POLICY ANALYSIS

Public Health and Mental Health Implications of Environmentally Induced Forced Migration

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ABSTRACT

Climate change is increasingly forcing population displacement, better described by the phrase *environmentally induced forced migration*. Rising global temperatures, rising sea levels, increasing frequency and severity of natural disasters, and progressive depletion of life-sustaining resources are among the drivers that stimulate population mobility. Projections forecast that current trends will rapidly accelerate. This will lead to an estimated 200 million climate migrants by the year 2050 and create dangerous tipping points for public health and security.

Among the public health consequences of climate change, environmentally induced forced migration is one of the harshest and most harmful outcomes, always involving a multiplicity of profound resource and social losses and frequently exposing migrants to trauma and violence. Therefore, one particular aspect of forced migration, the effects of population displacement on mental health and psychosocial functioning, deserves dedicated focus. Multiple case examples are provided to elucidate this theme. (*Disaster Med Public Health Preparedness*. 2019;13:116-122)

Key Words: Global Warming, Human Migration, Population Surveillance, Public Health, Mental Health, Climate Change

INTRODUCTION

The Intergovernmental Panel on Climate Change, set up under the auspices of the United Nations, has assessed and summarized the scientific evidence on human contributions to climate variability. Their report, developed by an expansive cadre of international experts through the most thorough peer review process in the history of science, convincingly documents the global impacts of climate change on social-ecological systems including the environment and human habitation.[1] Their scientists have grappled with the intricacies and feedback loops characterizing social-ecological systems, human and societal contributions to the progression of climate change, critical "tipping elements" in the climate system that arise abruptly at certain temperature thresholds,[2] and the globally networked nature of climate risks and their differential distribution.

Specific to public health, the US Global Change Research Program released a comprehensive assessment of human health impacts of climate change in the United States.[3] Climate-related public health effects include temperature-related illness and mortality, respiratory and related ailments associated with air quality, changes in the range and distribution of vector-borne diseases, proliferation and intensification of natural disasters and extreme events, effects on water-borne diseases, food insecurity secondary to droughts and crop failures, and detrimental effects on mental health.[3] Furthermore, a multitude of excellent peer-reviewed research and review articles have shed new light on the global distribution of climate change impacts on human health, particularly in an international development and security context.[4] These expert-authored and richly referenced compilations of climate-related public health consequences for United States citizens, as well as global populations, provide a valuable starting point for exploring the scope and severity of public health consequences of ongoing climate change, particularly in the developing world.

The present analysis extends the discourse into the realm of environmentally induced forced migration in developing nations, a phenomenon that is prominent, rapidly worsening, and severely impacting health security and national security in both developing and developed countries.[5] More precisely, within the overarching context of public health consequences, this discussion highlights the mental health and psychosocial effects of climate change–related population displacement.

The International Organization for Migration, a United Nations–related organization, defines *environmentally induced migration* as: "…persons or groups of persons who, predominantly for reasons of sudden or progressive change in the environment that adversely affect their lives or living conditions, are obliged to leave their

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habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad."[6] This phrase is now preferred to the older, widely popularized term *environmental migrants* that was introduced by Myers to signify "people who can no longer gain a secure livelihood in their erstwhile homelands because of drought, soil erosion, desertification, and other environmental problems. In their desperation, they feel they have no alternative but to seek sanctuary elsewhere, however hazardous the attempt. Not all of them have fled their countries; many are internally displaced. But all have abandoned their homelands on a semipermanent if not permanent basis, having little hope of a foreseeable return."[7] In policy documents, popular science, and the public media, the term *climate refugees* has gone viral in recent years.[8] This concept illustrates the dramatic consequences on human livelihoods, which in a growing number of cases become untenable. However, the term is not recognized by the United Nations High Commissioner for Refugees because it lacks a scientifically and legally sound rationale.[9] Therefore, in this essay we use the conceptual framework of environmentally induced migration.

CLIMATE CHANGE DRIVERS OF DISPLACEMENT AND FORCED MIGRATION

Climate change acts in a complex and compounding manner to affect human mobility patterns and trigger population displacement.[5] Expanding upon the earlier work of Warner and Martin,[10] multiple examples are presented below.

Rising ocean and land temperatures are well documented. New global sea and surface temperature records have been set for each of the three consecutive years, 2014 through 2016. Rising land temperatures create drying trends, desertification, and droughts, leading to food insecurity and related public health crises in much of the developing world where crop irrigation is inadequate. The situation may become so severe that famine declarations are issued. Increasing ocean temperatures have shifted the geographic patterns, migratory feeding behaviors, and ocean depths of fish populations, which affect the coastal populations that rely on fishing for their diets and economic subsistence. These same warming trends have affected other environment-dependent livelihoods such as forestry.

Rising sea levels, related to permafrost melt and loss of polar ice, are progressively reducing the inhabitable land surface area along continental coastlines, barrier islands, and especially, many of the world's 57 small island developing states (SIDS).[11] For SIDS nations with flat terrain and minimal vertical elevation above sea level, and for low-elevation coastal zones and deltas, the predicted one meter minimum rise in global sea levels poses a realistic existential threat and already leads to population displacement.[12]

Increasing natural disaster frequency and severity as a consequence of climate change will boost the numbers of persons who are displaced when these extreme events occur. Currently observable trends include elevated risks for climate-related natural disaster occurrence, increased intensity of disaster hazards leading to more severe destruction of the built environment and human habitats, and greater resource losses. While many disaster-displaced citizens are able to return to their home communities and rebuild in the postimpact recovery phase, current climate trends suggest the future likelihood of more megadisasters that destroy infrastructure and livelihoods and render the impact zones uninhabitable.

Diminishing availability of vital natural resources and ecosystem services due to climate change impacts may serve as an impetus for economic and institutional failure, fragile statehood, population relocation, and conflict. As the cases of Sudan and Somalia show, competition for scarce resources, goods, and services may evolve to the level of armed conflict and genocide. Out-migration may be dually driven by the needs to achieve a sustainable lifestyle and to escape violence. Moreover, environmental changes may worsen risks and increase dangers in active conflict zones. Climate and conflict consequences may synergistically deplete resources further. Climate-related natural disasters may impact populations already enduring the disruption of conflict. Food insecurity related to drying trends and global warming effects on fishing may generate conflict. The movement of climate migrants into already-inhabited areas will produce crowding and competition that may erupt into conflict.

Acceleration of rural-to-urban transplantation is occurring due to the constellation of environmental factors mentioned above. Relocation to urban settings exposes environmentally induced forced migrants to additional public health risks, such as crowding, poverty, ghettoization, urban community and gang violence, diminished opportunities for gainful employment, competitive disadvantage due to lack of urban employment skills, and a spectrum of unfamiliar urban physical hazards (ie, traffic, diminished air quality, pollution, and noise).

PROJECTING FUTURE EXACERBATION OF ENVIRONMENTALLY INDUCED FORCED MIGRATION

The climate change drivers of environmentally induced forced migration are likely to continue, worsen, and increase in complexity. Rechkemmer and colleagues previously described these dynamics: "In the late 1980s, humans' ecological footprint finally exceeded Earth's bearing capacity.[5] This marked the first time in history when humans globally managed the ecosphere in an unsustainable way. During these past decades, increasing natural resource scarcity and overexploitation, in particular soil and freshwater, have become a severe problem amplified by an unprecedented population growth rate."

As recounted by Brown, the Intergovernmental Panel on Climate Change had predicted as early as the 1990s that because of the combination of coastal flooding, shoreline erosion, and

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impacts on agricultural lands leading to food insecurity, population displacement and forced migration could become the most salient and visible human impacts of climate change.[13] The ultimate future scale of environmentally induced forced migration is yet unknown, but three influential expert assessments have projected that, by the year 2050, there may be an aggregate 150 to 200 million climate migrants worldwide.[13-15]

For a perspective with powerful public health implications, the projection of 200 million environmentally induced forced migrants by the year 2050 is more than twice the sum of current numbers of conflict-, violence-, and disaster-displaced persons: 85 million for 2015. The 85 million figure for 2015 is a composite from two primary sources. The Internal Displacement Monitoring Centre estimated that, in 2015, there were 40.2 million internally displaced persons (IDPs) who, as a result of violence and conflict, were forcibly displaced within their home countries.[16] The United Nations High Commissioner for Refugees enumerated an additional 21 million refugees worldwide who have sought safety and sanctuary in nations outside their home countries.[9] The United Nations High Commissioner for Refugees total of forcibly displaced persons, including IDPs, refugees, and "stateless persons," was 65 million in 2015. The Internal Displacement Monitoring Centre separately estimates the numbers of disaster-displaced persons, a number that is highly variable year over year; in 2015, the figure was just below 20 million. The total estimate of 85 million displaced persons for 2015 represents the sum of 65 million persons forcibly displaced by conflict and violence plus 20 million persons displaced by disasters. Even this daunting figure for 2015 will be dwarfed by the number of climate migrants projected for 2050.

POPULATION DISPLACEMENT AND MENTAL HEALTH—AND RELATED PUBLIC HEALTH—CONSEQUENCES

Among the myriad impacts of climate change on public health, environmentally induced population displacement is notable for its cascading effects on psychological health and well-being. The experience of forced migration is replete with individual and collective exposures to trauma and loss.

Exposure to trauma and violence is variable depending upon the nature of the displacement experience. In situations of armed conflict, the current predominant form of forced displacement worldwide, acts of aggression, combat, warfare, invasions, assassinations, massacres, kidnappings, and other forms of violence are common and instrumental in triggering displacement. In situations of natural disasters, populations are impacted by the physical forces of harm (high velocity winds launching projectiles, forceful ground-shaking from an earthquake, tsunami waves surging ashore). These traumatic exposures may be single or multiple, directed toward individuals or whole communities, and may occur at an instant in time or as a sequence of cumulative shocks over a prolonged period. Exposures to trauma in displaced populations are well documented to produce stress, psychological distress, and progression to diagnosable common mental disorders, including posttraumatic stress disorder, major depressive disorder, and generalized anxiety disorder, for those who have the most intense exposures. There are many other mental health outcomes associated with trauma exposure that are culturally defined. However, posttraumatic stress disorder is a prominently studied outcome of trauma and violence exposure in situations of conflict or disaster. Trauma exposure in the context of climate-related displacement deserves increased focus and study.

Exposure to loss is a defining attribute of population displacement of all types. Displacement may be considered, uncritically, as a life-changing episode involving the moment of leave-taking, or the departure, from one's home and community. This is a mentally riveting and psychologically anguishing life event. Indeed, the departure is a pivotal moment in the process, one that involves a multitude of profound and psychologically staggering losses. Material losses include home, lands, crops, tools, machinery, vehicles, and importantly, many sentimental personal possessions. Added to these monumental tangible losses, the instant of displacement is transformative across a series of psychosocial dimensions. Migrants lose their community affiliations with their multidimensional interpersonal ties and their networks of social support. Civic roles and social status evaporate. Critical survival mechanisms are abruptly severed: gone suddenly are the individual's vocation, livelihood, and occupational identity. Job skills that supported self and family may not be useful at the point of resettlement, which can lead to the loss of any semblance of economic stability.

For many forced migrants, this departure experience is irreversible. This is particularly true when population displacement is triggered by climate-related circumstances that cannot be remedied. The socioecological tipping point is reached—and exceeded—when, for example, there is no chance of returning to lands that can no longer sustain life or that are disappearing beneath the rising surface of the sea.

Appropriately, the psychological perspective does not view forced migration as an episode but rather as a prolonged process with multiple phases and ever-changing stressors. The moment of departure is a punctuation point and a marker of life change. Powerful stressors preceded and precipitated the moment of departure; hardships and uncertainties abound in the aftermath.

CASE EXAMPLES OF EXACERBATION OF PUBLIC/MENTAL HEALTH RISKS FOR VULNERABLE POPULATIONS IN DEVELOPING NATIONS

Case Example 1: Famine and Conflict in Drylands—South Sudan

Synopsis

Exposure to extreme climatic variability, severe droughts, and water scarcity further increases the already high risk of

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economic, political, security, and public health concerns. In recent years, climate change has aggravated the fragility of the country's statehood and stability, leading to violent conflict and forced migration.

Case Description

Exposure to extreme climatic variability poses threats of droughts and water scarcity to the people living in the Sudano-Sahel region within Sudan. Sudan is spread across an area of 250.6 million hectares, most of which consist of arid lands and desert. Most of the country faces frequent shortages of water, infertility of the soil, and repeated cases of drought.[17,18] Individuals with low income are in an exceptionally vulnerable state and face constant threats in the context of their personal and health security.

Climatic variability is said to affect the cultivation of approximately 12 million hectares of rain-fed, mechanized farmland and about 6.6 million hectares of rain-fed, conventional farmland. The pastoral and nomadic groups residing in the semiarid areas of Sudan are also affected by the recurring droughts. It is estimated that by the year 2060, warming will be between 1.5°C and 3.1°C during August and between 1.1°C and 2.1°C during January, on average. It is predicted that the rainfall will decrease up to 6 mm per month during the rainy season. These factors further increase the already high risk of economic, political, security, and public health concerns.[17-19]

Sudan continues to suffer from prolonged shortage of water. Frequent variability in rainfall patterns is more predominant in North Sudan, with a long-lasting effect on the agriculture and food security within the region. Unfavorable climatic conditions cause people to migrate and create political unrest. The worst impacts of the repeated droughts have been felt most on the central and northern states of northern Kordofan, northern and western Darfur, and the Red Sea and White Nile states.[20,21]

Some recent research has indicated that the most probable reasons for historical droughts have been rapid changes in the ocean temperature. Hence, the potential for such droughts continues for future generations. Desertification is the greatest environmental problem within Sudan. There is a high awareness within the academic community about the severity of the situation. The United Nations Environment Programme has identified three types of desertification processes in Sudan[22]:

a) Climate-based conversion of land to deserts. The pattern of rainfall in the region leads to drastic climatic changes. Trees and vegetation that are not resistant to drought eventually die. This is more common in northern Darfur and northern Kordofon.

b) Degradation of existing desert environments. At least 29% of Sudan is true desert. However, a few areas partially consist of wetlands. Nevertheless, based on the analysis by United Nations Environment Programme, most of Sudan is found to be severely degraded.

c) Conversion of land from semidesert to desert due to human action. Overexploitation of the semidesert regions within Sudan and their conversion to dry lands has been a common problem in Sudan. This is facilitated by excessive deforestation of the land.

The most common impacts of changes in climatic conditions are forced migration, political unrest and violent conflict, and unequal distribution of income and opportunities for people. The population of Sudan has historically been migrant. Almost 40% of the population moves every single year. The migrant community resides in parts of the western and northern Darfur region. Seasonal migration by both men and women for cultivation is predominant in Sudan. Darfur holds a long history of migration to East Sudan, where migrants move for a period of 3 to 5 years to earn money and send the deposits back home.[22] However, since 1990, there has been a 5% annual increase in urban growth rates, which is more than double the national average. This has caused an increased burden on the urban infrastructure and resources. There has been an influx of people into urban slums. The urban slums account for about 86% of the total urban population. This situation has a direct bearing on the capacity of the earth and the need of the current and future generations.

Takeaway

Sudan is among the first nations that the United Nations officially identified as experiencing climate change–induced state failure, war, forced migration, and famine. The country is already a divided nation, and the current situation in the newly independent state of South Sudan has further deteriorated into a deep, ongoing humanitarian crisis. The Sudan case is telling a sad, yet powerful story about potential climate change impacts on public health and political order.

Case Example 2: Climate Change and Natural Disaster Vulnerabilities in Vanuatu

Synopsis

In 2015 the nation of Vanuatu, one of 57 small island developing states (SIDS), experienced a rapid sequence of impacts from four distinct natural hazards—earthquake, tsunami, volcano, and cyclone—compressed into a 1-month time frame. Most destructive among these events was Cyclone Pam, a record-setting tropical cyclone that was one of the year's most notable climate-related disasters. The direct pass of Cyclone Pam was extremely destructive and mental health needs were pervasive but largely unmet due to the lack of trained personnel.

Case Description

Vanuatu, an 80-island SIDS nation in the South Pacific, shares with its 56 small island counterparts a particular

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vulnerability to the effects of climate change, including susceptibility to multiple forms of natural disasters. SIDS nations face particular challenges for disaster risk reduction and sustainable development related to their physical isolation (as island states), geographic placement in areas known to be disaster hotspots, geology, small size, and, frequently, multiple-island composition.[7] SIDS have disproportionate risks for a range of natural disasters and sea level rise.

On February 20, 2015, just after midnight, Vanuatu was struck by a 6.4 moment magnitude (Mw) underwater earthquake with an epicentre situated just 145 km north of the capital, Port Vila. Vanuatu, sitting perched on the eastern margin of the Australia Plate, is a veteran of such seismic events. What distinguished February and March of 2015 was the juxtaposition of four natural hazard events within 1 month. The earthquake instantly triggered a small-scale tsunami and may have influenced the eruption of the twin-crater Ambryn volcano that occurred 1 day later.[23] This powerful eruption created a new vent in the caldera, produced the first visible lava flow in 25 years, and pumped ash into the high altitudes.

The main event, however, and the one linked to climate change, was the exceptionally destructive impact of Cyclone Pam making a direct pass over the islands on March 13, 2015. Cyclone Pam was the Southern Hemisphere's strongest tropical cyclone in 2015 and wind speeds reached 165 mph over Vanuatu.

The strange coincidence of four different types of disaster events all impacting Vanuatu within the span of 1 month left the island nation reeling in the aftermath. It was estimated that about 75% of the crops were destroyed, emergency food supplies were depleted, and 90% of the physical structures on the island were damaged or completely destroyed.

This concentrated set of disaster assaults caused significant mental health consequences in a nation with a minimalistic health care system and a severe health care worker shortage, particularly in the mental health sector (with a mental health treatment gap of 99.99% according to the World Health Organization). Given these circumstances, psychological distress was broadly reported but the nation had no mechanism to mount a mental health and psychosocial support response.[7] Recent studies focusing on Pacific island nations have indicated the need to prioritize mental health services to be able to confront the effects of trauma exposure and psychological distress associated with increasing frequency and severity of climate change–related natural disasters.[24,25] These studies also specifically highlighted the vulnerabilities of South Pacific SIDS nations to disaster-associated and environmentally induced forced migration.

Takeaway

SIDS are among the first nations to experience the severe effects of increasing frequency and severity of natural disasters. Because of their small size and geographic isolation, SIDS also have limited resources to meet the public health and mental health needs of their citizens who experience potentially traumatizing exposures to disaster impacts or who are forced to migrate due to climate change effects.

Case Example 3: "Double Displacement" From Armed Conflict and Flood Risks in Colombia

Synopsis

The intersection of conflict- and climate-induced streams of forced migration is complex and multidirectional. In 2010 and 2011, La Niña conditions resulted in flooding and mudslides throughout the nation of Colombia in South America. More than 1.5 million citizens were displaced by La Niña inundation, including many who had been previously displaced by armed conflict. For these individuals, the households that were damaged or destroyed by flood waters were actually their homes-in-exile where they had relocated to escape the violence in their communities of origin.

Case Description

The year 2016 was notable for the ratification of the landmark peace accord that officially concluded Colombia's 52-year civil war. Colombian president Juan Manuel Santos received the Nobel Peace Prize. The conflict claimed the lives of more than 200 000 Colombian citizens. As a distinguishing, and continuing, feature of the conflict, Colombia has ranked either first or second in the world for numbers of conflict-displaced persons for 12 consecutive years.[26,27] The Internal Displacement Monitoring Centre estimated Colombia's total number of internally displaced persons (IDPs) at 6.2 million in 2015, second only to Syria, and these numbers have steadily accrued over time.[16] Colombia's Law of the Victims (Law 1448, passed in 2011) officially designates these IDPs as "victims of the armed conflict."[28] In Colombia, conflict displacement is typically lifelong; very few IDPs are able to return to their home communities.

Research with Colombian IDPs has documented a broad array of psychological stressors associated with exposures to violence, trauma, and loss throughout all phases of displacement. IDPs enrolled in our global mental health projects have high prevalence rates, and markedly elevated symptom levels, for common mental disorders, including posttraumatic stress disorder, major depressive disorder, and generalized anxiety disorder, that persist for years following the moment of the departure (*la salida*).

Given this backdrop, where 1 in 8 Colombian citizens are conflict-induced IDPs, and a high proportion of these IDPs experience clinically significant symptoms of one or more common mental disorders, the 2010 and 2011 La Niña-associated climate event created an overlay of large-scale disaster displacement.

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A prolonged "winter wave" brought months of torrential rains that set off widespread river and overland flooding throughout the nation, the worst in Colombia's history. Ninety-three percent of Colombia's municipalities were affected, and 2.5 million hectares of urban and agricultural lands flooded. More specifically, the El Niño/Southern Oscillation (ENSO) is the strongest natural interannual climate fluctuation influencing the climate system worldwide. As a result of environmental variability, and particularly rising rates of emission of carbon dioxide into the atmosphere, more frequent El Niño–like conditions and stronger cold events in the tropical Pacific Ocean were predicted three decades ago.[29] In Colombia, the ENSO warm phase (El Niño) causes droughts, while the ENSO cold phase (La Niña) produces intense and abundant rainfall, increases river flows, and causes widespread flooding. In terms of both duration and magnitude, the 2010-2011 La Niña was one of the most intense in the past 60 years[30] and triggered massive floods, landslides, mudslides, and windstorms. Collectively, this concentration of hydrometeorological events set off a major humanitarian crisis throughout the nation, resulting in 1374 deaths, 1016 persons missing, and 1.5 to 1.6 million persons displaced. Cascading effects rippled through all infrastructure sectors, and monetary losses were estimated at US$6 billion.

Particularly germane to the present discussion was the finding that persons who were officially registered as conflict-displaced "victims of the armed conflict" comprised almost one-quarter of the residents who were displaced by the floodwaters (185 901 of 785 583 flood-damaged households, or 23.7%). A separate analysis placed the proportion of flood-affected survivors who were officially registered as Colombian armed conflict victims at almost 40%. Thus, these La Niña disaster-displaced citizens essentially became "doubly displaced" in the immediate aftermath of the floods.

Takeaway

In this case example, a large proportion of the 1.5 million Colombian citizens who had to evacuate from homes that were threatened, damaged, or destroyed by the 2010-2011 La Niña floods were IDPs who were living in habitats to which they had relocated as a result of forced migration from their communities of origin to escape the armed conflict. While sheltering from the floods (the climate-associated disaster) these individuals were displaced, not from the communities of origin, but from their homes in exile.

CONCLUDING COMMENTS

The case examples represent just 3 among many. Climate change drives environmentally induced forced migration through multiple pathways and, in turn, sets off cascades of public health and mental health consequences. Climate change triggers displacement directly by, for example, progressively submerging island and coastal habitats. Climate change creates scarcities that propel competition that leads to conflict that forces migration. Climate change intensifies the destructive impact of natural disasters that displace persons who are already relocated due to previous displacement from other causes. Climate change is interlaced throughout each of these forced migration scenarios.

The commonality is that forced migration involves loss at a most profound level: loss of all material possessions; loss of lifestyle, social status, life role, and community; and loss of what is known, familiar, comfortable, and safe. Forced migration frequently also involves exposure to trauma and violence, sometimes in the form of the powerful natural forces of harm in a disaster, sometimes in the form of the intentional, perpetrated actions of an adversary. These signature exposures to loss and trauma that characterize forced migration generate severe mental health and broader public health consequences. Current predictions suggest that climate-induced forced migration, and the compounding effects on mental health, will eventuate a significant public health crisis over the coming decades.

Intervening in these realities will require a multifaceted approach of combatting climate change on multiple fronts and organizing mental health and psychosocial support, including the application of evidence-based interventions, for populations of forced migrants.

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