Associations of Household Structure and Presence of Children in the Household with Mental Distress during the early stages of the US COVID-19 Pandemic

Abstract

Purpose: The objectives of the current study were to: (1) assess associations between household structure (i.e., living with spouse compared to living alone, with children, or with a spouse and children), presence of children, and mental distress in April 2020 and change in mental distress (between April and August 2020); and (2) determine whether these associations are moderated by income or sex.

Participants: A total of 2,214 adults aged 25-55 from the April and August 2020 waves of the Understanding America Study were included in the analytic sample.

Study Method: Multivariable, survey-weighted linear regression models were used to examine associations between explanatory variables (i.e., household structure and number of children) and outcome variables (mental distress in April and change in mental distress), measured via the Patient Health Questionnaire (PHQ)-4.

Results: In adjusted models, each additional child under the age of 12 was associated with lower mental distress in April 2020 (β=-0.30, p=0.002). Having children aged 13 to 18 and household structure were not significantly associated with mental distress. In interaction models, living with children only was associated with decreased mental distress among individuals reporting low income (interaction β=-1.28, p=0.016) but not high income. Similarly, living with children only was associated with decreased mental distress in females (interaction β =-1.09, p=0.025) but not males.

Conclusion: This study supports prior literature that demonstrates the positive association of childrearing with psychological well-being and suggests that these benefits may be present even under stay-at-home orders in the early stages of the US COVID-19 pandemic.

Keywords: mental distress; COVID-19; family structure; parenting paradox

Introduction

The emergence of COVID-19 in the United States has created unprecedented challenges that have rendered many individuals financially unstable (Goodell, 2020) and emotionally vulnerable (Li et al., 2020). The well-being of families may be particularly at risk as a result of changes in relationships and routines during COVID-19, which may disproportionately affect children's coping abilities and parental burden (Prime, Wade, & Browne, 2020; Russell, Hutchison, Tambling, Tomkunas, & Horton, 2020). Although evidence suggests that there has been a rise in mental distress throughout the pandemic (Kirzinger, Kearney, Hamel, & Brodie, 2020), there is scarce research on the association between household structure and mental distress. Understanding these associations is key to informing public health response and long-term consequences of particular living situations.

Polls conducted in March 2020 highlighted the distressing nature of the pandemic (Holingue et al., 2020). Data from the Kaiser Family Foundation poll in April 2020 found that nearly half of adults in the US were experiencing negative mental health effects from worry and stress over the virus (Kirzinger et al., 2020; McGinty, Presskreischer, Han, & Barry, 2020). The COVID-19 pandemic has increased the amount of time that many adults are spending at home, which could have varying implications for mental health depending on household structure. People living alone may be particularly at risk for experiencing loneliness during the COVID-19 pandemic (McGinty et al., 2020). Among young (ages 16-34) and middle-aged (ages 35-59) adults, living alone has been associated with an increased risk for common mental disorders (Jacob, Haro, & Koyanagi, 2019), including a nearly two-fold increase in anxiety and depressive disorders, compared to those who are married or cohabiting (Joutsenniemi, Martelin, Martikainen, Pirkola, & Koskinen, 2006). Families with children may also be disproportionately affected as nearly every daycare and school across the US closed at the beginning of the pandemic. Classes shifted to virtual learning models, affecting over 55 million students in kindergarten through 12th grade (Golberstein, Wen, & Miller, 2020). In addition to everyday parenting, many parents quickly assumed the role of primary educator while potentially balancing competing demands from employment. The experience of COVID-19 related stressors, coupled with symptoms of anxiety and depression, has been

linked to higher parental perceived stress (Brown, Doom, Lechuga-Pena, Watamura, & Koppels, 2020; Spinelli, Lionetti, Pastore, & Fasolo, 2020).

Notably, however, having children in the home can be associated with both positive and negative mental outcomes. This phenomenon is known as the parenting paradox (Rizzo, Schiffrin, & Liss, 2013); though childcare is demanding and time-consuming, parents tend to value their time with children as it promotes familial connectedness and has high intrinsic value for the parent (Bianchi, Robinson, & Milkie, 2006). The latter is particularly true of interactive childcare, such as playing with a child, as opposed to routine care such as feeding or bathing a child (Offer, 2014). Previous research highlights that the type of interaction may be highly gendered (McDonnell, Luke, & Short, 2019) and may have discrete implications for wellbeing by the sex of the parent. For example, routine childcare is more stressful and less engaging for mothers than it is for fathers (Offer, 2014) and these associations may further depend on the age of the child (Roeters & Gracia, 2016). Thus, studies investigating associations between caregiving for children during the COVID-19 pandemic and mental distress should account for sex of the parent and child age.

The stresses of childrearing are likely amplified among single parents, partially due to lower levels of financial and emotional support (Sobolewski & King, 2005). These lower levels of support may result in poorer mental health for single parents compared to parents who are married or cohabiting (Crosier, Butterworth, & Rodgers, 2007). These challenges may be particularly relevant during the COVID-19 pandemic, as single parents may be unable to rely on supportive family and friends throughout shelter-in-place orders.

Finally, income inequalities have repeatedly been linked to psychological outcomes (Patel et al., 2018; Pickett, James, & Wilkinson, 2006). These inequalities are likely to be widened during the COVID-19 pandemic as a result of job loss (U.S. Department of Labor, 2020). Indeed, data from April 2020 suggest that individuals belonging to a low-income household (less than $40,000 per year) have disproportionately experienced negative impacts to their mental health during the COVID-19 pandemic compared to those who make $40,000 or more (Kirzinger et al., 2020).

As the world enters a new phase with COVID-19, many novel stressors are emerging. Families are faced with particular challenges of additional child-rearing and educational duties and people who live alone may experience distress due to isolation. The added responsibilities of childcare may be particularly distressing for women, who have historically provided the bulk of care. Further, households with low economic resources may experience high levels of stress, and the financial effects may compound stress differently based on household structure. To our knowledge, however, only one study has examined mental distress and household structure during the pandemic, finding that there was no relationship between household structure and mental distress or wellbeing (Veldhuis et al., 2021). Our study builds on these findings by considering age of children and potential moderation by income and sex. Exploring this topic has the potential to identify groups who are at greatest risk for mental distress. The objectives of this study are to: (1) assess associations between household structure (i.e., living with spouse compared to living alone, with children, or with a spouse and children), presence of children, and mental distress in April 2020 and change in mental distress (between April and August 2020) during the COVID-19 pandemic; and (2) determine whether these associations are moderated by income or sex.

Methods

Study Sample

Data for this study come from the Understanding America Study (UAS). UAS participants were selected using Address Based Sampling (ABS), in which postal records are used to select a random sample from a listing of residential addresses (Lavrakas, 2008). Eligible individuals include adults 18 and older in the contacted households. The UAS panel consists of 10 nationally representative cohorts (the University of Southern California, 2020) enrolled in the sample between 2014 and 2020. The current analysis uses data from the UAS waves 235 (April 2020 Monthly Survey, administered April 1st through April 28th with a total of 5,478 respondents) and 256 (August 2020 Monthly Survey, administered August 5th through September 1st with a total of 6,238 respondents), which assess participant responses to the COVID-19 pandemic. Survey weights in the UAS align sample distributions of key demographic

characteristics (e.g., sex, race/ethnicity) to their population counterparts based on the Basic Monthly Current Population Survey (CPS).

Measures

Mental Distress

The primary outcome measures stem from the 4-item version of the Patient Health Questionnaire (PHQ-4). This measure is a brief self-report questionnaire consisting of 2 items that assess depressive symptoms and 2 items that assess anxiety symptoms over a two-week period (Löwe et al., 2010). Response options include "not at all," "several days," "more than half the days," and "nearly every day." The total score is calculated by adding the scores of all 4 items; higher scores represent greater levels of mental distress (Kroenke, Spitzer, Williams, & Lowe, 2009). The PHQ-4 is valid and reliable ($\alpha = 0.78$) for assessing depression and anxiety in the general population (Lowe et al., 2010). To calculate difference in mental distress over time, PHQ-4 scores in April 2020 (UAS 235) were subtracted from scores in August 2020 (UAS 256), creating a continuous change score (range: -12 to 12).

Historical Depressive Symptoms

In earlier (pre-April 2020) waves of data collections, participants completed the 8-item version of the Center for Epidemiologic Studies-Depression Scale (CESD-8) (Bracke, Levecque, & Van de Velde, 2008; Radloff, 1977). Answers range from 0 (none or almost none of the time) to 3 (all or almost all the time). The number of symptoms (count: 0-8) a respondent previously endorsed as occurring "all or almost all the time" in the past 7 days was used as a historical measure of depressive symptoms. The CESD-8 scale shows high reliability ($\alpha = 0.90$) and validity among middle-aged US adults (Cosco et al., 2017). The most recent CESD-8 was used for participants with multiple CESD-8 measurements from prior waves (46% of the sample had a CESD-8 from June 2019, 36% from June 2017, and 18% from May 2015). Continuously measured pre-pandemic CESD-8 scores were included as a covariate in all models.

Household Variables

The primary exposure of interest was household structure, which was assessed using the respondent-reported relationships of household members. Household structure was assigned to the

following categories: living alone; living with spouse only; living with children only; living with spouse and children only. All other combinations of household structure (32.5% of households), including extended family and non-family members, were not assessed due to the heterogeneity of this population. In addition, household structure was further characterized by identifying the number of children living in the household. Children were split into two age groups, and the total number of children in each age group per household were each used as a continuous measure: children aged 12 or below (range: 0-6) and children aged 13 to 18 (range: 0-4).

Other Sociodemographic Items

Sociodemographic factors included: age (in years); sex (female or male); race/ethnicity [White, Black or African American, or Other (includes American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, and multiracial)]; education (high school degree or below, attended some college or received a two-year degree, Bachelor's degree, or graduate degree); household income, measured as the total combined 12-month income of all members currently living the respondent's household (less than 30k, 30-59k, 60k and above); and currently have a job (yes or no). A household income of $60,000 was selected as the cutoff for low versus high income as it roughly corresponds to the median income in the U.S. in 2018 (Guzman, 2019).

Statistical Analyses

Multivariable, survey-weighted linear regression was used to examine the associations of household characteristics (i.e., household structure and number of children) as explanatory variables and total PHQ-4 score in April 2020 and PHQ-4 score change from April to August 2020 as the outcomes. The analysis was restricted to individuals aged 25 to 55 and with complete information on all analytic variables (187 participants [~8%] excluded for incomplete data). Age restrictions were implemented to reduce confounding by age; age categories (by decade, beginning at age 25) were selected if greater than one-third of the group had children in the home. We then estimated two additional models with an interaction term of each primary predictor (household structure and number of children) with sex and household income separately for both April 2020 mental distress and change in distress (8 models total).

Sensitivity analyses were included to allow for potentially different results based on distinct threshold (i.e., cutoff for low income) and similarities of living situation (i.e., living with spouse and living with significant other). All analyses used the UAS survey weights and adjusted complex survey design, allowing these results to generalize to the US adult population. All analyses were performed in Stata 16 using the *svy* commands (Statacorp, 2017).

Results

Sample Description

A total of 2,214 adults ages 25-55 were included in this analysis. The majority of the participants were female (52%), white (75%), currently working (67%), and living with a partner (73%). Most had some post-secondary education (67%) and an annual income of greater than $60,000 (54%). CESD-8 total scores ranged from 0 to 8 with a mean of 1.9 (SE=0.07). Over one-third of participants endorsed no CESD-8 symptoms at their most recent measurement, and only 20% reported experiencing more than 3 of the symptoms. PHQ-4 total scores in April 2020 ranged from 0 to 12 with a mean of 2.9 (SE=0.10). On average, participants showed less distress in August 2020 (change: -0.86 (SE=0.08)). The household structure analyses included a subgroup of this sample who fell into one of four household categories: living alone, living with spouse only, living with kids only, living with spouse and kids. Sample characteristics are presented in Table 1.

Correlates of Mental Distress

Unadjusted Analyses

In unadjusted bivariate tests, household structure was not associated with mental distress (i.e., PHQ-4 total score) in April 2020 or change in mental distress between April 2020 and August 2020. Number of children aged 12 or below was associated with lower mental distress in April 2020 (β=-0.25, 95% CI: -0.43, -0.08), but not change in mental distress. Number of children aged 13-18 showed no associations with mental distress in April or with the change over time.

Adjusted Analyses

In adjusted models, household structure was not associated with mental distress in April 2020 or change in mental distress. In models looking at number of children under 12, compared to households with no children, each additional child under the age of 12 was associated with a decrease in mental distress in April 2020 (β=-0.30, p=0.002) (Table 2, Figure 1). This finding was significant when adjusting for sociodemographic variables (age, sex, race, education, household income, living with a partner, and currently having a job) and historical CESD-8 score. Having children between the ages of 13 and 18 and household structure were not significantly associated with mental distress in April 2020 or change in mental distress (both $p>0.05$). The strength of association and significance of other variables varied across models (household structure and number of children), but generally, being Black/African American, compared to White, was associated with lower levels of distress in April 2020, whereas currently not working and historical depressive symptoms were associated with higher levels of mental distress in April 2020 (both $p<0.05$). In contrast, being Black/African American, compared to White, and having a graduate degree, relative to high school or less, was associated with a significant increase in mental distress ($p<0.005$). Having an annual household income of $60,000 or above, relative to less than $30,000, was associated with a significant decrease in distress over time (p=0.04). A summary of these results is available in Table 2.

Moderation Analyses

Additional models included interaction terms between the primary exposures (i.e., household structure and number of children) and sex and income to investigate differential effects among males/females and high/low-income groups. Living with children only, relative to living with spouse only in a low-income home, was associated with decreased mental distress among individuals reporting low income (interaction β=-1.28, p=0.016) but not high income (association=-0.94, p=0.086). Similarly, living with children only, relative to living with a spouse only and being female, was associated with decreased stress among females (interaction β=-1.09, p=0.025) but not males (association=-0.18, p=0.783). No other interaction terms were statistically significant. A summary of these results is available in Tables 3 and 4.

Sensitivity Analyses

Using a more stringent household income cutoff for low income ($30,000) in the moderation analyses revealed additional significant interactions in the household structure models. Living alone, with children only, or with spouse and children, relative to spouse only in a low-income home, was associated with decreased distress for both low-income (interaction β=-2.29, -2.80, and -1.86, respectively) and high-income groups (association=-2.03, -2.01, and -2.05, respectively). The income cutoff showed no significant interactions in other moderation analyses looking at distress in April 2020 and number of children. Combining categories of comparable living situations (e.g., living with spouse only and living with significant other only) did not change the overall results.

Discussion

Our findings, based on data collected during the April and August 2020 waves of a nationally representative survey panel, found no significant differences in mental distress in April 2020 or change in mental distress in individuals living with a spouse compared to individuals living alone or with other immediate family members (e.g., spouse and children). This finding is consistent with literature that proposes no differences in mental health symptoms based on household structure (Cramer, 1993), but is in contrast to recent studies that suggest that individuals living alone fare worse than those living with others (Jacob et al., 2019). Individuals living alone may be less concerned about exposing friends and family to the virus (Shanafelt, Ripp, & Trockel, 2020), may be used to living alone, or have fewer stressors than people living with others.

This study suggests that having children ages 12 and under in the household is associated with lower mental distress in April 2020, whereas having children ages 13 to 18 in the household is not associated with mental distress. Findings for this study are consistent with previous literature which suggests that parents experience high levels of well-being when spending time caring for young children (Roeters & Gracia, 2016). This may be true particularly during stay-at-home orders, which were enacted almost ubiquitously across all 50 states in April. Many parents were able to spend additional time with

their children, and, as a result of the caregiving responsibilities, were prompted to implement practices that are known to be beneficial to mental health and resilience, including routine breaks from work, establishing a schedule, improving and increasing communication, and engaging in activities as a family (Prime et al., 2020). Having a family is associated with an increased sense of purpose and responsibility for parents which has positive impacts on health (Pollitt, Robinson, & Umberson, 2018). These effects may be enhanced during the pandemic as a result of the need to provide support and a sense of normalcy for children during a highly stressful time.

It is important to note, however, that these effects may not be universally experienced by parents. Recent studies have shown that the impact of COVID-19 among parents varies with caregiver burden and other crisis-related hardships (Gassman-Pines, Ananat, & Fitz-Henley, 2020), perceptions of children's stress (Russell et al., 2020), and the availability of resources to meet caregiver needs (Griffith, 2020). Therefore, while this study shows that young children, on average, are associated with reduced mental distress among parents, there are likely nuances in the experience of mental distress among parents as a result of these factors and other characteristics of family and work structure (e.g., age of children, flexibility of job, support system).

Not surprisingly, parents of adolescents are less likely to engage in caregiving activities as children in this age range are increasingly autonomous. While some earlier studies have suggested that rising parent-child tension in adolescence causes parental distress (Laursen, Coy, & Collins, 1998), there is little empirical evidence showing child-induced distress. Prior studies have suggested numerous possibilities for this lack of evidence, including inter-person variability in the experience of demands and rewards of childrearing and the notion that rewards and burdens of childrearing offset each other (Umberson, Pudrovska, & Reczek, 2010). This may be especially true during the pandemic; adolescents are likely to experience additional COVID-19-related stress, relative to younger children, due to decreased socialization and increased household stressors (e.g., job loss, illness) that teenagers can better detect and process (*Teen mental health*, 2020).

The data showed no main effects of income in April 2020. There are many plausible explanations for these findings. For example, self-report of household income is prone to measurement error (Moore & Welniak, 2000) and may not accurately represent one's actual household income, particularly during the COVID-19 pandemic. Further, there is substantial variation in household size (between 0 and 11 housemates reported in this population of UAS participants). As expected, a livable income for one household may not be equivalent to the livable income of another. In analyses looking at change in mental distress, high income is associated with significantly lower mental distress. Moreover, these data showed a significant interaction between household structure and income in adjusted models, such that living with children only, relative to living with spouse only in a low-income home, was associated with decreased mental distress among low-income but not high-income individuals. It is likely that, over time, low income became increasingly burdensome, particularly among large families who lost access to free or reduced-price meals for school-aged children and had to purchase learning tools or childcare that were not necessary prior to the pandemic.

Our findings show no significant difference in mental distress between males and females at in April 2020 or across time. However, we did see that living with children, relative to females living with spouse only, was associated with decreased distress among females but not males. These findings are contrary to research showing lower rates of depression and anxiety among males (Altemus, Sarvaiya, & Neill Epperson, 2014), especially during the pandemic, when women have reported disproportionate worry over coronavirus-related concerns (Frederiksen, Gomez, Salganicoff, & Ranji, 2020). Many sources hypothesized that men may be taking on additional household responsibilities during the pandemic (Carlson, Petts, & Pepin, 2020; Levs, 2020; Miller, 2020), leading to an increase in mental distress, but polls administered in October 2020 show that gender gaps in household responsibilities have remained consistent (Barroso, 2021). Instead, it may be that men are experiencing a greater negative impact on their mental health as a result of newfound isolation and job responsibilities, narrowing the traditional gap in mental distress (Mastroianni, 2020).

Black individuals show lower mental distress at baseline (before the pandemic began), consistent with previous studies (Hasin & Grant, 2015). However, as the pandemic progressed, being Black was associated with a significant increase in mental distress. This may be a result of the racial inequities that minority communities face, such as disproportionate involvement in service occupations (coined "essential" during the pandemic), which have been associated with high levels of mental distress partially due to high risk of exposure to COVID-19 (Kamal, Panchal, & Garfield, 2020). In addition, Black people have been subject to trauma from witnessing police brutality and experiencing systemic racism and racial stereotyping throughout the pandemic (Christiani, Clark, Greene, Hetherington, & Wager, 2020), which have been associated with increased mental distress (Schmitt, Branscombe, Postmes, & Garcia, 2014)

Despite many strengths, such as the use of a nationally representative study population, this study is not without limitations. First, we lacked data on relationship quality, marital satisfaction, and child mental health, which could mediate the association between household variables and mental distress. Investigating these potential mediators is an important direction for future studies. Second, we were unable to account for differences in timing of school closures and learning supports (e.g., tablets/computers, tutors), which likely influenced the relationship between living with children and mental distress. Understanding the impact of specific schooling situations (e.g., remote learning vs hybrid) on mental distress could inform policy and allocation of learning supports.

This study supports previous research suggesting positive effects of childrearing and demonstrates that parents with young children may be particularly likely to experience these benefits (e.g., increased likelihood of taking routine breaks from work, spending time outside, and having set wake and bedtime schedules) (Craig & Churchill, 2020) during the COVID-19 pandemic. Engaging in these physical and emotional activities, which come naturally with childcare, may also facilitate mental well-being among those not currently providing care. These data are unique in that they capture mental health of the U.S. population early in the pandemic at a time when nearly all schools were closed, and all states were under stay-at-home orders. These findings are among the first to document the consequences of

specific living situations on mental health, which could be used to inform public health interventions to reduce mental distress on a population level.

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471 **Table 1:** Participant characteristics among UAS sample ages 25-55.

Sociodemographic Characteristics - N (%)			
Model:		**Number of Children (*n*=2,214)**	**Household Structure (*n*=1,495)**
Age		40.1 (0.24)	40.8 (0.28)
Sex			
	Female	1151 (52.0%)	725 (48.5%)
	Male	1063 (48.0%)	770 (51.5%)
Race			
	White	1663 (75.1%)	1163 (77.8%)
	Black	265 (12.0%)	159 (10.6%)
	Other	286 (12.9%)	173 (11.6%)
Education Level			
	High school or less	741 (33.5%)	450 (30.1%)
	Some college or Associate's degree	559 (25.3%)	344 (23.0%)
	Bachelor's degree	507 (22.8%)	374 (25.0%)
	Graduate degree	407 (18.4%)	327 (21.9%)
Household Income			
	Less than 30k	499 (22.5%)	295 (19.7%)
	Less than 60k	528 (23.9%)	339 (22.7%)
	60k+	1187 (53.6%)	861 (57.6%)
Currently working			
	Yes	1471 (66.5%)	1055 (70.6%)
	No	743 (33.5%)	440 (29.4%)
Living with a Partner			
	Yes	1621 (73.2%)	1175 (78.6%)
	No	593 (26.8%)	320 (21.4%)
Household Characteristics			
Household Structure – N (%)			
	Alone	-----	276 (18.5%)
	Living with Spouse	-----	314 (20.9%)
	Living with Kids	-----	98 (6.6%)
	Living with Spouse and Kids	-----	807 (54.0%)
Number of Children – mean (se)			
	Ages 0-12	0.65 (0.03)	-----
	Ages 12-18	0.27 (0.02)	-----
Mental Distress - mean (se)			
PHQ-4 Score in April 2020		2.9 (0.10)	2.79 (0.12)
Change in PHQ-4 Score		-0.86 (0.08)	-0.77 (0.10)
Latest CES-D score		1.89 (0.07)	1.70 (0.08)

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Table 2: Multivariable linear regression models estimating 1) PHQ-4 total score in April 2020 and 2) change in PHQ-4 score between April and August 2020 by a) household structure and b) number of children in the household, stratified by age of children. Models are adjusted for age, sex, race, education, household income, current work status, living with a partner (number of children models only), and historical depressive symptoms.

Outcome:	Mental Distress in April		Change in Mental Distress		Mental Distress in April		Change in Mental Distress	
Primary Predictor:	Household Structure		Household Structure		Number of Children (by age)		Number of Children (by age)	
	N=1,495		N=1,495		N=2,214		N=2,214	
	Beta	*95% CI*	*Beta*	*95% CI*	*Beta*	*95% CI*	*Beta*	*95% CI*
Household structure (ref: spouse only)								
Alone	-0.21	[-0.97,0.55]	-0.40	[-1.03,0.23]	-----	-----	-----	-----
Kids Only	-0.14	[-0.87,0.59]	-0.71	[-1.47,0.05]	-----	-----	-----	-----
Spouse and Kids	0.04	[-0.54,0.62]	-0.12	[-0.61,0.37]	-----	-----	-----	-----
Number of children								
# children <-12	-----	-----	-----	-----	-0.30	[-0.49,-0.11] *	0.09	[-0.08,0.27]
# children 13-18	-----	-----	-----	-----	-0.02	[-0.31,0.26]	-0.02	[-0.28,0.24]
Age	-0.02	[-0.04,0.01]	0.01	[-0.01,0.04]	-0.02	[-0.05,0.00]	0.02	[-0.00,0.03]
Sex (ref: female)								
Male	-0.34	[-0.78,0.10]	-0.06	[-0.45,0.33]	-0.26	[-0.63,0.11]	-0.02	[-0.36,0.32]
Race (ref: white)								
Black	-1.34	[-2.03,-0.64] *	1.06	[0.38,1.74] *	-1.19	[-1.75,-0.63] *	0.81	[0.25,1.37] *
Other	-0.11	[-0.79,0.58]	0.39	[-0.32,1.11]	-0.26	[-0.77,0.25]	0.31	[-0.21,0.84]
Education (ref: high school or less)								
Some college/Associate's	0.05	[-0.54,0.63]	-0.01	[-0.54,0.52]	0.14	[-0.34,0.61]	0.15	[-0.28,0.57]
Bachelor's	0.53	[-0.05,1.12]	0.14	[-0.35,0.64]	0.49	[-0.02,1.00]	0.33	[-0.10,0.77]
Graduate degree	0.48	[-0.21,1.17]	0.63	[0.03,1.22] *	0.32	[-0.28,0.93]	0.80	[0.27,1.33] *
Household Income (ref: <30k)								
30 to less than 60k	-0.09	[-0.79,0.62]	-0.07	[-0.80,0.66]	-0.01	[-0.63,0.61]	-0.04	[-0.62,0.53]
60k+	-0.35	[-1.12,0.42]	-0.50	[-1.23,0.23]	0.00	[-0.60,0.60]	-0.59	[-1.15,-0.03] *
Current job (ref: Yes)								
No job	0.61	[0.04,1.18] *	-0.27	[-0.74,0.21]	0.81	[0.35,1.27] *	-0.25	[-0.64,0.14]
Live with partner (ref: no)								
Living with partner	-----	-----	-----	-----	0.06	[-0.40,0.51]	0.33	[-0.11,0.77]
Historical depression score (CESD-8)	0.54	[0.41,0.67] *	0.06	[-0.03,0.15]	0.50	[0.40,0.60] *	0.06	[-0.03,0.15]

*denotes significance at a p<0.05 level

Fig. 1 Predicted PHQ-4 score and 95% confidence interval by household structure (spouse only (ref) and children only), stratified by sex (left) and income (right) and adjusted for age, sex, race, education, household income, current work status, living with a partner, and historical depressive symptoms

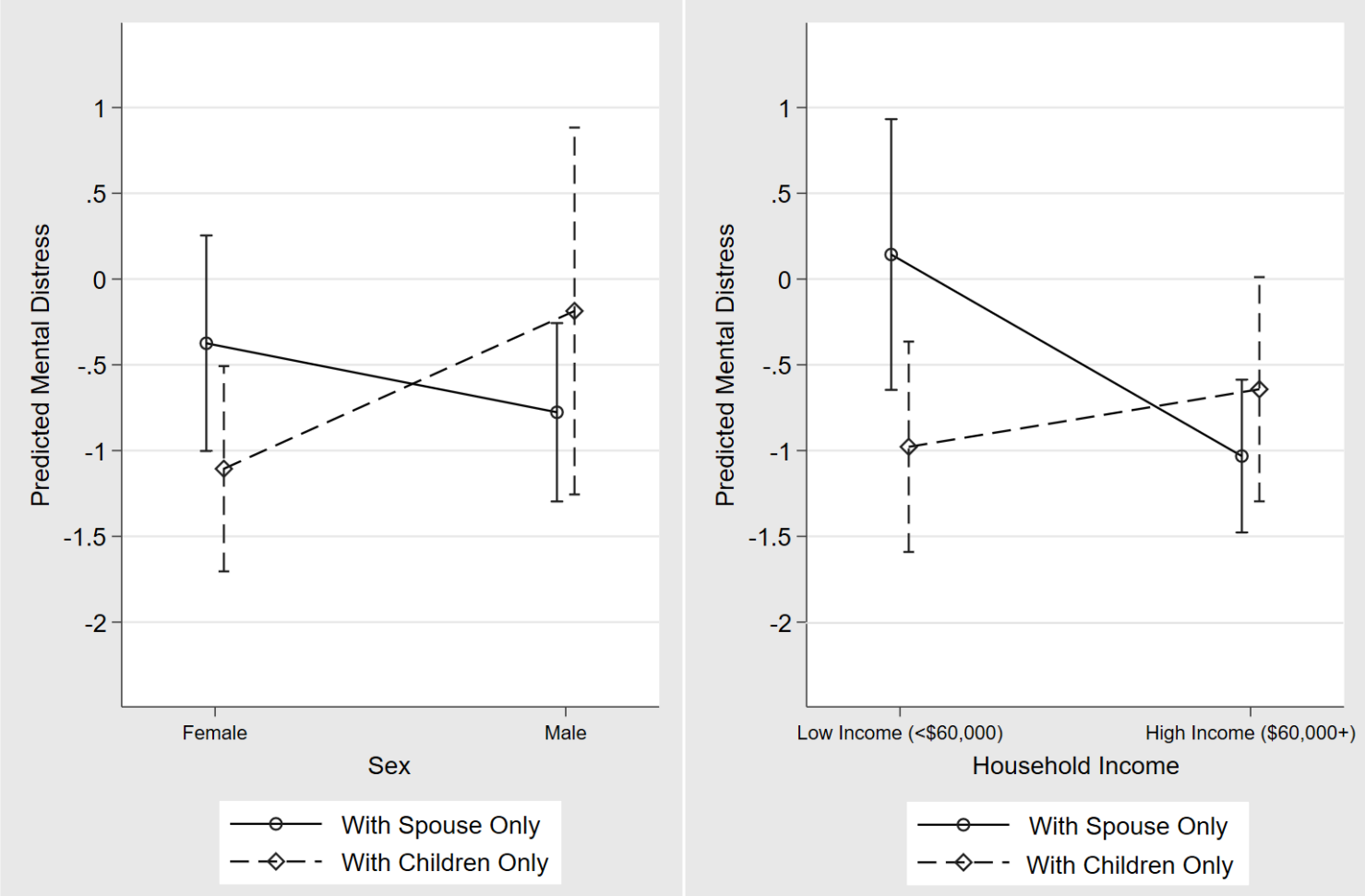

Table 3: Multivariable linear regression models with interaction terms estimating 1) PHQ-4 total score in April 2020 and 2) change in PHQ-4 score between April and August 2020 by a) household structure and b) number of children in the household, stratified by age of children, and their interaction with income. All models are adjusted for age, race, education, sex, current work status, living with a partner (number of children models only), and historical depressive symptoms.

Outcome:	Mental Distress in April		Change in Mental Distress		Mental Distress in April		Change in Mental Distress	
Primary Predictor:	Household Structure		Household Structure		Number of Children (by age)		Number of Children (by age)	
	N=1,495		N=1,495		N=2,214		N=2,214	
	Beta	*95% CI*	*Beta*	*95% CI*	*Beta*	*95% CI*	*Beta*	*95% CI*
Household structure (ref: spouse only)								
Alone	-0.20	[-1.42,1.02]	-0.87	[-1.88,0.13]	-----	-----	-----	-----
Kids Only	0.00	[-1.12,1.11]	-1.28	[-2.32,-0.24] *	-----	-----	-----	-----
Spouse and Kids	0.04	[-1.08,1.15]	-0.73	[-1.70,0.23]	-----	-----	-----	-----
Number of children								
# children <-12	-----	-----	-----	-----	-0.44	[-0.73,-0.15] *	0.05	[-0.24,0.34]
# children 13-18	-----	-----	-----	-----	0.26	[-0.23,0.76]	-0.09	[-0.50,0.32]
Annual Household Income (ref: <60k)								
≥ $60,000	-0.26	[-1.48,0.97]	-1.18	[-2.10,-0.25] *	-0.01	[-0.56,0.55]	-0.64	[-1.12,-0.16] *
Household structure by income interaction								
Alone & High Income	0.02	[-1.48,1.52]	0.84	[-0.38,2.05]	-----	-----	-----	-----
Kids Only & High Income	-0.72	[-2.04,0.60]	1.51	[0.26,2.76] *	-----	-----	-----	-----
Spouse and Kids & High Income	0.00	[-1.28,1.29]	0.95	[-0.15,2.04]	-----	-----	-----	-----
Number of children by income interaction								
# children <-12 & High Income	-----	-----	-----	-----	0.22	[-0.13,0.56]	0.07	[-0.26,0.40]
# children 13-18 & High Income	-----	-----	-----	-----	-0.46	[-1.06,0.14]	0.12	[-0.40,0.64]

*denotes significance at a p<0.05 level

Table 4: Multivariable linear regression models with interaction terms estimating 1) PHQ-4 total score in April 2020 and 2) change in PHQ-4 score between April and August 2020 by a) household structure and b) number of children in the household, stratified by age of children, and their interaction with sex. All models are adjusted for age, race, education, household income, current work status, living with a partner (number of children models only), and historical depressive symptoms.

Outcome:	Mental Distress in April		Change in Mental Distress		Mental Distress in April		Change in Mental Distress	
Primary Predictor:	Household Structure		Household Structure		Number of Children (by age)		Number of Children (by age)	
	N=1,495		N=1,495		N=2,214		N=2,214	
	Beta	*95% CI*	*Beta*	*95% CI*	*Beta*	*95% CI*	*Beta*	*95% CI*
Household structure (ref: spouse only)								
Alone	0.04	[-0.94,1.02]	-0.59	[-1.55,0.37]	-----	-----	-----	-----
Kids Only	0.18	[-0.66,1.03]	-1.09	[-2.05,-0.13] *	-----	-----	-----	-----
Spouse and Kids	0.43	[-0.33,1.18]	-0.33	[-1.11,0.46]	-----	-----	-----	-----
Number of children								
# children <-12	-----	-----	-----	-----	-0.33	[-0.59,-0.07] *	0.04	[-0.22,0.29]
# children 13-18	-----	-----	-----	-----	-0.25	[-0.74,0.24]	-0.15	[-0.60,0.31]
Sex (ref: female)								
Male	0.18	[-0.85,1.21]	-0.40	[-1.23,0.43]	0.07	[-0.24,0.38]	0.10	[-0.21,0.41]
Household structure by sex interaction								
Alone & Male	-0.47	[-1.88,0.95]	0.35	[-0.86,1.56]	-----	-----	-----	-----
Kids Only & Male	-0.74	[-2.43,0.94]	1.32	[-0.17,2.81]	-----	-----	-----	-----
Spouse and Kids & Male	-0.73	[-1.90,0.43]	0.39	[-0.61,1.38]	-----	-----	-----	-----
Number of children by sex interaction								
# children <-12 & Male	-----	-----	-----	-----	0.06	[-0.34,0.47]	-0.13	[-0.47,0.21]
# children 13-18 & Male	-----	-----	-----	-----	-0.21	[-0.73,0.32]	0.25	[-0.23,0.73]

*denotes significance at a p<0.05 level