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The Association of Child Mental Health Conditions and Parent Mental Health Status Among U.S. Children, 2007

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Abstract The purpose of this study is to examine the association of child mental health conditions and parent mental health status. This study used data from the 2007 National Survey of Children's Health on 80,982 children ages 2–17. The presence of a child mental health condition was defined as a parent-reported diagnosis of at least one of seven child mental health conditions. Parent mental health was assessed via a 5-point scale. Logistic regression was used to assess the association of child mental health conditions and parent mental health status, while examining socioeconomic, parent, family, and community factors as potential effect modifiers and confounders of the association. 11.1% of children had a mental health condition (95% CI = 10.5–11.6). The prevalence of child mental health conditions increased as parent mental health status worsened. Race/ethnicity was the only significant effect modifier of the child-parent mental health association. After adjustment for confounders, the stratum-specific adjusted odds ratios (95% CI) of child mental health conditions related to a one-level decline in parent mental health were: 1.44 (1.35–1.55) for non-Hispanic whites, 1.24 (1.06–1.46) for non-Hispanic blacks, 1.04 (0.81–1.32) for Hispanics from non-immigrant families, 1.21 (0.96–1.93) for Hispanics from immigrant families, and 1.43 (1.21–1.70) for non-Hispanic otherrace children. The effect of parent mental health status on child mental health conditions was significant only among non-Hispanic children. Parent-focused interventions to prevent or improve child mental health conditions may be best targeted to the sub-populations for whom parent and child mental health are most strongly associated.

Keywords Mental health · Child health · National Survey of Children's Health (NSCH)

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Childhood mental health (MH) conditions include a wide variety of emotional, behavioral, developmental, and neurological disorders. According to the 2007 National Survey of Children's Health (NSCH), approximately 11% of children ages 2–17 were reported to be affected by at least one of seven MH conditions [1]. A recent study of U.S. adolescents suggests the prevalence of MH conditions in this age group is about 20%, comparable to rates of other common childhood diseases like asthma and diabetes [2]. According to the World Health Organization, four of the ten most disabling diseases in the developed world are mental illnesses [3], and their impact worsens every year [4]. A child diagnosed with a MH condition will face many issues throughout childhood and adulthood. Children with MH disorders are more likely to be unintentionally injured, hospitalized, abuse drugs or alcohol, have a chronic disease, and are less likely to succeed educationally [5–7]. Longitudinal studies of this population have shown lower rates of successful integration into society and higher rates of suicide [6].

Addressing the needs of a child with a MH disorder poses unique challenges to families and to society as a

whole, including schools, communities, and the health care system. Educational and health care costs are also greater for children with MH conditions. Specialized training for teachers is expensive [8], and health care costs for children with a MH condition are estimated to be twice that of the average child [6]. The special needs of children with MH conditions are often neglected due to gaps in current health care and education systems [2, 5, 8]. Parents of these children must seek extra care and educational assistance, leading to increased stress, anxiety, and depression [9]. Parents of children with MH disorders have four times the odds of feeling stressed than parents of healthy children [5] and are at an increased risk of developing a MH condition themselves [9–12].

Many researchers have reported associations between parent MH and specific child MH disorders such as autism, ADD/ADHD, major depressive disorder, and anxiety disorders [13–16], but studies of general mental health are less common. It is known that both genetic and environmental factors are involved in the development of childhood MH disorders, but some conditions are more directly linked to genetic influences than others. Schizophrenia, for example, has a genetic link and can be passed from parent to child [17]. Twin studies of children with autism have helped isolate possible genetic associations; however, no single gene has been identified, and environment appears to be a significant contributor to the disorder [18, 19]. Similarly, there is data suggesting a genetic cause for Tourette syndrome, but as diagnostic sensitivity has improved, it has become evident that a large proportion of the disease etiology is environmental [7]. ADHD also seems to have some genetic basis, but little is known about how environmental factors impact the disorder [8].

Parent MH may also exert an effect on child MH through influence on the child's environment. A German study demonstrated a cumulative impact of family factors, such as family conflicts, unemployment, parental strain, and parent psychiatric symptoms, on child MH problems [20]. A recent study found modest increases in risk of autism in children exposed to selective serotonin reuptake inhibitors (antidepressant medications) in utero [21].

Very few studies have examined the association between parental and child MH while accounting for parent, family, and community factors that may modify this association. It is important to identify which factors may alter the strength of this association between parent and child MH in the United States in order to implement appropriate interventions to meet the needs of these children and their families. Therefore, the objective of this study is to utilize nationally-representative survey data to examine the socioeconomic, parent, family, and community factors that may modify the association of child and parent MH after controlling for confounding.

Methods

Data Source

Data came from the 2007 National Survey of Children's Health (NSCH), sponsored by the Maternal and Child Health Bureau (US Department of Health and Human Services) and conducted by the Centers for Disease Control and Prevention through the State and Local Area Integrated Telephone Survey (SLAITS) program. SLAITS uses a multi-stage cluster design based on random-digit dialing to identify a sample of households with children younger than 18 years of age. One child in each household was randomly selected to be the focus of the survey and the parent/guardian (hereafter referred to as parent) in the household who knew the most about the health of the child completed the survey. A total of 91,642 telephone interviews were conducted during April 2007 to June 2008. Additional information about the NSCH methodology has been previously published [22] and is available from http://www.cdc.gov/nchs/slaits/nsch.htm. Because the de-identified NSCH data is publically available, this research was determined to be non-human subjects research by the Institutional Review Board of the University of Illinois at Chicago.

Dependent Variable

The outcome of interest was child MH conditions, as defined by the presence of any of seven emotional, behavioral, or developmental conditions. Parents of children at least 2 years of age reported whether they had ever been told by a doctor or health care provider that the index child had: (1) attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD), (2) depression, (3) anxiety, (4) behavioral or conduct problems, (5) Autism, Asperger's Disorder, pervasive developmental disorder, or another autism spectrum disorder, (6) developmental delay that affects the ability to learn, or (7) Tourette syndrome. For affirmative responses, parents were asked if the child currently had the condition. Children were classified as having a MH condition if the parent reported they had been told their child had any of the conditions and the condition was current at the time of the survey.

Independent Variable

The independent variable of interest was parent MH status. The parent responding to the survey reported his/her own MH status on a five-level scale: poor, fair, good, very good, or excellent. The respondent then rated the MH status of any other parent(s)/guardian(s) on the same scale. To allow for children from different family structures to be included

in the analysis, a composite variable was created to indicate the lowest MH level for any parent of the child. This resulted in a single 5-category variable that was examined as nominal in descriptive analyses and as ordinal in regression analyses.

Covariates

Several demographic and socioeconomic status (SES) variables were considered as potential confounders and effect modifiers of the child-parent MH association. Race/ethnicity was classified into one of five mutually exclusive categories: non-Hispanic white, non-Hispanic black, Hispanic (non-immigrant family), Hispanic (immigrant family), and non-Hispanic other (including multi-race). We divided Hispanic children into two groups for family immigration status because many studies have demonstrated the association of immigration status with health behaviors, utilization of health services, and the health status of Hispanic children in the U.S. [23–27]. Hispanic children with any US-born parent were classified as being from non-immigrant families while Hispanic children with no US-born parents were classified as being from immigrant families. Other demographic/SES factors examined included: child's age, highest education of any parent in the household, household income as a percent of the federal poverty level (missing values were replaced with single imputation values) [28], and child health insurance type.

In addition, numerous parent, family, and community factors were examined as effect modifiers and confounders. Parent factors included: employment status, coping ability, emotional support, and parental aggravation. Coping ability was determined by grouping responses to the question "In general, how well do you feel you are coping with the day to day demands of [parenthood/raising children]?" into high ("very well" or "somewhat well") and low ("not very well" or "not at all well"). Emotional support was determined by whether the parent reported having someone to turn to for emotional help. An index for parental aggravation was created by combining responses to three questions about how often the parent felt the child was hard to care for, the child did things that bothered the parent, and the parent felt angry at his or her child. Parents who answered "usually" or "often" to at least one of these three questions were classified as exhibiting high aggravation. Family factors were: number of children in household, family structure, and frequency of family meals. Community factors were: neighborhood safety, neighborhood support, and frequency of the child attending religious services/activities. A child's neighborhood was considered safe if the parent responded "always" or "usually" to the question "how often do you feel [your child] is safe in your community or neighborhood?" Neighborhood support was measured through response to a series of statements: "People in this neighborhood help each other out", "We watch out for each other's children in this neighborhood", "There are people I can count on in this neighborhood", and "If my child were outside playing and got hurt or scared, there are adults nearby who I trust to help my child". Neighborhood support was classified as low if the parent somewhat or definitely disagreed with any of the four statements. Religious activity was included as a community factor as it may represent a source of community social support for the child and/or family.

Statistical Analyses

Because parents of young children were not asked the MH condition questions, analyses were limited to the 82,020 children who were 2–17 years old. Of this group, 80,982 children (98.6%) had valid data on both the dependent and independent variable of interest.

Differences between proportions were tested using a χ^2 test with $\alpha = 0.05$. Logistic regression was used to generate odds ratios (OR) and 95% confidence intervals (95% CI). Single-factor effect modification of the parent MH status—child MH condition association was evaluated for all covariates. Interaction was tested through a series of models including the pair-wise interaction terms and two corresponding main effects. Interaction terms with a type 3 P value < 0.20 were noted for potential inclusion in the full multivariable models.

A multi-stage sequential model building strategy was used to determine the significant confounders and effect modifiers of the association of parent and child MH. Covariates were retained in the model at each step if the type 3 P value was < 0.05. The models were built as follows: (1) parent MH status as only independent variable (crude association), (2) model 1 + demographic and SES variables, (3) significant model 2 variables + parent variables, (4) significant model 3 variables + family and community variables, and (5) removal of factors related to the outcome that were not confounders. Confounders were defined as covariates that changed the excess OR (OR minus 1) for the parent–child MH relationship by 10% or more when included in the model. Interaction terms noted during the assessment of single-factor effect modification were added to the model in the same step as the associated main effect and were retained if the type 3 P value was < 0.10.

All analyses were conducted using SAS version 9.2 survey procedures (SAS Institute, Cary, NC), which accounted for the complex sample design of the NSCH. Estimates were weighted to account for selection bias, non-response bias, and non-coverage of households without landline telephones. Weighted estimates are representative

of the non-institutionalized population of children ages 2–17 in the United States.

Results

Overall, 11.1% of children had a MH condition (95% CI = 10.5–11.6). Parent MH was generally good; the proportion of children living with parents reporting excellent, very good, good, fair, and poor MH were 28.5, 37.2, 24.3, 8.5, and 1.6%, respectively.

Table 1 shows the parent mental health status and prevalence of child mental health conditions among children 2–17 years old by various demographic, parent, family, and community characteristics. Children whose parents reported poorer MH status and children with a MH condition were more likely to be non-Hispanic black, older, on public insurance, have parents of lower education, have lower household income, have a parent exhibiting high aggravation, have a poorly coping parent, be in families with no employed parents, have parents receiving little emotional support, be the only child in the family, live with a single mother, eat few meals together as a family, live in unsafe and unsupportive neighborhoods, and never attend religious services. In addition, male children were more likely to have a MH condition, but child's gender was not associated with parent MH status.

Table 2 shows the crude association between diagnosis of a child MH condition and parental MH status. The prevalence of child MH conditions increased monotonically as parent MH status worsened from 6.8% of children with excellent parent MH to 31.9% of children with poor parent MH. Therefore, MH was considered as an ordinal variable for all regression analyses.

As an initial test of effect modification, single-factor stratified ORs for each covariate are presented in Table 3. Type 3 P values of < 0.20 were seen for the interactions between parent MH and race/ethnicity ($P = 0.02$), age ($P = 0.18$), gender ($P = 0.10$), parent aggravation ($P = 0.14$), parent coping ($P = 0.10$), and family meals ($P = 0.15$). These six potential interaction terms were included in the model-building process, but only the interaction between race/ethnicity and parent MH remained significant in the final model ($P = 0.04$).

The final logistic regression model included parent MH, race/ethnicity, child age, insurance type, parental coping, parent aggravation, parent employment, and family structure, as well as an interaction term for parent MH and race/ethnicity. Figure 1 presents the race/ethnicity-specific unadjusted and adjusted odds ratios for presence of a child MH condition related to a one-level decline in parent MH status (e.g. from "Excellent" to "Very Good", or from "Fair" to "Poor"). After adjustment for confounders, the type 3 P value for the interaction of parent MH and race/ethnicity was 0.0377. The stratum-specific adjusted ORs (95% CI) were 1.44 (1.35–1.55) for non-Hispanic whites, 1.24 (1.06–1.46) for non-Hispanic blacks, 1.04 (0.81–1.32) for Hispanics from non-immigrant families, 1.21(0.96–1.93) for Hispanics from immigrant families, and 1.43 (1.21–1.70) for non-Hispanic other race children. After adjustment, the effect of parent MH status on a child MH condition remained significant only among non-Hispanic white, non-Hispanic black, and other race children.

Discussion

Our analyses demonstrate that parent MH status and child MH conditions are associated, even after controlling for confounding factors. Age of the child, insurance status, parental coping, parental aggravation, parent employment, and family structure were confounders of the child and parent MH association in this study. After adjusting for confounding, the only factor that modified the strength of the child-parent MH association was child's race/ethnicity. Therefore, parent-focused interventions to prevent or improve child mental health conditions may be best targeted to the sub-populations for whom parent and child MH are most strongly associated.

After adjustment, worsening parent MH status was significantly associated with increasing odds of child MH condition diagnosis for all children except Hispanics (regardless of family immigration status). A one-level decline (i.e. from "Excellent" to "Very Good") in parent MH status was associated with an increase in the odds of having a MH condition by 46% for non-Hispanic white children, 24% for non-Hispanic black children, and 40% for non-Hispanic other race children. A one-level decline in parent MH status was associated with a 21% increase in the odds of having a MH condition for Hispanic children from non-immigrant families, but this increase was only marginally significant ($P = 0.11$).

Many studies have attempted to characterize the relationship between parent and child MH [7, 13, 14, 18, 20], but have done so with regards to only one particular MH condition, included only a small sample size, or controlled for only limited numbers of confounding factors. Our study is unique in that we were able to use a large, nationally-representative dataset to examine general MH conditions in children 2–17 and were able to account for an extensive list of environmental factors potentially influencing the child (including parent, family, and community factors). In addition, we assessed interaction between parent MH and these factors, something done by few studies and, to our knowledge, done in no studies of U.S. children.

Table 1 Parent mental health status and prevalence of a child mental health condition among U.S. children (age 2–17) by various demographic, parent, family, and community characteristics

	Parent mental health status						Child mental health condition	
	Excellent	Very good	Good	Fair	Poor	*P* value	Yes	*P* value
N	23,973	32,653	18,205	5,539	1,057		9,271	
Demographics								
Child race/ethnicity						<0.01		<0.01
White, Non-Hispanic	30.4	41.1	21.0	6.4	1.2		11.8	
Black, Non-Hispanic	26.8	32.4	26.4	11.8	2.6		12.9	
Hispanic, non-immigrant family	25.0	37.6	24.3	10.8	2.3		12.9	
Hispanic, immigrant family	23.8	23.5	37.4	14.6	0.7		4.7	
Other/Multi race	27.3	37.4	25.5	7.3	2.5		9.3	
Age						<0.01		<0.01
2–5 years old	29.7	37.0	24.5	7.7	1.2		4.2	
6–11 years old	29.6	37.8	22.6	8.3	1.6		11.9	
12–17 years old	26.6	36.7	25.7	9.2	1.7		14.7	
Gender						0.87		<0.01
Female	28.5	36.8	24.6	8.5	1.6		7.8	
Male	28.5	37.6	24.0	8.5	1.5		14.3	
Parent education						<0.01		<0.01
<High school	20.1	23.3	34.3	19.1	3.2		12.8	
High school diploma	24.2	32.1	29.8	11.5	2.3		13.4	
>High school	31.0	40.9	20.9	6.0	1.1		10.1	
Household income						<0.01		<0.01
<100% federal poverty level (FPL)	21.2	25.0	33.4	17.0	3.5		15.2	
100–199% FPL	23.9	35.6	27.7	11.0	1.8		12.4	
200–399% FPL	28.4	40.5	23.4	6.4	1.2		9.8	
400+ % FPL	36.1	42.2	17.3	3.8	0.5		9.1	
Insurance type						<0.01		<0.01
Private	31.9	41.4	20.4	5.4	0.9		8.8	
Public	22.5	30.3	30.3	14.0	2.9		17.2	
Uninsured	23.4	30.5	31.6	12.6	1.9		7.6	
Parent factors						<0.01		<0.01
Parent aggravation								
High	15.9	25.3	33.2	20.9	4.6		32.2	
Low	30.0	38.6	23.1	7.0	1.2		8.6	
Parent coping						<0.01		<0.01
Very well/somewhat well	29.0	37.8	24.2	7.7	1.3		10.7	
Not very/not at all well	5.9	11.2	26.2	44.3	12.5		29.9	
Parent employment						<0.01		<0.01
At least one parent employed	29.5	38.8	23.3	7.2	1.2		10.2	
No parents employed	20.7	26.0	31.3	17.9	4.0		17.8	
Parent emotional support						<0.01		<0.01
Yes	29.9	38.8	23.1	7.1	1.1		10.6	
No	18.1	26.3	32.7	18.4	4.4		14.5	
Family factors								
Number of children in household						<0.01		<0.01
1 child	27.7	36.6	25.6	8.2	1.8		13.5	
2–3 children	28.5	38.1	23.6	8.2	1.5		10.3	
4+ children	29.5	32.8	25.8	10.7	1.2		11.2	

Table 1 continued

	Parent mental health status						Child mental health condition	
	Excellent	Very good	Good	Fair	Poor	*P* value	Yes	*P* value
Family structure						<0.01		<0.01
2 Parent biological/adopted	31.0	39.0	22.3	6.6	1.2		7.7	
2 Parent stepfamily	27.1	35.8	24.1	11.5	1.4		16.7	
Single mother	22.0	32.6	29.6	13.0	2.8		17.9	
Other	22.8	34.5	30.1	10.9	1.7		18.0	
Days of family meals per week						<0.01		0.02
0–3 days	22.7	34.5	28.9	11.8	2.2		12.2	
4–6 days	27.9	42.0	22.3	6.5	1.3		11.3	
7 days	32.1	35.2	23.2	8.2	1.4		10.3	
Neighborhood factors								
Neighborhood safety						<0.01		<0.01
High	30.0	38.4	23.2	7.1	1.3		10.6	
Low	18.8	30.1	30.7	17.2	3.2		14.1	
Neighborhood support						<0.01		<0.01
High	30.9	38.4	22.8	6.6	1.3		10.2	
Low	19.4	32.8	29.5	15.6	2.7		14.6	
Religious activity attendance						<0.01		<0.01
Never	26.5	34.9	24.8	11.3	2.5		13.9	
Few times/year or month	24.4	38.7	26.7	8.8	1.5		12.0	
Weekly or more	31.2	37.3	23.0	7.3	1.3		9.7	

Table 2 Proportion of children with a mental health condition and crude odds ratios for having a child mental health condition, by parent mental health status

Parent mental health status	% Children with a MH condition	95% CI		OR (Any child MH condition vs. none)	95% CI	
Excellent	6.8	6.0	7.6	Ref	–	–
Very Good	9.4	8.6	10.2	1.43	1.22	1.67
Good	13.3	12.1	14.4	2.10	1.79	2.48
Fair	23.2	20.3	26.0	4.14	3.37	5.07
Poor	31.9	25.3	38.5	6.43	4.62	8.94

Our results agree with several past studies of the relationship between child and parent MH. One study from the state of Washington found that both parent MH and parent aggravation were highly associated with child emotional and behavioral problems. They did not, however, consider community factors or other parent factors, such as employment, education, or access to emotional support [9]. A study from Brazil found that child psychopathology was associated with living in a dangerous area, being in a nontraditional family, poor general childhood health, low IQ, repeating a year at school, being male, high parental stress, and harsh physical punishment from parents [29]. A German study demonstrated the cumulative impact of parent risk factors on child MH problems, such as parent unemployment, parental strain, parent psychiatric symptoms, and parental support [20].

1,038 children (weighted percent = 1.4%) were excluded from the study because of missing data on parent mental health status or child mental health conditions. Children with missing values were significantly different from those with valid values with respect to many characteristics (e.g. race/ethnicity, parent education, income, and health insurance), but given that the proportion of children with missing data is small, it is unlikely their exclusion would bias the results of our study.

To validate our assumption about the linear relationship between worsening parent MH status and increased odds of a child MH condition, we conducted a sensitivity analysis, re-running the final model with parent MH status as a nominal variable rather than ordinal. In this analysis, there was evidence of a linear relationship among all children except non-Hispanic blacks. For non-Hispanic black

Table 3 Single-factor stratified odds ratios for a child mental health condition from a one-level decline in parent mental health and p value for assessment of interaction

	Stratified odds ratio (95% CI) for any child MH condition (resulting from a one-level decline in parent MH status[a])	Type 3 effects of interaction (*P* value)
All children 2–17	1.43 (1.22–1.67)[a]	–
Demographic factors		
Child race/ethnicity		0.02
White, Non-Hispanic	1.78 (1.67–1.91)	
Black, Non-Hispanic	1.47 (1.27–1.71)	
Hispanic, non-immigrant family	1.26 (1.00–1.59)	
Hispanic, immigrant family	1.62 (1.30–2.00)	
Other/multi race	1.69 (1.42–2.00)	
Child's age		0.18
2–5 years old	1.68 (1.46–1.96)	
6–11 years old	1.50 (1.37–2.63)	
12–17 years old	1.66 (1.50–1.83)	
Child's gender		0.10
Female	1.54 (1.43–1.66)	
Male	1.70 (1.55–1.86)	
Parent education		0.93
<High school	1.53 (1.27–1.84)	
High school diploma	1.59 (1.48–1.70)	
>High school	1.58 (1.41–1.77)	
Household income		0.49
<100% federal poverty level (FPL)	1.56 (1.38–1.75)	
100–199% FPL	1.46 (1.31–1.63)	
200–399% FPL	1.55 (1.37–1.75)	
400 + % FPL	1.45 (1.18–1.78)	
Parent factors		
Parent aggravation		0.14
High	1.32 (1.18–1.48)	
Low	1.46 (1.37–1.56)	
Parent coping		0.10
Very well/somewhat well	1.56 (1.47–1.65)	
Not very/not at all well	1.28 (1.02–1.61)	
Parent employment		0.89
At least one parent employed	1.55 (1.45–1.65)	
No parents employed	1.57 (1.37–1.79)	
Parent emotional support		0.21
Yes	1.55 (1.46–1.65)	
No	1.71 (1.49–1.96)	
Family factors		
Number of children in household		0.31
1 child	1.52 (1.39–1.65)	
2–3 children	1.64 (1.52–1.77)	
4+ children	1.47 (1.21–1.79)	
Family structure		0.33
2 Parent biological/adopted	1.31 (1.11–1.54)	
2 Parent stepfamily	1.59 (1.34–1.90)	
Single mother	1.54 (1.42–1.67)	
Other	1.87 (1.45–2.42)	

Table 3 continued

	Stratified odds ratio (95% CI) for any child MH condition (resulting from a one-level decline in parent MH status[a])	Type 3 effects of interaction (*P* value)
Frequency of family meals		0.15
0–3 days per week	1.50 (1.39–1.67)	
4–6 days per week	1.74 (1.55–1.95)	
7 days per week	1.55 (1.43–1.67)	
Neighborhood factors		
Neighborhood safety		0.26
High	1.61 (1.51–1.71)	
Low	1.47 (1.28–1.70)	
Neighborhood support		0.98
High	1.56 (1.46–1.66)	
Low	1.57 (1.37–1.78)	
Religious activity attendance		0.43
Never	1.68 (1.50–1.88)	
A few times/year or month	1.55 (1.41–1.70)	
Weekly or More	1.53 (1.41–1.67)	

[a] Example interpretation of odds ratios: An odds ratio of 1.43 indicates that the odds of having a child mental health condition were increased by 43% with a one level decline in parent mental health. For instance, the odds of having a child mental health condition were 43% higher for children with "very good" parent mental health compared to children with "excellent" parent mental health. Likewise, the odds of having a child mental health condition were 43% higher for children with "poor" parent mental health compared to children with "fair" mental health

children, there was evidence of a potential "threshold effect" because it was only when parents had fair or poor MH that parent MH was associated with increased odds of a child MH condition. Therefore, there may be some buffering of the relationship between parent and child MH among black children with parents that have less severe MH problems. Further examination of this threshold effect and why it is present only among black children is necessary.

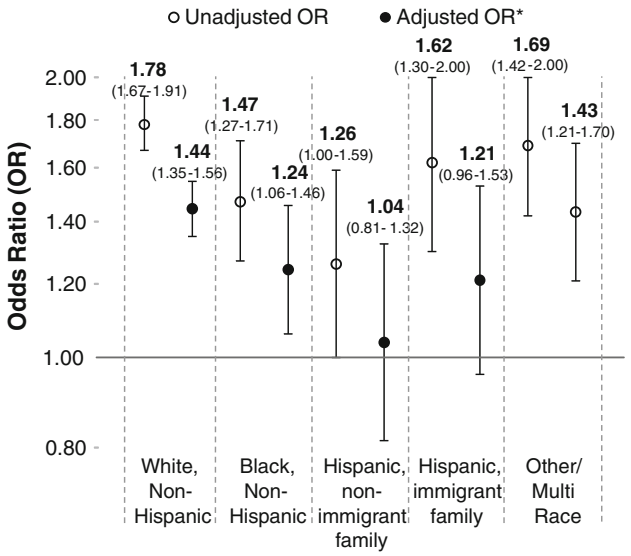

Fig. 1 Race/ethnicity group-specific crude and adjusted odds ratios for a child mental health condition from a one-level decline in parent mental health status. *Adjusted for child's age, insurance type, parent coping, parent aggression, parent employment, and family structure

The observed difference between Hispanic children from immigrant and non-immigrant families deserves attention. Hispanic children from non-immigrant families had a prevalence of MH conditions about three times higher than those from immigrant families, a finding consistent with the "immigrant paradox" demonstrated for adult Latino mental health [30]. Hispanic children from immigrant families are more likely to be uninsured and underutilize health services than those from non-immigrant families [23, 31, 32], which could lead to differential diagnosis. In the crude analysis, the association of child and parent MH was weaker among Hispanic children from immigrant families than among those in other racial-ethnic groups. For Hispanic children from non-immigrant families, controlling for confounding in multivariable analysis completely explained the observed crude association. For Hispanic children from immigrant families, the adjusted odds ratio was not statistically significant, but the odds ratio was still elevated (nearly equivalent to that of non-Hispanic black children) and the lack of significance likely may be due to small sample size for the group. This raises questions about why the effect differs based on race/ethnicity and immigration status, and provides an area for future research.

Our study has several limitations. First, the NSCH is a cross-sectional survey, so temporality between child and parent MH status cannot be established. While we conceptualized child mental health conditions as the dependent variable and parent mental health status as an independent

variable in the regression models, the causal relationship between them could be reversed. Some parents may report poorer mental health because their child has a mental health condition that makes caring for the child difficult. Regardless of the direction of the association, however, the results of our analysis are important for understanding the clustering of MH problems in family units. Prospective cohort studies of mental health could shed light on the directionality of the relationship of child and parent mental health.

Secondly, because the NSCH is a survey of parents, all of our variables are potentially subject to self-report bias. The parent completing the survey reported their own MH status as well as the MH statuses of other parent(s). Misclassification may exist due to social desirability bias or an incorrect perception of the other parent's MH status. Social desirability bias may be heightened among families from communities where MH problems are more stigmatized, such as in African-American and Latino communities [33]. Assuming misclassification of parent MH is non-differential with respect to the outcome, our results probably represent an underestimate of the true association of parent and child MH. Parents also reported on child MH condition diagnoses, which depends on a child having received appropriate health services that allowed for a diagnosis as well as accurate parent report of diagnoses. While we controlled for many factors that could influence a child's MH diagnosis (e.g. insurance and household income), residual confounding by unexamined factors may be present.

We elected to classify parent MH status based on the worst level of mental health experienced by any parent in the household. This was based on our hypothesis that the MH status of the parent with poorer MH would be the better predictor of the child's MH. Studies have shown that children whose parents have more severe mood disorders are at increased risk for mental health problems than children whose parents have less severe mood disorders [15]. However, the effects of having parents with divergent mental health status are unknown and should be examined further in future studies.

Additionally, we made the decision to separate Hispanic children into two groups by parent nativity in an attempt to create more homogenous groupings. This decision was based on previous research demonstrating that children of foreign-born parents use fewer health services and have poorer health outcomes/status than their counterparts with U.S.-born parents [23–27, 32]. While this distinction based on parent nativity is rather crude, options for better characterizing Hispanics in this study were limited, as country of origin was not included on the 2007 NSCH and the collection of primary language did not clarify whether someone citing non-English as their main language also spoke English.

Finally, our study is limited in that it only addresses the association between parent MH status and seven combined child MH conditions. Children may have had other MH conditions (e.g. eating disorders) that were not captured by the NSCH, which could result in misclassification, though the prevalence of other conditions is likely to be small. Our study also does not address whether the child-parent mental health relationship varies depending on which condition(s) the child has. We were interested in describing the patterns existed between general parent and child mental health and did not examine condition-specific relationships. The NSCH asks parents about seven specific child MH conditions and future research could focus on the condition-specific relationships, though small sample size would likely be an issue for less prevalent conditions (e.g. Tourette syndrome, autism). This study also does not examine the severity of the diagnosed child health conditions or the co-morbidity of multiple child MH conditions. This information is available from the 2007 NSCH and represents an area for future research to better describe the relationship between child and parent MH.

Our study affirms that there is a strong association between parent and child MH for most children, even after accounting for a wide variety of child, parent, family, and community factors. This finding is important for setting public health policy in pediatric MH programs, schools, and health care systems as it demonstrates a potential need to focus prevention programs on family processes rather than on individual child factors alone.

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