Mental Health and Access to Resources in a Schoolteacher Population Impacted by Earthquakes and the Pandemic in Puerto Rico

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Objective: A study was conducted to evaluate the mental health status and access to essential resources in a sample of schoolteachers impacted by earthquakes and the COVID-19 pandemic in Southwestern Puerto Rico.

Methods: From November 2020 through September 2021, an online survey was administered to schoolteachers working in municipalities listed in the Federal Emergency Management Agency earthquake disaster declaration. The prevalences of post-traumatic stress disorder (PTSD), anxiety, and depression were calculated based on scores from the PTSD Checklist for DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) (PCL-5), the Generalized Anxiety Disorder 7-item (GAD-7) scale, and the Center for Epidemiologic Studies-Depression (CES-D-7) scale, respectively.

Results: Most of the teachers in the sample (N = 58) reported serving students of low socioeconomic status (93.1%). Forty-eight percent (48.3%) reported having trouble making necessary home repairs, and 32.8%, accessing medical care. Twenty-one percent (20.7%) of the teachers met the clinical cutoff for PTSD, and 12.1% scored within the range of severe anxiety. Twenty-four percent (24.1%) of the teachers obtained scores indicative of depression.

Conclusion: The survey findings highlight the need to provide mental health services to schoolteachers in the aftermath of a natural disaster in Puerto Rico.

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Key words: Earthquakes, Pandemic, Mental Health, Puerto Rico, Teachers

From 2017 through 2020, Puerto Rico experienced 3 major natural disasters: Hurricanes Irma and Maria and a 6.4-magnitude earthquake followed by thousands of aftershocks (1,2,3). The earthquakes caused significant damage to school buildings and delayed the beginning of the 2020 Spring semester. Just when schools were resuming on-ground instruction after the earthquakes, the COVID-19 pandemic forced students and teachers to begin remote learning. This disruption was particularly significant to the Puerto Rican education system, because students lost an average of 78 school days in the aftermath of Hurricane Maria (4). On an island where 40.5% of the population lives in poverty, the lack of access to education is a barrier to educational attainment, especially for young Puerto Ricans living in the municipalities near the epicenter of the earthquake, where poverty rates are higher than they are on the rest of the island (5,6).

Natural disasters have a significant impact on the mental health of the general population, including school personnel. While studies on the mental health of teachers are limited, these studies indicate that teachers may experience symptoms of post-traumatic stress disorder (PTSD), anxiety, and/or depression at levels similar to or higher than those reported for the general population after hurricanes and earthquakes (7,8,9). After Hurricane Maria, schools in Puerto Rico functioned as essential support for the community by providing food and shelter to displaced individuals (10). As schools became shelters, teachers were faced with the challenge of balancing their own personal needs with the demands of their additional support roles in the community, leading to anxiety (10). A comprehensive screening of the mental health of teachers after Hurricane Maria reported rates of potentially significant symptoms of anxiety (13.1%), depression (8.7%), and PTSD (5.4%), emphasizing the need for data collection after natural disasters to support this often overlooked and vulnerabilized population (11). The present study was conducted (November 2020–September 2021) to specifically assess mental health status and access to resources in a sample of schoolteachers directly impacted by the aforementioned earthquakes and the subsequent COVID-19 pandemic in Puerto Rico.

Methods

Study design

A cross-sectional study was designed to evaluate both the access to resources and the mental health status of schoolteachers

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in Puerto Rico after the December 2019 and January 2020 earthquakes and during the COVID-19 pandemic.

Recruitment and data collection

Teachers working in areas impacted by the earthquakes were recruited via email following a virtual session on educational continuity after natural disasters and emergencies provided by Ciencia Puerto Rico, a non-profit organization dedicated to science advocacy (https://www.cienciapr.org/). The session was attended by 58 middle and high school teachers working in the southwestern municipalities of Puerto Rico. Additional participants were recruited via snowball sampling and targeted social media posts from November 2020 through September 2021. All the protocols were approved by the Institutional Review Board at the University of New Haven.

Details regarding demographic characteristics, academic preparation, years of experience teaching, types of student populations served, access to resources, perceived preparedness to teach, exposure to the pandemic and the earthquakes, and symptoms of PTSD, anxiety, and depression were collected through an anonymous online survey on the Qualtrics platform.

Data analysis

The participants included in the analysis (N = 58) were adult teachers (≥21 years) teaching in public or private schools located in municipalities within the Ponce and Mayagüez regions, as defined by the Puerto Rico Department of Education and included in the Federal Emergency Management Agency (FEMA) disaster declaration (12).

Descriptive statistics for demographic variables, access to resources, and prevalence of mental health outcomes were computed using Microsoft Excel. Self-reported measures for PTSD, anxiety, and depression were obtained using Spanish versions of the PTSD Checklist for DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) (PCL-5), the Generalized Anxiety Disorder 7-item (GAD-7) scale, and the Center for Epidemiologic Studies-Depression (CES-D-7) scale, respectively, all of which have been validated in multiple populations (13,14,15,16,17).

Each item on the PCL-5 (77% sensitivity and 96% specificity) was assigned a numerical value of 1 to 4, and the resulting values for each question were added to obtain a score (13,14). A score of 32 or above was considered indicative of possible PTSD (14).

To obtain the prevalence of probable generalized anxiety in the sample, responses to each question on the GAD-7 scale were assigned a numerical value of 1 to 3; the values for each question were added to obtain a total score. Scores of 0 to 4 were classified as minimal, of 5 to 9 as mild, of 10 to 14 as moderate, and of 15 to 21 as severe anxiety (15). The GAD-7 scale has been demonstrated to provide 89% sensitivity and 82% specificity when a cutoff of 10 is utilized (16).

To calculate the prevalence of probable depression cases, scores for the CES-D-7 scale were calculated by summing the scores of all the items. Possible scores for the items range from 0 (never, rarely, or less than 1 day) to 3 (5 to 7 days to all the time). Total possible scores on the scale can range from 0 to 21. The established cutoff is 9, providing 90.2% sensitivity and 86% specificity (17). Participants who did not answer any of the questions for the mental health scales were reported as "no response" in the data analysis. Total scores for participants who skipped 1 or more items on the CES-D-7 scale were reported as "missing" (N = 3). Missing values for any of the responses to the PTSD scale were imputed using mode imputation.

Results

This study describes a population of schoolteachers working near the epicenter of the 6.4-magnitude earthquake that impacted Puerto Rico on January 7, 2020, and working, as well, during the lockdowns imposed by the COVID-19 pandemic.

Characteristics of the population

The demographic characteristics of the population (N = 58) are described in Table 1. Most of the survey respondents identified as female (84.5%), whereas a minority (13.8%) identified as male and 1.7% did not disclose their gender identity. The study participants ranged in age from 29 to 69 years (mean: 45.6 years), with most being from 41 to 50 years of age (55.1%). Twenty-six percent (25.9%) had a bachelor's degree, and the majority (72.4%) held a master's or doctoral degree. Most of the respondents (72.4%) had taught for 15 or more years. Fifty-five percent (55.1%) of the participants indicated teaching more than 1 grade in the same academic year. The grades taught by teachers in the sample ranged from pre-school (N = 1) to 12th grade (N = 14) (data not shown).

The survey also collected information on the student populations that the participating teachers served, these including students of low socioeconomic status, students who were academically at-risk, students with physical disabilities, and students with learning disabilities. Ninety-three percent (93.1%) of the teachers indicated that they worked with students of low socioeconomic status, 67.2%, students who were at risk of failing, 74.1%, students with learning disabilities, and 37.9%, students with physical disabilities (Figure 1A). Seventy-nine percent (79.3%) reported that they worked with 2 or more of these vulnerabilized student populations at once (supplementary material).

Teacher access to resources and perceived preparedness

The participants were surveyed about their access to the resources necessary for overall health and well-being as well as those necessary to teach remotely, as required by the conditions in Puerto Rico after the earthquakes and the COVID-19 lockdown. All the teachers (100%) reported having a computer at home, and almost all of them (95%) reported also having a reliable internet connection at home (data not shown). Figure 1B shows the percentage of teachers who had difficulties accessing medical care, food, and technology, as well as making necessary repairs to their homes and/or vehicles. Forty-eight percent (48.3%) of the teachers reported having trouble making necessary repairs to their homes, while 22.4% indicated having trouble paying for necessary food purchases, 6.9%, accessing food, 29.3%, accessing technology, and 32.8%, accessing healthcare and/or making necessary car repairs; 74.1% of the respondents had difficulty accessing 1 or more resources (supplementary material). When asked about their readiness to teach after a future natural

Table 1. Demographic characteristics of Puerto Rican teachers in sudy sample

Variable	Frequency (n = 58)	Percent (%)
Gender		
Female	49	(84.5)
Male	8	(13.8)
No answer	1	(1.7)
Age		
29–35 years	6	(10.3)
36–40 years	5	(8.6)
41–45 years	18	(31.0)
46–50 years	14	(24.1)
51–55 years	8	(13.8)
>55 years	6	(10.3)
No answer	1	(1.7)
Mean: 45.6 years		
Marital status		
Married or in legal partnership	38	(65.5)
Single, never married	10	(17.2)
Divorced	6	(10.3)
Separated	2	(3.4)
Widowed	1	(1.7)
No answer	1	(1.7)
No. of people in household		
2 people	16	(27.6)
3 people	18	(31.0)
4 people	16	(27.6)
≥5 people	8	(13.8)
Highest degree obtained		
Bachelors	15	(25.9)
Masters	37	(63.8)
Doctorate	5	(8.6)
Other	1	(1.7)
No. of years teaching		
1–3 Years	3	(5.2)
4–9 Years	4	(6.9)
10–14 Years	9	(15.5)
15+ Years	42	(72.4)
Town of residence		
Adjuntas	2	(3.5)
Caguas*	1	(1.7)
Coamo	2	(3.5)
Guánica	1	(1.7)
Guayanilla	2	(3.5)
Jayuya	2	(3.5)
Juana Díaz	4	(6.9)
Lajas	1	(1.7)
Mayagüez	1	(1.7)
Peñuelas	5	(8.6)
Ponce	23	(39.7)
Sabana Grande	2	(3.5)
Santa Isabel	2	(3.5)
Utuado	1	(1.7)
Villalba	3	(5.2)
Yauco	5	(8.6)
Unknown*	1	(1.7)
School location (Jan–May 2020)		
Adjuntas	2	(3.5)
Guánica	1	(1.7)
Guayanilla	5	(8.6)
Jayuya	1	(1.7)
Juana Díaz	2	(3.5)
Lajas	1	(1.7)
Mayagüez	2	(3.5)
Peñuelas	5	(8.6)
Ponce	24	(41.4)
Sabana Grande	1	(1.7)
Santa Isabel	2	(3.5)
Utuado	1	(1.7)
Villalba	5	(8.6)
Yauco	6	(10.3)

*teaching in an area impacted by earthquakes

disaster, 52% of the teachers reported feeling better prepared to do so following their experiences with the earthquakes and the COVID-19 pandemic, while 34% indicated feeling equally prepared and 14% reported feeling less prepared (supplementary material).

Mental health

In our screening for PTSD, teachers were asked to identify the worst traumatic event experienced and respond to the items on the PCL-5 scale. Sixty-seven percent identified the combination of the earthquakes and the pandemic as the worst event experienced (supplementary data). Twenty-one percent (20.7%) of the participants obtained a score of 32 or above, suggesting clinically significant symptoms of PTSD (Figure 2A).

To assess the prevalence of anxiety, the participants answered questions on the Generalized Anxiety Disorder 7-item (GAD-7) scale. Responses to each question were based on symptoms experienced in the 2 weeks prior to taking the survey and were assigned a numerical value of 1 to 3. Total scores were used to calculate the prevalences of varying degrees of anxiety. As shown in figure 2B, 27.6% of the participants scored within the range of minimal anxiety, 37.9%, within the range of mild anxiety, 6.9%, within the range of moderate anxiety, and 12.1%, within the range of severe anxiety. Fifteen percent (15.5%) of the participants chose not to answer any of the questions in this section.

Lastly, the CES-D-7 scale was used to determine the frequency of depressive symptoms in the week prior to taking the survey. The data reflects the scores summed across all the items (minimum score: 0; maximum score: 21). As shown in figure 2C, 24.1% of the teachers scored 9 or more, suggesting referable symptoms of depression (17).

Discussion

Here, we present the results of a needs assessment designed to capture the mental health status of and assess the access to resources in a sample of teachers living and working in the areas of Puerto Rico directly impacted by earthquakes during the COVID-19 pandemic. Most of the teachers in the sample reported serving vulnerabilized student populations, including students of low socioeconomic status (93%), students with learning and physical disabilities (74.1% and 37.9%, respectively), and students at risk of failing (67.2%). It was also found that most of the participants (74.1%) had difficulty accessing 1 or more resources, such as food, health services, and technology, and/or making repairs to their homes or cars in the last six months. Despite experiencing decreased access to essential resources, most of the participants felt that they were better prepared to teach in the wake of a future natural disaster after having gone through the earthquakes and the pandemic. This finding could be due to our sample's consisting mostly of experienced teachers (≥15 years) and/or teachers who had received preparation on educational continuity after natural disasters.

On the self-reported measures, 20.7% of the participants had scores suggestive of clinically significant symptoms of PTSD, 12.1% obtained scores in the range indicating severe

Figure 1. Characteristics of Students Served and Access to Necessary Resources by Teachers Impacted by the Earthquakes and the COVID-19 Pandemic

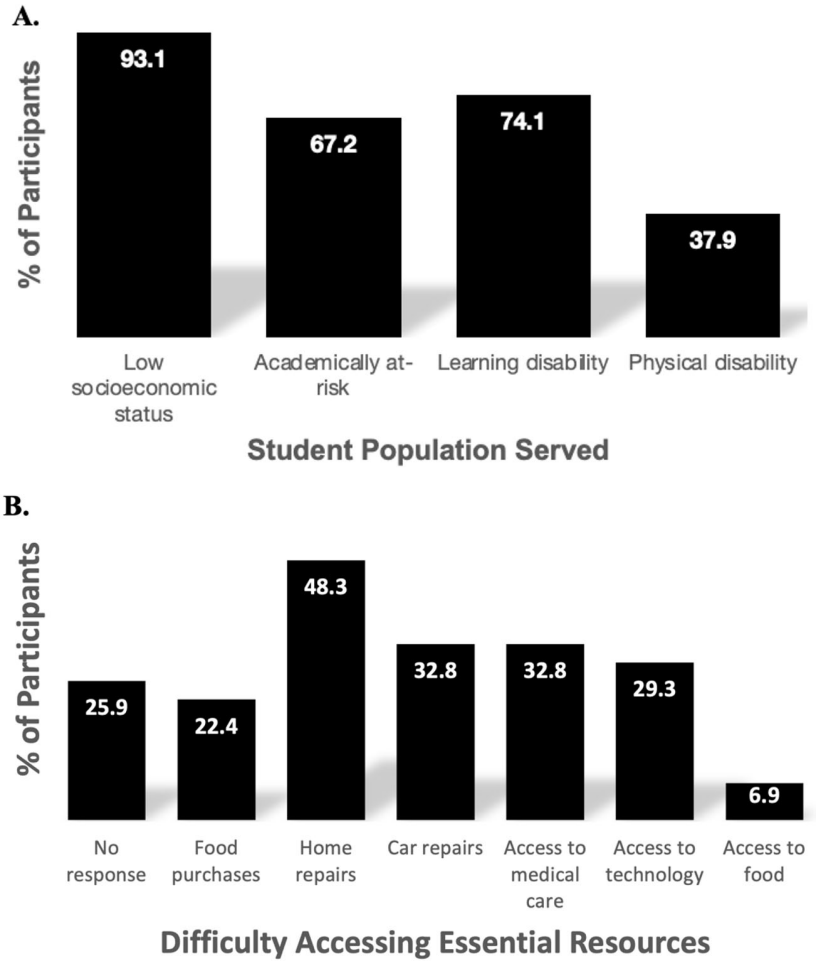

Figure 1A. Percentage of teachers in the study sample (N = 58) who served vulnerabilized student populations, including students of low socioeconomic status, students at risk of failing, and students with learning and/or physical disabilities at the time of the earthquake and the COVID-19 pandemic. **Figure 1B**. Percentage of teachers in the study sample (N = 58) who reported barriers to accessing food, purchasing food, making home repairs, making car repairs, and accessing medical care and/or technology after the January 6 earthquake and during the COVID-19 pandemic.

anxiety, and 24.1% scored at or above the cutoff for depression. The prevalences of PTSD and depression in our sample were higher than was previously documented in a large sample of Puerto Rican teachers exposed to Hurricane Maria, in whom the prevalences for PTSD and depression were 5.4% and 8.7%, respectively (11). The prevalences of anxiety were similar for both studies (13.1% after Hurricane Maria and 12.1% after the earthquakes). Differences between the present study and similar studies reporting the prevalence of mental health disorders may be due to the nature of the cross-sectional design and the use of different self-reporting mental health scales (11). Since our data were collected during both the COVID-19 pandemic and periods of seismic activity, the higher prevalences of PTSD and depression may reflect a compounding effect of having been exposed to multiple natural disasters in a short period of time.

To our knowledge, this is the first study that specifically collected information on mental health status and access to resources in a teacher sample living and teaching in the areas included in the FEMA earthquake disaster declaration during the time of the earthquake aftershocks and the COVID-19 pandemic in Puerto Rico. Furthermore, while other studies have used qualitative methods to document teachers' experiences of loss of property and life after natural disasters, our study presents quantitative data on specific barriers to resources, post-disaster, in a sample of teachers (8,18). Our results document the vulnerability of students and teachers in the southwestern region of Puerto Rico to the personal and educational impacts of natural disasters. Recognizing the critical role of teachers in the socio-emotional well-being of students after natural disasters, this study highlights the importance of data collection to inform the development of interventions for non-urban communities that are often under-resourced (9).

Nevertheless, our results should be interpreted with caution. Our study recruited a small sample of teachers, and this group was predominantly female (a population that has previously been found to have higher rates of anxiety, depression, and PTSD) (11). At the same time, most of the teachers in the sample (72%) had 15 or more years of teaching experience, which has been associated with the ability to regulate negative emotions (19). While we targeted our recruitment strategy to teachers in the Ponce region, as identified by the Department of Education, the online survey did not include mechanisms to confirm that the participants were in fact teachers. Thus, future data collection should aim to increase the size and diversity of the teacher sample to allow for rigorous statistical analysis and should, as well, design an online survey that would allow for the validation of participant responses.

Overall, our findings emphasize the need of providing access to counseling and social support services to address the psychosocial consequences of loss of life and property as well as of displacement in the aftermath of a natural disaster. Puerto Rico ranks number 1 in the 2021 Global Climate Risk Index list of countries most affected by extreme weather events in the last 20 years and, as a small island, remains vulnerable to the effects of the climate change (20,21). In the context of the climate crisis, it is imperative that emergency preparedness and recovery plans take into account the need to equip teachers with the tools necessary to ensure educational continuity. We advocate for robust quantitative and qualitative data collection that includes a community participatory approach in order to design programming that can best support teachers in the aftermath of a natural disaster.

Figure 2. Mental Health in Teachers Impacted by the Earthquakes and the COVID-19 Pandemic

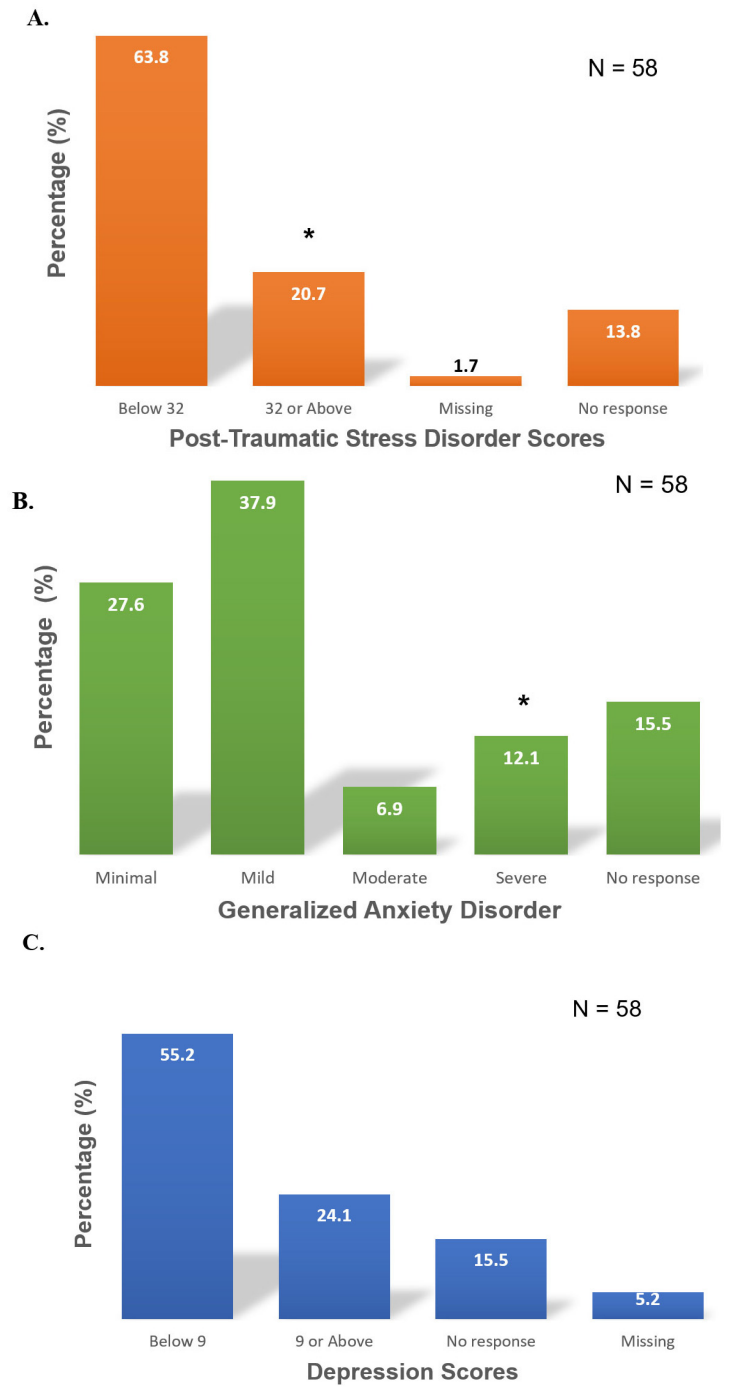

Figure 2A. Prevalence rates of post-traumatic stress disorder as determined by participant responses to the items on the PCL-5 instrument. Scores of 32 or above suggest cases of PTSD (*). One response was missing more than 1 item and is labeled "missing." (minimum score: 0; maximum score: 66) (M = 22.76, SD = 17.17, 95% CI [17.82, 27.69]; N = 58). **Figure 2B**. Prevalence of generalized anxiety disorder as determined by participant responses to the items on the GAD-7 instrument. Scores from 0 to 4 were classified as minimal anxiety, 5 to 9 as mild anxiety, 10 to 14 as moderate anxiety, and 15 to 21 as severe anxiety (*). (M = 6.86, SD = 5.09, 95% [5.39, 8.32]; N = 58). **Figure 2C**. Total depression scores as determined by participant responses to the items on the Center for Epidemiological Studies-Depression 7-item (CES-D-7) instrument. Scores for items range from 0 (rarely, never, less than 1 day) to 3 (all the time, 5–7 days). Total scores range from 0 to 21. Established cutoff is 9. Responses missing values for 1 item or more on the scale are reported as "missing" (N = 3) (M = 6.85, SD = 5.26, 95% CI [5.29, 8.41]; N = 58).

Resumen

Objetivo: Se realizó un estudio para evaluar la salud mental y el acceso a recursos esenciales en una muestra de maestros impactada por los terremotos y la pandemia de COVID-19 en el suroeste de Puerto Rico. Metodología: Se administró una encuesta en línea a una muestra de maestros en los municipios incluidos en la declaración de desastre por terremoto de la Agencia Federal para el Manejo de Emergencias entre noviembre del 2020 y septiembre del 2021. La prevalencia de estrés post-traumático, ansiedad y depresión fue evaluada utilizando la Lista de Verificación de Trastorno de Estrés Post-Traumático (PCL-5) del Manual Diagnóstico y Estadístico de los Trastornos Mentales, Quinta Edición (DSM-5), la Escala de 7 ítems del Trastorno de Ansiedad Generalizada (GAD-7) y la Escala de Depresión del Centro de Estudios Epidemiológicos (CES-D-7), respectivamente. Resultados: La mayoría de los maestros en la muestra (N=58) indicaron servir estudiantes de bajo nivel socioeconómico (93.1%). Cuarenta y ocho por ciento (48.3%) indicó tener dificultad para realizar reparaciones en su hogar y 32.8% reportaron dificultad teniendo acceso a cuidado médico. Veintiuno por ciento (20.7%) de los docentes alcanzaron el punto de corte indicativo de estrés postraumático y 12.1% obtuvieron puntuaciones en el rango de ansiedad severa. Veinticuatro por ciento (24.1%) de los encuestados obtuvieron puntuaciones indicativas de depresión. Conclusión: Los hallazgos de esta encuesta resaltan la necesidad de brindar servicios de salud mental a los maestros después de un desastre natural en Puerto Rico.

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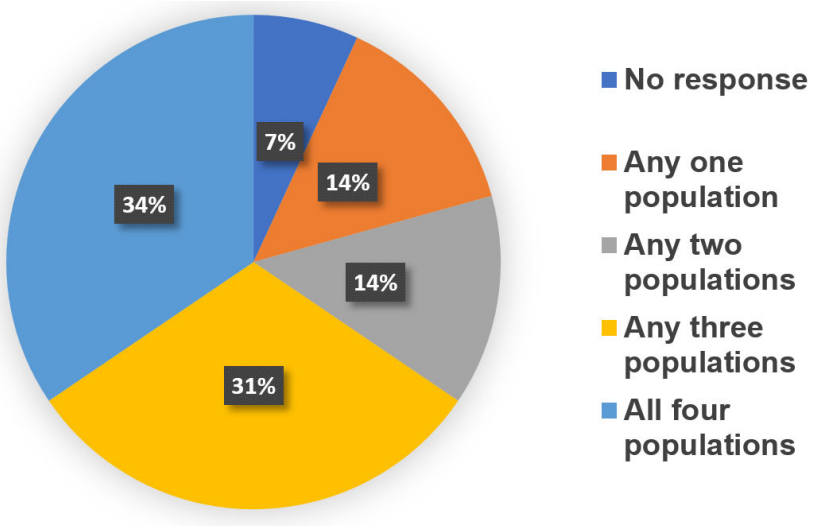
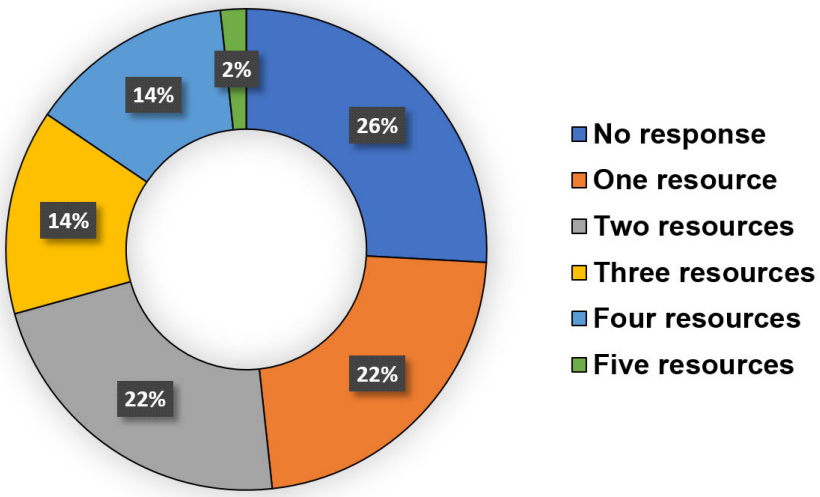
SUPPLEMENTARY DATA

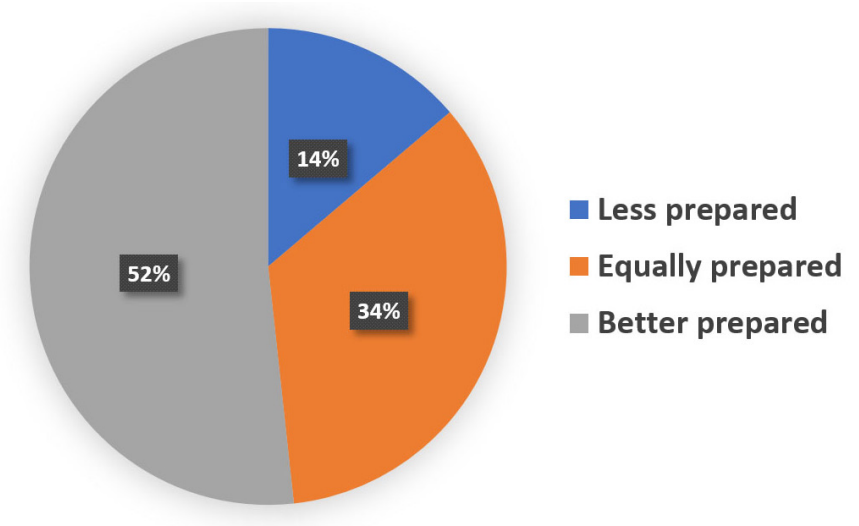
Percentage of teachers serving vulnerabilized student populations, including students of low socioeconomic status, at-risk of failing, and with learning and/or physical disabilities.



Percentage of teachers having difficulty accessing one or more essential resources.



Perceived preparedness to teach after experiencing the earthquakes and the COVID-19 pandemic.



Worst-event experienced as self-reported on the PTSD scale.