

Analysis of the psychological effects and coping strategies in puertorricans affected by hurricane maria

Análisis de los efectos psicológicos y estrategias de afrontamiento en puertorriqueños damnificados por el Huracán María

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ABSTRACT

Keywords:

Hurricane Maria, stress, anxiety, depression, damaged

Hurricane María severely impacted Puerto Rico, causing devastation to the population and resulting in significant human and material losses, leaving many families homeless. This research aimed to analyze the psychological effects and coping strategies of Puerto Ricans affected by this natural disaster. Method: A mixed-method, descriptive-correlational, non-experimental, and cross-sectional research design was used. Data were collected through the Post-Traumatic Stress Disorder (PTSD) Symptom Severity Scale, the Complementary Anxiety and Coping Strategies Scale for Risk Situations, and semi-structured interviews. The sample consisted of 385 participants, both men and women, aged between 16 and 65 years. Results: Pearson's correlation analysis revealed that the coping variable was positively and significantly correlated with stress symptoms ($r = 0.100$; $p < 0.049$), somatic manifestation ($r = 0.173$; $p < 0.001$), and the avoidance dimension of PTSD ($r = 0.193$; $p < 0.001$). These results suggest that coping strategies may be associated with an increase in anxiety and somatic manifestations. Discussion: The results indicate that coping strategies may increase the manifestation of anxiety and avoidance symptoms in the affected individuals. It is concluded that the most frequent psychological effects in this population are post-traumatic stress, anxiety, and depression. Therefore, it is essential to implement a comprehensive approach to psychological care, using appropriate and timely therapeutic strategies to address these conditions in those affected by Hurricane María.

RESUMEN

Palabras clave:

Huracán María, estrés, ansiedad, depresión, damnificados

El huracán María impactó severamente a Puerto Rico, causando devastación en la población y generando pérdidas humanas y materiales significativas, lo que dejó a muchas familias sin hogar. Esta investigación se propuso analizar los efectos psicológicos y las estrategias de afrontamiento en puertorriqueños damnificados por este desastre

natural. Método: Se utilizó un diseño de investigación mixto, descriptivo-correlacional, no experimental y transversal. La información se recopiló mediante la Escala de gravedad de síntomas de Estrés Post Traumático (TEPT), la Escala Complementaria de Ansiedad y Estrategias de afrontamiento frente a una situación de riesgo, así como entrevistas semiestructuradas. La muestra estuvo compuesta por 385 participantes, tanto hombres como mujeres, con edades entre 16 y 65 años. Resultados: El análisis de correlación de Pearson reveló que la variable de afrontamiento se relacionó positivamente y de manera significativa con los síntomas de estrés ($r = 0,100$; $p < 0.049$), la manifestación somática ($r = 0,173$; $p < 0.001$) y la dimensión de evitación del TEPT ($r = 0,193$; $p < 0.001$). Estos resultados sugieren que las estrategias de afrontamiento pueden estar asociadas con un aumento de la ansiedad y las manifestaciones somáticas. Discusión: Los resultados indican que las estrategias de afrontamiento pueden incrementar la manifestación de síntomas de ansiedad y evitación en los damnificados. Se concluye que los efectos psicológicos más frecuentes en esta población son el estrés postraumático, la ansiedad y la depresión. Por lo tanto, es esencial implementar un enfoque integral en la atención psicológica, utilizando estrategias terapéuticas adecuadas y oportunas para abordar estas condiciones en los afectados por el huracán María.

Introduction

On September 20, 2017, Hurricane Maria hit Puerto Rico, one of the natural phenomena that has had the greatest impact in the island's history. Hurricane Maria passed through the entire island, that is, from north to south. With a trajectory that started in the southeastern region of the country, traveling through the central area (where the poverty corridor is mainly located), and exiting through the northwest (Segarra, 2018). This weather event had a severe effect on the social, economic and health aspects of the country. Puerto Rico faced human losses, losses of basic elements such as electric power, drinking water and communication (internet, telephones, etc.), food and gasoline shortages, absence of medical services, loss of homes and material goods among other aspects (Muñoz, 2018). Also, the situation turned out to be much more complex due to the low effectiveness of the state for the management of this phenomenon (Cordero, 2018), and the duration time of the consequences of the event (e.g. there are sectors that eight months after the event did not have electric power).

Hurricane María entered through the southeast region, where there is a strip of municipalities with high levels of unemployment and poverty, and moved up through the central area, where the island's most marked poverty corridor is located. As a reference, according to newspaper accounts of the hurricane's passage, 22 municipalities are mentioned where the eye of the hurricane passed through and, therefore, where it hit with the greatest fury. Of these 22 municipalities, 18 present poverty levels above the average in Puerto Rico, and in 12 of them more than half of the population reports income below the poverty line (Segarra Alméstica, 2018). This phenomenon caused serious socioeconomic consequences in Puerto Rico, including a significant increase in unemployment, as many companies had to reduce their staff due to the damage caused by the hurricane, and a massive migration to the United States, causing a lack of labor, as many highly trained professionals and businessmen left the island in search of better opportunities on the mainland, which further hindered Puerto Rico's economic recovery. These consequences also contributed to an increase in the level of poverty on the island.

The historical background of Puerto Rico's vulnerability to hurricanes, disaster prevention and recovery plans and programs, the impact of Hurricane María on the communities, the psychological effects or after-effects on the affected population, the measures implemented after the event, the humanitarian aid provided by government agencies and other national and international organizations, the main coping strategies of Puerto Ricans in the face of this catastrophe, as well as theoretical foundations, models and theories that explain the appearance of psychological disorders following the experience of this hurricane will be discussed throughout this paper.

Different psychological manifestations were identified in a population of Puerto Rican victims of different gender, age, purchasing power, and place where the hurricane hit; and thus, the situations experienced before, during and after the hurricane were compiled. The coping strategies implemented in the face of this extreme risk were also analyzed.

During the first moments or in the days following the disaster, fear and anguish predominate. In the months that follow, both survivors and rescue personnel experience feelings of sadness, irritability and frustration. Grief processes develop that disrupt the performance of those affected. In the long term, months or years after the disaster, most of the population returns to its previous functional level. However, some people maintain persistent symptoms of stress (Santiago et al., 2010, p.1).

"Natural disasters involve environmental destruction, psychological symptoms, material losses and human losses. Various elements can produce a high level of anxiety in the person, making it impossible for them to function properly" (Nina-Estrella, 2019, p.1). Natural disasters are events or phenomena resulting from natural processes of the Earth that can cause significant damage to human life, property and the natural environment. These events can be sudden or develop gradually, and can have devastating impacts on communities and the environment. Natural disasters can have various causes, and their magnitude and consequences vary according to the type of event and geographic location. Post-traumatic stress disorder (PTSD), depression, anxiety disorders, or suicide attempts are some of the pathologies observed in people affected by natural or man-made disasters.

According to the National Institute of Health (NIH), n.d. post-traumatic stress disorder (PTSD) is a mental health condition that some people develop after experiencing or witnessing a traumatic event. This episode can be life-threatening, such as war, natural disaster, car accident or sexual assault.

From a mental health perspective, the Pan American Health Organization (PAHO) establishes that emergencies and disasters involve a psychosocial disturbance that exceeds the treatment or coping capacity of those who live through it (PAHO, 2016). All natural disasters, and more specifically hurricanes, have the particularity of causing immediate material and economic deterioration that has a direct impact on people's lives, even leading in some cases to the disintegration of families and the community, as seen in the creation of transit shelters, relocation to less vulnerable areas for an indefinite period of time or, as a last resort, forced emigration from one country to another (Abeldaño & Fernández, 2016).

In the face of a critical scenario such as hurricanes, all sectors of the population are affected: children, youth, adults and the elderly (ECLAC, 2014). Particularly, when the child and youth population is disrupted by these events, the fastest and most pertinent psychological intervention measures should be taken, as they are a subset more vulnerable to acquiring the burden of psychological stress due to losses (Kaplow, n.d.). The same author points out that hurricanes, being predictable phenomena, allow parents more time for preparations. In this time of anticipation, children and adolescents take on a greater burden of distress and stress, as they observe the desperation of their parents or guardians. This will lead them to want information about what is going on, so they know what they will face. Thus, the attitude assumed by adults in the face of the arrival of the hurricane will contribute to a calm and tranquil attitude on the part of children and adolescents.

According to López and Castro (2019), in Puerto Rico, it is common to hear about intense hurricanes such as San Ciriaco (1899), San Felipe II (1928), Hugo (1989), Georges (1998) and, now, María (2017). These hurricanes, and the intensity of their winds and rains, caused devastating damage on the island; however, we have experienced storms and hurricanes that, although of lesser intensity, have also caused great losses, even without having made landfall.

Method

Research Approach

A mixed approach was used, defined by Hernández, Fernández and Baptista (2014), as a set of processes for collecting, analyzing and linking quantitative and qualitative data in a single study or a series of investigations to respond to a problem statement. Data collection is used to test hypotheses based on numerical measurement and statistical analysis in order to establish patterns of and test theories. From the questions, hypotheses are established and variables are determined; a plan is drawn up to test them (design); the variables are measured in a given context; the measurements obtained are analyzed using statistical methods, and a series of conclusions are drawn.

The central premise of mixed studies is that the integration of quantitative and qualitative approaches can provide a better understanding of research problems than either approach alone (Osorio & Castro, 2021). According to these authors, their complementarity allows the contrast of non-coincident results, which would lead to broader reflections and subsequent rethinking, aimed at offering more elaborate conclusions. It is considered that a method by itself can rarely be strong and comprehensive enough to have a broader spectrum of the object of study; and research with a mixed method favors obtaining more robust results through triangulation. The combination of methods and techniques allows for greater richness and variety in the information obtained. Triangulation of their results contributes to achieving validity. To the extent that the research participants perceive the problem to be solved and the researcher has sufficient attitudes to collect all the information and interpret their feelings, this will contribute to the credibility of the results (Piza et al., 2019).

The study was carried out in five phases: the first was the exploration, investigation and diagnosis of the problematic situation; the second included the field work, that is, the application of surveys and interviews, as well as the evaluation of the instrument, accompanied by the drafting of the field report. The third phase consolidated the processes of action, reflection and planning, which led to the critical-reflective analysis of the findings and the development of a framework for reflection. In the fourth phase, the doctoral thesis was written as such and its defense was carried out; finally, the results of the study were synthesized in this article, which will be presented to the scientific community.

Population and Sample

The population was made up of Puerto Ricans affected during Hurricane Maria, according to the Central Intelligence Agency (CIA) World (2019), the population present at the time of the event was 2,792, 242 inhabitants. From this figure, the sample was calculated using the finite population formula, which resulted in a value of $n=385$. In other words, the sample considered for this study was 385 people from eighteen municipalities in Puerto Rico: San Juan, Caguas, Ceiba, Luquillo, Fajardo, Manatí, Carolina, Aguada, San Sebastián, Ponce, Cidra, Bayamón, Jayuya, Santa Isabel, Camuy, Arecibo and Hatillo.

Instruments

In the quantitative phase of the research, the following was used the Coping with Extreme Risks Scale of Lopez and Marvan (2004) by López and Marvan (2004). A Likert scale questionnaire containing 26 items grouped into two factors: active coping and passive coping. It was validated by the authors using Cronbach's Alpha coefficient, reaching an internal consistency index equivalent to 0.81, which indicates a high degree of reliability. In addition, the Post-traumatic Stress Disorder (PTSD) Symptom Severity Scale, designed by Echeburúa et al. (1997), was implemented, which consisted of 26 items,

distributed in three subscales: Reexperiencing, Avoidance and Increased Activation. This instrument showed a high internal consistency of 0.91 according to the Cronbach's Alpha coefficient determined by the researchers. The scale described above made possible the quantification of post-traumatic stress disorder, both in the global scale and in the different subscales. It is based on the DSM-IV diagnostic criteria and has been validated in a large sample of both patients and the normal population (Echeburúa, et al., 1997). In addition, these data were completed with the application of the Complementary Anxiety Scale of Echeburúa et al., (2016).

Meanwhile, the qualitative phase was characterized by the use of semi-structured interviews, validated through expert judgment. The interviews were conducted within the scheduled timetable. Each participant took between 1 and 2 hours to answer the ten questions contained in the interview guide. All agreed to the conditions of their participation and agreed to sign the informed consent form, in which they were also warned of the ethical principles governing the research process, as well as the risks involved in this type of encounter (high possibility of the informant having a flashback of the event or remembering moments of the disaster that make him/her feel sad or angry).

Results

Regarding post-traumatic stress symptoms, frequency distribution analysis revealed the following data. Of the total $n=385$, 186, i.e. 48.3% were female, and 199, representing 51.7% of the sample, were male. As for the Post-traumatic Stress Symptom Scale instrument, it was found that 33.8% of the participants manifested symptoms of re-experiencing, that is, nightmares, feelings similar to those of the day of the event and psychological discomfort when remembering the hurricane. Likewise, 96.6% of the participants stated that they did not have avoidance behaviors inherent to the phenomenon experienced. Well, they continue a normal life and remember the incident without pain. In this order, increased activation was reported in 15.2% of the sample studied. Victims reported symptoms such as insomnia, anger attacks and lack of concentration after the impact of Hurricane Maria.

On the other hand, the Complementary Scale of Somatic Manifestations of Anxiety revealed the presence of symptoms such as dyspnea in 16% of the participants, headache in 13, 12%, tachycardia in 9.4%, dizziness in 68% and nausea in 12, 12%. Regarding coping strategies, the Extreme Risk Coping Scale, 26% of the respondents showed passive coping and 74% active coping. The chi-square test was not significant ($p = 0.916$), so it is inferred that coping strategies are assumed in a similar way by both genders.

Active coping grouped the first thirteen items of López-Vázquez and Marvan's (2004) Extreme Risk Coping Scale. By means of which it was found that the majority of participants exercised active coping before the arrival of the hurricane and also in the days, weeks and months that followed. Men stood out in this regard; more than half of the male participants between the ages of 15 and 35 said they had a plan for dealing with this type of event. Sometimes the intervened subjects followed their planning, sought professional help, analyzed the severity and circumstances of the problem with its future implications, modified their environment (their home and community) to adapt to the changes left by the hurricane and participated in civil prevention activities.

On the other hand, the women used "rarely" active coping strategies focused on seeking a solution: asking for professional help, trying not to rush, carefully assessing the situation and talking to their family members. However, in the group of women who were evaluated, the vast majority resorted to passive coping strategies: not thinking about the problem, taking a walk to distract themselves, ignoring the seriousness of the situation, clinging to faith and praying for a miracle, among others. It is worth mentioning that this

is not the first time that a study on natural disasters has revealed this result in the female population. After Hurricane Katrina, many women, including girls, adolescents, young women and adults, showed passive coping as a psychological resource to cope with the shock caused by that natural disaster; since the need to maintain their sanity and not panic led more than 36% of women to block their emotions. This according to Rhodes et al., (2010, p.242).

Regarding Pearson's correlation test, the variable Coping correlated positively and significantly with the variables Symptoms ($r = 0.100$; $p < 0.049$), Somatic Manifestation ($r = 0.173$; $p < 0.001$) and with the variable Avoidance, a dimension of Post Traumatic Stress Disorder (PTSD) symptoms ($r = 0.193$; $p < 0.001$). As expected, the variable Symptoms (total responses of the 17 items) was significantly correlated with its components Re-Experiencing ($r=0.502$; $p<0.000$), Avoidance ($r =0.732$; $p<0.000$) and Activation ($r=0.444$; $p<0.000$). The Somatic Manifestation variable correlated negatively and significantly with the Re-Experimentation variable ($r= -0.153$; $p< 0.003$) and positively with the Avoidance variable ($r=0.137$; $p<0.007$). It is important to note that the Symptoms variable represents the totality of PTSD symptoms assessed in its three dimensions (Re-experiencing, Avoidance and Activation) and therefore it is logical to expect very high relationships between these variables.

Within the psychological effects, a high percentage of Puerto Ricans with anxiety was also revealed. Disorder evidenced by symptoms such as: headache, shortness of breath, dizziness, nausea, chest discomfort, tremors, numbness of the hands, feeling of unreality, fear of going crazy and fear of dying (Hernández, 2022). By virtue of the studies reviewed and their subsequent comparison with the experiences of the participants, it was concluded that the psychological impact caused by "Maria" was exacerbated by the slow response of the government, the deficiencies in basic services, the experience of recent and distant traumas, the personality of each individual, the existence of chronic mental or somatic illnesses, the poor planning of families, and the degree of vulnerability of many people who were in no way prepared to go through such a forceful experience.

The anguish experienced by residents of eighteen municipalities of Puerto Rico became even stronger as they felt the abandonment of government agencies, the poor organization of institutions to meet their needs, such as: the cumbersome protocol to request housing repairs, the collapse of psychological care lines and the delay in some municipalities to rebuild streets and schools (Rivas, 2018). Despite the efforts of the Federal Emergency Management Agency (FEMA) to immediately attend to the affected families and provide them with supplies, water, food and medicine, the psychological damage to the population appeared almost immediately, with people experiencing high blood pressure, panic attacks, fainting or dizziness, along with other anxious manifestations after the event.

Puerto Ricans with a history of similar trauma exhibited better active coping compared to those who had never gone through a similar experience. Negative emotions: sadness, helplessness, guilt and anger primarily in young women, who were found to be more vulnerable than the male population. This result was also visualized in studies of Hurricane Harvey victims (Amos Nwankwo et al., 2021, p. 22), who showed a high degree of post-traumatic stress, anxiety and depression after the hurricane, despite having received emergency psychological help.

Again, it was reaffirmed that the ability to accept and cope with a traumatic event depends on: the psychological structure of each individual, support networks, their capacity for resistance and resilience, previous experience of trauma or prolonged exposure to extreme risk situations. As in other research, the vulnerability of the

population has been a key variable in analyzing the effectiveness of coping measures. During Hurricane Irma in 2017, the municipalities of Culebra and Vieques were the most affected, registering more than 300 injuries, twelve deaths and hundreds of millions of dollars in material losses, including hours without electricity and drinking water, which lashed the population of these places for weeks (Sin comillas, 2017).

The aspects that distinguish Hurricane Maria from other similar hurricanes (hurricanes George, Irma, Katrina, Harvey, Sandy and Mitch, among many others), is that the Puerto Rican population was preparing for a strong hurricane, but it was not known that it would have such a devastating effect, the days prior to the phenomenon many supermarkets were empty, due to the high demand for food and bottled water, the nervous purchases of the residents of the Island were exacerbated by the uncertainty of not knowing if their reserves would be enough (El Nuevo Día, 2017). Not two weeks had passed since Hurricane Irma when Puerto Rico had to face a new natural disaster; this was also a determining factor in the psychological effects produced in the Caribbean population.

However, some studies highlight that the incidence of post-traumatic stress, anxiety and depression in the victims of "Maria" was not as high in relation to other hurricanes such as Katrina, Michael and Harvey, which, although they were category four, left huge material and human losses in the United States (Marca, 2017). This research found a high degree of resilience on the part of the respondents, as well as good coping skills. These characteristics can be attributed, as Vargas and Coria (2017) explain, to the fact that they are mass events already experienced by the population and even form part of their culture. As a result, many establish more assertive family contingency plans and seek psychological mechanisms to alleviate the emotional impact: deep breathing, conversations, self-comfort, analysis of the situation and how to get out of it.

To propose actions to avoid or mitigate the adverse psychological effects and to reinforce effective coping strategies for future hurricanes in the Puerto Rican population, this research suggests. As well as adopting community programs to promote resilience in sectors considered vulnerable. This involves taking talks, workshops and support groups (social workers) to the communities most affected by Hurricane Maria, strengthening the self-esteem of people who lost their homes, helping to rebuild neighborhoods, schools and avenues. That is to say, to promote the integration of human communities in the recovery of their own spaces, since this will serve to strengthen the sense of belonging and to move away from the idea that everything must be done by the government alone. It is important to highlight the vital importance of this strategy to prepare the Puerto Rican population for similar events that may continue to occur in view of the increasing climate change and the island's location, which makes it prone to phenomena of this nature.

Reinforce environmental education in the inhabitants of Puerto Rico, this would imply creating awareness campaigns in elementary schools, high schools and universities about the consequences of hurricanes and how to mitigate their social, economic and psychological effects. Considering the relevance of education as an entity that transforms society and creates progress. As highlighted by Asencio-Pagán (2018) in his study on the resilience of vulnerable communities in Mayagüez to the effects of Hurricane María, it is urgently necessary to improve plans that already exist such as the Family Contingency Plan offered by FEMA, which quantifies damaged homes and evaluates which families to provide with credits for the restoration of their homes and furnishings.

Propose improvements to the electrical system, since María damaged more than 80% of the electrical grid, leaving a large part of the municipalities in the dark for months (Sánchez and Mazzei, 2022). This study also recognized the importance of investing in a good electrical infrastructure to withstand future hurricanes. The energy supply is key to

maintaining the Island's commercial dynamics, the medical-health system, education and industrial activity. Likewise, mechanisms must be devised to have sufficient fuel reserves available for possible future natural disasters, since more than half of the deaths caused by Hurricane Maria were due to a lack of gasoline to transport the sick and injured, according to Nina-Estrella (2020).

Discussion and Conclusions

In order to support the results obtained from the descriptive statistical analysis, we the most significant findings were then compared with the literature review, the which included the consultation of scientific articles, master's theses, doctoral dissertations, the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (MDS-5), books, reports, among others. One of the most immediate psychological disturbances generated by a natural disaster or any other trauma is re-experiencing, conceived as the recreation of the event through conversations, dreams, flashbacks, situations that evoke the trauma.

In this study a significant number of participants exhibited reexperiencing symptoms. That is, because the majority chose to block these memories as a self-protection mechanism. On the other hand, the minority preferred to keep these memories in mind, recreating the traumatic scenes more frequently, in order to assimilate what happened, in order to subsequently overcome it. In similar studies of psychological effects in populations affected by hurricanes, it was found that women are the most likely to use avoidance as a coping strategy to relieve the tension and stress generated by the event, according to research conducted by Rhodes et al. (2010), on the impact of Hurricane Katrina on mental health, it was found that women were the most affected psychologically and that avoidance responses were linked to high levels of depression and anxiety. In this aspect, the differences were not significant, only a 2.2% difference between men and women.

Sleep disorders are due to noradrenergic projections from the locus ceruleus to the prefrontal cortex, amygdala, hippocampus and hypothalamus, which show increased activity in response to a stressor (Strawn, 2008). This activity mobilizes energy resources for the fight or flight response. Norepinephrine, for example, increases heart rate and blood flow to skeletal muscles, and triggers the release of glucose. In turn, from the lateral hypothalamus, the orexinergic system promotes the activation of the cerulean locus, leading to changes in the regulation of sleep/wakefulness, emotion and cognition in response to fear (Zegarra and Chino, 2022). These physiological responses involve the maintenance of PTSD symptoms such as SNS hyperarousal, conditioned fear reinforcement, nightmares, flashbacks and others.

After Hurricane Maria, it was not only the victims who showed signs of post-traumatic stress. Some staff members of the rescue team as well. According to Vázquez-Algarín (2021), the manifestations of stress and anxiety spread to those in charge of rescuing the population. People suffered shortages of basic necessities, lack of electricity, injuries and the spread of diseases due to the sanitary conditions of the shelters. A reality that dismayed the medical and rescue team, who felt very overwhelmed and powerless by the situation, as they were unable to do more than they could.

In connection with seeking professional help, the government activated a hotline to receive calls from people in critical situations, with serious injuries, with injured or ill

family members, with suicidal ideations and others. The rescue efforts were carried out by the Federal Emergency Management Agency (FEMA), in addition to the collaboration of other institutions such as INSPIRA to provide psychological care to those affected, the Red Cross, and the Addiction and Mental Health Services Administration (ASSMCA), which activated the PAS line, available 24 hours a day, 365 days a year.

It is concluded that the most common psychological effects in Puerto Ricans after Hurricane Maria were those associated with post-traumatic stress syndrome as defined by Kardiner (1941). Specifically, the avoidance of conversations, situations related to the event or memories, as a mechanism specific to each individual to minimize the emotional distress caused by the catastrophe. It was also revealed that many of the participants suffered serious physical, material and emotional damage due to the loss of family members, acquaintances and relatives who died as a result of the lack of medical attention and basic services in the weeks and months following the passage of Hurricane Maria.

This research proposes to continue investigating the psychological effects of Hurricane María. The government, foundations and international organizations should continue with prevention programs, as well as with the social aid provided to the municipalities most affected by this event, so that they can recover their spaces, resume the rhythm of their lives, successfully overcome this traumatic episode, develop a persistent and resilient attitude over time, accompanied by an awareness of the abrupt environmental changes that are coming.

The validation of the coping scale in the Puerto Rican population was achieved by calculating Cronbach's Alpha Coefficient, which yielded a value of 0.873, implying a very high reliability of this instrument. It is worth mentioning that this instrument was also validated by its original authors, Dr. Esperanza López Vázquez and Dr. María Luisa Marván (2004), who found it valid and reliable when applied to a population of people in Mexico living in situations of natural and industrial risk. Likewise, the development of this work allowed the validation of the coping scale when it was used with a group of victims of Hurricane Maria, who also constitute a population exposed to natural disaster risks.

This study demonstrated that the occurrence of a natural phenomenon such as Hurricane Maria leaves a strong social, economic and psychological impact on the population that experiences it, but especially on those with the highest degree of social vulnerability. The government of Puerto Rico does not have the capacity to respond effectively to these events due to its fiscal crisis; the aid allocated by the Federal Emergency Management Agency is not sufficient and involves a cumbersome protocol that slows down the housing reconstruction process. It was also evident that, despite the bureaucracy of the state government and its agencies, most residents of Puerto Rico manage useful and assertive coping strategies, that is, there is a collective culture on how to survive hurricanes.

The latter is an advantage from a socio-health point of view, as it helps to prevent prolonged mental health crises and leads the population to adopt increasingly effective measures to face, survive and overcome adverse natural events that jeopardize their stability and integrity.

This study on the psychological effects of Hurricane Maria on Puerto Ricans revealed that the most common effects were those associated with post-traumatic stress syndrome, especially the avoidance of memories and conversations related to the event. Many participants suffered physical, material and emotional damage due to the loss of family members and the lack of medical care and basic services in the aftermath of the hurricane. High levels of anxiety were also identified, reflected in physical and emotional symptoms such as headache, dizziness, fear of dying and panic attacks.

The psychological impact was exacerbated by the government's slow response, inadequate services and neglect of vulnerable populations, such as people with chronic illnesses, previous trauma or limited resources. Despite the efforts of FEMA and non-governmental organizations, assistance was insufficient in the face of high levels of post-traumatic stress and anxiety. The most vulnerable population, such as young people and people with a history of trauma, showed a higher degree of emotional distress.

In terms of coping strategies, it was observed that people who adopted active strategies, such as planning and seeking professional help, showed better adaptive capacity. On the other hand, many women resorted to passive strategies such as ignoring the problem or clinging to faith. The importance of resilience and preparedness for future events was highlighted, which should be fostered through community and educational programs that strengthen self-esteem and the integration of communities in recovery.

It was proposed to improve the infrastructure, especially the electrical system, and to continue with long-term psychological support to mitigate the emotional effects of the hurricane. The study also validated a coping scale applied to the victims, with high reliability, suggesting that coping strategies are key to psychosocial recovery. Despite the difficulties and lack of government resources, Puerto Ricans show a collective ability to cope with natural disasters, which contributes to reducing prolonged mental health crises.

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Conflict of interest

The author declares that she has no conflict of interest.

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