

## Original Research

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# Psychological Associations of Multiple Disasters: A Longitudinal Study of Adolescents in Puerto Rico

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## Abstract

**Objectives:** Psychological reactions in response to disasters have been associated with increased mental health (MH) symptomatology, decreased quality of life (QOL), and post-traumatic stress (PTSD). This study provides a rare opportunity to examine post disaster MH longitudinally in a sample of adolescents.

**Methods:** From 2018–20, adolescents (12–18 years,  $N=228$ ) were interviewed about disaster exposure, QOL using the Adolescent Quality of Life-Mental Health Scale (AQOL-MHS), psychological symptoms, and diagnoses.

**Results:** Having an MH diagnosis and PTSD are clear indicators of worse Emotional Regulation (ER) ( $P \leq 0.03$ ,  $P \leq 0.0001$ ) and Self-Concept (SC) ( $P \leq 0.006$ ,  $P \leq 0.002$ ) QOL. Girls were disproportionately affected in all models for SC and Social Context domains ( $P \leq 0.0001$ ,  $P \leq 0.01$ ). Interaction models results for ER ( $P \leq 0.05$ ) and SC ( $P \leq 0.01$ ) indicate that those with PTSD are improving over time at a greater rate than those without PTSD.

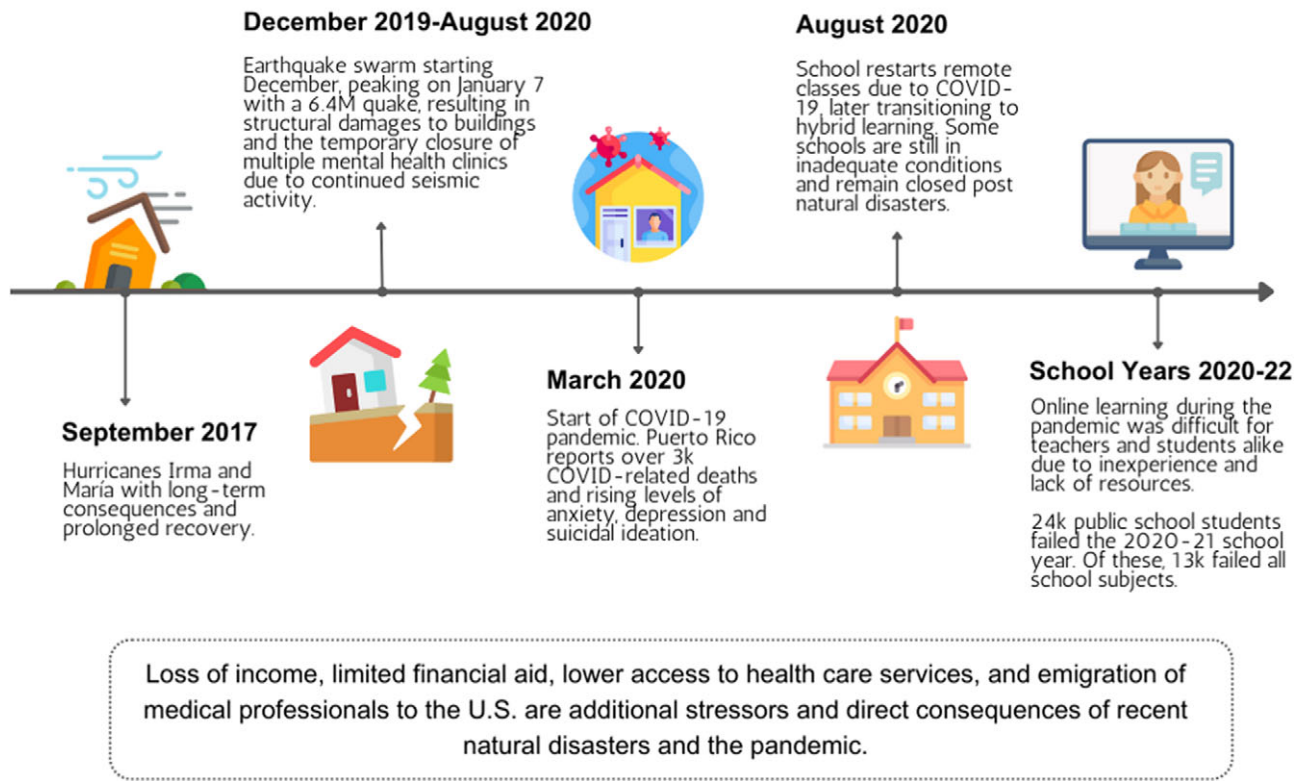
**Conclusions:** Recovery takes time and a clear sex disparity for girls was observed. Results for the different AQOL-MHS domains highlight how the challenges experienced by disasters are multifaceted. Knowing who is at greater risk can allow for better resource allocation and targeted population-based prevention strategies to promote and maintain MH and resolve risk factors for mental illnesses.

Childhood adversity is becoming more prevalent for youth because of increasing exposure to natural and manmade disasters and the recent COVID-19 pandemic.<sup>1</sup> Even before COVID-19, most youth reported at least 1 adverse childhood experience (ACE) by the age of 16.<sup>2,3</sup> The developmental differences between adults and adolescents make adolescents more vulnerable to the mental and physical effects of disaster exposure.<sup>4</sup> The most disenfranchised among the U.S. population are disproportionately harmed by disasters and national emergencies.<sup>5</sup> Vulnerable youth and disadvantaged families carry compounding consequences that give rise to higher vulnerabilities, with fewer protective factors and resources.<sup>6</sup>

Disasters that cause catastrophic damage disrupt the operations of virtually all systems essential to human life and desirable for well-being, including family life, health care, work, education, economic and financial operations, transportation, manufacturing, emergency and other social services, recreation, and the functioning of the governments from local to national levels. Disasters can have both short- and long-term effects on youth's health.<sup>7</sup> Post-traumatic stress disorder (PTSD) and long-term morbidity are more prevalent among persons experiencing both trauma and social/economic inequities.<sup>5</sup> Research on disasters experienced by youth has documented broad effects, including short- and long-term consequences for physical and mental health. For example, there is an increased risk for mental health problems (e.g., depression, anxiety, and post-traumatic stress), health risk behaviors (e.g., smoking, harmful alcohol use, illicit drug use), and other physical health problems.<sup>8–10</sup> Significant gender disparities have also been widely documented in disaster research.<sup>1,4</sup> For instance, girls are more likely than boys to report somatic, PTSD, and depression symptoms, and pre-existing gender disparities may become more prominent.<sup>11–13</sup>

As shown in Figure 1, youth in Puerto Rico have experienced a cascade of disasters starting in September 2017 with a catastrophic hurricane that devastated the island of Puerto Rico. Hurricane María collapsed the archipelago's communication infrastructure, including 95% of cell networks,<sup>14</sup> collapsed the power grid, leaving all 3.5 million residents without power,<sup>15</sup> destroyed over 80% of agriculture<sup>16</sup> and over 300 thousand homes,<sup>17</sup> and caused

# Timeline of Disaster Related Events in Puerto Rico



**Figure 1.** Timeline of Disaster Related Events in Puerto Rico. All icons were sourced from [flaticon.com](https://www.flaticon.com/).

an estimated 2975 deaths,<sup>18</sup> displacing over 200 thousand more.<sup>19</sup> The hurricanes exacerbated existing disparities.<sup>20</sup> Two years later, a swarm of earthquakes starting December 2019 resulted in at least another 7.5 thousand individuals displaced.<sup>21</sup> Nearly 1 million citizens were left without power and more than 250,000 without water due to heavy structural damage to buildings,<sup>22</sup> which led to the temporary closure of multiple schools.<sup>23</sup> A year after that, the COVID-19 pandemic began to affect Puerto Rico and the world. Youth again experienced multiple impacts with similar disruptions to school, social interactions, family life, and health care.

Although there is increasingly more focus on disaster-related research and trauma, consistent associations have not been found for youth and a lack of understanding on cultural differences in terms of resiliency underscores the need for further research.<sup>10</sup> This study analyzes data from a longitudinal study originally designed to estimate reliability of change for the AQOL-MHS using methods of Cranford et al.<sup>24</sup> It examines quality of life (QOL) with the backdrop of the emergence and persistence of psychological reactions in response to multiple compounding disasters. Associations between QOL and PTSD were evaluated, as well as prevalent mental health diagnoses. Specifically, differences in QOL reported by adolescents were quantified both overall and by domain (emotional regulation, self-concept, social context). Multivariable regression analyses were run with time as a linear trend to observe variables associated with change in QOL and explore the implications for disaster burdened youth.

## Participants and Procedures

Two hundred and twenty-seven (227) participants with at least 1 of 5 prevalent mental disorders: attention deficit hyperactivity disorder (ADHD), conduct disorder (CD), oppositional defiant disorder (ODD), generalized anxiety disorder (GAD), and major depressive disorder (MDD), were recruited from 5 clinics in the San Juan Metropolitan area. These clinics included APS Healthcare in San Juan, APS Healthcare in Bayamón, APS Healthcare in Caguas, Dr. Antonio Ortiz Pediatric Hospital, and the Child and Adolescent Clinic at the Medical Sciences Campus, as well as some private practices. The inclusion criteria for the study were as follows: a) the youth was at least 12 years old but not older than 18; b) the youth had received 3 or fewer sessions with a mental health professional in the current clinical setting; and c) the youth had not received mental health treatment at other settings in the 6 months prior to recruitment. In addition, the study excluded youth with cognitive impairment, history of severe brain injury, pervasive developmental disorder, or evident sensory impairment.

After an initial visit to inform clinic staff of the study, study staff made routine visits to collect referrals with information on age, diagnosis, type of treatment/modality, severity, and prognosis. Parents/Caregivers were called to complete the screening process and validate the referral information. Once the participants were deemed eligible, the staff explained the research project, and those who expressed interest were scheduled for an initial interview. Parents/Caregiver and adolescent dyads signed a consent/assent

form in which they acknowledged that their participation was voluntary and could withdraw from the study at any time. They also agreed to participate in the study over the course of a year. Baseline appointments were scheduled at the participants' homes or alternate convenient locations. The follow-up waves were self-report interviews using a tablet and scheduled during routine clinical appointments. A private room was made available at participating clinics to provide a quiet space for participants to respond. More than 1 adolescent would be scheduled to join the private room to take part in the study. Due to pandemic restrictions, the final set of follow-up interviews was conducted remotely with the use of the Zoom platform. All participants were receiving services at the time of the baseline assessment and were tracked for follow-up appointments regardless of treatment status.

Data collection spanned over a 2-year period that included the prolonged recovery post hurricanes (2018-ongoing), a swarm of earthquakes (2019-2020), and part of the COVID-19 pandemic (March-June 2020), with 4 assessments 3 months apart for every participant. Participants received a research incentive to participate. The incentives were incremental for each study visit. For the initial interview, they were offered \$30.00; for follow-up interview 1, \$35.00; for follow-up interview 2, \$40.00; and for follow-up interview 3, \$45.00. The initial interview lasted 1.5 hours on average, and the follow-up interviews lasted 45 minutes on average.

## Measures

The Adolescent Quality of Life-Mental Health Scale (AQOL-MHS)<sup>25,26</sup>, is a quality of life instrument for adolescents with mental health problems. This instrument differs from other QOL instruments developed for children or adolescents (e.g., the KIDSCREEN,<sup>27</sup> PedsQL,<sup>28</sup> YQOL-R<sup>29</sup>) in that it is a specific instrument developed for clinical mental health populations with established psychometric properties. The AQOL-MHS has also been studied using generalizability theory methods to track changes in adolescent reports as their underlying health or mental health condition changed. The results support the utility and applicability of the measure to estimate change over time. The AQOL-MHS<sup>25,26,30</sup> is a patient reported outcome measure with 21 items that can be scored as a whole or by domain for each of 3 QOL scales: emotional regulation (8 items), self-concept (6 items), and social context (7 items). Example of items: emotional regulation "When I have been angry, I haven't been able to think straight," self-concept "I have felt I would be able to achieve my goals," and social context "I have enjoyed sharing and doing things with my family." Participants evaluate whether the item description applies to them using an 11-point scale that ranges from 0= "completely disagree" to 10= "completely agree." The responses to the emotional regulation scale were reverse coded so that larger numbers correspond to more positive QOL.

Post-traumatic stress disorder was assessed for both parents/caregivers and youth by the Post-Traumatic Stress Disorder Checklist (PCL-5), which has been considered a psychometrically sound measure by several studies and has been reliably used in different contexts and samples.<sup>31,32</sup> The PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders (DSM)<sup>33</sup> was developed to assess DSM-5 PTSD. It includes 20 self-report items. Participants reported how much they were bothered by a symptom over the past month using a 5-point Likert scale (0= "Not at all," 1= "A little bit," 2= "Moderately," 3= "Quite a bit," 4= "Extremely"). The total score can range from 0 to 80, and we used the developers' suggested cutoff score of greater or equal to 33 as indicative of probable PTSD.

Participants were asked to complete the PCL-5 using last month as the time frame and in relation to the traumatic experience that troubled them the most. Preliminary analyses concluded that the PCL-5 has satisfactory psychometric properties, as measured with internal consistency, test-retest reliability, and aspects of convergent validity and sensitivity to clinical change. Discriminant validity was not strong; however, this might reflect the overlap in symptoms between depression, general stress, and PTSD.<sup>34,35</sup>

Psychiatric diagnoses were measured by the Diagnostic Interview Schedule for Children (DISC-IV). The presence of a past year DSM-IV psychiatric disorder was assessed using the youth version of the DISC-IV.<sup>36,37</sup> The DISC-IV is a structured diagnostic instrument for the assessment of psychiatric disorders in children and adolescents (collectively youth) designed to be administered by lay interviewers. Previous versions of both the English and Spanish DISC have generally shown adequate test-retest reliability in both clinic and community samples.<sup>38-40</sup> Criterion, concurrent, discriminant, and predictive validity for earlier versions of the DISC have been evaluated and reported.<sup>38,41-33</sup> The test-retest reliability of the current version of the DISC has been reported for Spanish (using Puerto Rican youth) and English-speaking youth samples yielding comparable results.<sup>36,37</sup> To ease response burden, only the modules for the 5 target disorders (ADHD, CD, ODD, GAD, and MDD) were administered.

Disaster exposure questions were selected from the Hurricane Exposure Questionnaire developed by Felix et al.<sup>44</sup> to assess the impact of the 1998 Hurricane Georges in Puerto Rico. The questionnaire has been used in other studies to explore the direct impact of disasters on Latino children and families.<sup>45-47</sup> Questions cover a range of areas that include experiences, personal loss, infrastructure loss, financial impact, preparing for a new hurricane season, and positive consequences. Questions were developed for both caregivers and youth. Reported impact in Table 1 includes only parents'/caregivers' reports. Higher scores indicate greater exposure. The sample was divided into 2 categories (no/limited impact vs major impact).

Parents/caregivers completed questions about themselves (residence, country of origin, educational level, race/ethnicity, family structure, economic status based on perception of poverty, marital status, and household composition) and their youth (age, grade, and sex).

## Statistical Analysis

Data on the demographic and clinical characteristics of the study sample were analyzed using descriptive statistics (means and percentages). To compare samples, independent *t*-tests (for continuous variables) and chi-squared tests of independence (for categorical variables) were performed. For mean differences on selected variables, effect sizes were calculated for continuous variables using Cohen's *d*. Skewness and kurtosis were examined for the dependent variable and normal distribution assumptions were met. Independent sample *t*-tests were assessed for homogeneity of variances as used in the SAS *t*-test procedure. Variance Inflation Factors (VIF) were calculated to assess multicollinearity among the independent variables in the regression models. A VIF greater than 1.5 was considered indicative of high multicollinearity. All regression variables were under this value. For linear regression, the homoscedasticity of residuals was evaluated using the Breusch-Pagan test, and the test did not indicate heteroscedasticity. In terms of multivariable outliers, data points were reviewed, and none were

**Table 1.** Distribution by Hurricane María's impact

Demographics	None or limited impact <i>n</i> (%)	Major impact <i>n</i> (%)
Total <i>N</i> = 222	54 (24.32%)	168 (75.68%)
Youth information		
Sex		
Male	33 (25.00%)	99 (75.00%)
Female	21 (23.33%)	38 (76.67%)
Age		
12–14	27 (24.11%)	85 (75.89%)
15–18	27 (24.55%)	83 (75.45%)
Caregiver information		
Education		
High school or less	27 (24.55%)	83 (75.45%)
Some college or college degree	27 (24.11%)	85 (75.89%)
Marital status		
Married/Living with couple	21 (24.14%)	66 (75.86%)
Separated/Divorced/Widowed	15 (23.44%)	49 (76.56%)
Never have been married	18 (25.35%)	53 (74.65%)
Perception of poverty**		
Live well	31 (34.44%)	59 (65.56%)
Check to check	18 (19.78%)	73 (80.22%)
Live poorly	5 (12.20%)	36 (87.80%)
Income loss***		
Few or some	14 (42.42%)	19 (57.58%)
A lot	4 (8.00%)	46 (92.00%)
Psychiatric disorder <sup>1</sup>		
Any psychiatric disorder	25 (22.73%)	85 (77.27%)
Any externalizing disorder	21 (24.14%)	66 (75.86%)
Any internalizing disorder	10 (20.41%)	39 (79.59%)
Caregiver reported PTSD screener*	6 (12.24%)	43 (87.76%)
Youth reported PTSD screener	5 (16.67%)	25 (83.33%)

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

<sup>1</sup>Psychiatric disorders were child reported except for ADHD.

identified that could disproportionately affect the regression results. By ensuring these assumptions were met, we aimed to maintain the robustness and validity of our parametric tests and linear regression models.

To determine which variables were significantly associated with QOL during the study period, a multivariable regression analysis was performed with time (quarterly) as a linear trend. A linear fixed effects model was chosen for its ability to control for unobserved individual heterogeneity by leveraging within-individual variation over time. Fixed-effects models use the variation within individuals over time to estimate parameters. Tests were conducted to assess if QOL differed across subscales by introducing interaction terms between variables of interest. The following variables were included as independent variables: age, sex, having a diagnosis, having PTSD,

and time. Four models were examined: Model A includes only main effects with the time-variant variable, Model B adds the time by diagnosis interaction term to the estimation model, Model C adds a time by PTSD (TP) interaction, and Model D adds a time by sex interaction.

The University of Puerto Rico, Medical Sciences Campus Institutional Review Board (IRB) for the protection of human subjects reviewed and approved this study (Protocol #2290033886).

## Results

### Sociodemographic Characteristics

The mean age of caregivers was 43 years old and 96% were female. Parents/caregivers represent 88% of mothers that responded, 4% of fathers, and 8% of “other” caregivers, such as grandparents or legal tutors. About half of the caregivers attained some college education or higher (50%), and 22% reported PTSD symptomatology. For adolescents, the mean age was 14 years old, 41% were female, 14% were classified as having PTSD, and 50% were scored as having a psychiatric disorder based on the DISC. The percentage of adolescents with an externalizing disorder was 39% and 22% with internalizing.

In Table 1, Hurricane María's impact illustrates additional information about the study sample. Significant differences were observed for perception of poverty (parent/caregiver reported). Those caregivers who reported living poorly were the most affected by the hurricane. In separate analyses (data not shown), those parents/caregivers who reported income loss due to the hurricane also reported significantly greater impact due to the hurricane ( $P \leq 0.001$ ). Parents/caregivers with PTSD also reported greater impact due to the hurricane ( $P \leq 0.01$ ; Table 1).

### QOL Mean Differences by Sex, PTSD, and Any Diagnosis

Mean differences and effect sizes for sex, any diagnosis, and PTSD for the 4 survey waves are depicted as line graphs in Figures 2-4.

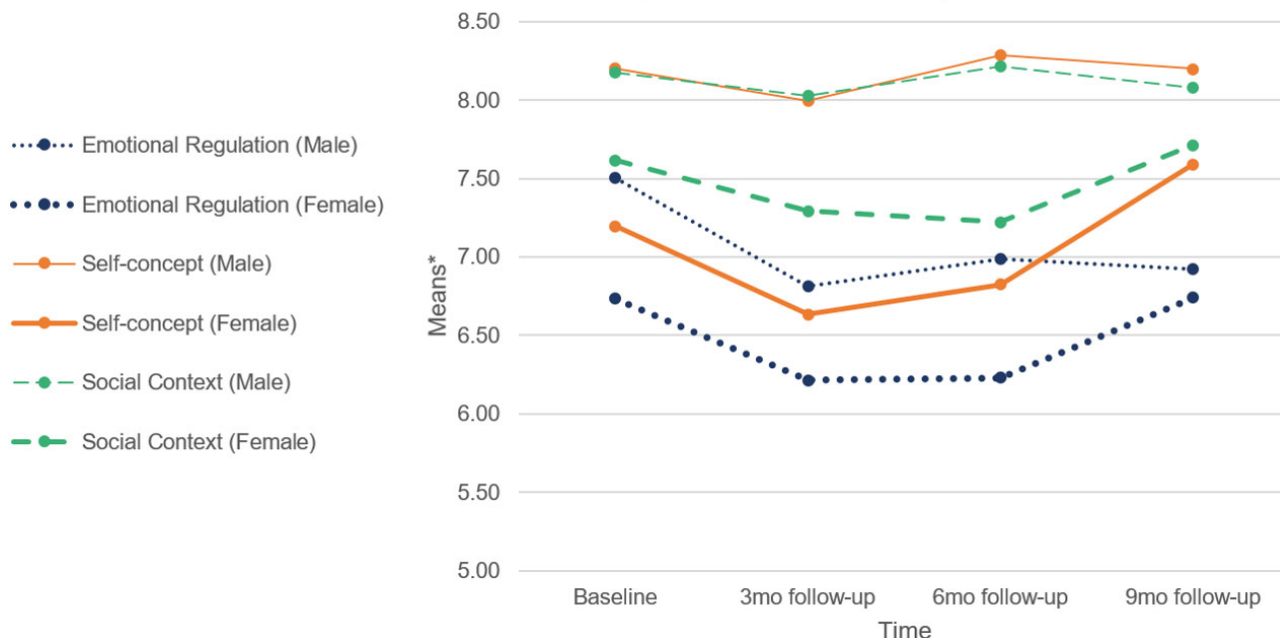
#### Sex

In general, girls fared worse for all 3 subscales of QOL in baseline through follow-up 2 interview reports, and improvement was finally seen on the third and final follow-up interview; emotional regulation and social context scores were no longer significantly different to boys ( $P \leq 0.52$ ,  $P \leq 0.13$ , respectively). Even though self-concept showed the most improvement, the sex difference is still significant at the follow-up 3 interview ( $P \leq 0.01$ ). Boys reported similar scores across time for self-concept and social context throughout the study. Girls reported lower self-concept scores through follow-up 2 interviews and showed a marked improvement at survey wave 3 (Figure 2).

#### PTSD

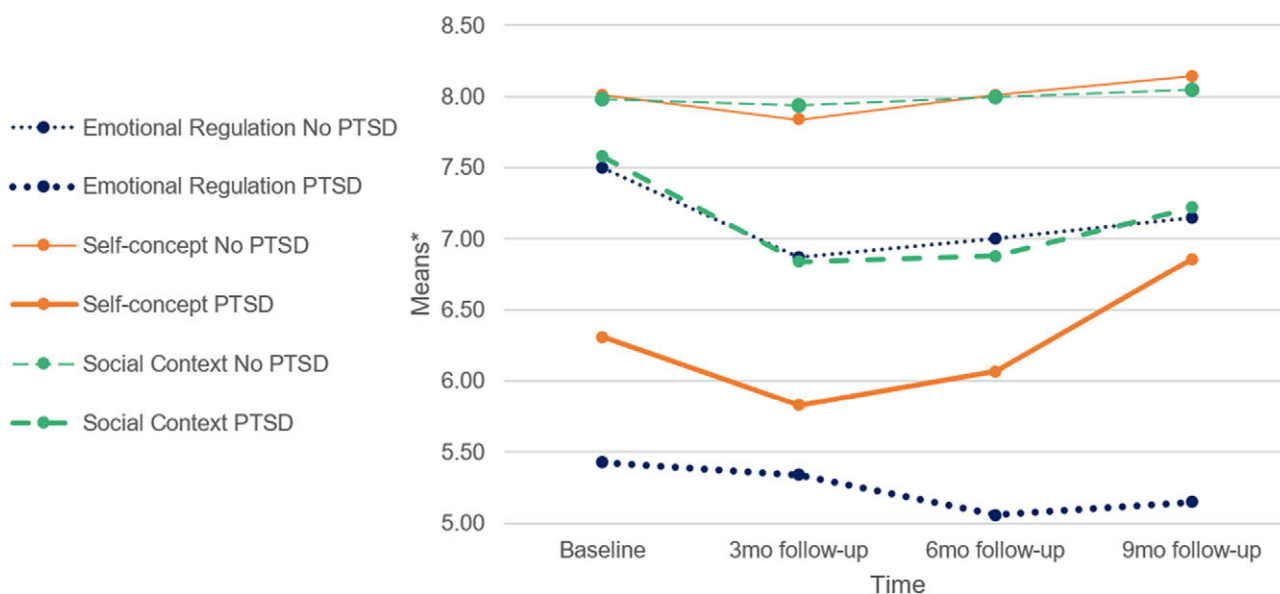
Those with PTSD also scored lower than those without for all scales and waves of data, with the sole exception being baseline social context ( $P \leq 0.22$ ), which is possibly due to the post hurricane devastation experienced by all. For those with PTSD, social context had the greatest decline on the first follow-up of data collection but with progressive recovery. The emotional regulation scale had the lowest scores for those with PTSD, and these remained significantly

### AQOL-MHS Mean Comparisons for Youth by Sex



**Figure 2.** AQOL-MHS Mean Comparisons for Youth by Sex. \*Means range from 0 to 10.

### AQOL-MHS Mean Comparisons for Youth PTSD



**Figure 3.** AQOL-MHS Mean Comparisons for Youth PTSD. \*Means range from 0 to 10.

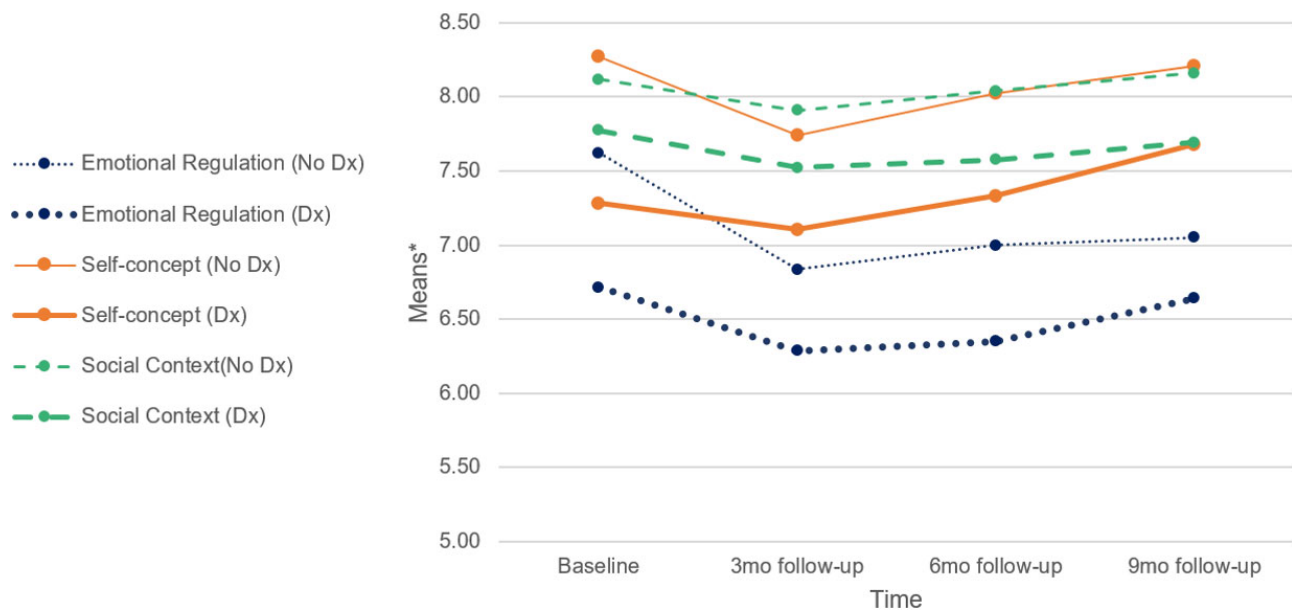
lower than the non-PTSD group through the end of the study. Self-concept is the only scale that had follow-up wave 3 scores surpass baseline scores for non-PTSD participants. For those with PTSD, there was also noticeable improvement (Figure 3).

#### Mental health diagnosis

Adolescents with a mental health diagnosis reported lower QOL for all scales. The largest difference between groups was reported for

baseline self-concept scores ( $P \leq 0.001$ ). Although there was a parallel trend of improvement in both groups, the differences remained significant to the end. Scores reported for the emotional regulation scale are the lowest across the board. Those with a diagnosis (Dx) showed improvement in emotional regulation by follow-up wave 3, and, although scores remained lower, they were no longer statistically different to the non-diagnosis group (non-Dx;  $P \leq 0.14$ ). Social context groups did not differ for the first 3 assessments (ranging from  $P \leq 0.06-0.12$ ). Results are similar to

## AQOL-MHS Mean Comparisons for Youth Diagnosis



**Figure 4.** AQOL-MHS Mean Comparisons for Youth Diagnosis.  
\*Means range from 0 to 10.

baseline scores for this scale in our PTSD analyses; this might be due to the prolonged recovery efforts post hurricane. By the final survey follow-up, the Dx/non-Dx groups differed ( $P \leq 0.05$ ), but this was due to those with no diagnoses showing slightly greater improvement (Figure 4).

### Longitudinal Mixed Model Analyses

Tables 2-4 summarize the main findings for each scale from the multivariable mixed-effects regressions for the AQOL-MHS. Model 1 includes main effects only. The successive models (2-4) include interaction terms for the variables of interest. The longitudinal time trend estimate confirms that QOL worsened during the study period for emotional regulation but remained stable for the self and social scales in all 4 models.

### Emotional regulation

Having a mental health diagnosis and PTSD were clear indicators of worse emotional QOL in all 4 models (see Table 2). A significantly positive time by PTSD interaction indicates that for those with PTSD there is greater improvement across the study periods. A similar trend was also observed which signaled improvement for those with a diagnosis. The time interaction for sex was not significant, but, nevertheless, the sex main effect for model 4 indicated that girls had worse emotional QOL (Table 2).

### Self-concept

Girls showed significantly worse self-concept compared to boys in all models (see Table 3). No change was observed in this pattern over time. Having a mental health diagnosis and PTSD were also indicators of worse self-concept in all 4 models. The only significant time interaction was with PTSD ( $P \leq 0.002$ ), which indicated improvement across time for those with the condition. No age group differences were observed. This contrasts with emotional

and social context QOL, where a statistical signal is observed for all but 1 model (Model 4 in emotional regulation in Table 2).

### Social context

Girls again showed significantly worse social context QOL in all 4 models (see Table 4). A statistical trend is observed for age ( $P \leq 0.09$ ) and having a mental health diagnosis ( $P \leq 0.07$ ). Younger adolescents fared better in their social environments as measured by the scale, while those with a diagnosis did worse. Having PTSD seems to be unrelated to social context. There were also no significant time interactions, which indicates no change throughout the study period (Table 4).

### Discussion

Results are based on the responses of adolescents in Puerto Rico collected after surviving the 2017 Hurricane María as the starting point. The series of events that unraveled in their lives may be unique, but in many ways might also mimic the trauma experienced by other youth in disaster related circumstances. Youth of every race, ethnicity, and cultural background experience adversity, but youth from disadvantaged backgrounds and historically minoritized and traumatized groups are at heightened risk for both trauma exposure and developing PTSD.<sup>48,49</sup> The sample came from economically disadvantaged families who had existing mental health problems and experienced adverse events. All these stress-ridden conditions can exacerbate existing disorders, result in a more severe course of mental health disorders, and lead to new stress-related conditions.<sup>50</sup> A holistic understanding, which includes the environmental context, is central to addressing the needs of families and youth affected by trauma and adversity.

This study aimed to understand the QOL in adolescents by tapping into the AQOL-MHS' 3 domains and drawing on the longitudinal data collected starting in 2018 to the beginning of summer 2020. There are 3 major findings. First, recovery takes

**Table 2.** AQOL-MHS mixed longitudinal analysis for emotional regulation

Predictor	Emotional regulation							
	Model 1		Model 2		Model 3		Model 4	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Time	−0.09*	0.04	−0.17**	0.06	−0.13**	0.05	−0.15**	0.06
Sex								
Female	−0.33	0.21	−0.33	0.21	−0.33	0.21	−0.64*	0.29
Male	0	0	0	0	0	0	0	0
Age								
12–14	0.39 <sup>a</sup>	0.21	0.38 <sup>a</sup>	0.20	0.38 <sup>a</sup>	0.20	0.39	0.20
15–18	0	0	0	0	0	0	0	0
Diagnosis								
Dx	−0.46*	0.21	−0.80**	0.28	−0.46 <sup>a</sup>	0.21	−0.46*	0.21
No Dx	0	0	0	0	0	0	0	0
PTSD								
PTSD	−1.25 <sup>†</sup>	0.31	−1.25 <sup>†</sup>	0.31	−1.91 <sup>†</sup>	0.41	−1.25 <sup>†</sup>	0.31
No PTSD	0	0	0	0	0	0	0	0
Time × Dx								
Dx			0.16 <sup>a</sup>	0.09				
No Dx			0	0				
Time × PTSD								
PTSD					0.31*	0.13		
No PTSD					0	0		
Time × Sex								
Female							0.15	0.09
Male							0	0

\* $p \leq .05$ ; \*\* $p \leq .01$ ; <sup>†</sup> $p \leq .0001$ ; <sup>a</sup> $p = .06-.10$ . All models use PCL at baseline.

AQOL-MHS, Adolescent Quality of Life-Mental Health Scale; Dx, diagnosis; PTSD, probability of post-traumatic stress disorder; SE, standard error.

time. This finding is reflected mostly by the emotional regulation QOL dimension. All emotional regulation models produced a negative time estimate, which indicated a decline. Second, there is a clear sex disparity for girls. This finding is consistent with results observed in numerous studies.<sup>51–54</sup> The self-concept scale highlights these differences most dramatically with effect size differences as high as 0.81 (second wave follow-up). This dimension of QOL explores self-esteem and a prospective outlook, which are both heavily influenced by circumstances. Third, the 3 quality of life domains addressed by the AQOL-MHS underline how the challenges experienced by disasters impact different areas of QOL in different ways and for different groups. An unexpected finding was that there were no significant differences for those with PTSD in the multivariable longitudinal regression analyses for social context. As much as the social context scale reflects the distressing post disaster realities experienced by all, the differences that were observed at the mean level of analyses were attenuated by a significant sex difference and by trends which indicate that the younger adolescents are less burdened. Also, those with a diagnosis conveyed worse social context QOL.

There is compelling evidence that, in youth, positive changes can produce a cascade of improved resilience capacity and improve health.<sup>55,56</sup> Changes at home, school, and community

are examples of how multiple aspects of resilience interact and affect the individual. Resilience research provides hope about the long-term outcomes of most youth and families in the wake of disasters.<sup>6,57</sup> Study results were analyzed across time to explore for evidence of resilience. Observations revealed that even under repeated threats, improvement can be found for specific dimensions of QOL. Of special interest post disasters, children with PTSD reported better emotional regulation and self-concept dimensions of QOL across time. The challenges that they will have to face during their lifespans are numerous, and all efforts made to help them along the way will be beneficial. Gaining mental health ground in disaster related prevention, maintenance, recovery, and remission can make a great impact for current and future generations.

### Limitations

This study has multiple strengths, which include a rigorous methodological and longitudinal design that measured the compounding impact of disaster events on youth and the use of a valid and reliable measure of QOL that was developed for Latino adolescents in Puerto Rico. Like most studies, however, there are also some limitations. First, the development of the instrument for a specific

**Table 3.** AQOL-MHS mixed longitudinal analysis for self-concept

Predictor	Self-concept							
	Model 1		Model 2		Model 3		Model 4	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Time	0.07	0.05	0.02	0.06	0.01	0.05	0.01	0.06
Sex								
Female	−0.92 <sup>†</sup>	0.20	−0.92 <sup>†</sup>	0.20	−0.92 <sup>†</sup>	0.20	−1.23 <sup>†</sup>	0.30
Male	0	0	0	0	0	0	0	0
Age								
12–14	0.28	0.20	0.28	0.20	0.28	0.20	0.28	0.20
15–18	0	0	0	0	0	0	0	0
Diagnosis								
Dx	−0.56**	0.20	−0.77**	0.29	−0.56**	0.20	−0.56**	0.20
No Dx	0	0	0	0	0	0	0	0
PTSD								
PTSD	−0.93**	0.29	−0.93**	0.29	−1.88 <sup>†</sup>	0.42	−0.94**	0.29
No PTSD	0	0	0	0	0	0	0	0
Time × Dx								
Dx			0.09	0.09				
No Dx			0	0				
Time × PTSD								
PTSD					0.41**	0.13		
No PTSD					0	0		
Time × Sex								
Female							0.13	0.09
Male							0	0

\*\* $p \leq .01$ ; <sup>†</sup> $p \leq .0001$ . All models use PCL at baseline.

AQOL-MHS, Adolescent Quality of Life-Mental Health Scale; Dx, diagnosis; PTSD, probability of post-traumatic stress disorder; SE, standard error.

population could hamper its generalizability. Previous work has identified that the psychometric properties of the AQOL-MHS extend to community samples. An English language version was also used in the U.S., and a Castilian Spanish version has been used in Spain, and both have promising results.<sup>58</sup> Nonetheless, additional testing of its psychometric properties with Latino groups in the U.S. mainland and in other countries is recommended. Second, data collection ended during the first few months of the COVID-19 shelter-in-place orders. Several recent studies have found increases in mental health symptoms associated with the onset of the COVID-19 pandemic.<sup>59</sup> Therefore, there is a need to consider the unique historic circumstances and possible consequences. Additional waves of data or additional new studies might demonstrate how these youth will fare in the future. Third, clinical youth may behave or react differently to adversity compared to non-clinical youth; therefore, results should also be framed within these considerations. Even so, mental health risks post pandemic should be considered for all youth, especially those who are disadvantaged and/or minoritized and have been disproportionately burdened. Finally, because the disasters occurred sequentially and given the study's longitudinal design, the analyses cannot be disaggregated by type of disaster.

## Conclusions

Adverse experiences during youth impact health outcomes and serve as mechanisms through which the detrimental effects of social determinants of health multiply across the lifespan.<sup>60</sup> There is a need to continuously monitor and address the impacts of disasters on youth beyond the immediate impact phases and well into the long-term recovery periods.<sup>4</sup> Supporting initiatives to prevent the onset and reduce the chronicity of existing mental health problems should be at the forefront of every health care system and policy-maker's list of priorities. As adversities continue to unfold and affect families, researchers and practitioners must consider how adversity-related demands placed on youth impact their mental health, behavioral risks, school performance, and how the consequences differ from those experienced by adults.<sup>53,61</sup> The mental health of young people must be supported as an upstream investment in long-term prevention because youth will experience the residual mental health effects of the disasters and the pandemic across their lifetimes.<sup>62</sup> Screening individual children for adversity is a first step in preventing and mitigating its negative effects.<sup>55</sup> One essential way to support the mental health of youth is to provide universal screening in schools. Although this study recognizes that



**Table 4.** AQOL-MHS mixed longitudinal analysis for social context

Predictor	Social context							
	Model 1		Model 2		Model 3		Model 4	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Time	−0.01	0.04	0.01	0.05	−0.01	0.04	−0.02	0.05
Sex								
Female	−0.57**	0.20	−0.57**	0.20	−0.58**	0.20	−0.64*	0.27
Male	0	0	0	0	0	0	0	0
Age								
12–14	0.33 <sup>a</sup>	0.19	0.33 <sup>a</sup>	0.19	0.33 <sup>a</sup>	0.19	0.33 <sup>a</sup>	0.19
15–18	0	0	0	0	0	0	0	0
Diagnosis								
Dx	−0.36 <sup>a</sup>	0.20	−0.27	0.27	−0.36 <sup>a</sup>	0.20	−0.36 <sup>a</sup>	0.20
No Dx	0	0	0	0	0	0	0	0
PTSD								
PTSD	−0.28	0.29	−0.28	0.29	−0.43	0.39	−0.28	0.29
No PTSD	0	0	0	0	0	0	0	0
Time × Dx								
Dx			−0.04	0.08				
No Dx			0	0				
Time × PTSD								
PTSD					0.07	0.11		
No PTSD					0	0		
Time × Sex								
Female							0.03	0.08
Male							0	0

\* $p \leq .05$ ; \*\* $p \leq .01$ ; <sup>a</sup> $p = .06$ –.10. All models use PCL at baseline.

AQOL-MHS, Adolescent Quality of Life-Mental Health Scale; Dx, diagnosis; PTSD, probability of post-traumatic stress disorder; SE, standard error.

caregivers and pediatricians play an important role in recognizing mental health problems, we pin-point schools as the fitting place to conduct routine screenings. By building a health safety net into education, a lifeline can be created for young people who lack support in the home or are housing unstable.

**Supplementary material.** To view supplementary material for this article, please visit <http://doi.org/10.1017/dmp.2024.175>.

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**Author contribution.** LMC designed study concept, analysis, collected and curated the data, and wrote the manuscript. PAG carried out data management, analysis, and interpretation. KV collaborated in the conceptualization of study design and writing. JS and AO participated in drafting the manuscript. JTSR edited, reviewed the paper, and prepared tables and figures.

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## References

1. **Rahmani M, Muzwagi A, Pumariega AJ.** Cultural factors in disaster response among diverse children and youth around the world. *Curr Psychiatry Rep.* 2022;**24**(10):481–491. doi: [10.1007/s11920-022-01356-x](https://doi.org/10.1007/s11920-022-01356-x)
2. **Champine RB, Hoffman EE, Matlin SL, et al.** “What does it mean to be trauma-informed?”: a mixed-methods study of a trauma-informed community initiative. *J Child Fam Stud.* 2022;**31**:459–472. <https://doi.org/10.1007/s10826-021-02195-9>
3. **Substance Abuse and Mental Health Services Administration (SAMHSA).** Considerations for the care and treatment of mental and substance use disorders in the COVID-19 Epidemic. Published March 20, 2020. Accessed November 2023. <https://www.samhsa.gov/sites/default/files/considerations-care-treatment-mental-substance-use-disorders-covid19.pdf>
4. **Felix E, Rubens S, Hambrick E.** The relationship between physical and mental health outcomes in children exposed to disasters. *Curr Psychiatry Rep.* 2020;**2**(70):33. doi: [10.1007/s11920-020-01157-0](https://doi.org/10.1007/s11920-020-01157-0)
5. **Fortuna LR, Tolou-Shams M, Robles-Ramamurthy B, et al.** Inequity and the disproportionate impact of COVID-19 on communities of color in the United States: the need for a trauma-informed social justice response. *Psychol Trauma.* 2020;**12**(5):443–445. <https://doi.org/10.1037/tra0000889>

6. Masten AS, Motti-Stefanidi F. Multisystem resilience for children and youth in disaster: reflections in the context of COVID-19. *Advers Resil Sci*. 2020;1(2):95–106. doi: 10.1007/s42844-020-00010-w
7. Tzaneva E, Maeva M, Erolova Y, Wei J. *Disasters and the quality of life*. Cambridge Scholars Publishing; 2023. [https://www.researchgate.net/profile/Mila-Maeva/publication/367664622\\_978-1-5275-9062-5-samplepdf/data/63da6234c97bd76a8253980a/978-1-5275-9062-5-sample.pdf?origin=scientificContributions](https://www.researchgate.net/profile/Mila-Maeva/publication/367664622_978-1-5275-9062-5-samplepdf/data/63da6234c97bd76a8253980a/978-1-5275-9062-5-sample.pdf?origin=scientificContributions)
8. Bellis MA, Hughes K, Ford K, et al. Life course health consequences and associated annual costs of adverse childhood experiences across Europe and North America: a systematic review and meta-analysis. *Lancet Public Health*. 2019;49(10):e517–e528. doi: 10.1016/S2468-2667(19)30145-8
9. La Greca AM, Silverman WK. Treatment and prevention of posttraumatic stress reactions in children and adolescents exposed to disasters and terrorism: what is the evidence? *Child Dev Perspectives*. 2009;3(1):4–10. <https://doi.org/10.1111/j.1750-8606.2008.00069.x>
10. Pumariega AJ, Jo Y, Beck B, et al. Trauma and US minority children and youth. *Curr Psychiatry Rep*. 2022;24(4):285–295. doi: 10.1007/s11920-022-01336-1
11. Felix E, Kaniasty K, You S, et al. Parent-child relationship quality and gender as moderators of the influence of hurricane exposure on physical health among children and youth. *J Pediatr Psychol*. 2016;41(1):73–85. doi: 10.1093/jpepsy/jsv03
12. Hensley L, Varela RE. PTSD and somatic complaints, following Hurricane Katrina: the role of trait anxiety and anxiety sensitivity. *J Clin Child Adolesc Psychol*. 2008;37:542–552. doi: 10.1080/15374410802148186
13. Orengo-Aguayo R, Stewart RW, de Arellano MA, et al. Disaster exposure and mental health among Puerto Rican youths after Hurricane Maria. *JAMA Netw Open*. 2019;2(4):e192619. doi:10.1001/jamanetworkopen.2019.2619.
14. NCEI. Billion-dollar weather and climate disasters. National Centers for Environmental Information. Published March 17, 2020. Accessed December 19, 2024. [https://www.ncei.noaa.gov/access/billions/events/US/1980-2017?disasters\[\]=tropical-cyclone](https://www.ncei.noaa.gov/access/billions/events/US/1980-2017?disasters[]=tropical-cyclone)
15. BBC News. Hurricane Maria: Puerto Rico May Be Months Without Power. Published September 21, 2017. Accessed July 11, 2024. <https://www.bbc.com/news/world-latin-america-41340392>
16. Robles F, Ferré-Sadurní L. Puerto Rico's Agriculture and Farmers Decimated by Maria. The New York Times. Published September 24, 2017. Accessed July 11, 2024. <https://www.nytimes.com/2017/09/24/us/puerto-rico-hurricane-maria-agriculture-.html>
17. FEMA. Hurricanes Irma and Maria in Puerto Rico: Building Performance Observations, Recommendations, and Technical Guidance. Published 2018. Accessed July 11, 2024. [https://www.fema.gov/sites/default/files/2020-07/mat-report\\_hurricane-irma-maria-puerto-rico\\_2.pdf](https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-irma-maria-puerto-rico_2.pdf)
18. Lynch Baldwin S, Begnaud D. Hurricane Maria: death toll in Puerto Rico much higher, estimated at 2,975, new study finds. *CBS News*. Published August 29, 2018. Accessed July 11, 2024. <https://www.cbsnews.com/news/hurricane-maria-death-toll-puerto-rico-2975-killed-by-storm-study-finds/>
19. Schachter J, Bruce A. Revising Methods to Better Reflect the Impact of Disaster. United States Census Bureau. Published April 3, 2023. Accessed July 11, 2024. <https://www.census.gov/library/stories/2020/08/estimating-puerto-rico-population-after-hurricane-maria.html>
20. Joshipura KJ, Martínez-Lozano M, Ríos-Jiménez PI, et al. Preparedness, Hurricanes Irma and Maria, and impact on health in Puerto Rico. *Int J Disaster Risk Reduct*. 2021;67:102657. doi: 10.1016/j.ijdrr.2021.102657
21. Communications and Publishing. As aftershocks continue in Puerto Rico, USGS supports quake recovery. U.S. Geological Survey. Published January 17, 2020. Accessed July 11, 2024. <https://www.usgs.gov/news/featured-story/aftershocks-continue-puerto-rico-usgs-supports-quake-recovery>
22. Baratz D. Puerto Rico Earthquakes cause heavy damage across island and knock out power. *USA Today*. <https://www.usatoday.com/picture-gallery/news/nation/2020/01/07/puerto-rico-earthquakes-cause-heavy-damage-and-knock-out-power/2830812001/>. Published January 17, 2020.
23. Coto D. 3 Weeks After Earthquake, Only 20% of Schools in Puerto Rico are Open and Deemed Safe. *USA Today*. Accessed July 11, 2024. <https://www.usatoday.com/story/news/nation/2020/01/28/puerto-rico-earthquake-only-20-schools-open/4595416002/>. Published January 28, 2020.
24. Cranford JA, Shrout PE, Iida M, et al. A procedure for evaluating sensitivity to within-person change: can mood measures in diary studies detect change reliably? *Pers Soc Psychol Bull*. 2006;32(7):917–929. doi:10.1177/0146167206287721
25. Chavez L, Mir K, Canino G. Starting from scratch: the development of the Adolescent Quality of Life-Mental Health Scale (AQOL-MHS). *Cult Med Psychiatry*. 2012;36(3):465–479. <http://www.ncbi.nlm.nih.gov/pubmed/22528055>
26. Chavez LM, Ramirez R, Garcia P, et al. Measurement properties of the Adolescent Quality of Life Mental Health Scale (AQOL-MHS). *Qual Life Res*. 2014;23(4):1327–1335. doi: 10.1007/s11136-013-0579-2
27. KIDSCREEN Group. The KIDSCREEN questionnaires-Quality of Life Questionnaires for Children and Adolescents. *Handbook*. Lengerich: Papst Science Publisher; 2006.
28. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med Care*. 2001;9(8):800–812. doi: 10.1097/00005650-200108000-00006
29. Patrick DL, Edwards TC, Topolski TD. Adolescent quality of life, part II: initial validation of a new instrument. *J Adolesc*. 2002;25(3):287–300. doi: 10.1006/jado.2002.0471
30. Chavez LM, Shrout PE, Garcia P, et al. Measurement invariance of the Adolescent Quality of Life-Mental Health Scale (AQOL-MHS) across gender, age and treatment context. *J Child Fam Stud*. 2018;27:3176–3184. doi: 10.1007/s11136-013-0579-2
31. Blevins CA, Weathers FW, Davis MT, et al. The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): development and initial psychometric evaluation. *J Trauma Stress*. 2015;28(6):489–498. doi:10.1002/jts.22059
32. Roberts NP, Lotzin A, Schäfer I. A systematic review and meta-analysis of psychological interventions for comorbid post-traumatic stress disorder and substance use disorder. *Eur J Psychotraumatol*. 2022;3:13(1):2041831. doi: 10.1080/2008198.2022.2041831
33. Weathers FW, Litz BT, Keane TM, et al. *The PTSD Checklist for DSM-5 – Standard*; 2013.
34. Forkus SR, Raudales AM, Rafiuddin HS, et al. The Posttraumatic Stress Disorder (PTSD) Checklist for DSM-5: a systematic review of existing psychometric evidence. *Clin Psychol*. 2023;30(1):110–121. <https://doi.org/10.1037/cps000111>
35. Svein J, Bondjers K, Willebrand M. Psychometric properties of the PTSD Checklist for DSM-5: a pilot study. *Eur J Psychotraumatol*. 2016;(7)Article 30165.
36. Bravo M, Ribera J, Rubio-Stipec M, et al. Test-retest reliability of the Spanish version of the Diagnostic Interview Schedule for Children (DISC-IV). *J Abnorm Child Psychology*. 2001;29(5):433–444. <http://www.ncbi.nlm.nih.gov/pubmed/11695544>
37. Shaffer D, Fisher P, Lucas CP, et al. NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): description, differences from previous versions, and reliability of some common diagnoses. *J Am Acad Child Adolesc Psychiatry*. 2000;39(1):28–38. doi: 10.1097/00004583-200001000-00014
38. Jensen P, Roper M, Fisher P, et al. Test-retest reliability of the Diagnostic Interview Schedule for Children (DISC 2.1). *Arch Gen Psychiatry*. 1995;52: 61–71. doi: 10.1001/archpsyc.1995.03950130061007
39. Ribera JC, Canino G, Rubio-Stipec M, et al. The Diagnostic Interview Schedule for Children (DISC 2.1) in Spanish: reliability in a Hispanic Population. *J Child Psychol Psychiatr*. 1996;37(2):195–204. doi: 10.1111/j.1469-7610.1996.tb01391.x
40. Shaffer D, Schwab-Stone M, Fisher P, et al. The Diagnostic Interview Schedule for Children-Revised Version (DISC-R): I. Preparation, field testing, interrater reliability, and acceptability. *J Am Acad Child Adolesc Psychiatry*. 1993;32(3):643–650. doi: 10.1097/00004583-199305000-00023
41. Goodman SH, Schwab-Stone M, Lahey BB, et al. Major depression and dysthymia in children and adolescents: discriminant validity and differential consequences in a community sample. *J Am Acad Child Adolesc Psychiatry*. 2000;39(6):761–770. doi: 10.1097/00004583-200006000-00015
42. Jensen PS, Salzberg AD, Richters JE, et al. Scales, diagnoses, and child psychopathology: I. *CBCL and DISC relationships*. *J Am Acad Child Adolesc Psychiatry*. 1993;32(2):397–406. doi: 10.1007/BF01441482

43. Schwab-Stone ME, Shaffer D, Dulcan MK, et al. Criterion validity of the NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3). *J Am Acad Child Adolesc Psychiatry*. 1996;35(7):878–888. doi: 10.1097/00004583-199607000-00013
44. Felix E, Hernandez LA, Bravo M, et al. Natural disaster and risk of psychiatric disorders in Puerto Rican children. *J Abnorm Child Psychology*. 2011;39(40):589–600. doi: 10.1007/s10802-010-9483-1
45. Felix ED, You S, Canino, G. Family influences on the relationship between Hurricane exposure and ataques de nervios. *J Child Fam Stud*. 2015;24(8):2229–2240. doi: 10.1007/s10802-012-9654-3
46. Felix E, Kaniasty K, You S, et al. Parent-child relationship quality and gender as moderators of the influence of hurricane exposure on physical health among children and youth. *J Pediatric Psychol*. 2016;41(1):73–85. doi: 10.1093/jpepsy/jsv038
47. Rubens SL, Felix ED, Hambrick EP. A meta-analysis of the impact of natural disasters on internalizing and externalizing problems in youth. *J Traumatic Stress*. 2018;31(3):332–341. Epub 2018/06/06.
48. Cohen JA, Deblinger E, Mannarino AP, et al. The importance of culture in treating abused and neglected children: an empirical review. *Child Maltreat*. 2001;69(2):148–157. doi: 10.1177/1077559501006002007
49. Jaycox LH, Stein BD, Kataoka SH, et al. Violence exposure, posttraumatic stress disorder, and depressive symptoms among recent immigrant schoolchildren. *J Am Acad Child Adolesc Psychiatry*. 2002;41(9):1104–1110. doi: 10.1097/00004583-200209000-00011
50. Fegert JM, Vitiello B, Plener PL, et al. Challenges and burden of the Coronavirus 2019 (COVID-19) pandemic for child and adolescent mental health: a narrative review to highlight clinical and research needs in the acute phase and the long return to normality. *Child Adolesc Psychiatry Ment Health*. 2020;14:20. <https://doi.org/10.1186/s13034-020-00329-3>
51. Luijten MAJ, van Muilekom MM, Teela L, et al. The impact of lockdown during the COVID-19 pandemic on mental and social health of children and adolescents. *Qual Life Res*. 2021;30(10):2795–2804. doi:10.1007/s11136-021-02861-x
52. Duan L, Shao X, Wang Y, et al. An investigation of mental health status of children and adolescents in China during the outbreak of COVID-19. *J Affect Disord*. 2020;275:112–118. doi: 10.1016/j.jad.2020.06.029
53. Roche KM, Huebner DM, Lambert SF, et al. COVID-19 stressors and Latinx adolescents' mental health symptomatology and school performance: a prospective study. *J Youth Adolesc*. 2022;51(6):1031–1047. doi: 10.1007/s10964-022-01603-7
54. Zhou SJ, Zhang LG, Wang LL, et al. Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *Eur Child & Adolesc Psychiatry*. 2020;29(6):749–758. doi: 10.1007/s00787-020-01541-4
55. Bartlett JD. Screening for childhood adversity: contemporary challenges and recommendations. *Adv Res Sci*. 2020;1:65–79. doi:10.1007/s42844-020-00004-8
56. Masten AS, & Cicchetti D. Developmental cascades [Editorial]. *Dev Psychopathol*. 2010;22(3):491–495. doi: <https://doi.org/10.1017/S0954579410000222>
57. Masten AS, Cicchetti D. Resilience in development: progress and transformation. In: D. Cicchetti (Ed.) *Developmental Psychopathology: Risk, Resilience, and Intervention (3<sup>rd</sup>)*. John Wiley & Sons, Inc; 2016:271–333. <https://doi.org/10.1002/9781119125556.devpsy406>
58. Magallón-Neri E, Chávez L, Ortiz N, et al. Psychiatric comorbidity and quality of life in adolescents attended in mental health services. *Paper presented at: 23rd World Congress of the Int Ass Child Adolesc Psychiatry*. 2018;23–27; Prague, Czech Republic.
59. Hussong AM, Midgette AJ, Thomas TE, et al. Coping and mental health in early adolescence during COVID-19. *Res Child Adolesc Psychopathol*. 2021;49(9):1113–1123. doi: 10.1007/s10802-021-00821-0
60. Allen J, Balfour R, Bell R, et al. Social determinants of mental health. *Int Rev Psychiatry*. 2014;26(4):392–407. doi: 10.3109/09540261.2014.928270
61. **Before, during, and after an emergency.** U.S. Centers for Disease Control and Prevention. Published October 24, 2024. Accessed December 19, 2024. <https://www.cdc.gov/children-and-school-preparedness/before-during-after/>
62. McCray CI, Rosenberg LA. Path forward: mental health and the U.S. pandemic response. *J Behav Health Serv Res*. 2021;48:161–170. doi: 10.1007/s11414-020-09747-9