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The Role of Trauma in Mothers' COVID-19 Vaccine Beliefs and Intentions

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Abstract

Objective   Research on COVID-19 vaccine beliefs has focused primarily on adults' intentions to vaccinate themselves; however, many parents will also face decisions about vaccinating their children. In this study, we examine how maternal posttraumatic stress disorder (PTSD) and trauma history relate to mothers' beliefs and intentions about the COVID-19 vaccine for themselves and their children. **Methods**   A total of 240 mothers with a mental health history participating in a parenting study answered online survey questions via Prolific. Questions assessed: (a) trauma indictors (past diagnosis, current symptoms, and lifetime exposure to events); (b) vaccine measures (intentions for self and child, COVID-19 vaccine confidence, general vaccine perceived safety, reasoning about vaccine intentions, sources of influence on intentions); and (c) possible explanatory variables (institutional distrust, negative worldviews). ANCOVAs and regression analyses were used. **Results**   When compared with mothers with other mental health diagnoses, mothers with a PTSD history had significantly less confidence in the COVID-19 vaccine and less intent to get the vaccine for themselves or their child. These effects were explained by greater institutional distrust (i.e., significant indirect effects). Mothers with a previous PTSD diagnosis also expressed different reasons for vaccine hesitancy (e.g., less belief in science) and ascribed less influence to healthcare and governmental sources in vaccine decision-making. **Conclusion**   Findings highlight the potential utility of a trauma-informed approach in efforts to reduce COVID-19 vaccine hesitancy. For mothers with a history of PTSD, addressing institutional distrust, including towards the healthcare industry, may be an important element to consider in the content, delivery, and mode of vaccine messaging.

Key words: COVID-19; immunology (including HIV), parents; posttraumatic stress trauma.

Introduction

COVID-19 has dramatically impacted nearly every aspect of life in the United States, resulting in increased stress for most families (American Psychological Association, 2020). The initiation of vaccines in December 2020 therefore provided welcome hope for an eventual return to normalcy. Yet, the extent to which vaccine availability leads to a national recovery will depend in part on the willingness of individuals to take the vaccine. Thus, understanding who may be less willing to receive the COVID-19 vaccine and why is crucial in efforts to promote widespread uptake and herd immunity.

To date, research on COVID-19 vaccine intentions has focused primarily on identifying demographic factors associated with differences in adults' intentions (e.g., Malik et al., 2020). However, many parents will soon also face decisions about vaccinating their children. Although COVID-19 vaccines are currently approved for use only down to age 16, there are ongoing

trials with children as young as 12 and plans for trials with younger children (Zimmer, 2020). The decisions parents make about vaccinating themselves and their children can impact the health of family members, as well as children's involvement in normative childhood activities (e.g., attending school, seeing relatives). Consequently, identifying groups who may benefit from targeted vaccine messaging is important for reducing the impact of the pandemic on children.

Identifying factors related to parents' beliefs about COVID-19 vaccines can also provide new directions for addressing vaccine hesitancy more generally. Vaccine hesitancy, defined as the reluctance or refusal to vaccinate despite the availability of vaccines, was listed as one of the top 10 global health threats by the World Health Organization (2019). Vaccine hesitancy has increased in the last 20 years for several reasons, including the global reach of antivaccination messaging through social media and a general shift from vertical (i.e., provider to patient) to horizontal (e.g., from friends, social media) transmission of health information (Brewer et al., 2017). Although specific aspects of COVID-19 (e.g., politicization of the virus, speed of vaccine development) likely add to vaccine hesitancy, the need for research on a broader range of characteristics associated with vaccination beliefs and behaviors predates the current pandemic.

Somewhat surprisingly, very few studies have examined how mental health symptoms relate to vaccination beliefs and behaviors. There is some evidence that older adults with a history of depression or anxiety are more likely to get influenza vaccinations (Lawrence et al., 2020). In contrast, a few studies have found lower immunization rates in children of mothers with a depression history (e.g., Minkovitz et al., 2005), although null results have also been reported (e.g., Farr et al., 2013). No known studies have examined how trauma history and posttraumatic stress disorder (PTSD) symptoms relate to vaccine beliefs and behaviors; however, there are conceptual reasons to believe trauma factors may be particularly relevant for understanding vaccine hesitancy.

Individuals who experience significant trauma or PTSD often develop mistrust of other people and institutions and a generalized negative view of the world (e.g., Gobin & Freyd, 2014; Janoff-Bulman, 1989; Park et al., 2012). This can include decreased trust in healthcare institutions and providers (e.g., Klest et al., 2019). Although distrust is associated with a range of mental health symptoms, the relation may be stronger with PTSD compared with depression and anxiety symptoms (Kopacz et al., 2018). Importantly, distrust in trauma-affected individuals persists over time, and can impact daily life and health behaviors years after the event (Nilsen et al., 2019). Among adults with trauma symptoms, mistrust may be one reason for lower use of recommended healthcare (Edmondson et al., 2013; Hoge, 2011). Together, these findings suggest that general or institutional distrust (ID) can impact engagement with health services among trauma-affected individuals. Distrust is likely to be particularly salient for vaccine behaviors (McCormick, 2007). Perhaps more than any other preventative health behavior, vaccine decisions rely strongly on trust in others and confidence in various institutions: Trust that the pharmaceutical company developed an effective vaccine; trust in the government and scientific organizations that determine a vaccine is safe and poses less risk than the associated disease; trust that the medical provider delivering the vaccine will do so safely and effectively; and trust that others in the community will also participate in vaccinations. Given the critical role of trust in vaccine behaviors, focusing on populations where distrust is more common, such as those with a trauma history, may be fruitful for both research and intervention.

With this goal in mind, this study examines three questions on the role of maternal trauma history and symptoms on mothers' beliefs and intentions about the COVID-19 vaccine for themselves and their children. First, we test whether maternal trauma indicators (past PTSD diagnosis, lifetime exposure to potentially traumatic experiences, current PTSD symptoms) relate to differences in COVID-19 vaccine intentions (for self and child), COVID-19 child vaccine confidence, and perceived general vaccine safety in a sample of mothers with a mental health history. Second, we examine whether significant relations between trauma indicators and vaccine measures are due to differences in institutional trust and negative worldviews. We hypothesized that mothers with a trauma history would report more distrust of others and institutions, and that this would account for differences in vaccine intentions (i.e., indirect effects). Third, we explore if mothers with a trauma history report different reasons or influences on their COVID-19 vaccine intentions since such differences can inform tailored messaging strategies.

We address these questions in a sample of 240 mothers with a positive mental health history participating in a study on parenting vulnerabilities in 2020–21. We focus specifically on this population because they are likely to have higher rates of trauma indicators and because mothers are often responsible for healthcare decisions for multiple family members. The survey was administered in December 2020, as COVID-19 rates and deaths reached an all-time high in the United States and as the first two vaccines were approved and initiated.

Materials and Methods

Participants
Participants include 240 mothers with children aged 3–18 recruited through Prolific Academic, a widely

used crowdsourcing platform. Prolific participants have higher attention rates and more diversity than university samples and show a lower propensity towards cheating than other crowdsourcing platforms (Peer et al., 2017). Prolific participants undergo a detailed prescreening as part of their involvement with the platform. Based on prescreening data, participants were eligible if they: (a) lived with a biological child between the ages of 3–18; (b) had ever received a mental health diagnosis; and (c) lived in the United States.

The average age for mothers was 36.9 years (SD = 7.42, range = 24–60) and for target children was 10.76 (SD = 4.89, range = 3–18). Mothers identified as non-Hispanic White (78%), African-American (9%), Latina (5%), Asian-American (3%), and Multiracial (5%), and represented all regions of the United States. Educationally, 41% had a High School Degree, 15% had an Associate Degree or similar qualification; 30% had a Bachelors' Degree; and 14% had some postbaccalaureate education. Fifty-seven percent of mothers were currently married or living with the biological father of the target child; 44% of school age children qualified for free or reduced lunch at school.

Procedure

Mothers are part of a three-wave, 1 year study examining how trauma symptoms relate to certain parenting vulnerabilities (i.e., parental mentalization) beyond other types of mental health symptoms. Although not initially designed to examine COVID-19 factors, additional measures were added to explore associations between parenting factors and COVID-19 stressors and family changes (e.g., home schooling, job loss) over this 1-year period, including vaccine measures, given the pervasive impact of the pandemic. At study entry, mothers selected one target child for whom to respond, with options falling in three age groups (3–5, 6–12, and 13–18). Recruitment was stratified to have relatively balanced numbers in each age group. After providing consent, participants completed an online survey assessing demographics, mental health, parenting, and the impact of current events (i.e., COVID-19 pandemic and election). All recommended procedures for data quality control were followed (e.g., attention check and inconsistency items). Two participants were excluded for failing two or more attention check items. The survey took ~1 hr, and participants were paid $10.00 for their time. Procedures were approved by the University of Connecticut Institutional Review Board.

Measures

Demographic Factors

Mothers provided information about their race/ethnicity, marital status, socioeconomic status, family structure, employment, and political identification.

Diagnostic History

Participants were provided with a list of 12 of the most common mental health diagnoses and asked to indicate any previous diagnoses they had been given by a doctor, nurse, psychologist, therapist, counselor, or other health professional. For the current purposes, dummy codes were created for PTSD, any mood disorder (e.g., major depression, bipolar), and any anxiety disorder (e.g., generalized anxiety, social anxiety).

Current Posttraumatic Symptoms

The Post Traumatic Checklist for DSM V (PCL-5; Weathers et al., 2013) is a well-validated 20-item self-report measure of PTSD symptoms according to criteria in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Participants rate the severity of a symptom during the past month on a 5-point scale ranging from 0 (not at all) to 4 (extremely), with a clinical cutoff of 32. Internal consistency for the sample was high ($\alpha = .95$).

Current Depressive Symptoms

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) is a well-validated measure of depressive symptoms consistent with the DSM-5. Items are rated on a 4-point Likert scale with scores ranging from 0 (not at all) to 3 (nearly every day), with scores of 10 or above used as the clinical cutoff. Internal consistency was high ($\alpha = .91$).

Exposure to Potentially Traumatizing Events

The Life Events Checklist for DSM-5 (Weathers et al., 2013) is a self-report measure of exposure to 16 potentially traumatic events in a respondent's lifetime. Four very rare events for this population (e.g., captivity, exposure to toxic substances) were excluded. Total scores (sum of yes/no for lifetime exposure of each event) were calculated.

COVID Vaccine Intentions

Parents read the following statement developed for this study:

> COVID vaccines are expected to be available to the public in the US in the coming months. When it has been approved and is available to you and your family, how likely are you to get the vaccine for you/for the target child?

Responses for each of the two items were on a 7-point scale from 1 (definitely no) to 7 (definitely yes).

COVID Child Vaccine Confidence

Vaccine confidence was measured with the Vaccine Confidence Index (VCI; Larson, 2016), which includes three items assessing perceptions of the safety, effectiveness, and importance of vaccines. The VCI has been used in over 60 countries to monitor

geographical differences in vaccine confidence over time. For the current purposes, questions were modified to ask specifically about the COVID-19 vaccine (e.g., "I believe it is important for my child to get the COVID vaccine"). Responses are on a 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Internal consistency for the three items was high (α = .95). Participants were also asked the VCI item on perceptions of safety a second time for existing child vaccines generally (e.g., flu, MMR) for comparison since COVID vaccines may be viewed differently (i.e., general child vaccine safety).

Vaccine Intentions Reasoning

After rating intentions for their child, mothers were asked to type in the biggest reason influencing why they would or would not get their child the COVID-19 vaccine. An initial set of categories for thematic coding was generated drawing from common vaccine concerns described by Brewer et al. (2017). After the authors jointly reviewed 20 responses, two additional themes were added for a total of ten categories (see Table I). Next, all responses were independently coded by three coders blind to mental health history. Responses could have multiple codes. Interrater reliability was high, with kappas ranging from .76 to .91.

Vaccine Intentions Influences

A measure designed for this study asked parents how much their intent to vaccinate their child would be influenced by seven different sources, including: recommendations from the child's pediatrician, recommendations from other health providers involved with the family (e.g., school nurse), school requirements, requirements for travel or activities, seeing experiences of friends/family, personally reading research and clinical trials, and information from government and public health agencies. Response options were on an ordinal scale from "*not at all*", "*a little or some influence,*" and "*a great deal of influence.*" Internal consistency was α = .80, suggesting that responses for individual sources may reflect more general openness to information regarding vaccines.

Benevolent World View (BWV)

The World Assumptions Scale (Janoff-Bulman, 1989) is a 32-item list of statements reflecting three broad scales of worldviews impacted by trauma experiences: Benevolence of the World, Meaningfulness, and Worthiness of the Self. The Benevolence of the World domain was used to assess differences in general views of goodness in people and the world (e.g., "*People are basically kind and helpful*"). Participants indicate how much they agree with each statement on a 6-point scale, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). In the current sample, internal consistency was

high (eight items, α = .92). Higher scores reflect more benevolent view of the world.

Institutional Distrust

The World Values Survey (WVS) institutional confidence domain was used to assess ID (Newton & Norris, 2000). The WVS is cross-national study of nationally representative individuals in over 60 countries conducted regularly since 1981 (see www.worldvaluessurvey.org). Participants were given a list of 10 institutions and asked to indicate their level of confidence or trust in each, including: the police, military, courts, press, television, social media, universities and colleges, churches and religious organizations, election officials, and government. Responses are on a 4-point scale from 1 (*a great deal*) to 4 (*none at all*). Previous studies have used individual level items; however, factor analysis indicated that 7 items loaded on one factor, with police, military, and church loading separately. These seven items were averaged to create a composite score of ID (α = .80).

Data Analytic Plan

Correlations and ANCOVAs were used to examine associations between mental health and vaccine measures. Next, Hayes (2013) process macros (model 4) were used to test for significant indirect effects from maternal trauma to COVID-19 vaccine measures via benevolent world view (BWV) and ID. Direct, indirect, and total effects with bias corrected 95% CIs using bootstrapped estimates were calculated. Chi-square analyses were used to test for trauma group differences in the primary reason given for child vaccine intentions. Repeated measures ANCOVA was used to examine if PTSD history was related to different sources of vaccine intention influences. Analyses controlled for demographic factors related to vaccine intentions (Malik et al., 2020), including target child age, maternal education, race/ethnicity (i.e., African-American), and political party (i.e., Republican).

Results

Across the sample, 66.5% of mothers reported a positive history for a mood disorder, 71.2% for an anxiety disorder, and 31.4% for PTSD; 65% had more than one diagnosis. The average number of lifetime potentially traumatizing events (PTEs) was 2.26 (SD = 1.82, range = 0–8). The PCL-5 mean was 22.41 (SD = 16.30; range = 0–75; 25% clinically elevated); the PHQ-9 mean was 9.41 (SD = 6.73; range = 0–27; 40% clinically elevated). Correlations between mental health and vaccine measures are presented in Table II. As shown, PTSD diagnosis history and total PTEs were significantly correlated with all vaccine measures; no other mental health measures were related to

Table I. *Primary Reason for Child Vaccine Intentions Coded From Open-Ended Responses*

Theme	Example quote	Overall %
Concern about vaccine safety and side effects	"I recently read an article on the vaccine and about all the horrible side effects that come with it. I don't want to expose my child to those kind of dangers."	31%
Concern with speed of vaccine production	"I'm afraid that because the vaccine was rushed through, that there could be something wrong they don't realize yet"	14.2%
Risk of COVID in children is low	"I would be more inclined if she was older and more likely to get COVID."	5.0%
Child individual risk factors/previous vaccine reactions	"She had bad reactions to flu vaccines in the past" "We both have autoimmune disorders that can be triggered by poorly tested vaccines"	2.9%
Need for more information or observation	"I need to see evidence that it has been tested and approved for kids 16 and under which I don't think has been done" "I would wait a few extra months to see how the general public reacts to receiving the vaccine"	25.1%
Generalized or institutional distrust	"Me nor my child will be used as a guinea pig" "I don't feel like we are being told the truth about Covid, how it started, how serious it is, and why is the media and news lying to confuse us."	12.6%
Vaccine will protect child	"He is out and about and I can't stop him. He needs to be protected."	20.5%
Vaccine will protect others/public good	"The quicker we can all get vaccinated the better off it will be for the vulnerable among us who can't."	14.6%
Belief/trust science	"I believe in science and from what I've seen, the vaccine is safe. The benefits far outweigh the risks."	14.6%
Vaccine will allow return to normalcy	"Herd immunity. I want Covid to no longer be a pandemic so we can get back to normal life."	5.0%

vaccine indicators. Mother and child vaccine intentions were highly correlated with each other ($r = .90$, $p < .001$) and the VCI ($r = .88$, $p < .001$ and $r = .84$, $p < .001$, respectively), and moderately correlated with general child vaccine perceived safety ($r = .50$, $p < .001$ and $r = .46$, $p < .001$, respectively).

Mean scores and tests of group differences in vaccine measures by PTSD history are presented in Figure 1. Controlling for demographic factors, there were significant group differences in COVID-19 vaccine intentions, VCI, and general vaccine safety perceptions, with mothers with PTSD history reporting less intent and less confidence. For descriptive purposes, we also categorized mothers into a "reluctant group" (responses from "*lean no*" to "*definitely not*"), as done in national polling (e.g., Malik et al., 2020). Among mothers with a PTSD history, 40% were vaccine reluctant for themselves versus 23.9% of mothers without a PTSD history, χ^2 ($df = 1$, $N = 238$) $= 6.45$, $p < .01$. For their child, 38.7% of mothers

with a PTSD history were reluctant versus 25.8% of mothers without a PTSD history, χ^2 ($df = 2$, $N = 238$) $= 4.08$, $p < .05$.

Our second research question was whether ID and BWV account for significant associations between trauma measures and vaccine intentions and confidence (see Figure 2). ID and BWV were correlated at $r = .31$, $p < .001$. Table III presents results from regression models with and without the proposed mediators and Table IV provides total, direct, and indirect effect estimates and confidence intervals from PTSD history to the vaccine measures. As shown, the indirect effects from PTSD history to all vaccine outcomes via ID and BWV were significant. The model with both variables included (i.e., parallel mediation) indicated that it was ID, rather than BWV, that accounted for differences in vaccine intentions and confidence associated with PTSD history. Lifetime PTEs and past PTSD diagnosis showed the same pattern in analyses (for space we just report on PTSD diagnosis).

Table II. Correlations Between Mental Health Variables and Vaccine Intentions and Beliefs ($N = 240$)

	COVID vaccine intention—Self	COVID vaccine intention—child	COVID child Vaccine Confidence Index	General child vaccine safety
Control variables				
Child age	−0.06	−0.02	−0.08	−0.07
Maternal education	0.29***	0.29***	0.26***	0.22***
African-American	−0.21**	−.21**	−.24***	−.15**
Republican	−0.29***	−0.30***	−0.31***	−0.13*
Diagnostic history				
PTSD	−0.21**	−0.19*	−0.20**	−0.17*
Mood disorder	−0.03	−0.03	−0.00	−0.03
Anxiety disorder	0.02	−0.03	−0.02	−0.01
Lifetime PTEs	−0.21**	−0.17**	−0.18**	−0.13*
Current symptoms				
Depression	−0.05	−0.02	−0.01	0.04
PTSD	−0.07	−0.08	−0.05	−0.08
Possible mechanisms				
Benevolent view of world	0.27***	0.25***	0.30***	0.22**
Institutional distrust	−0.49***	−0.49***	−0.53***	−0.35***

Note. PTSD = posttraumatic stress disorder. PTE = potentially traumatizing events.
*$p < .05$;
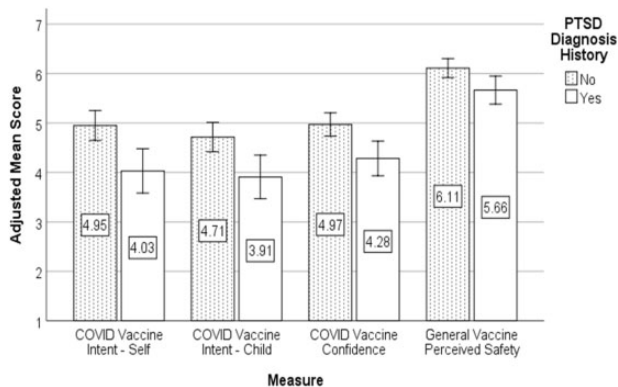**$p < .01$;
***$p < .001$.

Figure 1. Mean scores for COVID-19 vaccine intentions and confidence by posttraumatic stress disorder history ($N = 238$). *Note.* Scores are adjusted for covariates, including child age, maternal education, race (African-American), and political affiliation (Republican). All group differences were statistically significant in ANCOVAs: COVID Vaccine Intent—Self, $F (1, 230) = 11.16$, $p < .001$; COVID Vaccine Intent—Child, $F (1, 230) = 8.87$, $p < .01$; COVID Vaccine Confidence, $F (1, 230) = 10.22$, $p < .01$; General Child Vaccine Perceived Safety, $F (1, 230) = 6.54$, $p < .001$.

Our third question examined mothers' primary reason for their vaccine intentions. Open-ended responses were coded for ten possible themes (previously presented in Table I). Across the sample, the most common reason given was concern about side effects (31%) and a need for more information and observation (24%). Mothers with a PTSD history differed on only two of the coded categories: They were less likely to mention belief in science (8% vs. 18%, χ^2 [1, $N = 239$] = 3.86, $p < .05$) and more likely to say their child has specific health concerns (7% vs. 1%, χ^2 [1, $N = 239$] = 5.37, $p < .05$). Although we anticipated mothers with trauma would be more likely to give ID as a reason for vaccine hesitancy, the group difference was not statistically significant (17% vs. 10%, χ^2 [1, $N = 239$] = 2.28, $p = .13$).

Next, we examined whether mothers with a PTSD history differed in the sources they said would influence their vaccine intentions. Across the sample, mothers said the strongest influences would be personally reading about trials and research and recommendations from a pediatrician. In MANCOVA, there was an overall between-group effect of PTSD history on average ratings of influence (2.18 vs. 2.03 overall on the 1- to 3-point scale), $F (1, 231) = 4.52$, $p < .05$, indicating that mothers with PTSD history tended to say their vaccine intentions would be less influenced by the different sources generally. As shown in Figure 3, the overall lower score reflected mothers with a PTSD history giving less influence to pediatricians ($F [1, 228] = 4.55$, $p < .05$), other healthcare providers ($F [1, 228] = 5.87$, $p < .05$), and government agencies ($F [1, 228] = 3.68$, $p = .05$) compared with mothers without a PTSD history.

Given the large age range of target children, we conducted post hoc analyses to determine if any of the above effects were moderated by age. No significant effects were found.

Discussion

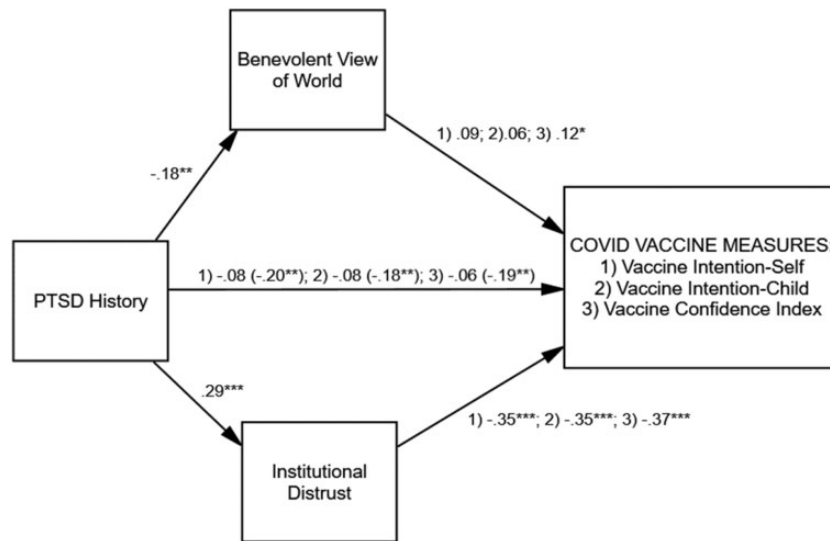The purpose of this article was to examine the role of trauma in COVID-19 vaccine beliefs and intentions

Figure 2. Standardized path estimates from posttraumatic stress disorder history to vaccine intentions and confidence via benevolent world view and institutional distrust ($N = 240$). *Note.* Values on paths reflect standardized estimates from analyses with the three vaccine measure outcomes. For the path from PTSD History to COVID-19 vaccine measures (the c path), the value outside the parentheses reflects the standardized total effect; the value inside the parentheses indicates the standardized direct effect. All values are controlling for child age, maternal education, African-American racial group membership, and Republican party group membership.

Table III. *Regression Analysis Predicting Vaccine Intentions and Confidence from Maternal Posttraumatic Stress Disorder History, Benevolent World Views and Institutional Distrust*

	Initial model (without indirect effects) B (SE)	Final model (with indirect effects) B (SE)	Overall model F, R^2
	OUTCOME = VACCINE INTENT—SELF		$F (7, 230) = 16.08, p < .001; R^2 = 0.33$
Child age	−0.04 (0.03)	−0.03 (0.02)	
Maternal education	0.43 (0.12)***	−0.21 (0.12)	
African-American	−1.97 (0.48)***	−1.48 (0.47)**	
Republican	−1.76 (0.33)***	−1.24 (0.33)**	
PTSD diagnosis history	−0.88 (0.28)***	−0.38 (0.28)	
Benevolent world view		0.20 (0.15)	
Institutional distrust		−1.12 (0.23)***	
	OUTCOME = VACCINE INTENT—CHILD		$F (7, 230) = 15.49, p < .001; R^2 = 0.32$
Child age	−0.02 (0.03)	−0.01 (0.02)	
Maternal Education	0.44 (0.11)***	0.23 (0.12)*	
African-American	−1.84 (0.47)***	−1.39 (0.46)**	
Republican	−1.77 (0.33)***	−1.27 (0.33)***	
PTSD Diagnosis History	−0.78 (0.27)**	−0.31 (0.27)	
Benevolent world view		0.16 (0.15)	
Institutional distrust		−1.08 (0.23)***	
	OUTCOME = VACCINE CONFIDENCE		$F (7, 229) = 20.06, p < .001; R^2 = 0.38$
Child age	−0.03 (0.02)	−0.03 (0.02)	
Maternal education	0.27 (0.09)**	0.07 (0.09)	
African-American	−1.73 (0.37)***	−1.27 (0.35)***	
Republican	−1.61 (0.26)***	−1.14 (0.25)***	
PTSD diagnosis history	−0.67 (0.21)**	−0.22 (0.21)	
Benevolent world view		0.23 (0.11)*	
Institutional distrust		−0.99 (0.18)***	

*Note.* PTSD = posttraumatic stress disorder.
*$p < .05$;
**$p < .01$;
***$p < .001$.

Table IV. *Unstandardized Direct, Indirect, and Total Effects (with 95% CIs) From Posttraumatic Stress Disorder Diagnosis History to Vaccine Intentions and Confidence via Benevolent View of the World and Institutional Distrust*

	Total effect	Direct effect	Indirect effect
PATH: PTSD → vaccine intention for self			
Via BWV	**−0.88 (−1.42, −0.34)**	**−0.77 (−1.32, −0.22)**	**−0.11 (−0.26, −0.01)**
Via ID	**−0.89 (−1.43, −.35)**	−0.43 (−0.97, 0.11)	**−0.46 (−0.76, −0.22)**
Via both[a]	**−0.88 (−1.43, −0.34)**	−0.38 (−0.93, 0.16)	**−0.50 (−0.81, −0.24;** BVW = −0.07 [−0.20, 0.03]; **ID = −0.43 [−0.75, −0.19])**
PATH: PTSD → vaccine intention for child			
Via BWV	**−0.78 (−1.32, −0.25)**	**−0.68 (−1.22, −0.14)**	−0.10 (−0.25, 0.01)
Via ID	**−0.79 (−1.32, −0.26)**	−0.34 (−0.87, 0.19)	**−0.44 (−0.74, −0.20)**
Via both	**−0.78 (−1.31, −0.25)**	−0.31 (−0.84, 0.23)	**−0.47 (−0.78, −0.22;** BVW = −0.05 [−0.18, 0.02]; **ID = −0.42 [−0.73, −0.17])**
PATH: PTSD → Vaccine Confidence Index			
Via BWV	**−0.67 (−1.09, −0.25)**	**−0.56 (−0.98, −0.13)**	**−.12 (−0.25, −0.01)**
Via ID	**−0.68 (−1.10, −0.26)**	−0.27 (−0.68, 0.14)	**−0.41 (−0.65, −0.21)**
Via both	**−0.67 (−1.09, −0.25)**	−0.22 (−0.63, 0.20)	**−0.46 (−0.71, −0.25;** BVW = −0.08 [−0.19, 0.00]; **ID = −0.38 [−0.62, −0.19])**

Note. Bolded values are statistically significant (i.e., the confidence intervals do not include 0). a. For paths via both mediators, the indirect effects reflect the total for the two indirect effect pathways followed by how much each path contributed to the total indirect effect.
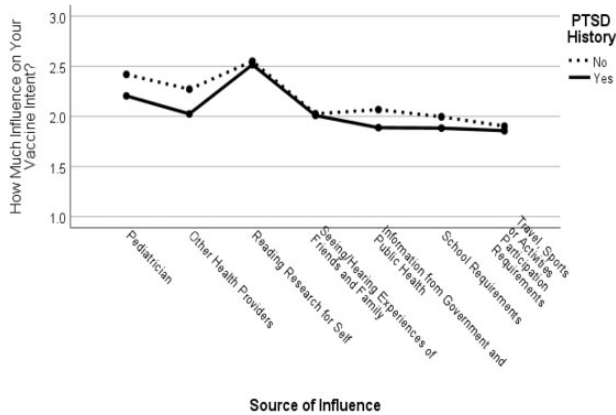
Figure 3. Perceived impact of different sources of information on child vaccine intentions by PTSD history.

among mothers with mental health vulnerabilities. In mothers without a PTSD history, about 62% had favorable intentions towards vaccination (i.e., intention ratings from *lean yes* to *definitely yes*), which mirrors favorable rates in national polls from the same time (Pew Research Center, 2020). In contrast, only 40% of mothers with a PTSD history expressed favorable vaccine intentions. Mothers' ratings for themselves and their child were very highly correlated and similarly related to trauma indicators, indicating that mothers with a PTSD history are less inclined to obtain the COVID-19 vaccine for themselves and for their children. Although confidence in the safety of existing child vaccines (e.g., MMR) was higher than for COVID-19 vaccines across the sample, the same PTSD history group differences were evident. Consequently, maternal trauma appears to be an important factor to consider in vaccine hesitancy research generally. Of note, it was mothers' trauma history, not current symptoms that predicted vaccine

measures. One possibility is that early or cumulative exposure to PTEs has a greater impact on comfort with invasive medical procedures or ID than current PTSD symptoms. This is an important question for future research. In addition, it will be important to determine if specific types of events (e.g., events involving healthcare or governmental institutions, events that resulted in bodily harm) are particularly influential on how mothers view medical procedures or providers.

We hypothesized that general distrust may be one reason for a relation between trauma history and vaccine beliefs and behaviors. In this sample, mothers with a PTSD history reported greater ID and less benevolent views of others; however, it was ID that accounted for reduced COVID-19 vaccine confidence and intention. Relatedly, mothers with PTSD history also were less likely to include "belief in science" in their open-ended responses about reasons underlying their vaccine intentions, and they said medical providers and government officials would have less influence on their intentions compared with mothers without a PTSD history. Together, these findings highlight the possibility that PTSD history is a marker or cause of diminished trust in healthcare and related institutions. Among adults with a PTSD history, reduced trust in healthcare has been shown to impact health behaviors such as medication adherence (e.g., Edmondson et al., 2013; Klest et al., 2019). Our findings suggest this same process could play a role in vaccine behaviors.

Results of this study highlight the potential utility of taking a trauma-informed approach to promoting uptake of the COVID-19 vaccine and addressing parental vaccine hesitancy more generally. One way this might be achieved is by incorporating mental health professionals into vaccine messaging efforts. If

institutional trust is impacting vaccine intent among individuals with a trauma history, mental health professionals could fill a needed informational role. These professionals typically establish ongoing, trusting relationships with clients, and thus may not be seen as depersonalized institutions. Many also have experience talking with clients about scientific material, such as what a randomized controlled trial is or how to interpret side effect risk rates. Vaccine behaviors are not typically part of the therapeutic purview; however, the pervasive impact of COVID-19 increases the need for collaborative efforts across professions. To contribute to this effort, mental health professionals likely need to become more informed about the COVID-19 vaccine development process themselves (e.g., to effectively discuss concerns about it being "rushed") and about the best ways to frame health messaging for increasing effectiveness (e.g., Chou & Budenz, 2020). There are several useful resources on COVID-19 vaccine development (e.g., Park et al., 2020) and COVID-19 health messaging (e.g., Beaumont Foundation, 2020) to aid in these efforts.

At the organizational level, mental health agencies can think creatively about how to share health information with clients in this time of telehealth. For example, prescreening and highlighting public service videos may take the place of handouts or flyers in a waiting room. Additionally, pediatrician offices could consider ways to assess maternal trauma history in routine care (e.g., Gillespie & Folger, 2017). Although many pediatricians routinely screen for maternal depression, this may not be sufficient for identifying families who may benefit from additional vaccine discussions. Finally, the high correlation between parent and child intent and the lack of age effects suggests that mothers' attitudes about vaccines may be more generalized than child-specific. Thus, communication efforts by providers working with a specific family member (e.g., an adult therapist) could yield benefits for additional family members.

Several study limitations should be acknowledged. First, all participants had some previous mental health diagnosis. Thus, mothers with trauma histories were being compared with mothers with other mental health vulnerabilities, not a normative sample. Although is it noteworthy that group differences still emerged, mothers in the nontrauma group in this sample may still differ from mothers with no mental health history in their vaccine beliefs. Although vaccine intentions for oneself in the nontrauma group were very similar to national survey data (Pew Research Center, 2020), national data for child vaccine intentions is not available for comparison. As another limitation, this is a study of intentions rather than behaviors. Intentions are a strong predictor of subsequent vaccine uptake (Brewer et al., 2017), but

various other practical and systemic barriers play an important role. Relatedly, the cross-sectional design limits interpretations of mediational or temporal processes related to trust. There are also limits associated with measures. Several of the vaccine measures were created specifically for this study and have not been validated, and the ID measure used does not include various healthcare members, which would speak more directly to this type of distrust.

Perhaps the most important study limitation is the inability to look at the intersecting influence of race/ethnicity and trauma because the sample was predominantly White. For example, virtually all polls have shown lower vaccine intentions among African-Americans (e.g., Malik et al., 2020). This may reflect distrust in medical and scientific communities as an adaptive response to historical mistreatment and ongoing institutional racism (Freimuth et al., 2017). In this sample, ID partially accounted for lower vaccine intentions and confidence in African-American mothers, but the pattern of results suggests the presence of additional determinants. Research on the best ways to build trust in the healthcare industry among parents of color, particularly those who have experienced trauma, is a critical area of inquiry for pediatric psychology research.

Despite these limitations, results from this study provide insights for direct care providers, public health officials, and vaccine researchers. Our findings suggest that COVID-19 vaccine uptake efforts may need to be tailored to meet the specific concerns of individuals with a trauma history, including mothers. These efforts should consider the role of ID in both message content and source. Further, our findings highlight the potential role of mental health providers with established trusting relationships with trauma-affected individuals to serve as conduits of vaccine-related information. Promoting widespread vaccine acceptance to address the global COVID-19 pandemic will require collaborative efforts across professions.

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References

American Psychological Association. (2020). *Stress in the time of COVID-19. Stress in America Volume 1*. American Psychological Association.

Beaumont Foundation. (2020). New poll reveals most effective language to improve COVID-19 vaccine acceptance. Retrieved from https://debeaumont.org/covid-vaccine-poll/. Retrieved December 20, 2020.

Brewer, N. T., Chapman, G. B., Rothman, A. J., Leask, J., & Kempe, A. (2017). Increasing vaccination: Putting psychological science into action. *Psychological Science in the Public Interest: A Journal of the American Psychological Society*, 18(3), 149–207. doi:10.1177/1529100618760521

Chou, W.-Y S., & Budenz, A. (2020). Considering emotion in COVID-19 vaccine communication: Addressing vaccine hesitancy and fostering vaccine confidence. *Health Communication*, *35*(14), 1718–1722. doi:10.1080/10410236.2020.1838096

Edmondson, D., Horowitz, C., Goldfinger, J., Fei, K., & Kronish, I. (2013). Concerns about medications mediate the association of posttraumatic stress disorder with adherence to medication in stroke survivors. *British Journal of Health Psychology*, *18*(4), 799–813.

Farr, S. L., Dietz, P. M., Rizzo, J. H., Vesco, K. K., Callaghan, W. M., Bruce, F. C., Bulkley, J. E., Hornbrook, M. C., & Berg, C. J., (2013). Health care utilisation in the first year of life among infants of mothers with perinatal depression or anxiety. *Paediatric and perinatal epidemiology*, *27*(1), 81–88.

Freimuth, V. S., Jamison, A. M., An, J., Hancock, G. R., & Quinn, S. C. (2017). Determinants of trust in the flu vaccine for African Americans and Whites. *Social Science & Medicine (1982)*, *193*, 70–79. doi:10.1016/j.socscimed.2017.10.001

Gillespie, R. J., & Folger, A. T. (2017). Feasibility of assessing parental ACEs in pediatric primary care: Implications for practice-based implementation. *Journal of Child & Adolescent Trauma*, *10*(3), 249–256. doi:10.1007/s40653-017-0138-z

Gobin, R. L., & Freyd, J. J. (2014). The impact of betrayal trauma on the tendency to trust. *Psychological Trauma: Theory, Research, Practice, and Policy*, *6*(5), 505–511. doi:10.1037/a0032452

Hayes, A. F. (2013). *Methodology in the social sciences. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Hoge, C. W. (2011). Interventions for war-related post-traumatic stress disorder: Meeting veterans where they are. *JAMA*, *306*, 549–551.

Janoff-Bulman, R. (1989). Assumptive worlds and the stress of traumatic events: Applications of the schema construct. *Social Cognition*, *7*(2), 113–136.

Klest, B., Tamaian, A., & Boughner, E. (2019). A model exploring the relationship between betrayal trauma and health: The roles of mental health, attachment, trust in healthcare systems, and nonadherence to treatment. *Psychological Trauma: Theory, Research, Practice and Policy*, *11*(6), 656–662. doi:10.1037/tra0000453

Kopacz, M. S., Ames, D., & Koenig, H. G. (2018). Association between trust and mental, social, and physical health outcomes in veterans and active duty service members with combat-related PTSD symptomatology. *Frontiers in Psychiatry*, *9*, 408.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*(9), 606–613.

Lawrence, T., Zubatsky, M., & Meyer, D. (2020). The association between mental health diagnoses and influenza vaccine receipt among older primary care patients. *Psychology, Health & Medicine*, *25*, 1083–1093.

Larson, H. J., de Figueiredo, A., Xiahong, Z., Schulz, W. S., Verger, P., Johnston, I. G., Cook, A. R., & Jones, N. S. (2016). The state of vaccine confidence: Global insights through a 67-country survey. *EBioMedicine*, *12*, 295–301. doi:10.1016/j.ebiom.2016.08.042

Malik, A., McFadden, S., Elharake, J., & Omer, S. (2020). Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine*, *26*, 100495.

McCormick, M. C. (2007). Trust in vaccines. In D. A. Shore (Ed.), *The trust crisis in healthcare: Causes, consequences, and cures* (pp. 131–138). Oxford University Press.

Minkovitz, C. S., Strobino, D., Scharfstein, D., Hou, W., Miller, T., Mistry, K. B., & Swartz, K. (2005). Maternal depressive symptoms and children's receipt of health care in the first 3 years of life. *Pediatrics*, *115*(2), 306–314. doi:10.1542/peds.2004-0341

Newton, K., & Norris, P. (2000). Confidence in public institutions: Faith, culture or performance? In S. J. Pharr ?0026; & R. D. Putnam (Eds.), *Disaffected democracies* (pp. 52–73). Princeton University Press.

Nilsen, L., Thoresen, S., Wentzel-Larsen, T., & Dyb, G. (2019). Trust after terror: Institutional trust among young terror survivors and their parents after the 22nd of July terrorist attack on Utøya Island. *Frontiers in Psychology*, *10*, 2819.

Park, C. L., Mills, M. A., & Edmondson, D. (2012). PTSD as meaning violation: testing a cognitive worldview perspective. *Psychological Trauma: Theory, Research, Practice and Policy*, *4*(1), 66–73. doi:10.1037/a0018792

Park, H., Samuels, E., & Bocchini, J. (2020). Vaccine development: From laboratory to policy. *Pediatric Annals*, *49*(12), e509–e515.

Peer, E., Brandimarte, L., Samat, S., & Acquisti, A. (2017). Beyond the Turk: Alternative platforms for crowdsourcing behavioral research. *Journal of Experimental Social Psychology*, *70*, 153–163. doi:10.1016/j.jesp.2017.01.006

Pew Research Center. (2020). "Intent to Get a COVID-19 Vaccine Rises to 60% as Confidence in Research and Development Process Increases". Retrieved from https://www.pewresearch.org/science/2020/12/03/. Retrieved December 20, 2020.

Weathers, F. W., Blake, D. D., Schnurr, P. P., Kaloupek, D. G., Marx, B. P., & Keane, T. M. (2013). *The Life Events Checklist for DSM-5 (LEC-5)*. Retrieved from https://www.ptsd.va.gov. Retrieved December 1, 2020.

World Health Organization (2019). *Ten threats to global health in 2019*. https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019. Retrieved December 2020.

Zimmer, C. (2020). When will we see a Covid-19 vaccine for kids? *The New York Times*. Retrieved from https://www.nytimes.com/2020/09/21/parenting/kids-vaccine-coronavirus.html. Retrieved December 20, 2020.