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Parental Mental Health Associated With Child Overweight and Obesity, Examined Within Rural and Urban Settings, Stratified by Income

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Abstract

Purpose: Rural areas experience greater childhood obesity compared with urban areas. Differences in reported physical activity and dietary intake do not fully explain the disparity. The purpose of this study was to examine the association between parental mental health and childhood obesity within urban and rural areas.

Methods: We used data from the National Survey of Children's Health, 2016, subset to children age 10–17 with available weight data. We stratified the sample by rural and urban settings and examined whether maternal or paternal mental health was associated with child overweight or obesity, accounting for income stratum (low-income: 200% federal poverty line; high-income, > 200%: federal poverty line). We used multivariable analyses to test if associations remained after including covariates of food security, physical activity, and screen time.

Findings: For the 14,733 children 10–17 years of age in our sample, family income but not rurality was associated with overweight or obesity. Among high-income families, positive mental health of either the mother or the father was associated with lower odds of overweight or obesity. In multivariable models, the association between positive maternal mental health and lower odds of child overweight/obesity persisted after adjustment for family food security, child physical activity, and child screen time. For paternal mental health, the association was not significant after adjusting for these covariates.

Conclusions: After stratification by income, there were no differences in childhood overweight/obesity by rurality. Both maternal and paternal mental health are associated with children's weight, though only the maternal association remains after adjusting for covariates.

Keywords

children; health disparities; mental health; obesity; rural health

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The evidence for a link between parental mental health and childhood obesity comes primarily from studies focused on the post-partum period in mothers and early childhood weight status.¹ The mechanism by which maternal depression and child weight are linked includes negative feeding practices such as pressuring children to eat or restricting food.² Sex-specific interactions between maternal depression and child weight status have been noted, with maladaptive feeding practices as the mediating factor in boys and reduced physical activity as the mediating factor in girls.³

Various factors contribute to the relationship between parental mental health and childhood obesity, including food security, child physical activity, and child screen time. Maternal mental health has been associated with food insecurity across multiple studies in rural populations.^{4,5} Maternal depression leading to difficulty in keeping or maintaining employment has been identified as a mechanism associated with persistent food insecurity in rural populations.⁴ A separate analysis found evidence for a bidirectional relationship between food insecurity and maternal depression.⁵ Studies assessing food insecurity and obesity have shown a consistent association among women and adolescents and produced mixed evidence among children and hardly any evidence among men.⁶ In a recent systematic review, worse maternal mental health was associated with decreased child physical activity (5 of 7 studies) and increased sedentary time (7 of 9 studies), with most studies being cross-sectional.⁷ The association of paternal mental health with childhood obesity has received little examination in the literature.

Mental health disparities are pronounced in rural settings, but no study has explored the relationship between parental mental health, geography, and childhood obesity. Rural areas experience similar rates of mental health illness but have fewer resources to address those needs.^{8–10} Unmet parental mental health needs may contribute to the disparities observed in rural childhood obesity that currently are not fully understood.¹¹

In this paper, using data from the 2016 National Survey of Children's Health (NSCH), we examined the associations between maternal and paternal mental health and childhood obesity, specifically associations within rural and urban settings and within income strata. Our overall hypothesis was that both maternal and paternal mental health are associated with child weight, and that this association would be moderated by family food insecurity, child physical activity, and child screen time. Secondly, we hypothesized that 1) the strength of the association is greater among low-income, rural populations where resources to address mental health needs are lowest, and 2) the strength of the association is greater among single-parent households, compared with 2-parent households.

Methods

We conducted a cross-sectional analysis of the 2016 National Survey of Children's Health (NSCH). We stratified the sample by rural and urban status, defined using Metropolitan Statistical Areas (MSA), to examine the associations of parental mental health and child weight status. We also stratified by income (high versus low), defining low-income as less than or equal to 200% of the federal poverty line (FPL) given its common use as a guideline for Medicaid.

Data Source

We used data from the public-use file for the 2016 NSCH. The NSCH is the only national-level survey completed on the health and well-being of children aged 0–17 and their families in the United States. Complete methodology regarding the sample strategy, sampling frame, stratification, clustering, and data generation can be found at www.census.gov¹².

The 2016 NSCH differs from prior years by using physical addresses as the sampling frame. Adult participants were invited to complete the survey as either a web or mailed survey. Of the 139,923 households screened for eligibility based on addresses selected from the Census Bureau's Master Address File, 50,212 adults completed the detailed questionnaires with 80% using the web survey. Adjusted sample weights account for non-response and the oversampling of certain populations; these sample weights allow the estimates to be representative of the non-institutionalized child population in the United States.

Dependent Variable: Overweight or Obesity

Parents report their children's weight and height in the NSCH. Body mass index (BMI) percentiles are calculated from those reported measurements and then categorized using the Centers for Disease Control and Prevention (CDC) guidelines for overweight or obese. We compared children with a normal weight (5th to < 85th percentile for age and gender), children with overweight (85th to < 95th percentile), and children with obesity (> 95th percentile). We combined children with overweight or obesity (> 85th percentile) for bivariate and multivariable analyses. Only children aged 10–17 years have publicly available data from the 2016 NSCH with the younger ages restricted for privacy concerns.

Independent Variable: Maternal and Paternal Mental Health Status

Mental health status was generated from the question, "In general, how is your mental or emotional health?" with no reference period provided. Response categories included excellent, very good, good, fair, or poor. Given the skewed distribution of the data, we created a dichotomous mental health variable: positive mental health. Respondents who answered excellent or very good to the mental health question were categorized as "yes" to positive mental health; otherwise they were categorized as "no." We generated separate mental health variables for maternal and paternal caregivers.

We denoted maternal and paternal caregiver by using the reported sex of the respondent and their relationship to the child. We assigned any biological or adoptive parent, step-parent, or foster parent who reported female sex as a maternal caregiver and those who reported male sex as a paternal caregiver. For single parents, caregivers were coded as either maternal or paternal; 2-parent, different-sex households were coded as having both maternal and paternal caregivers; and 2-parent, same-sex households were coded as either 2 maternal caregivers or 2 paternal caregivers. Same-sex parent households had a limited sample size, particularly for the rural groups, and thus they were excluded from the analysis. Family structures with other relatives caring for the child (eg, aunt, uncle, or grandparent) also were excluded.

Strata Variables

Rurality—The residence of the participants within an MSA is provided as a dichotomous variable (yes/no). An MSA is defined as a county with at least one urbanized area of 50,000 persons or greater, and with adjacent counties with a high degree of social and economic integration measured via commuting.¹³ We used this variable to define respondents as rural residents if they did not live in an MSA. MSA status information is missing for 16 states due to confidentiality protections.

Income—The public use file provides family level income data as a percent of the FPL, categorized as < 100%, 100%–199%, 200%–399%, and 400% of the FPL. The primary analysis used a variable defining the lower 2 income strata as “low-income” (< 200% FPL) and the upper 2 income strata as “high-income.”

Confounding Variables

Family Food Security—The food insecurity variable has 4 possible categorical responses, with the parent responding for the family: 1) family could always afford to eat good nutritious meals; 2) family could always afford enough to eat but not always the kinds of food they know they should eat; 3) family sometimes could not afford enough to eat; 4) family often could not afford enough to eat. For this analysis, an affirmative response to the first category was considered food secure while all other responses were considered food insecure.

Child Physical Activity and Sedentary Time—The physical activity variable queries how many days the child spent more than 60 minutes per day exercising or playing a sport per week. Television and computer or other electronic device time for the child are queried separately using categorical responses ranging from none to 4 or more hours, specifically asking about weekdays only. Based on the distribution of data and the recommended amount of screen time being less than 2 hours per day,¹⁴ we combined the screen time responses into categories of less than 2 hours, 2 to 4 hours, and 4 or more hours of combined screen time.

Child Race and Ethnicity—Race and ethnicity were queried separately, with ethnicity being non-Hispanic or different subgroups of Hispanic (eg, Mexican, Puerto Rican) and race having 15 different options. We categorized all persons reporting a subgroup of Hispanic ethnicity as Hispanic for this analysis with non-Hispanic groups being white, black, and all others.

Parent Education—Educational level of the respondent was queried as the highest educational level achieved across 9 potential categories from less than 8th grade to a doctorate or professional degree. We used the highest level of education for either parent in the family level analysis.

Child Insurance—Insurance coverage was queried for the last 12 months and current coverage. We used the current coverage to categorize children as receiving publicly funded insurance, privately funded, or uninsured.

Language in the Household—The primary language spoken at home was queried as English, Spanish, or other. We categorized this variable as English and non-English speaking households.

Analytic Approach

We first examined the overall prevalence of overweight, obesity, and positive mental health stratified by income and rural/urban status. Next, we examined bivariate associations between parental mental health and child weight as well as with demographic characteristics (child age, child gender, household language, parent race/ethnicity, and parent education). We next examined the associations between parental mental health and the covariates of family food security, child physical activity, and child screen time. Finally, we used multivariable models to examine whether significant associations between parental mental health and child weight were explained by confounders. Models were adjusted for other variables such as child age, parent race/ethnicity, parent education, child insurance, child gender, and household language. All regression analyses were conducted within 2-parent, different sex households; single, female parent households; and single, male parent households. All statistical tests were conducted at a 2-sided significance level of 0.05 and conducted with SPSS version 24 (IBM Corp., Armonk, NY) using the Complex Sampling Module. The complex sampling weights inherent in the design of the NSCH provide estimates at the national level for the non-institutionalized child population of the United States.

Results

The final raw sample sizes, not weighted for the complex sampling strategy, for the 4 analyzed strata after excluding those with missing data were: urban, low-income: 2,835; urban, high-income: 10,026; rural, low-income, 848; and rural, high-income: 1,719.

Overall Prevalence of Overweight, Obesity and Mental Health

Among rural families, 19.3% of children in low-income families had overweight and 24.8% had obesity (44.1% combined overweight/obesity), compared with 14.6% of children in high-income families with overweight and 18.3% with obesity (32.9% combined overweight/obesity), $P < .001$. For urban families, 16.9% of children in low-income families had overweight and 23.5% had obesity (40.4% combined overweight/obesity), compared with 15.8% of children in high-income families with overweight and 12.5% with obesity (28.3% combined overweight/obesity), $P < .001$. Income was significantly associated with overweight and obesity in both rural and urban families (see Table 1).

For 2-parent, different-sex households, we found positive maternal and paternal mental health associated with high income in rural settings; in urban settings, only positive paternal mental health was associated with high income (Table 1). A lower percentage of single parent households reported positive mental health in urban and rural settings compared to 2-parent households. Differences by income were seen for mothers in both urban and rural settings but for fathers only in rural settings. There were many differences between income strata for both rural and urban groups, but we observed no significant differences in mental

health between rural and urban settings after stratifying by income, as indicated by the lack of superscripts in Table 1.

Bivariate Associations Between Mental Health (Paternal or Maternal) With Child Overweight and Obesity, Stratified by Income Level

For 2-parent, different-sex families, we found positive maternal and paternal mental health associated with child weight only in the high-income groups (see Table 2). While there was greater food security in high-income families compared with low-income families, we observed that among high-income families, there was a significantly lower percentage of food security among the overweight/obese group compared to the normal weight group. Children with overweight/obesity in the high-income groups reported less physical activity, whereas there were no differences in reported physical activity by child weight among low-income families (Table 2).

For single female parent families, there was an association between maternal mental health and child weight in rural settings, regardless of income. In low-income, rural families headed by a single female parent, food security was low at 20% for children with overweight/obesity compared to 45.6% for children with a normal weight, $P = .003$. In high-income, rural families headed by a single female parent, physical activity was associated with child weight, with only 7% reporting physical activity every day in the overweight/obese group compared with 35% in the normal weight group, $P = .004$.

In single male parent families, the association between paternal mental health and child weight among high-income rural families was in the opposite direction as predicted, with positive paternal mental health associated with child overweight/obesity, $P = .007$. Neither family food security, child physical activity, nor child screen time for this group showed a significant association with child weight (Table 2).

Bivariate Associations Between Mental Health (Maternal or Paternal) and Confounding Factors for Obesity

We found a consistent association between parental mental health and family food security amongst 2-parent, different-sex families. Parents with positive mental health had a higher prevalence of family food security across strata (see Table 3). Physical activity of the child was significantly associated with high-income maternal mental health status in both rural ($P < .001$) and urban ($P = .001$) families.

For single father families, there were no significant associations between paternal mental health and family food security, child physical activity, and child screen time, consistently across all strata. For single mother families, family food security was the only significant association with maternal mental health across income groups and rural/urban status.

Multivariable Regression Analyses of Parental Mental Health With Obesity

In 2-parent households, maternal mental health was significantly associated with child weight in high-income rural and urban families. In high-income rural families, mothers reporting positive mental health had lower odds (AOR 0.41; 95% CI: 0.27–0.61) of having a

child with overweight/obesity compared to mothers not reporting positive mental health. Similarly, in high-income urban families, mothers reporting positive mental health had lower odds (AOR 0.66; 95% CI: 0.51–0.84) of having a child with overweight/obesity than mothers not reporting positive mental health. See Figure 1a, model 1 and Supplemental Table (available online only). This association persisted in model 2, adjusted for confounders, only in high-income rural families (AOR of 0.48; 95% CI: 0.32–0.72) but not in high-income urban families (AOR of 0.78; 95% CI: 0.61–1.00) (see Figure 1a).

Paternal mental health was associated with child weight only in high-income families. Fathers in high-income rural families reporting positive mental health had lower odds (AOR 0.61; 95% CI: 0.40–0.91) of having a child with overweight/obesity compared to fathers not reporting positive mental health. Fathers in high-income urban families reporting positive mental health also had lower odds (AOR 0.70; 95% CI: 0.55–0.90) of having a child with overweight/obesity than those not reporting positive mental health (Figure 1b and Supplemental Table). This association did not remain after adjustment for confounding factors (Figure 1b). We did not find significant interactions between food security, physical activity, and screen time with either measure of parental mental health in multivariable analyses.

In single-parent families, we observed a significant association between positive maternal mental health and lower risk of child overweight/obesity in both low-income rural families (AOR of 0.29; 95% CI: 0.14–0.63) and high-income urban families (AOR 0.56; 95% CI: 0.33–0.96) (see model 1, Figure 1c). In model 2, accounting for food security, child physical activity, and child screen time, low-income single mothers in rural settings with positive mental health had lower odds of having a child with overweight or obesity (AOR 0.44; 95% CI: 0.20–0.97) compared with mothers not reporting positive mental health (Figure 1c). This association did not hold for single mothers in high-income urban settings.

Discussion

Our findings highlight the need to address maternal mental health in rural settings in order to address the physical health of the child. We show that mothers' mental health (in rural settings) remains associated with child weight among high-income rural families despite adjustment for known individual, child-level risk factors for obesity. In the United States, the most common mental health disorders in mothers are anxiety and depression.¹⁵ Maternal depression or anxiety in this pre-adolescent to adolescent age group of children may lead to greater isolation of the child, a lack of support in developing autonomy, and a lack of monitoring or supporting other behavioral changes.^{16–18}

Additionally, the data presented in this paper identify a novel association between fathers' mental health and child weight: fathers reporting positive mental health had lower odds of having a child with overweight/obesity, although the association did not remain when adjusting for confounders. Paternal mental health related to child weight has previously not been investigated. We found that family food security was associated with paternal mental health, whereas child physical activity did not have a consistent association. Recent work has tried to better define how fathers' mental health status affects family life and children's

outcomes.^{19,20} For fathers, substance abuse and anti-social disorders predominate as mental health problems, with anxiety and depression following in prevalence.¹⁵ A more transactional relationship has been described between fathers' mental health status and their children, in comparison to the supportive role of mothers.²¹ This might explain why the variables of family food security, child physical activity, and child screen time moderated the association between paternal mental health and child weight.

The finding of an association between parental mental health and child weight status only in higher income 2-parent families is intriguing. Recent reports of increased anxiety and depression among more affluent youth may account for this finding.²² Evidence for a more direct link between poorer mental health among high-income parents and their children's weight is lacking. Another possibility is a larger sample size in the higher income groups; however, both the rural and urban lower income groups had substantial numbers as a nationally representative sample.

The data around potential mechanisms for observed greater obesity among rural populations are inconsistent. Studies that have examined physical activity between rural and urban children have reported significant variation,²³ and smaller studies using objective measures have found higher physical activity in rural youth.²⁴ A recent systematic review found that 5 out of 6 studies examining physical activity demonstrated that rural children have greater physical activity compared to urban children.¹¹ Consistent with prior findings, food security was markedly affected by income in this study and was lower in rural families overall.²⁵ Despite low-income families having lower food security, we did not observe an association of food insecurity and child weight within low-income families with 2 parents. For single-mother families, food security was associated with mental health whereas child physical activity and screen time were not associated with mental health.

Limitations

The limitations of this study include the cross-sectional nature of the data collection and the potential for reverse causality. If children with overweight/obesity experienced more stress at school, that might affect parental mental health negatively rather than the assumed direction laid out in this paper. The self-report of mental health by parents is a limitation, though we would expect response bias to be towards better mental health and reduce the strength of the association. Non-response to the mental health survey question, especially in regards to the lower end of the scale, may have biased the sample towards a healthier group.

Despite these limitations, we found associations between mental health and child overweight/obesity. In addition, these national-level data provide evidence that the rural-urban differences in obesity prevalence among children may be secondary to distributions of income, as we observed no difference in the rural prevalence of overweight/obesity after stratifying by income. Future analyses examining the association of rurality, income, and obesity should consider the potential collinearity between rurality and income, potentially using stratification such as that done in this analysis.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

National Survey of Children's Health 2016 data, showing multivariable models for the association between maternal or paternal mental health and child weight status, with the reference of poor mental health. Model 1 controlled for race, sex, insurance, education, age. Model 2 additionally for screen time, food security and physical activity. Interaction terms with each of these three tested individually in model with no significant interactions. No estimate depicted for single male parent families in rural areas due to sample size.

Table 1.

National Survey of Children's Health 2016 data showing children, stratified by rural or urban setting and income strata, weight status categorized as normal weight (NW) compared with overweight (OW) and obese (OB), as well as prevalence of positive mental health. Number (n) shown is unadjusted, not taking into account the complex sampling weights.

	Rural			Urban		
	<i>Low income (n=848)</i>	<i>High income (n=1,719)</i>	<i>p</i>	<i>Low income (n=2,835)</i>	<i>High income (n=10,026)</i>	<i>p</i>
Child weight status			0.001			<0.001
Normal weight	55.9	67.0		59.6	71.7	
Overweight	19.3	14.6		16.9	15.8	
Obese	24.8	18.3 ^a		23.5	12.5 ^a	
Age in years, mean	13.5	13.6	0.68	13.6	13.5	0.94
Gender, % female	47.5	47.4	0.98	51.2	49.2	0.36
Primary household language English, % yes	92.0	98.5	<0.001	74.5	93.7	<0.001
Race/ethnicity			<0.001			<0.001
White, non-Hispanic	67.7	85.6		30.9	61.7	
Hispanic	12.0	5.7		41.7	17.8	
Black, non-Hispanic	12.2	4.3		19.6	10.1	
All others	8.1	4.4		7.8	10.4	
Insurance			<0.001			<0.001
Public	67.7	19.3		65.2	13.1	
Private	20.1	75.9		24.1	83.4	
Uninsured	12.1	4.8		10.6	3.5	
Highest education level			<0.001			<0.001
Less than high school	17.2	1.2		20.1	3.3	
High school	37.4	20.2		32.7	11.6	
Some college	28.8	30.0		28.4	19.1	
College or higher	16.6	48.5		18.8	66.0	
Two-parent, different sex households:						
Maternal mental health			0.005			0.10
Positive mental health, %	71.1	80.6		78.0	81.5	
Paternal mental health			0.006			<0.001
Positive mental health, %	70.8	80.4		75.6	83.8	
Single-parent households:						
Maternal mental health			0.03			0.02
Positive mental health, %	54.2	71.6		61.0	71.6	
Paternal mental health			0.05			0.22
Positive mental health, %	51.6	79.3		71.1	81.7	

p-values listed in the table denote differences between income groups within either rural or urban. Superscript ^a denotes a difference between high-income groups at $p < 0.05$; no differences were noted between low-income groups.

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Table 2.

National Survey of Children's Health 2016 data showing children, stratified by rural or urban setting and income strata, examining demographic factors associated with weight status categorized as normal weight (NW) compared with overweight or obese (OW/OB). Number (n) shown is unadjusted, not taking into account the complex sampling weights.

	Rural						Urban					
	Low income (n=474)			High income (n=1,429)			Low income (n=1,622)			High income (n=8,338)		
Two parents	NW	OW/OB	p	NW	OW/OB	p	NW	OW/OB	p	NW	OW/OB	p
Maternal mental health, % Positive mental health	75.5	64.3	0.06	85.8	70.1	<0.001	80.0	75.1	0.25	83.6	75.6	<0.001
Paternal mental health, % Positive mental health	73.4	67.0	0.30	83.7	73.8	0.005	77.5	72.7	0.32	85.2	80.1	0.004
% Both parents positive mental health	65.3	56.1	0.18	76.9	63.3	<0.001	69.4	64.1	0.61	77.7	69.6	0.001
Covariates												
Food security, % secure	41.7	37.5	0.58	79.9	65.3	<0.001	52.4	50.4	0.72	86.2	73.1	<0.001
Physical activity, days >60 mins/day			0.76			<0.001			0.21			<0.001
0 days	9.3	13.0		5.4	10.2		8.6	13.8		8.2	11.9	
1–3 days	38.7	40.6		31.2	45.2		39.9	45.0		38.3	47.2	
4–6 days	25.8	25.3		37.1	27.2		24.0	18.5		34.5	28.9	
7 days	26.2	21.1		26.3	17.3		27.5	22.7		19.1	12.0	
Screen time			0.02			0.15			0.93			<0.001
< 2 hours/day	17.4	9.4		15.5	12.8		13.6	14.8		16.5	8.9	
2–4 hours/day	38.2	27.1		43.3	36.4		34.5	35.3		40.9	34.5	
>=4 hours/day	44.5	63.6		41.2	50.8		51.9	49.8		42.6	56.6	
	Rural						Urban					
	Low income (n=200)			High income (n=112)			Low income (n=676)			High income (n=777)		
Single, female parents	NW	OW/OB	p	NW	OW/OB	p	NW	OW/OB	p	NW	OW/OB	p
Maternal mental health, % positive mental health	68.4	37.3	0.001	81.7	56.7	0.04	64.2	56.7	0.26	74.1	65.8	0.17
Covariates												
Food security, % secure	45.6	20.0	0.003	70.3	54.6	0.23	32.1	34.3	0.73	72.3	56.8	0.008
Physical activity, days > 60 mins/day			0.19			0.004			0.22			0.17
0 days	10.0	18.4		1.3	16.5		13.8	20.2		11.5	15.1	
1–3 days	38.9	42.4		33.4	49.2		34.5	42.6		36.7	46.6	
4–6 days	33.5	14.6		30.0	27.3		25.7	18.6		35.7	30.1	
7 days	17.6	24.6		35.3	6.9		26.0	18.6		16.1	8.2	
Screen time			0.54			0.19			0.04			0.14
< 2 hours/day	6.2	5.1		8.4	2.0		8.3	8.7		9.2	7.7	

2–4 hours/day	32.7	25.2		49.1	37.0		36.2	21.5		39.9	29.9	
>=4 hours/day	61.1	69.7		42.5	61.1		55.6	69.8		50.9	62.4	
	Rural						Urban					
	<i>Low income (n=29)</i>			<i>High income (n=37)</i>			<i>Low income (n=81)</i>			<i>High income (n=258)</i>		
Single, male parents	NW	OW/OB	p	NW	OW/OB	p	NW	OW/OB	p	NW	OW/OB	p
Paternal mental health, % positive mental health	37.9	65.7	0.22	74.4	97.6	0.007	75.3	57.3	0.24	82.1	81.2	0.92
Covariates												
Food security, % secure	36.4	52.7	0.15	75.0	54.1	0.17	31.8	52.4	0.18	78.0	78.6	0.96
Physical activity, days > 60 mins/day			0.82			0.84			0.03			0.20
0 days	3.0	8.8		1.9	0		11.7	20.6		8.3	26.4	
1–3 days	51.7	53.9		42.4	47.4		36.2	67.2		40.3	26.9	
4–6 days	24.2	24.7		41.3	33.1		23.6	9.6		37.7	40.2	
7 days	21.1	12.6		14.4	19.4		28.5	2.6		13.8	6.5	
Screen time			0.51			0.22			0.008			0.19
< 2 hours/day	7.9	24.3		0.9	7.8		13.8	0.2		9.7	2.3	
2–4 hours/day	12.6	20.1		46.8	53.4		17.4	8.4		42.9	26.6	
>=4 hours/day	79.5	55.5		52.3	38.8		68.8	91.5		47.5	71.1	

Table 3.

National Survey of Children's Health 2016 data showing children, stratified by rural or urban setting, by parental mental health status examining associations with demographic and obesity risk factor variables. Number (n) shown is unadjusted, not taking into account the complex sampling weights.

	Rural						Urban					
Two parent families	Low income (n=474)			High income (n=1,429)			Low income (n=1,622)			High income (n=8,338)		
Maternal mental health status	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p
Food secure, % secure	44.5	29.9	0.07	81.1	49.3	<0.001	57.6	29.9	<0.001	85.5	70.0	<0.001
Physical activity, days > 60 mins/day			0.43			<0.001			0.05			0.001
0 days	8.6	16.4		6.6	8.5		8.4	18.8		7.9	14.5	
1–3 days	41.2	35.4		32.4	50.8		42.6	40.1		40.5	41.7	
4–6 days	25.9	23.5		34.7	30.5		22.8	18.0		33.7	29.4	
7 days	24.3	24.7		26.3	10.2		26.2	23.1		17.8	14.4	
Screen time			0.13			0.008			0.002			0.002
< 2 hours/day	15.7	10.8		16.5	7.3		16.7	5.0		15.3	10.5	
2–4 hours/day	36.4	26.0		41.8	37.5		35.0	33.5		40.0	35.9	
>=4 hours/day	47.9	63.2		41.7	55.2		48.3	61.5		44.7	53.6	
Paternal mental health status	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p
Food secure, % secure	46.8	24.8	0.007	80.4	53.1	<0.001	56.1	37.7	0.004	85.7	68.0	<0.001
Physical activity, >60 mins/day			0.61			0.04			0.19			0.22
0 days	9.0	15.1		6.3	9.9		8.5	17.0		8.8	11.5	
1–3 days	41.4	34.9		34.0	43.4		41.6	39.9		40.3	42.6	
4–6 days	26.0	24.8		34.6	31.3		22.7	19.0		33.7	29.6	
7 days	23.5	25.2		25.2	15.4		26.1	24.1		17.2	16.3	
Screen time			0.30			0.007			0.009			0.003
< 2 hours/day	14.2	14.6		16.2	7.8		16.7	6.1		15.3	10.2	
2–4 hours/day	36.7	25.4		42.3	36.0		35.7	31.7		39.7	36.4	
>=4 hours/day	49.1	60.0		41.4	56.3		47.6	62.2		45.0	53.5	
Single parent families	Rural						Urban					
	Low income (n=200)			High income (n=112)			Low income (n=676)			High income (n=777)		
Maternal mental health status	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p
Food secure, % secure	49.3	16.3	<0.001	72.1	45.6	0.05	43.0	16.4	<0.001	75.6	47.3	<0.001
Physical activity, >60 mins/day			0.08			0.07			0.10			0.07
0 days	11.6	15.4		3.0	19.2		13.8	20.7		8.9	22.0	
1–3 days	35.8	47.0		38.4	45.2		35.9	40.8		40.5	37.6	
4–6 days	35.8	11.5		31.8	19.1		28.3	14.1		35.7	29.8	
7 days	16.8	26.1		26.9	16.6		22.0	24.4		14.9	10.6	

Screen time			0.57			0.49			0.60			0.95
< 2 hours/day	6.9	4.3		7.3	2.1		9.9	6.3		8.4	9.5	
2–4 hours/day	31.3	26.2		45.3	39.2		28.7	31.5		36.9	36.8	
>=4 hours/day	61.8	69.5		47.4	58.7		61.4	62.2		54.7	53.7	
	<i>Low income (n=29)</i>			<i>High income (n=37)</i>			<i>Low income (n=81)</i>			<i>High income (n=258)</i>		
Paternal mental health status	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p	+ MH	– MH	p
Food secure, % secure	58.1	29.8	0.14	73.0	65.0	0.63	40.4	24.3	0.26	81.7	63.5	0.14
Physical activity, days >60 mins/day			0.39			0.06			0.58			0.64
0 days	0	11.8		0	7.3		13.7	14.8		16.3	12.2	
1–3 days	66.1	39.2		37.0	65.7		38.8	56.8		32.9	41.8	
4–6 days	21.7	27.2		47.5	10.9		20.5	16.1		41.5	28.1	
7 days	12.2	21.8		15.6	16.1		27.0	12.3		9.3	17.9	
Screen time			0.12			0.82			0.12			0.06
< 2 hours/day	12.4	19.9		0.9	2.4		13.5	4.1		4.2	18.2	
2–4 hours/day	32.3	0		49.6	45.8		18.8	7.5		39.4	23.4	
>=4 hours/day	55.2	80.1		49.5	51.8		67.7	88.3		56.4	58.4	

+MH = positive mental health in parent, –MH = poor mental health in parent