A review of mental health and wellbeing under climate change in small island developing states (SIDS)

Article (Accepted Version)

ENVIRONMENTAL RESEARCH
LETTERS

ACCEPTED MANUSCRIPT • OPEN ACCESS

A review of mental health and wellbeing under climate change in small island developing states (SIDS)

To cite this article before publication: Ilan Kelman *et al* 2021 *Environ. Res. Lett.* in press https://doi.org/10.1088/1748-9326/abe57d

A review of mental health and wellbeing under climate change in small island developing states (SIDS)

Ilan Kelman[1,2*], Sonja Ayeb-Karlsson[3,4], Kelly Rose-Clarke[5], Audrey Prost[1], Espen Ronneberg[6], Nicola Wheeler[7], Nicholas Watts[8]

*Corresponding author: ilan_kelman@hotmail.com

[1]University College London (UCL), UK (https://orcid.org/0000-0002-4191-6969)
[2]University of Agder, Norway
[3]University of Sussex, UK (http://orcid.org/0000-0001-6124-2730)
[4]United Nations University Institute for Environment and Human Security, Germany
[5]King's College London, UK (https://orcid.org/0000-0001-8959-9184)
[1]University College London (UCL), UK (https://orcid.org/0000-0001-6121-8132)
[6]Secretariat of the Pacific Regional Environment Programme (SPREP), Apia Samoa
[7]Consultant (World Health Organization), Associate (Outsight International), London, UK
[8]National Health Service, London, UK

Acknowledgement

This paper was completed as part of the Lancet Countdown project (Tracking the connections between public health and climate change) at http://www.lancetcountdown.org which is supported by an unrestricted grant from the Wellcome Trust (200890/Z/16/Z).

A review of mental health and wellbeing under climate change in small island developing states (SIDS)

Abstract

Small island developing states (SIDS) are often at the forefront of climate change impacts, including those related to health, but information on mental health and wellbeing is typically underreported. To help address this research lacuna, this paper reviews research about mental health and wellbeing under climate change in SIDS. Due to major differences in the literature's methodologies, results, and analyses, the method is an overview and qualitative evidence synthesis of peer-reviewed publications. The findings show that mental health and wellbeing in the context of climate change have yet to feature prominently and systematically in research covering SIDS. It seems likely that major adverse mental health and wellbeing impacts linked to climate change impacts will affect SIDS peoples. Similar outcomes might also emerge when discussing climate change related situations, scenarios, and responses, irrespective of what has actually happened thus far due to climate change. In the context of inadequate health systems and stigmatisation of mental health diagnoses and treatments, as tends to occur globally, climate change narratives might present an opening for conversations about addressing mental health and wellbeing issues for SIDS.

Keywords

adaptation, climate change, immobility, islands, migration, mental health, wellbeing

1. Introduction: SIDS Dealing with Climate Change

The political grouping of SIDS (Small Island Developing States) is often identified as being highly vulnerable to climate change impacts, including by the Intergovernmental Panel on Climate Change (IPCC 2014, 2018, 2019). Stereotypical island characteristics, such as small land area, small populations, natural resource-based livelihoods, and isolation may contribute to their vulnerabilities and may detrimentally affect the populations' health (Akpinar-Elci and Sealy 2014, Baldacchino 2018, Lewis 1999). These same characteristics may also help overcome vulnerabilities: isolation and a small resource base can result in increased self-reliance and planning for adversity, while tight kinship networks can breed trust for rapid action (Baldacchino 2018, Campbell 2009, Grydehøj 2015, Johnston 2015, Lewis 1999, 2009). Despite SIDS' coping mechanisms and millennial histories of addressing environmental changes with varying degrees of success (Nunn 2007, Tabe 2019), SIDS peoples, settlements, and territories are now experiencing major health impacts from climate change. These are expected to worsen rapidly in the future unless action is taken (Akpinar-Elci and Sealy 2014, Hanna and McIver 2014, Kim *et al.* 2015, Macpherson and Akpinar-Elci 2015).

Adverse climate change impacts are expected for mental health, which is defined by WHO (2013, p. 6) as "a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community". This definition has been extensively critiqued (e.g. Galderisi *et al.* 2015) leading to Ayeb-Karlsson (2020, p. 2) suggesting wellbeing "as a subjective and dynamic state of feeling healthy and happy that ties into life satisfaction and influences a person's (or a collective's) psychological and social function".

Mental health and wellbeing difficulties are often stigmatised, deprioritised, or not monitored fully in SIDS (as well as many other places), as shown by Leckie and Hughes (2017) for some Pacific SIDS and by Picco et *al.* (2019) for the SIDS of Singapore. For example, in SIDS such as Fiji (Foster *et al.* 2008), Jamaica (Semrau *et al.* 2015), and Timor-Leste (Hawkins 2010), mental health and wellbeing difficulties are frequently interpreted as being retribution against a family or caused by an individual's sins. Other major challenges for SIDS are the lack of health information systems (Setoya and Kestel 2018), limited modelling capabilities to downscale climate projections for small land areas, especially those with substantial topographic variations (Foley 2018), and lack of local mental health professionals (e.g. Poltorak 2016 for Tonga). The effectiveness of mental health and wellbeing interventions in SIDS is poorly understood, exacerbated by the long-lasting effects of colonialism and of post-colonial views of mental health and wellbeing assessment, diagnosis, and treatment (e.g. Islam 1999 for Seychelles and Nicolas and Wheatley 2013 for the Caribbean).

Within these contexts for mental health, climate change is now leading to major environmental and social changes across SIDS, with more changes projected for the future (IPCC 2014, 2018, 2019, 2020). SIDS peoples have already undergone major cultural changes in the past, including through the introduction of new religions, colonisation, globalisation, and continual permanent outmigration and circular migration, i.e. back-and-forth movement, for example to access work or education. Many SIDS have nonetheless retained forms of local and cultural knowledges, as well as place-based identities (even when migrating) and ways of being (Beckford 2018, Connell and Lowitt 2020). This could be because many SIDS peoples have remained on islands; migration and cultural changes were largely voluntary; and people frequently continued using their oceans and coasts for livelihoods (e.g. Hau'ofa 1998, Naidu *et al.* 1993). While mental health and wellbeing difficulties most probably did occur during

past periods of change, the islanders remained, to a large degree, in control of their lives and livelihoods, firmly rooted in their own knowledges, identities, cultures, and territories. This would have supported their mental health and wellbeing. Climate change and climate change adaptation bring a set of circumstances in which cultural and livelihood changes, as well as any migration, might be forced, and would deviate from the environmental baseline upon which SIDS peoples have previously developed their cultures, settlements, and livelihoods.

No other reviews were found focusing on mental health and wellbeing in SIDS, although the Pacific region has such publications (e.g. Charlson *et al.* 2015, Hunter *et al.* 2015, Tiatia-Seath *et al.* 2020). This paper thus reviews work on mental health and wellbeing under climate change in SIDS, and maps knowledge gaps. Because so much has been published on climate change and mental health separately, and on non-SIDS locations more generally, this paper focuses on studies explicitly mentioning SIDS in general, or specific SIDS. The next section (Section 2) provides an overview of methods. Section 3 summarises climate change impacts in SIDS. Section 4 offers a synthesis of existing literature about mental health and wellbeing in SIDS under climate change. Section 5 concludes with implications and recommendations for further research.

2. Methods

A critical overview through a narrative and thematic synthesis was used, especially as it helps to connect topics over a wide diversity of literature covering disparate disciplines, methods, and vocabularies (Emerson and Frosh 2004, Grant and Booth 2009, Mallidou 2014, Milardo 2015, O'Byrne and Smith 2010, Paterson 2012). Google Scholar, MEDLINE, PsycNet, PubMed, Scopus, and Web of Science were searched according to the search strategy in Table 1. Inclusion criteria were peer-reviewed publications in English up until the end of June 2020 without limiting the start date. Then, snowball sampling examined the reference lists of the publications found. As per such methods (e.g. Grant and Booth 2009, Mallidou 2014, O'Byrne and Smith 2010), the authors' expertise was used to:

(i) Screen the publications found to ensure that they contributed substantively to this review's topic, rather than just mentioning it in passing.
(ii) Add in further peer-reviewed publications directly relevant to this review's topic.
(iii) Exclude non-peer-reviewed documents (e.g. government briefings, reports from intergovernmental agencies and non-governmental organisations, and National Adaptation Programmes of Action (NAPAs)), because they not been validated or examined from a scientific perspective.

Table 1: Search strategy

Column 1	Column 2	Column 3
Mental health	Small Island Developing State	Climate change
Mental disorder	Small Island Developing States	Pollution
Mental illness	SIDS	Sea level
Mental ill health	Anguilla	Global warming
Psychosocial distress	Antigua	Climate variability
Psychological distress	Barbuda	Greenhouse effect
Depression	Aruba	Greenhouse Gas Emissions
Anxiety	Bahamas	GHGE
Psychosis	Barbados	
Schizophrenia	Belize	
Substance abuse	British Virgin Islands	

Substance misuse Substance use Wellbeing	Cuba Dominica Dominican Republic Grenada Guyana Haiti Jamaica Montserrat Netherlands Antilles Puerto Rico Saint Kitts Nevis Saint Lucia American Samoa Cook Islands Federated States of Micronesia FSM Fiji French Polynesia Guam Kiribati Marshall Islands Nauru New Caledonia Niue Northern Mariana Islands Palau Papua New Guinea PNG Samoa Solomon Islands Timor-Leste Tonga Tuvalu Vanuatu Bahrain Cape Verde Comoros Guinea-Bissau Maldives Mauritius São Tomé Príncipe Seychelles Singapore	

Notes:

(i) Each acronym in the table is from the full expansion in the line above the acronym.

(ii) Some terms might be deemed inappropriate from some viewpoints, e.g. "substance abuse" and "mental disorder", but they are included in the search terms because literature did use them frequently and some still does.
(iii) Some terms such as "solastalgia" (distress related to environmental change; Connor *et al.* 2004), "ecoanxiety" (worrying about the environment; Doherty and Clayton 2011), and many related concepts are used in some contexts. They are contested in some literature and are subsets of terms in Column 1. As this review aimed to ensure that material was focused on mental health and wellbeing, rather than assumed or hard-to-diagnose impacts, these terms were not searched for directly.

The search string was:

Each phrase in Column 1 separated by OR
AND
Each phrase in Column 2 separated by OR
AND
Each phrase in Column 3 separated by OR

Every search engine could not take the full search string, so searches were conducted in chunks and the results collated.

The publications selected were analysed by extracting key information pertaining to this review's topic. Discussions among the authors led to the structure and categories in sections 3 and 4.

3. A Summary of Climate Change Impacts in SIDS

The search before snowball sampling provided 45 peer-reviewed journal articles, one PhD dissertation, and four book chapters. Some publications mentioned this review's topic yet had little detail, so the authors decided to exclude them. Additionally, several publications mentioned or were framed as being about climate change, but the research was about weather or climate. The authors decided collectively to be more inclusive regarding weather- and climate-related publications.

This literature explains how mental health and wellbeing have strong connections to environmental conditions – covering the built and natural environment – as well as to physical health. Section 3.1 summarises the physical environmental changes leading into section 3.2, which discusses physical health impacts, as this material is needed to set the stage for Section 4's discussion on mental health and wellbeing in SIDS under climate change. Because aspects of uncertainty feature prominently across health impacts, it is summarised in section 3.3.

3.1. Physical Environmental Changes in SIDS Under Climate Change

Climate change is projected to affect SIDS through physical changes to the environment including higher air and sea surface temperatures, altered weather, ocean acidification, and sea-level rise (IPCC 2014, 2018, 2019, 2020). No physical or environmental outcome is inevitable. Some coral reefs may have the potential to keep up with environmental changes under climate change (Perry *et al.* 2015). Many mangroves have so far adapted to sea-level changes, while nevertheless being damaged by human activity (Woodroffe *et al.* 2016). Yet SIDS ecosystem health under climate change remains uncertain and if the coastal ecosystems are severely harmed, then erosion and storm damage could be exacerbated.

Increased encroachment of saltwater onto land contaminates freshwater supplies and damages agricultural land, harming livelihoods, water supplies, and food sources. The changing weather and environmental conditions – even where weather-related hazards become less frequent or less intense –change ecosystems, notably through invasive alien species (Cohen *et al.* 2015, Wilkie 2002), undermining SIDS peoples' local and cultural knowledges, wisdom, and livelihoods.

3.2. Physical Human Health Impacts in SIDS Under Climate Change

Attribution of specific changes in weather to climate change is improving (Herring *et al.* 2020). Nevertheless, physical health impacts on people are harder to determine because people can take action to reduce their vulnerabilities and to improve how they survive changing weather, as is frequently shown for SIDS (Johnston 2015, Lewis 1999, 2009). Under climate change, adverse health impacts from heat and humidity are projected to exceed people's ability to survive (Watts *et al.* 2021), so this could be a major impact for SIDS. Projections for heat and humidity are currently not good enough to apply to the spatial resolution of most SIDS settlements, so it is unclear when specific SIDS or SIDS locations would be entering realms of substantially increased morbidity and mortality due to heat-humidity.

With increased evapotranspiration, ocean acidity, freshwater salinification, and invasive species (IPCC 2014, 2018, 2019, 2020), changing local food and freshwater have the potential for the greatest health impacts on SIDS peoples. They would need to change their agriculture, aquaculture, and fishing to the new and rapidly altering environment, moving away from their local and cultural knowledges. Substantial dietary shifts have happened before. For example, some Pacific SIDS peoples prefer imported, processed foods over local supplies leading to high obesity and diabetes rates (Swinburn *et al.* 2011). This indicates possibilities for adapting, because people are willing to change their diets, but it does not mean that the adaptations increase health overall or support mental health and wellbeing.

Another major area of physical health and wellbeing impacts from climate change is infectious and non-communicable diseases sensitive to climate change. Watts *et al.* (2021) demonstrated globally how and why diseases including dengue fever, malaria, cholera, and the effects of undernutrition are among the important global indicators for physical-related health and wellbeing impacts of climate change. Attribution at the SIDS country scale is not robust at the moment, especially when locally influenced transmission factors such as vector management, population densities, and poor state of health systems supersede short-term signals.

3.3. The Role of Uncertainty

Several SIDS locations around the Caribbean have recently reported severe coastal erosion anecdotally or through local shoreline surveys. These reports require further formal study in terms of local understandings, quantitative tracking, and attribution to climate change. For instance, climate change was thought to be causing beach erosion in Barbados until locally caused ecosystem damage was found to play the predominant role (Mycoo 2014). Good practice case studies also exist, but require formal research for verification. In Anse à la Mouche, Seychelles, the government instituted coastal protection through land reclamation in 2013, creating a local park which supported local ownership and protected a main road. Such locally focused green spaces are known to promote mental health and wellbeing (Nieuwenhuijsen and Khreis 2017), but the developments in Anse à la Mouche (and elsewhere

around SIDS, e.g. Havana (Orta Ortiz and Geneletti 2018)) have not been formally evaluated with respect to their local and national influences on health and wellbeing.

If large losses of, or major changes to, land and livelihoods occur due to climate change, or if detrimental changes are assumed to be inevitable, then many SIDS peoples may feel that they have little choice but to leave their islands. There is considerable uncertainty around future need for migration: some predict scenarios with large-scale forced migration (Guzman 2013), while others suggest that many options are available including in-situ adaptation (Gerrard and Wannier 2013, Yamamoto and Esteban 2014). This disparity leads to challenges in decision-making and uncertainty for affected SIDS peoples. Settling elsewhere, even with some sovereignty rights (Gerrard and Wannier 2013), or while retaining settlements on changing islands, would each result in substantial cultural changes.

Many uncertainties remain to be investigated and clarified. Empirical evidence, modelling, and laboratory results thus far tend to show that low-lying islands are mainly accreting or changing shape, with a few diminishing in size under measurable sea-level rise (Kench *et al.* 2015, Mann *et al.* 2016, Masselink *et al.* 2020, McLean and Kench 2015, Tuck *et al.* 2019). Differences might be coming, as accelerating and more damaging sea-level rise is expected soon, as well as possible ice sheet melting (Bamber *et al.* 2019, Thomas and Lin 2020).

Large losses of coastal areas and livelihoods across SIDS are possible under climate change. Some SIDS, such as Maldives and Tuvalu, are entirely low-lying coastlines with no high ground. Others, such as Mauritius, Samoa, and St. Lucia, have most of their infrastructure and livelihoods in low-lying locations. Moving back from coasts would entail considerable cultural change, both for the people moving and for people in places where migrants would arrive (Krüger *et al.* 2015). Consequently, irrespective of unknowns and uncertainties, and of whether or not they migrate, SIDS peoples can expect large-scale alterations to their settlements, cultures, knowledges, and identities under climate change, with subsequent impacts on mental health and wellbeing.

4. Mental Health and Wellbeing in SIDS Under Climate Change

Based on the background provided in Section 3, this section details mental health and wellbeing in SIDS under climate change using studies identified in the literature search. Section 4.1 is on changing weather, section 4.2 covers creeping changes, and sections 4.3 and 4.4 are about migration.

4.1. Changing Weather and Mental Health and Wellbeing

Weather impacts on mental health and wellbeing have been documented in some SIDS, with examples including acute stress, anxiety, depression, and PTSD (Post-Traumatic Stress Disorder) (e.g. Joseph 2006, Kutcher *et al.* 2005, Loughry 2012, McNamara and Prasad 2014, Sattler *et al.* 2018, Shultz *et al.* 2016, Stair and Pottinger 2005). Such work demonstrates the mental health and wellbeing consequences of stressors, including loss of family and peers, interference with livelihoods, damage to property and land, and post-disaster displacement, especially over the long-term. Local weather changes are not always straightforward to attribute to climate change, although attribution science is improving (Herring *et al.* 2020). Consequently, attribution needs to be made from weather changes to mental health and wellbeing changes.

A systematic review of the effects of weather on injury, anxiety, depression, and PTSD found that 30-40% of a disaster-affected population experiences some form of negative mental health and wellbeing consequences within a year of the disaster, declining afterwards but remaining chronic within the population (Rataj *et al.* 2016). The review was global and included 'Oceania' as one continent, as well as other SIDS enfolded within their respective continents, but individual countries were rarely mentioned.

For the Caribbean, Joseph (2006) found that, for Grenada in Hurricane Ivan in 2004, the factor with the most influence on children's PTSD symptoms appearing was losses experienced. Grenada received a train-the-trainer programme to identify and address post-disaster mental health and wellbeing needs (Kutcher *et al.* 2005). Also after Hurricane Ivan, in the Cayman Islands, Grenada, and Jamaica, volunteers with professional qualifications in mental health and wellbeing assisted disaster-affected people and trained others in supporting oneself and first aid for mental health and wellbeing needs (Stair and Pottinger 2005). After Hurricane Matthew in 2016, Shultz *et al.* (2016) characterised the psychosocial effects in Haiti. They used 'trauma signature analysis' to identify how the storm's hazard profile leads to negative impacts—including casualties, displacement, job losses, assault and other forms of violence, and loss of essential services—which can present stressors on mental health and wellbeing.

In the Pacific, a growing body of literature (e.g. Charlson *et al.* 2015, Hunter *et al.* 2015, Sattler *et al.* 2018, Thomas *et al.* 2019) is linking disasters involving tropical cyclones to mental health and wellbeing impacts such as feelings of loss, grief, sadness, anger, and stress leading to anxiety, depression, and PTSD. Women, children, and elderly people are identified as being particularly vulnerable, facing disproportionate health and wellbeing impacts. Specific geographic areas such as rural locations and more remote islands are also described as taking a heavier toll. Studies from countries such as Vanuatu, Fiji, Kiribati, and the Solomon Islands report that women register more tropical cyclone-linked distress (McIver *et al.* 2016, McNamara and Prasad 2014).

Fear and worries related to the storms might also travel through generations. This might occur through secondary health stressors, such as concern about infectious disease outbreaks due to standing water, as they are more likely to have life-threatening or fatal impacts on children, whose relatives are left carrying the loss, trauma, and grief (Britton and Howden-Chapman 2011, McIver *et al.* 2016, Watts *et al.* 2021). Additionally, post-disaster shorter- and longer-term displacement unsettles and harms children's mental health and wellbeing though loss of routines and feelings of safety; for instance, familiar school environments, teachers, and the joy and fulfilment of learning (e.g. Dannenberg *et al.* 2019). As a result, parents and grandparents feel concerned for their children's future and for future tropical cyclone impacts on life, homes, belongings, livelihoods, land, and cultures. Studies also suggest that the rise in PTSD due to resource losses (and other impacts) from weather may influence people's adaptation desires and behaviours, as happened after Cyclone Winston in 2016, for example (Sattler *et al.* 2018, Thomas *et al.* 2019).

Not all impacts are about direct experience. In Kiribati, qualitative interviews with youth showed that witnessing weather in other SIDS increased their anxiety about their own future (Loughry 2012), although this weather was not necessarily linked to climate change.

A major difficulty with using these studies to assess the mental health and wellbeing impact of climate change is that they focus on specific weather. SIDS peoples can and do deal with weather, irrespective of how extreme (Johnston 2015, Lewis 1999), while climate change is

having complicated impacts on weather. For example, tropical cyclones affecting SIDS are generally projected to increase in intensity while decreasing in frequency (Knutson *et al.* 2019, 2020), so changes in rainfall patterns (more precipitation per storm, but fewer storms) might end up being the main concern (Falkland and White 2019). To understand better how to prepare for climate change, more post-disaster mental health and wellbeing needs assessments could be useful for gathering information on these impacts and for instilling more acceptance about mental health and wellbeing—as well as about changing weather. Caution is needed when using disaster data as proxies for climate change impacts, since disaster risk reduction can reduce disaster impacts irrespective of changes to the weather (Lewis 1999, 2009, McNamara and Prasad 2014, Watts *et al.* 2021). Nonetheless, some studies indicate more openness to relocating and improving settlement planning for climate change after having experienced a specific storm disaster (e.g. Sattler *et al.* 2018).

4.2. Creeping Changes and Mental Health and Wellbeing

Climate change impacts beyond weather appear more slowly, including a warmer ocean and atmosphere, rising sea levels, ocean acidification, ecosystem changes, and alterations in land and freshwater. These impacts have been termed 'creeping changes' (Glantz 1994). If SIDS peoples are unable to adapt their livelihoods – both subsistence (such as agriculture, fishing, forestry, and hunting) and non-subsistence (such as tourism and hospitality) – to climate change, then mental health and wellbeing impacts may be exacerbated by unemployment, economic hardship, and inability to meet basic needs (Lund *et al.* 2010, McIver *et al.* 2017). All these challenges are layered on pre-existing vulnerabilities, such as the structural violence of colonialism leading to impacts ranging from poor infrastructure to cash crops (e.g. Mika 2019 for Haiti). Food and water insecurity have been associated with symptoms of depression, anxiety, and other mental health and wellbeing difficulties, with gender- and age-differentiated consequences (Steel *et al.* 2009, Weaver and Hadley 2009).

Mental health and wellbeing impacts which have been considered important in the context of creeping changes, but for which SIDS-related literature is sparse, include self-harm, suicide, conflict, violence, and abuse. The non-SIDS literature on these topics is vast and fall into two general categories. First (Dumont *et al.* 2020, Kevan 1980), research aims to correlate a specific weather or climate parameter, such as heat wave values, with a specific mental health and wellbeing outcome, such as fatal intentional self-harm (which is a phrase used to help avoid the stigma often associated with completing suicide). Debates occur on whether or not these correlations indicate causal mechanisms. Second (e.g. Berry *et al.* 2010, Hayes *et al.* 2018,), research documents mental health and wellbeing outcomes such as violence and abuse emerging from diagnoses such as stress or anxiety linked to trends in livelihoods, food, water, income, and other individual and household needs. The connections here are often more accepted overall, but with few SIDS-specific studies.

Initiating investigations of these topics for SIDS has not been easy and few studies currently exist. In coastal areas of the Solomon Islands, people have described loss, uncertainties, and feelings of powerlessness related to sea-level rise interlinking with fear and worry for family members, the extended society and culture, and the country (e.g. Asugeni *et al.* 2015). A review of health inequalities in the Caribbean did not mention mental health and wellbeing (Cloos 2010). A review of climate change impacts on health in Kiribati described the importance of mental health and wellbeing, but concluded that policymakers deemed it to be a much lower priority than other health impacts of climate change (McIver *et al.* 2014). Maldives has specifically identified the need to improve health systems with respect to mental health and

wellbeing as part of climate change adaptation, but without providing extensive specifics (Moosa 2008). Setoya and Kestel (2018) highlight poor health information systems in Pacific and Caribbean SIDS as a limiting factor for understanding mental health and wellbeing concerns and needs.

4.3. Climate Change, Migration, and Mental Health and Wellbeing

There has been little investigation of the effects of potential migration linked to climate change on mental health and wellbeing in SIDS. This includes for the places most often mentioned as likely candidates for large-scale forced migration due to sea-level rise, namely the Federated States of Micronesia, Kiribati, Maldives, Marshall Islands, and Tuvalu. Migration can be a highly stressful experience, especially when forced. The stress of migration can be exacerbated by a lack of social support, poor health systems, insufficient livelihoods, economic hardship, discrimination, and limited access to housing, education, social services, and healthcare. Consequences can include reduced self-esteem, poor adjustment to the new location, and increased rates of depression, phobias, and schizophrenia (e.g. Bennouna *et al.* 2019, Henssler *et al.* 2020, Selten *et al.* 2020). Unpublished local anecdotes from people previously affected in the Pacific by forced migration from nuclear testing indicate that psychosocial impacts of forced migration can span generations, so corroboration through research methods would be an important task.

Research across Pacific SIDS emphasises the importance of land as a foundation for culture and identity, thus promoting mental health and wellbeing (Keesing 1989). Cultural aspects such as *Fenua* in Tuvalu (Stratford *et al.* 2013) and *Vanua* in Fiji (Williksen-Bakker 1990) sit at the core of Pacific Island culture to relate people, their societies, and their identities to nature, land, and natural resources, intertwining with people's mental health and wellbeing. Relocation and migration can therefore have substantial mental health and wellbeing impacts though the loss of place attachment, ancestral connections, and identities, which in turn can lead to eroded belief systems, family ties, and local and cultural knowledges (Latai-Niusulu *et al.* 2020, McMichael *et al.* 2019, Singh *et al.* 2020, Stratford *et al.* 2013). The mental health and wellbeing effects of forced migration – and subsequent loss of land, culture, and identity – were demonstrated among the Banabans forcibly relocated to Fiji during colonial times (Tabucanon 2012). Similarly, Chagossians in the Indian Ocean were forcibly removed from their UK-governed island so that the USA could build a military base; they ended up marginalised and poor, mainly in Mauritius (Sand 2009).

Migration is challenging to link directly to climate change, although evidence of other reasons for voluntary migrating from SIDS indicates impacts on mental health and wellbeing. In Cape Verde, such impacts were shown to relate to those left behind – often women and children – especially as the Cape Verdean diaspora currently outnumbers the country's residents (Åkesson 2009, Åkesson *et al.* 2012, Carling 2002, Drotbohm 2010). Many of the men who migrated were supposed to have returned for their partners, but did not after they re-married in the USA, Portugal, or elsewhere. Women also leave their children behind to be fostered by relatives and extended social networks. The large diaspora and increasingly restrictive migration policies in many destinations fuel an increasing desire to leave, in particular among the young and poor, leading to feelings of hopelessness and despair when unable to migrate (Åkesson 2009, Åkesson *et al.* 2012, Carling 2002, Drotbohm 2010). Studies investigating immobility in the context of climate change show that longer-term emotional erosion, despair, and gender role constraints for 'trapped' women may be transferred into the narratives given

to their children, augmenting mental health and wellbeing difficulties across generations (Ayeb-Karlsson 2021, Ayeb-Karlsson *et al.* 2020, Bhatta *et al.* 2015, Fellmeth *et al.* 2018).

In some cases, migration from SIDS can benefit mental health and wellbeing, which might or might not extend to migration linked to climate change impacts. A study among Tongan migrants in New Zealand suggests that their mental health and wellbeing improved, especially for women and for those with previously poor mental health and wellbeing (Stillman *et al.* 2006). The authors attribute this observation to increased income, improved social life, and access to better public services including education and healthcare. SIDS peoples have long been migrants. Historically, they settled new islands while, recently, they used migration for education, training, livelihoods, and sending back remittances which are now a mainstay of many SIDS economies (Bellwood 2013, Connell and Conway 2000, King 2009). This migration is generally presumed to be voluntary and desired, rather than being directly forced, although the literature is clear that migration is rarely only forced or only voluntary, instead typically having elements of both (Fiddian-Qasmiyeh 2020, Fiddian-Qasmiyeh *et al.* 2016, Stojanov 2014). For example, remittance-related migration is voluntary in the sense of choosing to seek jobs, but is also forced in the sense of feeling that remittances are essential to have adequate income. A similar combination exists in considering migration due to environmental changes or warnings about environmental changes. Would people move because they do not like the new environmental regime, because it is not liveable, or because they are told that they should move because of it?

When possibilities for migration and jobs change suddenly, as with the COVID-19 pandemic starting in 2020, then the opportunity to support mental health and wellbeing through migration can flip to being a difficulty undermining mental health and wellbeing (Corburn *et al.* 2020, Kluge *et al.* 2020, Raju and Ayeb-Karlsson 2021). Many SIDS, such as Vanuatu, Seychelles, and Grenada, have remained ostensibly COVID-19-free or with low rates (although testing has been incomplete). They achieved this status mainly from closing their borders almost entirely, stopping all forms of migration in and out – which also trapped some people in the place where they had migrated to, even if they lost their job.

Another element in the literature covering climate change, migration, mental health and wellbeing, and SIDS is assumed attribution. Some authors reported that specific villages in Fiji were forced to move inland due to climate change impacts (Charen *et al.* 2017, McNamara and Combes 2015). They do not provide evidence showing that the observed local environmental changes are linked to climate change and others contest the climate change causation (Green 2016). Assumptive attribution could miss local solutions for preventing migration while also making people feel that their loss of home is a hopeless situation and out of their control. Overall, misattribution to climate change could lead to mental health and wellbeing difficulties.

4.4 Migration as Adaptation

One adaptation measure which is frequently proposed for SIDS (and other countries) is managed migration. The literature debates whether migration due to climate change impacts is an adaptation measure by ensuring survival or a failure to adapt because the only option is to leave home (Stojanov 2014). Some SIDS peoples, families, and settlements adapt more readily to challenging circumstances, including through migration. Many SIDS settlements and countries were founded by migrants and continued to be viable as a result of circular migration and out-migration, because mobility reduces local consumption pressures and provides remittance opportunities (Bellwood 2013, Connell and Conway 2000, King 2009).

Consequently, migration can support adaptation to local conditions and, in some instances, may help SIDS peoples support mental health and wellbeing.

The literature also suggests that planned relocation can affect people's health and wellbeing detrimentally through loss of place, identity, and belonging (McMichael *et al.* 2019, McMichael and Katonivualiku 2020). The link between (i) culture or heritage loss which is ostensibly climate change induced and (ii) mental health and wellbeing was observed through (i) sadness and emotional stress relating to livelihood activity loss in Fiji and (ii) worry, anxiety, and disrupted sleep due to reduced local subsistence-based living in Tuvalu (du Bray *et al.* 2017, Gibson *et al.* 2019, Gibson *et al.* 2020). SIDS women's mental health in particular is suggested as being affected by planned relocation, recognising that the migration process might inhibit or change gendered livelihood activities such as craft work, textile weaving, and local food provision. In Fiji and PNG, the emotional impact of sadness, stress, and anxiety is suggested as hindering women from actively taking part in national and local climate change adaptation decision-making (Schwerdtle *et al.* 2018, Singh *et al.* 2020). This can be further exacerbated when authority is unclear for defining risky or uninhabitable locations, for determining where a person is allowed to live, and for labelling who is 'involuntarily' immobile or 'trapped' and who must be relocated promptly (Ayeb-Karlsson *et al.* 2018, 2020).

The SIDS of Belize provides an analogy of managed migration as a form of weather-related adaptation. Partly to reduce hurricane vulnerability by moving away from an exposed coastline, Belize relocated its capital inland to a newly built city, Belmopan, in 1970 (Everitt 1984). Yet Belize had space in which to build a new city, which is a luxury absent from most SIDS – and cultural and environmental impacts of new developments were not as high on the political agenda as they are today. Relocation at this scale is therefore likely to face many more barriers now and might not always be accepted as a viable option.

Despite migration desires and successes in SIDS, not everyone wishes to move since they see their land and home as integral to their being and identity. Some SIDS peoples live by burial grounds as part of living with their ancestors and being an important part of their identity (McMichael *et al.* 2019, Mueller and Meindl 2017). Migrating could lead to irrecoverable and detrimental impacts on mental health and wellbeing. Yet staying behind and then witnessing and experiencing the changes to one's environment and society projected under climate change, without prospects for adjusting livelihoods, could have equally unrecoverable and detrimental mental health and wellbeing impacts.

At times, discussing these situations, explaining the expectations under climate change, and mapping out adaptation options can have severe mental health and wellbeing impacts. Talking about climate change might affect mental health and wellbeing irrespective of actual climate change impacts, as was documented for Tuvalu (Gibson *et al.* 2020) and implied for people in Vanuatu considering climate change related migration (Perumal 2018). Alternatively, it can provide a sense of empowerment, control, and seeking solutions which might be good for mental health and wellbeing.

For those who do not wish to move, but for whom it would be dangerous to stay behind, limits to adaptation emerge because no option supports mental health and wellbeing. SIDS peoples left with these untenable choices have little scope for adapting to climate change's mental health and wellbeing effects, adding another example of the limits to adaptation for SIDS. These limits have already been recognised, for instance, for coastal management in the Federated States of Micronesia (Monnereau and Abraham 2013).

Where decisions need to be made to aim for adaptation which sustains a viable settlement or which moves the settlement, few populations will have 100% consensus. Divergences of opinion can strain relationships and lead to local political conflict, inducing mental health and wellbeing difficulties. If a settlement needs 30% of its population to remain viable, but 80% decide to leave, or if a settlement needs 80% of its population to remain viable, but 30% decide to leave, then difficult dilemmas emerge which are about people's own interests and decisions, regardless of resources given for adaptation. Irrespective of choices regarding migrating or staying, preventative interventions would assist both adaptation and mental health and wellbeing.

5. Implications and recommendations

SIDS are often identified as being at the forefront of the health impacts of climate change. Nonetheless, mental health and wellbeing in the context of climate change have yet to feature prominently and systematically in SIDS-related research, policy, and action. This paper has provided an overview of current research knowledge and research gaps regarding mental health and wellbeing under climate change in SIDS, indicating some ways forward. The findings show that mental health and wellbeing in the context of climate change have yet to feature prominently and systematically in research covering SIDS. Yet, in the absence of appropriate action, a high likelihood exists that adverse mental health and wellbeing effects linked to climate change's impacts will affect SIDS peoples; for instance, from altered weather, creeping changes, and migration which can also be used for adaptation. To move forward using available knowledge and experience, climate change narratives might present an opening for conversations about addressing mental health and wellbeing issues for SIDS.

Major gaps nonetheless remain in understanding the links between climate change and mental health and wellbeing in SIDS. Prevention and treatment of mental health and wellbeing difficulties appear to be a low priority within some SIDS health systems, and the prioritisation is unclear in others (see also the data and data gaps in WHO, 2017). Limited attention is paid to the actual or possible connections to climate change. Understanding the preventative and treatment-related mental health and wellbeing interventions that are effective across SIDS or in specific SIDS, as well as interventions that could be translated from elsewhere to be adapted for SIDS, would assist in providing recommendations. The groups of people studied need to better disaggregate gender and age groups within the same study in order to better compare the results. Further investigations are particularly needed to improve understanding of mental health and wellbeing impacts on women and non-binary genders, as well as a stronger research emphasis on how gender roles affect mental health and wellbeing in the context of climate change.

To fill in these gaps, a co-benefits agenda for policy and action should build on existing strengths and programmes in SIDS, even when using external support. Involving health professionals to highlight the connections between climate change and mental health and wellbeing to other health professionals is one way forward, as is linking health professionals with environmental professionals which was done by, for instance, Rose-Clarke *et al.* (2020) and Watts *et al.* (2021). SIDS public health professionals who are already supportive would be the conduit to other public health professionals. They could then expand this network to reach the public with their messages. In parallel, local health workers could be trained in mental health and wellbeing, especially within the context of their local cultures, assisting in

identifying people who need help and promoting mental health and wellbeing. WHO's Mental Health Gap Action Programme provides training modules and guidelines (e.g. WHO 2008).

A core message typically highlighted, and for which this paper provides evidence from some SIDS, is the need for greatly improved health systems, services, training, and infrastructure overall, including for mental health and wellbeing. Where this is needed, an important component of such action is a balance between (i) incorporating local and Indigenous views of, and practices for, health and (ii) overcoming engrained stigmas of mental health and wellbeing difficulties. Climate change might present an opportunity because it is generally seen by SIDS peoples, and framed for them, as an external threat. Consequently, discussing climate change could open conversations about the detrimental mental health and wellbeing impacts it imposes, and so shift the discussion away from 'mental illness' or 'mental disorders' as retribution.

Another implication from this analysis is that some mental health and wellbeing impacts from climate change may be difficult to address. In cases such as forced migration, some people will experience adverse impacts on mental health and wellbeing, no matter what happens, no matter what choices are made, and no matter what health systems are available. Being aware of these possibilities can assist with interventions to reduce the adverse consequences as much as feasible. Limits to adaptation may exist, so circumstances could occur in which expecting any positive outcomes for mental health and wellbeing would be optimistic. Nonetheless, negative impacts could be somewhat mitigated.

The overarching policy lesson is thus to ensure that climate change's effects on mental health and wellbeing – either from climate change impacts, from responses to them, or from raising and discussing these topics – are fully incorporated into and given prominence in discussions and actions without stigmatisation or denigration. Policy development for climate change needs to consider that people have a right to be involved in local-to-global planning, decision making, and action. People must be allowed to take their own mental health and wellbeing needs into account, including for any intervention-related decisions, as well as feeling responsible that they are proactively protecting the health and wellbeing of their society on their own terms.

Both climate change and mental health and wellbeing remain prominent topics, with extensive science completed and ongoing, although with large gaps yet to be filled. Combining them and applying them to a specific set of locations, including SIDS, is more rarely completed, despite the importance for advancing knowledge and then applying it for policy and practice. This review has contributed an approach and results for synthesising a variety of disparate literature in order to draw lessons for a typically underrepresented combination of topics.

Data availability

No new data were created or analysed in this study.

References

Åkesson L 2009 Remittances and inequality in Cape Verde: the impact of changing family organization *Glob. Net.* **9** 381–398.

Åkesson L, Carling J and Drotbohm H 2012 Mobility, Moralities and Motherhood: Navigating the Contingencies of Cape Verdean Lives. Journal of Ethnic and Migration Studies **38** 237–260.

Akpinar-Elci M and Sealy H 2014 Climate Change and Public Health in Small Island States and Caribbean Countries *in Global Climate Change and Public Health* eds K E Pinkerton and W N Rom (New York: Springer)

Asugeni J, MacLaren D, Massey P D and Speare R 2015 Mental health issues from rising sea level in a remote coastal region of the Solomon Islands: Current and Future *Aus. Psych.* **23** 22–25.

Ayeb-Karlsson S 2020 No Power without Knowledge: A Discursive Subjectivities Approach to Investigate Climate-Induced (Im)mobility and Wellbeing *Soc. Sci.* **9** article 103.

Ayeb-Karlsson S 2021 'When we were children we had dreams, then we came to Dhaka to survive': urban stories connecting loss of wellbeing, displacement and (im)mobility *Clim. Dev.* forthcoming.

Ayeb-Karlsson S, Smith C D and Kniveton D 2018 A discursive review of the textual use of 'trapped' in environmental migration studies: The conceptual birth and troubled teenage years of trapped populations *Ambio* **47** 557–573.

Ayeb-Karlsson S, Kniveton D Cannon T 2020 Trapped in the prison of the mind: Notions of climate-induced (im)mobility decision-making and wellbeing from an urban informal settlement in Bangladesh *Pal. Comm.* **6** 1–15.

Baldacchino G ed. 2018 *The Routledge international handbook of island studies* (Abingdon, Routledge)

Bamber J L, Oppenheimer M, Kopp R E, Aspinall W P, and Cooke R M. 2019 Ice sheet contributions to future sea-level rise from structured expert judgment *PNAS* **116** 11195–11200.

Beckford C 2018 Climate change resiliency in Caribbean SIDS: building greater synergies between science and local and traditional knowledge *J. Env. Stud. Sci.* **8** 42–50.

Bellwood P 2013 *First Migrants: Ancient Migration in Global Perspective* (Chichester: Wiley Blackwell)

Bennouna C, Khauli N, Basir M, Allaf C, Wessells M, and Stark L 2019 School-based programs for Supporting the mental health and psychosocial wellbeing of adolescent forced migrants in high-income countries: A scoping review *Soc. Sci. Med.* **239** article 112558.

Berry H L, Bowen K, Kjellstrom T 2010 Climate change and mental health: a causal pathways framework *Int. J. Public Health* **55** 123–132.

Bhatta G D, Aggarwal P K, Poudel S and Belgrave D A 2015 Climate-induced migration in South Asia: Migration decisions and the gender dimensions of adverse climatic events *J. Rural Comm. Dev.* **10** 1–23.

Campbell J 2009 Islandness: vulnerability and resilience in Oceania *Shima* **3** 85–97.

Carling J.2002 Migration in the age of involuntary immobility: Theoretical reflections and Cape Verdean experiences *J Ethnic Mig. Studies* **28** 5–42.

Charen D, Kaur M and Singh P 2017 Customary Land and Climate Change Induced Relocation—A Case Study of Vunidogoloa Village, Vanua Levu, Fiji *in Climate Change Adaptation in Pacific Countries* ed W Leal Filho (Berlin: Springer)

Charlson F J, Diminic S and Whiteford H A 2015 The Rising Tide of Mental Disorders in the Pacific Region: Forecasts of Disease Burden and Service Requirements from 2010 to 2050. *Asia Pac. Pol. Stud.* **2** 280–292.

Cloos P 2010 Health inequalities in the Caribbean: increasing opportunities and resources *Glob. Health Prom.* **17** 73–76.

Cohen J F, Clarke-Harris D O, Khan A, and Isaac W A P 2015 Sustainable Management of Invasive Species for Small Island Developing States under Changing Climates *in Impacts of Climate Change on Food Security in Small Island Developing States* eds W G Ganpat and W A P Isaac (Hershey, Pennsylvania: IGI Global)

Connell J and Conway D 2000 Migration and remittances in island microstates: a comparative perspective on the South Pacific and the Caribbean *Int. J. Urban Reg. Res.* **24** 52–78.

Connell J and Lowitt K eds 2020 *Food Security in Small Island States* (Singapore: Springer)

Connor L, Albrecht G, Higginbotham N, Freeman S and Smith W 2004 Environmental Change and Human Health in Upper Hunter Communities of New South Wales, Australia *EcoHealth* **1** SU47–SU58.

Corburn J, Vlahov D, Mberu B, Riley L, Caiaffa W T, Rashid S F, Ko A, Patel S, Jukur S, Martínez-Herrera E, Jayasinghe S, Agarwal S, Nguendo-Yongsi B, Weru J, Ouma S, Edmundo K, Oni T and Ayad H 2020 Slum Health: Arresting COVID-19 and Improving Well-Being in Urban Informal Settlements *J Urb. Health: Bull. NY Acad. Med.* **97** 348–357.

Dannenberg A L, Frumkin H, Hess J J, and Ebi K L 2019 Managed retreat as a strategy for climate change adaptation in small communities: public health implications *Clim. Change* **153** 1–14.

Doherty T J and Clayton S 2011 The Psychological Impacts of Global Climate Change *Am. Psych.* **66** 265–276.

Drotbohm H 2010 Gossip and social control across the seas: targeting gender, resource inequalities and support in Cape Verdean transnational families *Afr. Black Dias.* **3** 51–68.

du Bray M V, Wutich A, Larson K L, White D D and Brewis A 2017 Emotion, Coping, and Climate Change in Island Nations: Implications for Environmental Justice *Env. Just.* **10** 102–107.

Dumont C, Haase E, Dolber, T, Lewis, J, Coverdale, J 2020 Climate Change and Risk of Completed Suicide *J. Nerv. Mental Dis.* **208** 559–565.

Emerson P and Frosh S 2004 Critical Narrative Analysis in Psychology: A Guide to Practice (New York: Palgrave Macmillan)

Everitt J C 1984 Belmopan, dream and reality: A study of the other planned capital in Latin America *Rev. Geog.* **99** 135–144.

Falkland T and White I 2020 Freshwater Availability Under Climate Change in L Kumar ed. *Climate Change and Impacts in the Pacific* (Cham: Springer)

Fellmeth G, Rose-Clarke K, Zhao C, Busert, L K, Zheng Y, Massazza A, Sonmez H, Eder B, Blewitt A, Lertgrai W, Orcutt M, Ricci K, Mohamed-Ahmed O, Burns R, Knipe D, Hargreaves S, Hesketh T, Opondo C, and Devakumar D 2018 Health impacts of parental migration on left-behind children and adolescents: a systematic review and meta-analysis *Lancet* **392** 15–21.

Fiddian-Qasmiyeh E ed 2020 *Refuge in a Moving World: Tracing refugee and migrant journeys across disciplines* (London: UCL Press)

Fiddian-Qasmiyeh E, Loescher G, Long K and Sigona N eds 2016 *The Oxford Handbook of Refugee and Forced Migration Studies* (Oxford: Oxford University Press)

Foley A M 2018 Climate impact assessment and 'islandness': Challenges and opportunities of knowledge production and decision-making for Small Island Developing States *Int. J. Climate Change Strat. Manag.* **10** 289–302.

Foster K, Usher K, Baker J A, Gadai S and Ali S 2008 Mental health workers' attitudes toward mental illness in Fiji *Aus. J. Adv. Nursing* **25** 72–79.

Galderisi S, Heinz A, Kastrup M, Beezhold J and Sartorius N 2015 Toward a new definition of mental health *World Pysch* **14** 231–233.

Gerrard M B and Wannier G E eds 2013 *Threatened Island Nations: Legal Implications of Rising Seas and a Changing Climate* (Cambridge: Cambridge University Press)

Gibson K, Barnett J, Haslam N and Kaplan I 2020 The mental health impacts of climate change: Findings from a Pacific Island atoll nation *J. Anx. Dis.* **73** article 102237.

Gibson K, Haslam N and Kaplan I 2019 Distressing encounters in the context of climate change: Idioms of distress, determinants, and responses to distress in Tuvalu *Trans. Psych.* **56** 667–696.

Glantz M H 1994 Creeping environmental phenomena: Are societies equipped to deal with them? *in Creeping Environmental Phenomena and Societal Responses to Them. Proceedings of Workshop held 7–10 February 1994 in Boulder, Colorado* ed M H Glantz (Boulder, Colorado: National Center for Atmospheric Research)

Grant M J and Booth 2009 A typology of reviews: an analysis of 14 review types and associated methodologies *Health Info. Lib. J.* **26** 91–108.

Green M 2016 Contested territory *Nature Clim. Change* **6** 817–820.

Grydehøj A 2015 Island city formation and urban island studies *Area* **47** 429–435.

Guzman A T 2013 *Overheated: The human cost of climate change* (Oxford: Oxford University Press)

Hanna E G and McIver L 2014 Small island states–canaries in the coal mine of climate change and health *in Climate Change and Global Health* ed Butler C D. (Wallingford: CABI)

Hau'ofa E 1998 The ocean in us *Cont. Pac.* **10** 392–410.

Hawkins Z 2010 A decade of mental health services in Timor-Leste *Int. Psych.* **7** 11–13.

Hayes K, Blashki G, Wiseman J, Burke S, and Reifels L 2018 Climate change and mental health: risks, impacts and priority actions *Int. J. Mental Health Sys.* **12**, article 28.

Henssler J, Brandt L, Müller M, Liu S, Montag C, Sterzer P, and Heinz A 2020 Migration and schizophrenia: meta-analysis and explanatory framework *Eur. Arch. Psych. Clin. Neur.* **270** 325–335.

Herring S C, Christidis N, Hoell A, Hoerling M P, and Stott P A eds 2020 Explaining Extreme Events of 2018 from a Climate Perspective *BAMS* **101** S1–S141.

Hunter E, Thusanth S, McCalman J and Gopalkrishnan N 2015 Mental health in the island nations of the Western Pacific: a rapid review of the literature *Aus. Psych.* **23** 9–12.

IPCC 2014 *IPCC Fifth Assessment Report* (Geneva: IPCC (Intergovernmental Panel on Climate Change))

IPCC 2018 *IPCC Special Report on Global Warming of 1.5 °C* (Geneva: IPCC (Intergovernmental Panel on Climate Change))

IPCC 2019 *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* (Geneva: IPCC (Intergovernmental Panel on Climate Change))

IPCC 2020 *IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems* (Geneva: IPCC (Intergovernmental Panel on Climate Change))

Islam R 1999 Mental health services in the Seychelles *Psych. Bull.* **23** 565–567.

Johnston I 2015 Disaster management and climate change adaptation: a remote island perspective *Dis. Prev. Manag.* **23** 123–137.

Joseph L 2006 *The Effects of Mass Trauma on Children of Different Developmental Stages: Examining PTSD in Children Affected by Hurricane Ivan and Hurricane Katrina*. Doctoral Dissertation (Palo Alto, California: Pacific Graduate School of Psychology).

Keesing RM 1989 Creating the Past: Custom and Identity in the Contemporary Pacific *Contemp. Pacific* **1** 19–42.

Kench P S, Thompson D, Ford M R, Ogawa H, McLean R F 2015 Coral islands defy sea-level rise over the past century: Records from a central Pacific atoll *Geology* **43**, 515–518.

Kevan S M 1980 Perspectives on season of suicide: A review *Soc. Sci. Med.* **14** 369–378.

Kim R, Costello A, and Campbell-Lendrum D 2015 Climate change and health in Pacific island states *Bull. World Health Organ.* **93** 819

King R 2009 Geography, Islands and Migration in an Era of Global Mobility. *Is. Stud. J.* **4** 53–84.

Kluge H H P, Jakab Z, Bartovic J, D'Anna V and Severoni S 2020 Refugee and migrant health in the COVID-19 response *Lancet* **395** 1237–1239.

Knutson T, Camargo S J, Chan J C L, Emanuel K, Ho C-H, Kossin J, Mohapatra M, Satoh M, Sugi M, Walsh, K and Wu, L 2019 Tropical Cyclones and Climate Change Assessment: Part I: Detection and Attribution *Bull. Am. Met. Soc.* **100** 1987–2007.

Knutson T, Camargo S J, Chan J C L, Emanuel K, Ho C-H, Kossin J, Mohapatra M, Satoh M, Sugi M, Walsh, K and Wu, L 2020 Tropical Cyclones and Climate Change Assessment: Part II: Projected Response to Anthropogenic Warming *Bull. Am. Met. Soc.* **101** E303–E322.

Krüger F, Bankoff G, Cannon T, and Schipper L. 2015 *Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction* (Abingdon: Routledge)

Kutcher S, Chehil S, and Roberts A T 2005 An integrated program to train local health care providers to meet post-disaster mental health needs *Pan. Am. J. Public Health* **18** 338–345.

Latai-Niusulu A, Binns T. and Nel E 2020 Climate change and community resilience in Samoa *Sing. J. Trop. Geog.* **41** 40–60.

Leckie J and F Hughes 2017 Mental Health in the Smaller Pacific States Mental Health in Asia and the Pacific ed H Minas and M Lewis (Boston, MA: Springer) pp 253–272.

Lewis J 1999 Development in disaster-prone places: studies of vulnerability (London: Intermediate Technology Publications)

Lewis J 2009 An island characteristic: Derivative vulnerabilities to indigenous and exogenous hazards *Shima* **3** 3–15.

Loughry M 2012 Climate change, human movement and the promotion of mental health: what have we learnt from earlier global stressors? *in Climate Change and Displacement: Multidisciplinary Perspectives* ed J McAdam (London: Bloomsbury Publishing).

Lund C, Breen A, Flisher A J, Kakuma R, Corrigall J, Joska J A, Swartz L, and Patel V 2012 Poverty and common mental disorders in low and middle income countries: a systematic review *Soc. Sci. Med.* **71** 517–528.

Macpherson C C and Akpinar-Elci 2015 Caribbean Heat Threatens Health, Well-being and the Future of Humanity *Pub. Health Ethics* **8** 196–208.

Mallidou A 2014 Mapping the landscape of knowledge synthesis *Nurs. Manag.* **21** 30–39.

Mann T, Bayliss-Smith T, and Westphal H 2016 A Geomorphic Interpretation of Shoreline Change Rates on Reef Islands *J. Coastal Res.* **32** 500–507.

Masselink G, Beetham E, and Kench P 2020 Coral reef islands can accrete vertically in response to sea level rise *Sci. Adv.* **6** article eaay3656

McIver L, Bowen K, Hanna E. and Iddings S 2017 A 'Healthy Islands' framework for climate change in the Pacific *Health Prom. Int.* **32** 549–557.

McIver L, Kim R, Woodward A, Hales S, Spickett J, Katscherian D, Hashizume M, Honda Y, Kim H, Iddings S, Naicker J, Bambrick H, McMichael A J and Ebi K L. 2016 Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities *Env. Health Persp.* **124** 1707–1714.

McIver L, Woodward A, Davies S, Tibwe T, and Iddings S 2014 Assessment of the Health Impacts of Climate Change in Kiribati *Int. J. Env. Res. Public Health* **11** 5224–5240.

McLean R and Kench P 2015 Destruction or persistence of coral atoll islands in the face of 20th and 21st century sea-level rise? *WIREs Clim. Change* **6** 445–463.

McMichael C, Katonivualiku M and Powell T 2019 Planned relocation and everyday agency in low-lying coastal villages in Fiji *Geog. J.* **185** 325–337.

McMichael C and Katonivualiku M 2020 Thick temporalities of planned relocation in Fiji *Geoforum* **108** 286–294.

McNamara K E and Des Combes H J 2015 Planning for community relocations due to climate change in Fiji *Int. J. Dis. Risk Sci.* **6** 315–319.

McNamara K E and Prasad S S 2014 Coping with extreme weather: communities in Fiji and Vanuatu share their experiences and knowledge *Clim. Change* **123** 121–132.

Mika K 2019 *Disasters, vulnerability, and narratives: Writing Haiti's futures* (London: Routledge)

Milardo R M 2015 Crafting Scholarship in the Behavioral and Social Sciences: Writing, Reviewing, and Editing (New York: Taylor and Francis)

Monnereau I and Abraham S 2013 Limits to autonomous adaptation in response to coastal erosion in Kosrae, Micronesia *Int. J. Global Warm.* **5** 416–432.

Moosa S 2008 Adaptation measures for human health in response to climate change in Maldives *Reg. Health Forum* **12** 49–55.

Mueller N J and Meindl C F 2017 Vulnerability of Caribbean Island Cemeteries to Sea Level Rise and Storm Surge *Coastal Manag.* **45** 277–292.

Mycoo M 2014 Sustainable tourism, climate change and sea level rise adaptation policies in Barbados *Nat. Res. Forum* **38** 47–57.

Naidu E, Waddell E and Hau'ofa E eds *A New Oceania: Rediscovering our sea of Islands* (Suva: School of Social and Economic Development, The University of the South Pacific)

Nicolas G and Wheatley A 2013 Historical and socio-political perspectives of the Caribbean region on mental health *Rev. Interam. Psic.* **47** 167–176.

Nieuwenhuijsen M and Khreis H 2017 Green space is important for health *Lancet* **389** 700.

Nunn P D 2007 *Climate, Environment and Society in the Pacific during the Last Millennium* (Amsterdam: Elsevier)

O'Byrne L and Smith S 2010 Models to enhance research capacity and capability in clinical nurses:a narrative review *J. Clin. Nurs.* **20** 1365–1371.

Orta Ortiz M S and Geneletti D 2018 Assessing Mismatches in the Provision of Urban Ecosystem Services to Support Spatial Planning: A Case Study on Recreation and Food Supply in Havana, Cuba *Sustainability* **10** article 2165.

Paterson B L 2012 "It looks great but how do I know if it fits?": An introduction to meta-synthesis research *in Synthesizing Qualitative Research: Choosing the right approach* eds K Hannes and C Lockwood (Oxford: : John Wiley & Sons)

Perry C T, Murphy G N, Graham N A J, Wilson S K, Januchowski-Hartley F A, East H K 2015 Remote coral reefs can sustain high growth potential and may match future sea-level trends *Nature Sci. Rep.* **5** article 18289.

Perumal N 2018 "The place where I live is where I belong": community perspectives on climate change and climate-related migration in the Pacific island nation of Vanuatu *Is. Stud. J.* 13 45–64.

Picco L, Chang S, Abdin E, Chua B Y, Yuan Q, Vaingankar J A, Ong S, Yow K L, Chua H C, Chong S A, and Subramaniam M 2019 Associative stigma among mental health professionals in Singapore: a cross-sectional study *BMJ Open* **9** article e028179.

Poltorak M 2016 Anthropology, brokerage, and collaboration in the development of a Tongan public psychiatry: Local lessons for global mental health *Trans. Psych.* **53** 743–765.

Raju E. and Ayeb-Karlsson S 2020 COVID-19: How do you self-isolate in a refugee camp? *Int. J. Public Health* **65**, 515–517.

Rataj E, Kunzweiler K, and Garthus-Niegel S 2016 Extreme weather events in developing countries and related injuries and mental health disorders - a systematic review *BMC Public Health* **16** article 1020.

Rose-Clarke K, Gurung D, Brooke-Sumner C, Burgess R, Burns J, Kakuma R, Kusi-Mensah K, Ladrido-Ignacio L, Maulik P K, Roberts T, Walker I F, Williams S, Yaro P, Thornicroft G and Lund C2020 Rethinking research on the social determinants of global mental health *Lancet* **7** P659-P662.

Sand P H 2009 Diego Garcia: British-American Legal Black Hole in the Indian Ocean? *J. Env. Law* **21** 113–137.

Sattler D N, Whippy A, Graham J M, and Johnson J 2018 A Psychological Model of Climate Change Adaptation: Influence of Resource Loss, Posttraumatic Growth, Norms, and Risk Perception Following Cyclone Winston in Fiji *in Climate Change Impacts and Adaptation Strategies for Coastal Communities* ed. W L Filho (Cham: Springer)

Schwerdtle P, Bowen K, and McMichael C 2018 The health impacts of climate-related migration *BMC Medicine* **16** 1–7.

Selten J-P, van der Ven E, and Termorshuizen, F 2020 Migration and psychosis: a meta-analysis of incidence studies *Psych. Med.* **50** 303–313.

Semrau M, Evans-Lacko S, Koschorke M, and Ashenafi L 2015 Stigma and discrimination related to mental illness in low- and middle-income countries *Epi. Psych. Sci.* **24** 382–394.

Setoya Y and Kestel D 2018 WHO Mental Health Gap Action Programme implementation in the Small Island Development States: experience from the Pacific and English-speaking Caribbean countries *BJP Int.* **15** 27–30.

Shultz J M, Cela T, Marcelin L H, Espinola M, Heitmann, I, Sanchez C, Pierre A J, Foo C Y, Thompson K, Klotzbach P, Espinel Z, and Rechkemmer A 2016 The trauma signature of 2016 Hurricane Matthew and the psychosocial impact on Haiti *Disaster Health* **3** 121–138.

Singh P, Charan D, Kaur M, Railoa K and Chand R 2020 Place Attachment and Cultural Barriers to Climate Change Induced Relocation: Lessons from Vunisavisavi Village, Vanua Levu, Fiji *in Climate Change Impacts and Adaptation Strategies for Coastal Communities* ed. W L Filho (Cham: Springer)

Stair A G and Pottinger A M 2005 Disaster Preparedness and Management in the Caribbean: The Need for Psychological Support *West Ind. Med. J.* **54** 165–166.

Steel Z, Chey T, Silove D, Marnane C, Bryant R A, and van Ommeren M 2009 Association of torture and other potentially traumatic events with mental health outcomes among populations exposed to mass conflict and displacement: a systematic review and meta-analysis *JAMA* **302** 537–549.

Stillman S, McKenzie D, and Gibson J 2006 Migration and mental health: evidence from a natural experiment *J. Health Econ.* **28** 677–687.

Stojanov R ed 2014 *Migration as Adaptation? Population Dynamics in the Age of Climate Variability* (Brno: Global Change Research Centre, Academy of the Sciences of the Czech Republic)

Stratford E, Farbotko C and Lazrus H 2013 Tuvalu, sovereignty and climate change: considering fenua, the archipelago and emigration *Is. Stud. J.* **8** 67–83.

Swinburn B A, Millar L, Utter J, Kremer P, Moodie M, Mavoa H, Snowdon W, McCabe M P, Malakellis M, de Courten M, Waqa G, Fotu K F, Roberts G and Scragg R 2011 The Pacific Obesity Prevention in Communities project: project overview and methods *Obesity Rev.* **12** 3–11.

Tabe T 2019 Climate Change Migration and Displacement: Learning from Past Relocations in the Pacific *Soc. Sci.* **8** 1–18.

Tabucanon G M 2012 The Banaban resettlement: implications for Pacific environmental migration *Pacific Stud.* **35** 1–28.

Thomas M A and Lin T 2020 Illustrative Analysis of Probabilistic Sea Level Rise Hazard *J. Clim.* **33** 1523–1534.

Thomas A S, Mangubhai S, Vandervord C, Fox M, and Nand Y 2019 Impact of Tropical Cyclone Winston on women mud crab fishers in Fiji *Clim. Dev.* **8** 699–709.

Tiatia-Seath J, Tupou T, and Fookes I 2020 Climate Change, Mental Health, and Well-Being for Pacific Peoples: A Literature Review *The Contemporary Pacific* **32** 399–430.

Tuck M, Kench P S, Ford M F, and Masselink G 2019 Physical modelling of the response of reef islands to sea-level rise *Geology* **47** 803–806.

Watts N, Amann M, Arnell N, Ayeb-Karlsson S, Beagley J, Belesova K, Boykoff M, Byass P, Cai W, Campbell-Lendrum D, Capstick S, Chambers J, Coleman S, Dalin C, Daly M, Dasandi N, Dasgupta S, Davies M, Di Napoli C, Dominguez-Salas P, Drummond P, Dubrow R, Ebi K L, Eckelman M, Ekins P, Escobar L E, Georgeson L, Golder S, Grace D, Graham H, Haggar P, Hamilton I, Hartinger S, Hess J, Hsu S-C, Hughes N, Mikhaylov S J, Jimenez M P, Kelman I, Kennard H, Kiesewetter G, Kinney P L, Kjellstrom T, Kniveton D, Lampard P, Lemke B, Liu Y, Liu Z, Lott M, Lowe R, Martinez-Urtaza J, Maslin M, McAllister L, McGushin A, McMichael C, Milner J, Moradi-Lakeh M, Morrissey K, Munzert S, Murray K A, Neville T, Nilsson M, Sewe M O, Oreszczyn T, Otto, M, Owfi F, Pearman O, Pencheon D, Quinn R, Rabbaniha M, Robinson E, Rocklöv J, Romanello M, Semenza J C, Sherman J, Shi L, Springmann M, Tabatabaei M, Taylor J, Triñanes J, Shumake-Guillemot J, Vu B, Wilkinson P, Winning M, Gong P, Montgomery H, and Costello A 2021 The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises *Lancet*, forthcoming.

Weaver L J and Hadley C 2009 Moving beyond hunger and nutrition: a systematic review of the evidence linking food insecurity and mental health in developing countries *Ecol. Food Nut.* **48** 263–284.

WHO 2008 *mhGAP Mental Health Gap Action Programme: Scaling up care for mental, neurological, and substance use disorders* (Geneva: WHO, World Health Organization)

WHO 2013 *Mental health action plan 2013-2020* (Geneva: WHO, World Health Organization)

WHO 2017 *Mental Health Atlas – 2017 country profiles* (Geneva: WHO, World Health Organization)

Wilkie M L 2002 Climate change, forests and SIDS *Int. Forestry Rev.* **4** 313–316.

Williksen-Bakker S 1990 Vanua—a symbol with many ramifications in Fijian culture *J. Anthro.* **55** 232–247.

Woodroffe C D, Rogers K, McKee K L, Lovelock C E, Mendelssohn I A and Saintilan N 2016 Mangrove Sedimentation and Response to Relative Sea-Level Rise *Ann. Rev. Mar. Sci.* **8** 243–266.

Yamamoto L, Esteban M 2014 *Atoll Island States and International Law: Climate Change Displacement and Sovereignty* (Berlin: Springer)