



Child health, parental behavioral health, and the role of living arrangements

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ABSTRACT

Parental behavioral health disorders are associated with adverse childhood health outcomes, including injury, asthma, obesity, emergency department utilization, and hospitalization. Less is known about factors that confound this association and the interventions needed to best support children whose parents have behavioral health disorders. The following examines a nationally representative sample of households in the United States from the Medical Expenditure Panel Survey, 2014–2016. Inverse probability weighted logistic and two-part regression models were used to estimate the association of parental behavioral health disorder with (1) perception of child's health, (2) illness/injury in prior 12-months, (3) emergency department utilization in prior 12-months, and (4) total health care expenditures. Covariates included family/household structure (e.g., presence of siblings, single-parent households, etc.), child characteristic (i.e., race/ethnicity, gender, age), and household/respondent characteristics (e.g., family income, parental educational achievement, health insurance type, and Census region). Compared to children in homes where a parent does not have a behavioral health disorder, parental behavioral health disorder is associated with perception the child's health is fair or poor (41% higher), likelihood that the child was ill or injured in the prior 12 months (26.4% higher), likelihood that the child had an emergency department visit in the prior year (29.4% higher), and total health care expenditures (21.4% higher). The presence of siblings is associated with improved perceptions of a child's health and lower emergency department utilization. Additional adult family members are associated with lower likelihood of child illness/injury in prior 12 months. Researchers and policymakers should seek input from families of varying household structures, especially those where one or more caregivers have a behavioral health disorder, on ways to support the health of all members of the family and leverage efforts toward co-location of mental health care and primary care within family medicine practices.

1. Introduction

In the absence of a nurturing environment, trauma and chronic stress during childhood disrupt neurological and physiological development (Shonkoff et al., 2009). Researchers who study the association between trauma and poor mental and physical health have noted that even if a person may not have an active memory of childhood trauma, traumatic events can still have a powerful impact on health outcomes later in life (Sara and Lappin, 2017; Center on the Developing Child, 2010; Duffee et al., 2021). Adverse childhood experiences (ACEs), defined as traumatic events occurring prior to age 18, are associated with high rates of

cancer, heart disease, diabetes, mental illness, and high-risk behaviors among adults with a history of childhood trauma (Boullier and Blair, 2018). Researchers from the US Center for Disease Control and Prevention find that preventing ACEs could reduce rates of depressive disorder in the United States by 44%, chronic obstructive pulmonary disease by 27%, asthma by 24%, kidney disease by 16%, and stroke by 15% (Merrick et al., 2020).

Parental behavioral health disorders are a key component of ACEs, because they are not only a source of childhood trauma, as indicated on ACE scales, but also because they may predispose children to additional adverse events. Past studies have highlighted that parental behavioral

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health disorders are associated with childhood injury, asthma, obesity, emergency department utilization, and hospitalization (Olfson et al., 2003; Sills et al., 2007; Balsa and French, 2012; Brooks et al., 2015; Raitasalo and Holmila, 2017; Pierce et al., 2020; Yang et al., 2020; Heuckendorff et al., 2021). However, this relationship may reflect unmeasured confounding between families where a parent has a behavioral health disorder and those where a parent does not. We hypothesized that children of parents with behavioral health disorders, compared to children whose parents do not have such a diagnosis, experience poorer health and greater levels of health care utilization and expenditure, even when adjusting for household and child characteristics (such as the presence of additional adults in the household, socio-demographic conditions, and the mental health of the child).

This study contributes nationally representative estimates of the association of parental behavioral health disorder on child health and health care utilization in the United States. Data from the Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey (MEPS) with a doubly robust inverse probability weighting methodology was used to account for the observable heterogeneity in estimating the association of parental behavioral health disorder and study outcomes.

1.1. Family and the role of living arrangements

Family living arrangements in the United States have changed dramatically over the past fifty years. The percentage of children being raised in two-parent families has declined considerably from 73% in 1960 to 46% in 2015, and single-parent households have increased nearly three-fold from 9% in 1960 to 26% in 2015 (Pew Research Center, 2015). These trends reflect an increased prevalence of divorce, childrearing outside of marriage, and cohabitation that have led to a variety of living arrangements within the contemporary American household. A secondary focus of this study examines whether different living arrangements, such as the inclusion of additional siblings, relatives, and non-family members in a dwelling unit, confound the association of parental behavioral health disorders on the health and health care utilization of children.

1.1.1. The role of siblings

Approximately 78% of youths under the age of 18 live with a sibling (Manning et al., 2014), but studies of the association on child health from siblings, the “sibling effect,” is mixed. Additional siblings have been associated with less cognitive development among low-income families, perhaps due to limited resources (Li et al., 2017). However, siblings have also been shown to offer opportunities for greater socialization and well-being. For instance, Amici et al. (2022) finds that siblings can offer a protective buffer to the negative effects of maternal stress on child behavior and were beneficial to child development (Amici et al., 2022). The effect of siblings also depends on the nature of the relationship, especially regarding the older siblings’ personality (i.e., antisocial or well-adjusted), which is important in determining health outcomes of younger children (Snyder et al., 2005). In considering the role of family living arrangements in moderating the effects of a parental mental illness, this study responds to calls to better understand how changes in family living arrangements can facilitate nurturing environments and protect against trauma during childhood (Ganong et al., 2022; Merrick et al., 2020).

2. Methods

The purpose of the study was to provide national estimates of the association of parental behavioral health disorders and child wellbeing, health care use, and health care expenditure. Using the Medical Expenditure Panel Survey, our objectives were to create robust empirical models of (1) perception of child’s health, (2) illness/injury in prior 12-months, (3) emergency department utilization in prior 12-months,

and (4) total health care expenditures. Covariates included family/household structure (e.g., presence of siblings, single-parent households, etc.), child characteristics (i.e., race/ethnicity, gender, age), and household/respondent characteristics (e.g., family income, parental educational achievement, health insurance type, and Census region). Our main hypotheses were that parental behavioral health disorder is associated with worsening perception of child health, increased likelihood of injury and illness for the child, increased emergency department use, and increased overall health care expenditures.

2.1. Data Source

Initially released in 1996, the Agency for Healthcare Research and Quality (AHRQ), Medical Expenditure Panel Survey (MEPS) is a large collection of nationally representative surveys that offer a comprehensive view of health care utilization and cost within the United States (AHRQ, 2021; AHRQ, 2023). Respondents are a subset of those engaged through the National Health Information Survey. Experiences of individuals are summarized within the MEPS Household and Insurance Components. Within the Household Component, additional information on health, including diagnosis codes used in this study, are available in a medical conditions file. This study uses the public-use Full Year Consolidated files, merged with diagnosis data from the Medical Conditions files for the years 2014 to 2016, and applies survey weights for nationally representative estimates.

2.1.1. Families and dwelling units in MEPS

With the MEPS data file system, “dwelling unit” refers to the “physical structure” where one or more families reside (AHRQ, 2021). Multiple families may be organized and classified within a given dwelling unit. Families in MEPS include relations by blood, marriage, adoption, foster placement, non-married partners, or other familial associations. This approach suggests that the respondent, typically the head of household, determines which members of the dwelling unit are “family” rather than other cohabitants living in the same dwelling unit.

2.1.2. Classifying behavioral health disorders

For this study, it was important to be able to identify parents with behavioral health disorders. The MEPS Medical Conditions File includes information on International Classification of Diseases diagnoses for all study participants. Through the application of AHRQ’s Clinical Classifications Software (AHRQ, 2019), this study used diagnoses to flag records where either parent had a mood disorder, anxiety disorder, or substance use disorder (hereafter, behavioral health disorder). This study then merged the diagnoses data onto the MEPS full year consolidated data file. Data management steps were performed with SAS 9.4 for Windows.

2.1.3. Sample

The final sample includes children whose parents were a reference person in the 2014–2016 MEPS Full Year Consolidated Files. Observations on children in the study include information about the reference person (i.e., their parent) that is aggregated onto the child’s record. Data gathered from the respondent/parent includes identification about their partner, their living arrangement, their children, and other families that live in the dwelling unit. Approximately 4.5% of MEPS records were for children in families where the reference person was not their parent. Since relationships between these children and other adults in such families could not be ascertained, children whose parents are not the reference person are excluded from the study sample. However, counts of non-family children living in the dwelling unit and other family and household level descriptors are recorded on the observation record of children in the study.

2.2. Study outcomes

Study outcomes include perception of child's health, where the variable is transformed to be dichotomous and is 1 if "fair or poor" and zero if "good, very good, or excellent." The measure for injury or illness in prior 12-months (value of 1 if injured or taken ill, 0 otherwise) and for emergency department utilization (value of 1 if any use, 0 otherwise) are also dichotomous. Health expenditure is continuous, and inflation adjusted to the year 2017.

2.3. Calculation

Information about children and families from the MEPS data files was used to measure the association of parental behavioral health disorder on child health and health outcomes. In the absence of a randomized trial, observational studies can be improved by adjusting estimates from exposure by using weighting or matching techniques. This includes using information on the dataset to draw comparisons between treatment and control groups that are similar on observable characteristics.

The final analytic file contains pooled cross-sections for 2014–2016 and applies the propensity score weights, along with the MEPS survey weights and variance adjustments; to make comparisons of children whose parent(s) has a behavioral health disorder and those whose parent(s) does not have such a diagnosis. Inverse probability weighting approaches were used to address the issue of non-random assignment and adjust estimates without sacrificing sample size. With inverse probability weighting approaches, the researcher can use all observations in the sample rather than being required to drop unmatched observations (i.e., as with 1:1 matching).

Summary statistics by exposure were computed and Wald-tests of differences were calculated to assess the equivalence of treatment and control groups and to check covariate balance. After confirming a successful weighting procedure, bivariate analysis was completed to assess the study outcomes with both population weights and inverse probability weights based on the propensity scores. Logistic regressions were applied to determine the effect of a parental behavioral health disorder on parental perception of the child's health, and injury or illness in the prior twelve months, and utilization of an emergency department during the year. Finally, a two-part model of health care expenditures was used to estimate changes in health care utilization between the two groups using a logistic regression in the first part and a generalized linear model in the second part (using a gamma error distribution and logarithmic link).

2.3.1. Analysis with complex survey designs

Analysis of surveys with complex designs, such as MEPS, requires appropriate weighting to yield accurate national estimates and corrections to account for the MEPS clustered survey design by dwelling unit and family. As with all complex survey designs, failure to adjust for possible response correlations among households within a cluster will understate standard errors, leading to increased likelihood of type-I errors (i.e., rejecting the null hypothesis when it is true; Kneipp and Yarandi, 2002). DuGoff et al. (2014) performed a review of studies using MEPS, available through PubMed. Of 28 studies that utilized the MEPS datasets in 2010 and 2011, 16 (57%) did not incorporate the survey weights into the final analysis and six (21%) of the studies made false claims about the results from the studies being nationally representative.

As a remedy for researchers using observational data derived from complex survey designs, DuGoff et al. (2014) offer techniques for correctly calculating weights for treatment effects when using a propensity score weighting framework to adjust for observable heterogeneity. These yield population-based estimates of the average treatment on treated (i.e., "ATT," the effect of having a parent with behavioral health disorder among children whose parent has a behavioral health

disorder).

2.3.2. Applying propensity score weights in group selection

Prior to conducting the main analysis, propensity scores and inverse probability weighting were applied to the control group in the study sample based on models of likelihood of behavioral health status of the parent. Limited demographic and other relevant characteristics were used in the weighting procedure, as available within the MEPS data (i.e., child age, sex, race, ethnicity, US Census region, and survey weights for analysis of MEPS data – described in greater detail, below). A limited number of predictors are chosen to reduce the chance of endogenous selection where group selection is predictive of the error term in models of study outcomes (Freedman and Berk, 2008).

Propensity score, p , represents the probability of a parent having a behavioral health disorder, represented by Z , given a set of observable covariates, X . For a propensity score p with a set of covariates X , the researcher estimates a probability of a parental behavioral health disorder given the set of covariates that they choose for the weighting procedure.

$$p = \Pr(Z = 1|X) \quad (1)$$

After determining the propensity score through logistic regression, with X set of covariates, we calculated an "inverse probability weight," $(\frac{p}{1-p})$, for each child whose parent did not have a behavioral health disorder (Lunceford and Davidian, 2004). We applied the propensity scores by using information from observable demographic variables to create the inverse probability weights (equation (2)). $Parent_{MH}$ equals 1 if the child's parent (i.e., the reference person for the family or their spouse) has a behavioral health disorder. The inverse probability weight, $\frac{p}{1-p}$, is applied to all other children in the study (Dugoff et al., 2014).

$$ATT_{weight} = \begin{cases} 1|Parent_{MH} = 1 \\ \frac{p}{1-p}|Parent_{MH} = 0 \end{cases} \quad (2)$$

Dugoff et al. (2014) present a procedure to combine the ATT weight with person-level estimation weights available on MEPS after dividing the person-level weight by the number of years in the sample (Dugoff, 2014; AHRQ, 2021). For the MEPS data, the weights applied to the study sample would be determined as presented in equation (3).

$$Final_weight = Person_weight / 3 \times ATT_{weight} \quad (3)$$

2.3.3. Logistic regression for binary outcomes

Models using logistic regression include parent's perception of child health, injury or illness in the past 12 months, and emergency department utilization. η is the logit function which is transformed into a linear model by applying the log of odds, i.e., the ratio of probability (p) and its complement ($1-p$). β is a vector of coefficients corresponding to each predictor in the set of predictors, X . $\alpha + \beta X + \varepsilon$ is the linear or "systematic" component. $E(Y)$ is the function of the probability of an event that can be determined using the logit approach, as follows:

$$\eta = \text{logit}(\pi) = \log\left(\frac{p}{1-p}\right) \quad (4)$$

$$\eta(E(Y)) = \log\left(\frac{E(Y)}{1-E(Y)}\right) = \alpha + \beta X + \varepsilon \quad (5)$$

$$\frac{E(Y)}{1-E(Y)} = e^{\alpha + \beta X + \varepsilon} \quad (6)$$

That is, $e^{\alpha + \beta X + \varepsilon}$ reflects that the odds of the binary outcome and estimates for coefficients can be used to determine measures of association. The "logit" command in Stata 17 was used with coefficients reported as odds ratios.

2.3.4. Modeling health care expenditures

Total health care expenditure is available within the MEPS Full Year Consolidated File. This reflects the total amount spent on the care of a child in a year, including copays, coinsurance, out-of-pocket payments, and insurance premiums. We adjusted expenditures for inflation, using 2017 as the base year. It is common for children observed in the MEPS data to have zero health care expenditures in a year. A naive analysis would effectively censor observations in children where there are no health care expenditures. To resolve this, we followed a two-part model approach presented in Belotti et al. (2015), who provide a useful summary and procedure.

In a two-part model, the overall mean for expenditures is the product of the function for probability (Φ) of health care expenditures, where Y now represents health care expenditures. Given that Y is greater than zero along with predictors, X :

$$\Phi(Y > 0) = \Pr(Y > 0|X) \quad (7)$$

We would like to estimate health expenditures (Y) with function E , given a set of X predictors.

$$\text{HealthExpAdj} = E(Y|X) \quad (8)$$

See Belotti et al. (2015) who provide a formal justification of the model, but show that predictions of health expenditures are given by

$$\hat{Y}_i|X_i = (\hat{p}_i|X_i) \times (\hat{Y}_i|Y_i > 0, X_i) \quad (9)$$

Where $\hat{p}_i|X_i$ is the probability, $\hat{p}_i$, that predicted value of Y , $\hat{Y}_i$, is greater than 0 given predictor X_i (Belotti et al., 2015).

In Stata 17, this is implemented with “twopm” command. We used logistic regression in the first part of the model and a generalized linear model with a gamma error distribution and a log link in the second part of the model (Belotti et al., 2015). When assessing model fit, we conducted a modified Park’s test to determine that a gamma distribution was appropriate and applied the Pregibon’s Link Test to assess goodness of the fit of the gamma distribution (p-value on squared residual suggested adequate fit from gamma distribution). We also implemented the Hosmer–Lemeshow Test to assess model fit (Archer and Lemeshow, 2006).

2.3.5. Marginal effects and interpretation

Interpretation of odds ratios can have limited utility in informing policy because changes in odds ratios are unfamiliar to the public and often lead to misinterpretation (Persoskie and Ferrer, 2017). This is in part because the odds ratio is a relative measure of changes in probability of an event (i.e., $\text{oddsratio} = \frac{\text{probabilityofeventa}}{1-\text{probabilityofeventa}} / \frac{\text{probabilityofeventb}}{1-\text{probabilityofeventb}}$). To understand overall changes in risk, the researcher must take the extra step of including information about underlying risk in the absence of the predictor being studied (Persoskie and Ferrer, 2017). We used the “margins” command in Stata 17 to transform results and report effect as a percentage change based on changes in estimates from estimated outcome values of study outcomes taken at predictor means.¹

3. Results

3.1. Summary statistics

There were 25,146 children whose mother or father could be determined as the reference person in MEPS. Of children in the sample, 5,015 lived in a home where their mother or father had a mood, anxiety, or substance use disorder. Table 1 summarizes child and household characteristics of the sample before and after performing the propensity

Table 1

Child Demographics and Survey Responses by Parental Behavioral Health Status, Adjusted with Propensity Score and Population Weights, MEPS, 2014–2016.

	Control: Parent <i>not</i> diagnosed with a mood, anxiety, or substance use disorder (n = 20,131)		Exposure: Parent diagnosed with a mood, anxiety, or substance use disorder (n = 5,015)	
	Unweighted, mean, % (S.E)	Weighted	Weighted	Difference
Study outcomes				
Health need				
Child's health is perceived as fair or poor	1.5(0.001)	1.3(0.002)	2.2(0.002)	0.9**
Injury or illness in prior 12-months	19.7(0.005)	21.3 (0.007)	27.9 (0.009)	6.6***
Health utilization and spending				
Any emergency room visit	11.1 (0.004)	10.8 (0.005)	15.1 (0.008)	4.3***
Total health care expenditures	1944.2 (155.8)	2177.48 (191.0)	2649.7 (203.58)	472.22^
Family Structure				
Single parent family	32.1 (0.011)	28.2 (0.013)	29.5 (0.014)	1.3
Number of non-parent adults in family	0.4 (0.010)	0.4 (0.013)	0.3 (0.013)	−0.1**
Number of children in family	2.4 (0.028)	2.3 (0.032)	2.2(0.036)	−0.1*
Number of non-family adults in dwelling unit	0.2(0.013)	0.2 (0.013)	0.2 (0.017)	0.0
Number of non-family children in dwelling unit	0.1(0.010)	0.1 (0.008)	0.1 (0.008)	0.0
Youngest child	56.8 (0.005)	56.0 (0.007)	58.1 (0.009)	2.1
Matched characteristics				
Age	8.5(0.1)	9.0(0.1)	9.1(0.2)	0.1
Race/Ethnicity				
White, non-Hispanic	46.5(0.015)	67.3 (0.014)	65.5 (0.019)	−1.8
Hispanic	26.2(0.014)	15.5 (0.009)	18.0 (0.014)	2.5**
Black or African American, non-Hispanic	14.7(0.010)	8.4(0.006)	7.4(0.007)	1.0
Asian, non-Hispanic	6.0(0.005)	1.5(0.001)	1.6(0.003)	0.1
All other responses to race, non-Hispanic	6.7(0.007)	7.3(0.007)	7.5(0.001)	0.2
Gender				
Female	48.7(0.006)	49.7 (0.008)	49.4 (0.013)	0.3
Male	51.3(0.006)	50.3 (0.008)	50.6 (0.013)	0.3
Region				
Northeast	15.85(0.009)	19.8 (0.012)	16.6 (0.017)	−3.2
Midwest	20.2(0.011)	26.1 (0.012)	25.5 (0.023)	−0.6
South	39.3(0.016)	31.1 (0.018)	35.1 (0.022)	4.0
West	24.8(0.013)	23 (0.015)	22.7 (0.017)	−0.3
Year				
2014	34.0(0.007)	32.2 (0.008)	32.1 (0.012)	−0.1
2015	33.0(0.008)	32.7 (0.006)	34.3 (0.008)	1.6
2016	33.0(0.006)	35.1 (0.008)	33.6 (0.011)	−1.5

Source: Medical Expenditure Panel Survey, 2014–2016.

Notes: Matched using propensity score weighting. Weighted using strata, PSU, and person-level weights available on the MEPS Full-Year Consolidated Data files. Multiple years combined with person-weight/3. ^p < 0.1, **p < 0.01, ***p < 0.001.

¹ Statement of Ethics Approval – This study was designated as exempt by the author’s Institutional Review Board on May 4, 2022.

0.01, *** $p < 0.001$, p -values are results from Wald test. Observations used in calculating summary statistics ranged from 24,594 to 24,634 due to missing values.

procedure and population adjustment. In the rightmost column are the differences and p -values from a Wald Test for weighted differences between children in homes whose parents, or parents, had a diagnosis of behavioral health disorder and children whose parents, or parents, did not after applying the survey and inverse probability weights. Except for proportion of the weighted sample that responded as being Hispanic (within 3 percentage points), none of the matched covariates have statistically significant differences between exposure and control groups after the propensity score and population weighting procedure.

Reported in Table 1., there were statistically significant differences across all study outcomes ($p < 0.1$ or less) between children residing in families where a parent is diagnosed with a behavioral health disorder and those whose parents are not diagnosed. The percentage of children whose health was perceived by their parent as “poor or fair” was 0.9 percentage points higher if the child had a parent with a behavioral health disorder. While the difference in perception of child health was minimal, percentage of children injured or ill in the prior 12 months was 6.6 percentage points higher among children whose parent had a behavioral health disorder. The percentage of children with an emergency room visit was 4.3 percentage points higher than children whose parents had a behavioral health disorder, and children whose parents had a behavioral health disorder had \$472.22 higher health care expenditures (reported in 2017 inflation-adjusted dollars).

3.2. Regression results

Results from the regression analyses suggest that parental behavioral health disorder strongly predicts study outcomes. In Table 2, we report regression results for the dichotomous variables as odds ratios (relative change in odds with a unit increase in predictor) for the varied child and household characteristics and coefficients in the second part of the two-part model as a difference in log odds. Children whose parent had a behavioral health disorder diagnosis experienced 51.6% increased odds of having their health perceived as “poor or fair,” compared to the other children in the study. Children whose parents had a behavioral health disorder diagnosis experienced 41.9% increased odds of having an injury or illness in the prior 12-months, compared to the other children in the study. Children whose parents had a behavioral health disorder diagnosis experienced 39.6% increased odds of having any emergency department visit, compared to the other children in the study. Study outcomes were moderated by living arrangement. While parent’s perception of child health as “fair or poor” was not significantly affected by living arrangement, an additional child in the family is associated with lower odds of injury or illness (18.1% decrease in odds), emergency department utilization (9.6% decrease in odds), and any health care expenditures (16.2% decrease). Conversely, children have greater odds of injury or illness and emergency department utilization when there are additional non-family adults living in the household (16.2% increase in odds). Models included interactions of parental behavioral health disorder diagnosis and living arrangement characteristics (not reported here) that suggested the effect of living arrangement characteristics were not different by parental behavioral health disorder diagnosis. F -tests were used to assess the significance of the models. Model fit was assessed using the Hosmer–Lemeshow Test. This utilized the user-generated series of commands for Stata 17, *svylogitgof* (Archer and Lemeshow, 2006). We used an adapted Hosmer–Lemeshow test to assess the two-part model (Deb et al., 2013, 2017).

For interpretation purposes, post hoc marginal analysis procedures in Stata on the regression results using the “margins” command are reported; marginal effects of varying child and household characteristics as a percent change from mean values of study outcomes when a parent has a behavioral health disorder in Table 3.

Table 2

Adjusted Association Between Family Unit Composition and Indicator of Child Health using Propensity Score and Survey Weights, MEPS, 2014–2016.

Model	Child's health is perceived as fair or poor	Injury or illness in prior 12 to months	Any emergency room utilization	Two-part (2): Total health care expenditures
Observations	24,630	24,594	24,630	24,630
Variable	Odds Ratio (SE)			Log Difference (SE)
Exposure: Matched (propensity score and population weighted)				
Parents with a mood disorder, anxiety, or substance use disorder	1.516 (0.22) **	1.409 (0.090) ***	1.396 (0.103) ***	0.166 (0.098) ^
Covariate: Family Structure				
Single parent family	1.171 (0.256)	1.047 (0.081)	1.08 (0.101)	−0.146 (0.093)
Number of non-parent adults in family	1.306 (0.162) *	0.866 (0.046) **	0.969 (0.059)	−0.06 (0.058)
Number of children in family	0.819 (0.061) **	0.953 (0.143)	0.904 (0.034) **	−0.162 (0.046) ***
Number of non-family adults in dwelling unit	0.994 (0.105)	1.084 (0.055)	1.162 (0.071) *	0.073 (0.079)
Number of non-family children in dwelling unit	1.386 (0.149) *	1.003 (0.077)	0.932 (0.085)	−0.063 (0.096)
Youngest child	0.767 (0.123) ^	1.151 (0.081) *	1.167 (0.099) ^	0.075 (0.107)
Covariate: Family Demographic Characteristics				
Reference to person for family is female	1.329 (0.248)	1.133 (0.071) *	1.186 (0.101) *	0.086 (0.105)
Parents have at least a bachelor's degree	0.779 (0.129)	1.045 (0.043)	0.909 (0.049) ^	0.061 (0.062)
Total Family Income per \$10,000	0.982 (0.036)	1.002 (0.0063)	0.99 (0.008)	0.008 (0.007)
Insurance Coverage (ref=Private)				
Public	1.866 (0.421)	0.910 (0.70)	1.304 (0.126) **	−0.188 (0.089) *
None	1.058 (0.303)	0.843 (0.179)	0.8 (0.295)	−0.907 (0.149) ***
Constant	0.017 (0.006)	0.285 (0.035) ***	0.129 (0.019) ***	8.032 (0.198) ***
F-statistic	11.21 ***	5.72 ***	9.76 ***	16.55 ***
Goodness-of-Fit Test (Hosmer–Lemeshow p -value) ^a	0.310	0.416	0.090	0.462

Source: Medical Expenditure Panel Survey, 2014–2016.

Notes: Wald-test used to assess significance of difference. $^p < 0.1$, $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$ “svylogitgof” for logistic regression and Deb algorithm for two-part model see methods for a description.

Starting with the predicted outcome variable at mean values of all covariates, there were large increases in study outcomes by the main exposure, children who had a parent with a behavioral health disorder, had a 41.0% increase in likelihood ($p < 0.01$) of their health being

Table 3

Marginal analysis, percent change in outcomes by family and living arrangement, MEPS, 2014–2016.

	Child's health is perceived as fair or poor	Injury or illness in prior 12-months	Emergency department utilization	Total health care expenditure
Prediction at mean values ^a	0.015	0.231	0.118	\$1,646.31
Predictors	% Change			
Parents with a mood disorder, anxiety, or substance use disorder	41.0%**	26.4%***	29.4%***	21.4%*
Single parent family	15.6%	3.5%	6.8%	−14.5%
Additional non-parent adult in family	26.2%*	−11.1%**	−2.8%	−9.5% [^]
Additional child in family	−19.7%*	−3.7%	−8.9%**	−17.3%***
Additional non-family adults in dwelling unit	−0.6%	6.2%	13.2%*	8.0%
Additional non-family child in dwelling unit	32.2%**	0.2%	−6.2%	−7.7%
Youngest child	−26.1% [^]	10.8%*	13.6% [^]	7.3%

Source: AHRQ, Medical Expenditure Panel Survey, 2014–2016.

Notes: [^]p < 0.1, *p < 0.05, **p < 0.01, ***p < 0.001, “a” Estimates calculated at mean values with “asbalanced” option for factor variables.

perceived as fair or poor. Similarly, children in the exposure group had a 26.4% increase in likelihood of the child being injured or ill in the prior 12-months ($p < 0.001$) and a 29.4% increase in likelihood of having had an emergency room visit ($p < 0.001$). Children in the treatment group also had a 21.4% increase in total health care expenditures, or \$352.56 ($p < 0.05$).

There were also interesting associations among confounding factors of living arrangement in the study. An additional adult in the family was associated with an 11.1% reduction in child injury or illness. The presence of an additional child in the family was associated with an 8.9% reduction in emergency department use ($p < 0.01$), and a 17.3% reduction in total health care expenditure ($p < 0.001$). An additional non-family adult in the dwelling unit was associated with a 13.2% increase in emergency department use ($p < 0.05$). The effects of an additional non-family child in the dwelling unit were mixed. Notably, the perception of child health as fair or poor in homes where a parent has a behavioral health disorder dramatically increased with the presence of an additional non-family child in the home (32.2%, $p < 0.01$). Despite being more likely to have their health perceived as being good, very good, or excellent (26.1%), the youngest child in the home had a 10.8% greater likelihood of injury or illness in prior 12 months ($p < 0.05$) and a 13.6% increase in likelihood of emergency department utilization ($p < 0.1$).

4. Discussion

Aligned with prior research, our study suggests that children whose parent has a behavioral health disorder are considerably more likely to be ill, injured, and use health care services (Olfson et al., 2003; Sills

et al., 2007; Balsa and French, 2012; Brooks et al., 2015; Raitasalo and Holmila, 2017; Pierce et al., 2020; Yang et al., 2020; Heuckendorff et al., 2021). It also appears that living arrangements may moderate the association. Findings on living arrangement are secondary to the main findings of the study but offer important insights into the health and health care needs of contemporary American families. Family members who reside in the dwelling unit/home seem to offer a possible protective effect, while “non-family” adults in the dwelling unit are associated with greater emergency department use. This is consistent with prior research into cohabitation of non-family partners on child health (Schmeer, 2011; Brown, 2004). However, across all outcomes, the association of living in a single-parent family was not statistically significant. This was unexpected because reports of adverse child health outcomes are common in studies of single-parent homes (Leininger and Ziolk-Guest, 2008; Angel and Worobey, 1988). Our study suggests that the prior findings on single-parent homes may be confounded by household characteristics associated with single-parent families, such as living with non-family member adults, smaller households (such as the child not having siblings), lack of robustness of social support and familial networks, or fewer economic resources. The effects of different living arrangements was similar regardless of whether or not the parent had a behavioral health disorder diagnosis.

4.1. Limitations

Within the Andersen (1995) model of health services use, a need factor such as awareness of a health need may predispose the individual to seek treatment. Relevant to this study, a parent who was diagnosed with a behavioral health disorder may be in the process of seeking care or is already under the care of a behavioral health provider. Parents with a diagnosis might be able to manage the stressors of life more effectively than a parent with the same severity of a condition but without access to a diagnosis or treatment. There are likely undiagnosed parents with behavioral health disorders in our sample, and they would be considered part of the control group. Taken together, this suggests that using parental behavioral health diagnosis as a proxy for behavioral health disorder offers a conservative estimate, and the true effect of parental behavioral health disorder on child health and health care expenditures is likely greater than what is reported in this study.

Our results largely align with prior studies on the role of parental behavioral health in child health care utilization (Olfson et al., 2003; Pierce et al., 2020; Heuckendorff et al., 2021; Yang et al., 2020). The additional covariates in this study, such as household structure and socioeconomic characteristics, and the doubly robust inverse probability weighting and regression adjustment, offer additional confidence to evidence of the association found in prior studies. However, it is important to note the potential for unmeasured confounding persists and this association is not necessarily causal. For instance, identification of children with special health care needs was not adjusted for in these estimates due to concerns of endogeneity, nor in many of the prior studies. However, it is well known that adverse parental health outcomes are common among parents whose children that have “special health care needs” (Shahali et al., 2024). An area of future research would be to consider if exposure to the chronic stress of having a child who is ill and has high levels of health care use leads to parental behavioral health disorders, rather than the reverse.

4.2. Implications and recommendations

For providers and policymakers, when children and adolescents are experiencing repeated incidents of injury or illness, this may signal that greater support for the child's parents is needed. Family-based interventions hold promise for mitigating excessive health care use and addressing the child's health needs. This seems especially important when considering the wellbeing of the youngest child in families with multiple children. The youngest child is, somewhat paradoxically, more

likely to be perceived as being in good, very good or excellent health but is more likely to be injured or require emergency medical treatment. Future research should include determining ways to best support the health of all members of the family and leverage efforts to coordinate care, such as the co-location of behavioral health care and primary care practice within integrated family medicine practices (Biel et al., 2020). Additionally, future research should consider alternate causal pathways to the relationship between parental mental illness and child health and wellbeing, namely that being the parent of children with high health care utilization and spending may lead to increased incidence of parental behavioral health disorders.

5. Conclusions

This study uses data with an underlying complex survey design and provides an example of applying propensity weighting strategies that accommodate such complex survey designs. It also provides estimates of the effect of a parental behavioral health disorder on child health and health care utilization that can be generalized to the United States. Consistent with prior studies, having a parent with a behavioral health disorder is strongly predictive of adverse child health outcomes and increased health services utilization. These effects are moderated by living arrangements and offer insights into the development of interventions to meet the needs of both parents and children in homes where parents have behavioral health disorders.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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