

Climate Change and Bereavement: The Mental Health Toll of Hurricane Maria on Puerto Rican Communities

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Abstract Hurricane Maria forever changed the lives of countless Puerto Ricans, leaving behind not just physical destruction but deep emotional scars. While much attention has been given to the damage to infrastructure, far less focus has been placed on the emotional and mental toll of the disaster, particularly the experiences of grief and loss. This commentary sheds light on the urgent need to study bereavement in the aftermath of Maria, exploring how the storm's impact uprooted lives and forced many to migrate to the U.S. mainland. For these displaced individuals, they face language barriers, limited access to healthcare, economic hardships, and the weight of leaving loved ones and a homeland behind. Many are at risk of developing Prolonged Grief Disorder (PGD), as unresolved trauma and loss linger without the support they need. The absence of culturally sensitive mental health care only deepens the struggle. We argue for urgent attention to culturally sensitive mental health interventions, improved screening initiatives and mental healthcare infrastructure, and policy initiatives tailored to address the prolonged psychological effects of displacement and bereavement. Addressing these gaps is crucial to fostering resilience and supporting the recovery of affected communities.

Keywords: *Climate change disasters, Hurricane Maria, Prolonged Grief Disorder, Migration, Mental Health*

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1. Introduction

Climate change is broadly defined as a long-term change in weather patterns that impacts the built environment in unpredictable ways with devastating consequences [1]. Many areas of the world have seen weather patterns that are significantly different over the past decade, which has taken a major toll on humans and non-humans alike [1]. Changes in the Earth's weather pattern have been well documented [2,3], and urban cities are seen as the focal point for climate-related devastations. The recent storms, wildfires, and droughts are just a few examples that have been highlighted in recent years [4]. Climate change is modifying the local environment in coastal areas around the world, resulting in an already fragile and weakened infrastructure in these areas [5]. This weakened state leaves citizens unprepared for the devastation of massive hurricanes that wreak havoc, leaving displaced citizens with limited resources. Natural disasters such as hurricanes Irma and Maria, deemed Category five (5) hurricanes, are becoming more common across the United States and its territories. Hurricane Maria hit only two weeks after Irma severely damaged the infrastructure in Puerto Rico (PR) in September 2017 [6]. With an estimated \$90 billion in damages, Maria ranked

as the third most costly tropical cyclone in the United States since 1900 [7]. Hurricane Maria forced the migration of thousands of Puerto Ricans to the mainland United States and many Puerto Rican families settled across several cities in the state of New York and Florida [7,8] where they were met with even further devastation, i.e., limited ability to communicate in English, limited housing options, inability to find employment, lack of access to healthcare, unfamiliar culture, and yearning for a place to belong [9]. The number of excess deaths linked to Hurricane Maria in Puerto Rico is over 70 times higher than the initial official estimate [7]. Even though the recorded hurricane-related death toll was at 64, there was a 62% increase in the mortality rate from September 20 through December 31 in 2017 attributed to delays and disruptions in the healthcare system, as was observed during hurricanes Katrina, Harvey, and Superstorm Sandy [7]. Individuals with chronic illnesses and disabilities are highly vulnerable. In the aftermath of such calamities, where there is a paucity of healthcare professionals and resources, disaster-related trauma diagnosis can be completely disrupted. The effects of losing family members, homes, and communities during sudden traumatic events are associated with psychological conditions, such as bereavement disorders. Due to a paucity of healthcare professionals and resources, bereavement disorders are undiagnosed among these

individuals. There is a lack of bereavement disorder-related studies in this population, given that it is at high risk of suffering from Prolonged Grief Disorder (PGD).

2. Mental Health Toll and PR Communities

From 2015 to 2022, Puerto Rico saw a total of 556,284 people migrating off the island [10]. Migration remained relatively stable from 2015 to 2017, with around 90,000 people leaving annually. However, in 2018, there was a sharp increase to 129,438, likely due to the aftermath of Hurricane Maria in 2017 [10]. The data from the American Community Survey indicates shifting migration trends across different age groups, with younger adults and children migrating more during the hurricane's aftermath, while older populations saw a gradual increase later [10]. This migration was fueled by a major economic crisis in Puerto Rico after Hurricane Maria [8], which impacted resources to rebuild, employment, transportation and communication infrastructure, and the healthcare system.

In 2018, approximately 34% of the total migrants from PR spoke English very well, 13.4% spoke only English, and 12.1% did not speak English [10]. Over time, the percentage of those who only spoke English increased significantly, reaching 23.6% in 2022, while the proportion of non-English speakers decreased to 7.9% [10]. This suggests a gradual increase in English proficiency among Puerto Rican migrants. The data on educational attainment for Puerto Rican migrants indicates a shift towards higher educational attainment among migrants over the years, with a notable increase in those holding a Bachelor's Degree or higher [10]. Employment data shows a shift in unemployment as it declined over the years, highlighting significant changes in employment trends over this period, with employment showing peaks, while unemployment generally declined [10]. In this population of migrants from PR, the percentage of people above 125% of the poverty level increased from 54.2% in 2015 to 66.5% in 2019 [10]. This socioeconomic shift in patterns of migration to the mainland reflects an evolving demographic profile marked by greater English proficiency, higher educational attainment, and improved economic stability among Puerto Rican migrants as they go through the process of acculturation in the US mainland. While these are positive improvements for Puerto Ricans, they face significant life challenges.

Displaced populations often face challenges accessing healthcare, especially in new regions where healthcare systems may be unfamiliar. Migrants may experience interruptions in ongoing treatments or preventive care, leading to worsened health outcomes. The data shows that while English proficiency among Puerto Rican migrants improved over time, a portion of the population still has limited English skills [10]. Language barriers can lead to serious complications in accessing healthcare services, following medical instructions, and navigating insurance systems. These challenges contribute to the mismanagement of health conditions and reduced health literacy [11]. The trauma of displacement, particularly

after disasters like Hurricane Maria, may lead to acute and chronic mental health issues, with migrants often facing stress, anxiety, and depression due to the pressures of resettlement, loss of community, and social network disruptions [12]. These impacts on individuals are compounded by the loss of family members and close friends. Assistance with navigating the US healthcare system and mental health services may be critical for this population, particularly for those who face prolonged recovery from the disaster.

Prolonged grief disorder (PGD) has been reliably differentiated from other bereavement-related mental health conditions like depression, anxiety, and post-traumatic stress disorder (PTSD), by validated diagnostic criteria, distinctive phenomenology, etiopathology, and treatment responses [13]. It was added as a new diagnostic entity in the International Classification of Diseases (ICD) and the Diagnostic and Statistical Manual of Mental Disorders (DSM) [13]. PGD is a relatively new mental health disorder diagnosis. There is a lack of awareness about this illness among communities and it has not been studied among the Puerto Rican population.

PGD is diagnosed when a person experiences intense and persistent grief for at least 12 months (in adults) or 6 months (in children), causing significant disruption in a person's ability to function in their daily life [14]. If untreated, PGD can lead to further mental health issues, such as depression, anxiety, or substance abuse. PGD is marked by an intense and persistent longing for the deceased, accompanied by a preoccupation with the loss, deep emotional pain, and difficulty moving on with life. Individuals may feel that life is meaningless, withdraw from social interactions, and struggle to experience positive emotions [13,14]. Guilt, self-blame, and confusion about one's identity without the loved one are common, along with physical symptoms like fatigue. These symptoms persist and can significantly impair daily functioning and emotional well-being [13].

PGD research studies following natural disasters have a critical role in creating health equity by informing early intervention strategies to identify high-risk individuals and creating tailored mental health services, community support initiatives, and policy-level changes. Such research advances the rigorous conceptualization of PGD interventions in the aftermath of climate change calamities. The knowledge gained from conducting research on this project to fill the gap will help inform current approaches used to predict and address problems related to PGD post-natural disasters.

The research questions that could be guiding such studies could seek the answers to these questions; 1) What are the characteristics of the sample population of bereaved individuals impacted by Hurricane Maria?; 2) What is the prevalence of prolonged grief disorder in the sample of bereaved individuals impacted by Hurricane Maria? 3) What are the common risk factors associated with prolonged grief disorder among the sample of bereaved individuals impacted by Hurricane Maria? 4) How are individuals coping with the bereavement process, for example, social support, psychotherapy, or pharmacotherapy?

3. Conclusion

The inadequacies in healthcare infrastructure in Puerto Rico following Hurricane Maria were shown by how delays in healthcare delivery contributed to higher mortality rates [7]. These gaps reflect broader systemic weaknesses that need to be addressed, including the need for emergency healthcare planning, resource allocation, and disaster response training for healthcare professionals in disaster-prone areas. Adding to this, the cultural challenges faced by Puerto Rican migrants adjusting to life on the U.S. mainland, combined with trauma from the disaster, contribute to psychological stress, depression, and anxiety. The interplay between cultural dislocation and the lack of mental health resources further intensifies these issues. This commentary elucidates the need for mental health services in disaster recovery, particularly for those suffering from Prolonged Grief Disorder (PGD). Mental health awareness and education can be expanded in Puerto Rico and among Puerto Rican migrants, particularly focusing on the need to train healthcare providers to diagnose and treat PGD. A research study filling this gap can provide policy recommendations to improve disaster preparedness and recovery resources, particularly in the areas of healthcare, mental health services, and social support. It could also emphasize the need for targeted investments in climate-resilient infrastructure, as well as community-based mental health initiatives to support displaced populations. These interventions could minimize immediate loss of life due to the direct impact of natural disasters, and improve the quality of life of survivors.

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Statement of Competing Interest

The authors have no competing interests regarding this paper.

List of Abbreviations

PR – Puerto Rico
 PGD – Prolonged Grief Disorder
 ICD – International Classification of Diseases
 DSM – Diagnostic and Statistical Manual of Mental Disorders
 PTSD – Post-Traumatic Stress Disorder
 CENTRO– Center for Puerto Rican Studies

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