for multiple comparisons (F(3, 111) = 3.71, p = 0.02). These trends were confirmed with the sensitivity analysis conducted with the continuous family support variable. Other covariates in the model follow similar trends to those seen for males.

To determine if the patterns seen with lifetime COD might also apply to those who have temporally overlapping COD, sensitivity testing of the models estimated for this study with an alternative definition of co-occurrence was conducted and although the magnitude of the associations changed with this operationalization, the significance of associations and the direction of associations remain the same for all focal relationships seen in the lifetime COD analysis (results not shown).

Discussion

Summary of Findings. Both childhood poverty and childhood adversities are associated with lifetime COD, however, their relationship with disorder outcomes depends on gender. This study found that males with childhood poverty are more likely than males without to have COD but poverty does not affect COD risk for females. Conversely, for both males and females increases in number of adversities are associated with increased probability of COD, though the magnitude of this association is stronger for males.

Intersections Between Gender, Childhood Poverty, Adversity and COD. In concordance with Najt and colleagues (Najt et al., 2011), lifetime COD is

Table 3

Multinomial logistic regression of COD outcomes, males only, NESARC-III, 2014, United States (n = 14,763).

	Model 3a: Co-occurring Disorder Risk for Males Relative to:								
	A:No Disorder			B:Psychiatric Disorder Only			C:Substance Use Disorder Only		
Characteristic	RRR		95% CI	RRR		95% CI	RRR		95% CI
Childhood Poverty (/no)	1.177		0.985 -	1.406	1.042		0.875 -	1.241	1.411	***	1.185 -	1.679
Childhood Adversity Variables												
Childhood Adversities (Count)	1.104	***	1.068 -	1.143	1.058	***	1.026 -	1.092	1.071	**	1.032 -	1.111
Early Sexual Abuse (Freq)	1.540	**	1.159 -	2.045	0.918		0.754 -	1.117	1.708	**	1.259 -	2.318
Early Physical Abuse (Freq)	1.459	***	1.269 -	1.678	0.950		0.832 -	1.086	1.251		1.072 -	1.461
Age (years)	0.980	***	0.975 -	0.984	0.980	***	0.975 -	0.985	0.997		0.992 -	1.002
Race (/NH White)												
NH Black	0.661	***	0.543 -	0.804	0.807	‡	0.652 -	0.999	0.988		0.819 -	1.191
NH Asian	0.493	***	0.338 -	0.719	0.446	***	0.296 -	0.673	0.607	‡	0.409 -	0.902
Hispanic	0.666	***	0.546 -	0.811	0.802		0.636 -	1.012	0.999		0.826 -	1.207
US-Born (/foreign born)	2.079	***	1.633 -	2.648	1.379	‡	1.055 -	1.804	0.965		0.739 -	1.259
Childhood family structure (/two biological parents)												
Reconstituted families	0.879		0.734 -	1.052	0.951		0.772 -	1.172	0.929		0.791 -	1.090
Single parent	0.927		0.779 -	1.103	0.938		0.746 -	1.179	0.946		0.784 -	1.141
Other	1.154		0.756 -	1.760	0.885		0.577 -	1.357	1.395		0.871 -	2.236
Family support (/no)	1.160		0.980 -	1.374	1.101		0.910 -	1.332	1.143		0.948 -	1.378
Family history variables												
Family history COD (/no COD)	2.516	***	2.078 -	3.046	1.196		0.985 -	1.452	1.703	***	1.422 -	2.039
Family history unknown (/known)	1.572	**	1.224 -	2.020	0.995		0.686 -	1.444	1.548	**	1.162 -	2.061
Family history SUD (/no SUD)	1.915	***	1.611 -	2.278	1.419	**	1.134 -	1.776	1.114		0.922 -	1.345
Family history psychiatric disorder (/no psych disorder)	3.022	***	2.637 -	3.462	1.074		0.911 -	1.267	2.475	***	2.192 -	2.794
Age at first substance use	0.811	***	0.794 -	0.828	0.814	***	0.796 -	0.832	0.956	***	0.938 -	0.975

Model Statistics: Design df = 113, F (54, 60) = 48.66, p < 0.001.

Note: Model is estimated with each comparison relative to COD as the reference group, RRR are re-parameterized to show COD relative to the comparison.

CI = confidence interval, RRR = relative risk ratio,/= omitted reference category.

‡ p < 0.05; **p < 0.01; ***p < 0.001, Analytic significance level is set to p = 0.01 to account for multiple comparisons.

Table 4

Multinomial logistic regression of COD outcomes, females only, NESARC-III, 2014, United States (n = 19,004).

	Model 3b: Co-occurring Disorder Risk for Females Relative to:								
	A:No Disorder			B:Psychiatric Disorder Only			C:Substance Use Disorder Only		
Characteristic	RRR		95% CI	RRR		95% CI	RRR		95% CI
Childhood Poverty (/no)	0.977		0.832 - 1.147	0.907		0.763 - 1.078	0.947	**	0.782 - 1.147
Childhood Adversity Variables									
Childhood Adversities (Count)	1.072	***	1.043 - 1.102	1.037	**	1.013 - 1.062	1.045	‡	1.002 - 1.090
Early Sexual Abuse (Freq)	1.643	***	1.407 - 1.919	1.006		0.902 - 1.121	1.484	***	1.247 - 1.766
Early Physical Abuse (Freq)	1.427	***	1.267 - 1.607	1.08		0.979 - 1.193	1.318	**	1.115 - 1.558
Age (years)	0.979	***	0.975 - 0.982	0.980	***	0.976 - 0.983	0.997		0.993 - 1.002
Race (/NH White)									
NH Black	0.477	***	0.394 - 0.578	0.691	***	0.571 - 0.836	0.720	**	0.578 - 0.897
NH Asian	0.661	‡	0.462 - 0.945	0.897		0.592 - 1.359	0.641		0.398 - 1.031
Hispanic	0.641	***	0.537 - 0.766	0.905		0.744 - 1.102	0.933		0.742 - 1.173
US-Born (/foreign born)	2.656	***	2.113 - 3.337	2.153	***	1.679 - 2.760	1.302		0.923 - 1.836
Childhood family structure (/two biological parents)									
Reconstituted families	1.028		0.874 - 1.209	0.988		0.836 - 1.167	0.798	‡	0.646 - 0.984
Single parent	0.931		0.795 - 1.091	0.922		0.781 - 1.088	0.780	‡	0.620 - 0.981
Other	1.507	‡	1.025 - 2.215	1.114		0.731 - 1.697	1.183		0.761 - 1.838
Family support (/no)	1.220	**	1.065 - 1.396	1.127		0.974 - 1.303	0.930		0.761 - 1.136
Family history variables									
Family history COD (/no COD)	2.823	***	2.429 - 3.280	1.564	***	1.351 - 1.811	1.874	***	1.516 - 2.315
Family history unknown (/known)	1.461	‡	1.035 - 2.062	0.861		0.615 - 1.204	1.221		0.807 - 1.848
Family history SUD (/no SUD)	1.488	***	1.240 - 1.785	1.318	**	1.096 - 1.585	0.967		0.766 - 1.220
Family history psychiatric disorder (/no psych disorder)	2.815	***	2.453 - 3.230	0.977		0.861 - 1.110	2.073	***	1.747 - 2.461
Age at first substance use	0.830	***	0.808 - 0.852	0.834	***	0.813 - 0.856	0.963		0.936 - 0.991

Model Statistics: Design df = 113, F (54, 60) = 55.53, p < 0.001.

Note: Model is estimated with each comparison relative to COD as the reference group, RRR are re-parameterized to show COD relative to the comparison outcome. CI = confidence interval, RRR = relative risk ratio,/= omitted reference category.

‡ p < 0.05; **p < 0.01; ***p < 0.001, Analytic significance level is set to p = 0.01 to account for multiple comparisons.

more common among males than females in this analysis, but the difference in prevalence is small compared to the large gendered differences in prevalence of psychiatric disorder only and SUD only. There are gender differences in the factors associated with these phenomena, and failing to account for such gendered differences causes incorrect conclusions to be drawn. On a bivariate level, childhood poverty is directly associated with COD in the whole population, however, with the addition of childhood adversities and other covariates, there is no longer a direct association between poverty and lifetime COD in the non-stratified models. This suggests, only inferentially, that the relationship between poverty and disorder outcomes is operating indirectly or is spurious. If it is indirect, and poverty is actually only harmful because it is the vehicle to other negative experiences that determine disorder outcomes, this is an important avenue to explore further. Examining mediation was not statistically possible in this study, but should be considered in future research. Conditional models revealed that males with childhood poverty are much more likely than males without to have COD; but for females the experience of poverty in childhood is not associated with risk of COD overall, as hypothesized. It could be that males place more importance on economic success and internalize the stigma associated with childhood poverty in deeper ways than their female counterparts. It could alternatively be the case that the experience of poverty, which is associated with fewer ameliorative resources overall, is particularly damaging for males who may have less social support and coping resources to begin with (Rudolph, 2002), increasing their risk of COD compared to females. Regardless, not accounting for this gendered patterning leads to an incorrect conclusion that poverty is not related to COD (as in Model 1). Childhood poverty may be operating differently in its impact on disorder development for males and females, and the association that is visible in opposite directions in the stratified models when comparing COD and SUD risk flags the need for further population-level research in this area.

Childhood adversity, both in terms of number of stressful experiences and frequency of two types of experiences, childhood sexual abuse and physical/verbal abuse, is associated with higher relative risk ratios for COD. Generally, this relationship exists whether the association is assessed for people who have COD relative to SUD only, psychiatric disorder only, or no disorder, although there are variations in which types of adversities are impactful depending on the comparison outcome. This finding is consistent with the strong relationship between childhood adversity and increased risk for occurrence of substance use and psychiatric disorders seen in the literature (e.g. (Afifi et al., 2011; Dube et al., 2003; Evans et al., 2017; Green et al., 2010; McLaughlin et al., 2012)). For both males and females, increases in number of adversities are associated with increased probability of COD, however, in the non-stratified analysis with conditional relationships it is possible to detect that the magnitude of this association is stronger for males than for females: an effect that is invisible without considering the interaction between gender and adversity. It may be that the experience of adversities also affects the development of the first disorder, and given that females are more likely to seek treatment for disorder than males, they may resolve some of the traumatic impact of the adversities in treatment for their first disorder. It could also be that due to the strong relationships adolescent girls develop with parents, siblings, friends and romantic partners (Rudolph, 2002), they have stronger social support to deal with the impact of adversities when they occur. Regardless of the mechanisms driving these gendered experiences, further investigation is needed of the impact of status characteristics on COD, through their propensity to affect exposure to stressors. Finally, there remains a need for more intersectional research on COD that studies multiple social statuses in tandem, and not as the sum of their parts (Bauer, 2014).

Familial and Environmental Factors and COD. Controlling for covariates, family support and family structure do not have an impact on COD in this investigation. This is contrary to literature that has suggested that positive childhood experiences (such as having positive interpersonal experiences with family, friends, and in school/community) decrease poor mental health, even when accounting for the negative impact of adverse childhood experiences (Bethell, Jones, Gombojav, Linkenbach, & Sege, 2019). It is possible that the way that family support was measured in this study precludes these benefits from being detected. Further research on COD with family, friend, and community support as a focal relationship should be conducted. In addition, more

investigations into the interaction between support, adversity, resilience in the shaping COD trajectories should be pursued. Family history of disorder does have an effect on disorder outcomes, and the effect is large. Family history variables may be capturing some genetic components operating in disorder risk, or could also be indicating the presence of more intensified social risks such as learning unhealthy coping mechanisms from the parent, socialization, and availability of substances in the home. Age of first substance use is associated with COD in this study and it is possible that this is capturing some of the negative effects of having a peer group that promotes risky behavior and may thus indicate additional social risk for future disorder.

Limitations. The dataset in this study is cross-sectional and the measures are retrospective. Retrospective cross-sectional data carry inherent weaknesses: most critically that they are more subject to recall bias and do not allow for causality to be ascertained. This research, therefore, is aided by other studies with longitudinal data that have distinguished the separate and distinct influences of poverty and adversity on psychiatric disorder, and that these occur in the temporal manner hypothesized in this study (Varese et al., 2012). There is evidence that the retrospective self-assessment of childhood trauma tends to underestimate rather than overreport the occurrence of trauma (Hardt & Rutter, 2004) and that retrospective reports of trauma can vary but are still predominantly valid and reliable (Varese et al., 2012). Measurement limitations include the limited measures of childhood poverty and gender available in NESARC-III. By using receipt of government assistance before age 18 as a measure of poverty, people not eligible for benefits but who are still living in poverty, especially immigrants, may be misclassified which may result in the underestimates of the association between childhood poverty and COD. Childhood poverty rates reported by females in NESARC-III were higher than those reported by males. It is possible that this is due to females being more likely to have awareness of their social and material environment due to stronger social and familial bonds, or perhaps that females are more comfortable disclosing poverty than males, or it could indicate selection or selective recall issues. Additionally, there was no information collected on gender identity, which would have allowed for a more nuanced analysis of associations between poverty, adversity, and COD for people who are transgender, gender non-conforming, or have a gender identity that differs from their biological sex. NESARC-III did not collect sufficient information to determine temporal overlap of all disorders, so instead lifetime COD was used and sensitivity testing was done with a variable representing temporally-overlapping COD (occurring during the year prior to data collection). This definition applies a more restrictive analysis that is more closely aligned with the definition of COD used in clinical research. Although the magnitude of the associations changed in this testing, the significance of associations and the direction of associations stayed the same for all focal relationships seen in the lifetime COD analysis suggesting that the trends seen in this paper may also apply to temporally overlapping COD, but further research is required to confirm this.

Strengths. Despite the weaknesses noted above, this study presents several innovations that advance COD research. The use of recent population data to study the phenomenon of COD is something done rarely in the existing literature. In addition, considering multiple psychiatric and substance use disorders together shows patterns that exist in COD development generally, without restricting conclusions to disorder- or substance-specific outcomes. Separating COD from SUD, psychiatric disorder, and no disorder in one study allows for a precision in estimation of the effects attributable to COD as distinct from just one type of disorder or no disorder. Finally, this study thoroughly tests multiple conditional relationships which is rarely done in COD research and shows gender differences in the early social factors that affect COD with sufficient sample size to properly test such associations.

Implications. COD is a pressing health concern because it represents serious and largely unaddressed health issues for a substantial proportion of the population. The social determinants of COD include areas of risk that are modifiable and occur in such a way that designing interventions to ameliorate these risks may be possible. Efforts to help children and adolescents develop strategies to cope with adversity are important and may be able to curb added risk due to harmful early experiences, and there is potential to tailor such strategies by gender. Opportunities for prevention could include enhancing existing evidence-based adverse childhood experience programming in schools to be gender-specific. Further, developing interventions that support mental health and target healthy substance use for boys who grow up in poverty may be warranted given the risks identified for this group in the current study. In the absence of being able to increase income and decrease adversity in the childhood home, there is still the potential for amelioration of negative outcomes, for example, by developing early gender-specific mental health and substance use treatment for males and females who experience such stressors in early life. This study's focus on childhood poverty and stressors considers some of the earliest and most socially determined antecedents of later COD, psychiatric disorder, and SUD and suggests that gender should be a central focus of research and prevention.

Ethics approval

This research was reviewed and approved by the University of California Los Angeles Institutional Review Board.

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Declaration of competing interest

The author has no conflicts of interest to report.

CRediT authorship contribution statement

Jenna van Draanen: Conceptualization, Methodology, Formal analysis, Writing - original draft.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2020.100540.

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