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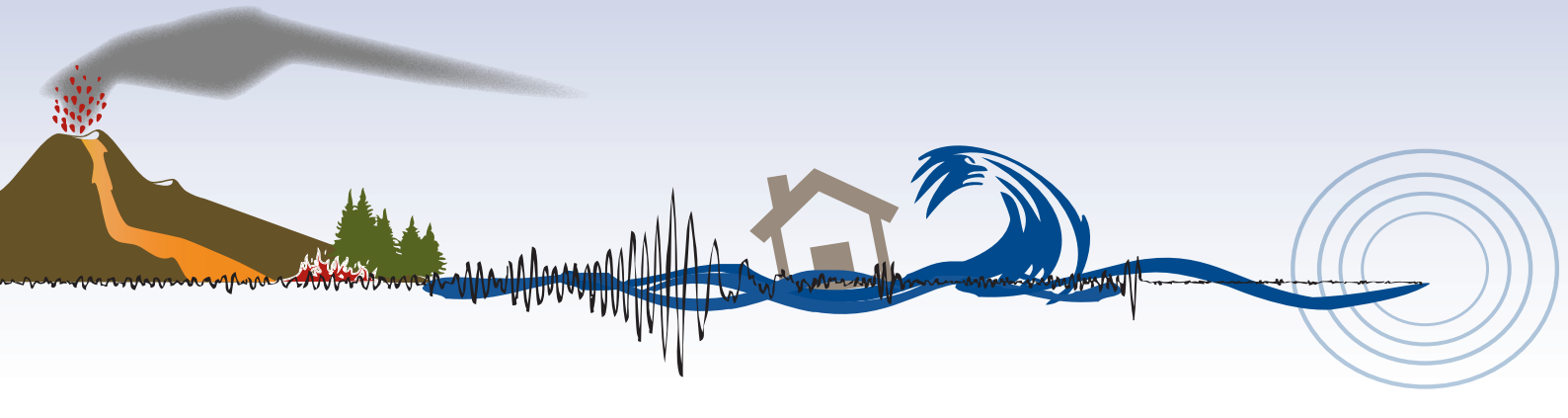

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Post-disaster residential mobility: Considerations for Aotearoa New Zealand and Australia

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Abstract

A range of hazards such as earthquakes and fires can propel people and communities to flee or seek safety to protect or rebuild their lives. These forms of residential mobility can encompass temporary and permanent displacement, relocation, and return. They also impact on individuals, relationships, and experiences of security. Here, residential mobility research is examined with a specific focus on two events in Aotearoa New Zealand and Australia to highlight the need for ongoing consideration of residential mobility in preparation for and recovery from a disaster. Applying a push/pull lens, this article outlines critical drivers for people's movements after a disaster. Areas of interest are noted as well as considerations for future research. How and why people relocate is complex and contextual, and influences community recovery and wellbeing. As such, greater knowledge about residential mobility is essential to assist people and communities to recover well.

Keywords: *Residential mobility, relocation, displacement, earthquakes, bushfires, disasters, Aotearoa New Zealand, Australia*

Residential mobility – the processes of temporary displacement or more permanent relocation – has been evidenced following various natural hazard-related events (for example see Groen & Polivka, 2010). In extreme cases, with particular hazards such as earthquakes and fires, entire communities in an affected area need to flee to find safety and rebuild their lives due to houses being destroyed or to seek better air quality (Belcher & Bates, 1983; Peacock et al., 2018). Drivers to relocate, known as push or pull factors, are complex and many. Relocating after a disaster, as with staying in place, has been associated with a range of poor psychological outcomes and can impinge on individual wellbeing, social relationships, and experiences of security (Uscher-Pines, 2009). This in turn influences whether people and communities recover well and re-engage in their various everyday activities and routines (Peacock et al., 2018).

Foregrounding the various push/pull drivers can aid in advancing natural hazard preparedness and recovery practices (Peacock et al., 2018) and benefit those working at the coalface of emergency management and at the policy level. This paper considers some of the push/pull elements that have been shown to contribute to residential mobility following a disaster generally, then explores how these elements materialised in research following the 2010/11 Canterbury earthquakes in Aotearoa New Zealand and the 2009 Black Saturday bushfires in Victoria, Australia. While this is not a comprehensive literature review, the two case studies offer insights into working with communities to rebuild and recover after natural hazard-related events in both Aotearoa New Zealand and Australia. We then suggest key areas of interest as well as considerations for future research. This article was produced prior to the ongoing COVID-19 pandemic, so it provides a broad overview of residential mobility in natural hazard situations not including pandemics or related considerations.

The Need to Move

In response to or following a disaster, residential mobility is often associated with types of housing and housing needs which can be categorised as follows: initial emergency sheltering required directly during/after a disaster, temporary sheltering based on short-term accommodation, temporary housing which spans

a longer period of time due to housing repairs or limited access to longer-term housing, and permanent housing which includes returning to original dwellings at the time of the event or relocating permanently (Peacock et al., 2018; Quarantelli, 1982; Scheele & Horspool, 2018). The types of housing required after a disaster are important, however residential mobility encompasses more than just housing; it is about people's wherewithal and capacity to move or not. At times after a disaster, people relocate initially because of housing needs and either return or permanently remain at their relocation area. At other times, however, people will not immediately relocate but do so later. Notably, relocation is not a linear process; some people have to withstand various shifts back and forward between multiple forms of shelter due to ongoing housing and social issues, such as rebuild complications or constant environmental dangers (Scheele & Horspool, 2018). Residential mobility, in this article, considers the range of mobility experiences and people's social and cultural experiences, their agency to move, and the complexity surrounding movement within everyday lives.

Push and/or Pull Influences on Residential Mobility

Residential mobility involves a dynamic interplay between individual, social, cultural, financial, political, and environmental push and pull drivers that interact with people's motivation and decisions to move (Hugo, 1996; Myers et al., 2008). Push factors include the natural hazard-related event itself and other unfavourable conditions that people want to avoid, such as environmental degradation, loss of income, or reduced sense of safety. Pull factors entice people to relocate to new environments (Pullin, 2017) or to stay and rebuild. Elements that pull include a better climate, increased wealth, or security. Either way, a different result or living condition is sought. The push and pull interplay is multi-dimensional and layered (Dickinson, 2013; Lee, 1966).

Personal and social characteristics like age, ethnicity, gender, and education, alongside personal circumstances and life events such as becoming parents, divorce, exposure to domestic violence, and carer responsibilities, all interact with the push and pull elements that affect people's actions. In addition, social features include cultural beliefs and practices and spiritual attachment to places and the land (Becker et al., 2018; Groen & Polivka, 2010; Morris et al., 2018). Connection to kinship and land is especially relevant for Indigenous people (for example see Lambert, 2014; Williamson et al., 2020). In this way, various anchors such as attachment to kinship groups or ancestral networks and place can consciously or unconsciously contribute to residential mobility actions and outcomes, which are also moderated by the conditions surrounding the natural hazard-related event. Cultural and emotional connections to dwellings and to communities are recognised as potentially intrinsic to where people reside (Adams-Hutcheson, 2014; Becker et al., 2018; Gibbs et al., 2016; D. King et al., 2014; Lee, 1966).

Push and/or pull triggers on people's mobility are related to community ties and socio-political elements generally, such as the demographics of a neighbourhood before and after a disaster, location of the dwelling(s), owning or renting, and access to more suitable dwellings (Storr & Haeffele-Balch, 2012). For instance, the pull to stay can be influenced by the likelihood of other community members remaining and rebuilding, especially with communities that have a high level of connection, cohesion, and shared identity and who are more able to collectively mobilise to rebuild and recover well (Chamlee-Wright & Storr, 2011; Storr & Haeffele-Balch, 2012).

It is well known that socially disadvantaged or marginalised groups are disproportionately susceptible to displacement from natural hazard-related disasters (Groen & Polivka, 2010; Hunter, 2005). Low-income households are more affected because they are more likely to rent or reside in substandard or unsafe housing. People who do not own a home tend to be the most mobile (Elliot, 2014), which likely arises from a combination of factors including poverty, fewer resources, and less social capital to draw on for mobility or recovery actions (Blake et al., 2017; Scheele et al., 2019).

Hazard-related property damage is considered a strong and consistent predictor of any push or pull to relocate or stay (Gibbs et al., 2016), over and above the influence of other elements. People respond to hazards through existing social structures. Entrenched in issues surrounding property damage and the ability to move are insurance claims and the length of time it takes to repair or rebuild through those official mechanisms (Insurance Council of New Zealand, 2021; A. King et al., 2014; Nguyen & Noy, 2017). The type and severity of a hazard and government policy are reasons for moving and influence how that moving unfolds.

This summary emphasises that whether people move or stay is contextual and situationally complex. A range of push and pull elements contribute to any actions regarding residential mobility (or lack thereof) for people exposed to hazards. Ideally, any research, policy, or

practice should consider all elements across individual, social, cultural, financial, political, and environmental spheres to understand residential mobility more fully and what influences the capacity to be mobile (Quarantelli, 1982); however, this can be difficult due to constraints such as time and resourcing.

Case Study Method

This article evolved from a collaboration between Australian and Aotearoa New Zealand researchers and key stakeholders working in disaster recovery, funded by the Bushfire Natural Hazards Cooperative Research Centre. The broader project focused on the development of a "Recovery Capitals" resource that emphasises community capitals (social, natural, political, built, human, financial, and cultural) and resources within communities to support disaster recovery (for example see Campbell et al., 2021; Quinn et al., 2021).

The following section explores the push/pull of residential mobility using two cases studies, namely the Aotearoa New Zealand Canterbury earthquakes and the Australian Black Saturday bushfires. We saw value in combining our research spaces to underscore contextuality within residential mobility. The Aotearoa New Zealand researchers chose the Canterbury earthquake sequence as it remains one of the most significant disasters to occur in Aotearoa in recent times (Ministry of Business Innovation and Employment, 2017), and initiated significant residential movement. The Australian researchers have in-depth knowledge of, and research experience with, the Black Saturday bushfires, which also triggered significant residential movement. Case studies further enable investigations of community-situated and contextually embedded events in ways that support in-depth understandings (Yin, 2014).

Post-disaster Residential Mobility Following the Canterbury Earthquakes in Aotearoa New Zealand

Aotearoa New Zealand's literature on post-disaster residential mobility mainly results from the 2010/11 Canterbury earthquake sequence and more specifically the 22nd of February, 2011, Christchurch earthquake, where 185 people lost their lives following the widespread destruction of Ōtautahi (Christchurch) city. As Aotearoa New Zealand's major contemporary disaster, the earthquakes shaped post-disaster mobility (or immobility) in that it precipitated Aotearoa New Zealand's greatest temporary and permanent residential movement (Dickinson, 2013; Potter et al., 2015).

The population of Christchurch decreased by 8,900 (2.5%) between June 2010 and June 2011, as recorded by Statistics New Zealand (2011). The exact numbers of people who relocated from Christchurch to regions beyond Canterbury have been difficult to find, however. National census data from Christchurch at the time of the earthquakes was compromised because the timing of the data collection was delayed until 2013. Further, any known figures represent population shifts at a broad level, not internal displacement or movement within the city or short-term relocation after the earthquakes. Internal migration across Christchurch city transpired as people needed to shift from damaged homes for non-specific time periods (Murphy, 2021), as indicated by population increases in certain suburbs of Christchurch after the earthquakes (Statistics New Zealand, 2011). Broader literature on the Christchurch earthquakes signals toward residential mobility as part of the recovery process (for example see Cloke & Conradson, 2018; Marlowe, 2013, 2015; Vallance, 2011).

With a psychological focus, Hogg et al. (2016) investigated the relationship between different forms of relocation and treatment for mood and anxiety 1 year before and 1 and 2 years following the 2011 Christchurch earthquake. Participants were a subset of residents from Christchurch who lived in different areas of the city; these people were described as stayers, within-city movers, out-of-city movers, and returners. Findings indicated that moving within the city had a protective effect on wellbeing over time while returning produced short-term risk for mood and anxiety symptoms in the first year only after the earthquake. Out-of-city movers from minor to severely damaged areas were more vulnerable to mood and anxiety symptoms 2 years after the earthquake. For those who resided in more impoverished areas, moving out of the city was associated with longer-term risk (after 2 years) for mood and anxiety symptoms. These outcomes may have intersected with other conditions, such as living in hazard-prone areas or having little political agency or power. As expected, groups more affected were older adults, those who identified as female, and those with pre-existing mental distress.

Lambert (2014) also acknowledged wider social inequalities relating to post-disaster residential mobility. Lambert analysed government data and various reports for information about Māori responses and locations affected by the earthquake. Twelve interviews with first responders, marae (complex of buildings) managers, and others were held 6 months after the February 2011 earthquake and a further 14 interviews were held 12-

14 months after the earthquakes. Data revealed that Māori communities resided in the hardest hit and often lowest socioeconomic areas of Christchurch (such as the Eastern suburbs). For these communities, mobility was greater due to property and infrastructure damage. Estimating habitability, displacement, and sheltering needs for tsunami in the coastal areas of Christchurch, Scheele et al. (2019) corroborates Lambert's work (Lambert, 2014, 2015; Lambert et al., 2012), citing relocation actions as an outcome of low income, the prevalence of renting, poor standards of housing, and lack of resources.

Regarding refugee communities following the Canterbury earthquake sequence, Marlowe (2015) explored belonging and anchoring for families who were already inherently mobile due to previous resettlement. Christchurch was a primary resettlement locality for refugees before the earthquakes (Marlowe, 2018). Talking to 101 people with refugee backgrounds, Marlowe's (2015) research points to the complexities of refugees' ethno-backgrounds and experiences of people held under the conflated banner of "refugees". For example, Marlowe (2018) estimated that half of the Somali community and 75% of Ethiopian communities relocated after the 2011 earthquake to find work. Kurdish and Eritrean communities felt that they had "almost no-one left following the earthquakes" (p. 113). Marlowe highlights how the push/pull of belonging and relationality and contextual elements (e.g., time, culture, and language) as part of recovery processes are connected to disaster mobility.

Some research is noted in reference to insurance. While these studies are not specific to residential mobility, they allude to issues that underscore drivers of movement for households and dwellings and contribute to the push/pull process. Merkin (2012) and A. King et al. (2014) studied the complexity of the insurance settlement processes following the 2010/2011 earthquakes. With 17 earthquakes causing intense shaking and extensive damage, the period between the earthquake events was not sufficient to assess buildings or repair any damage. There were over 500,000 residential claims for property, land, and household contents. Approximately 160,000 of those were for dwellings.

Aotearoa New Zealand has one of the highest uptakes of insurance in the world, and the 2011 earthquake sequence was the most heavily insured earthquake event in history (Nguyen & Noy, 2017). Brown et al. (2013, 2017) studied the role and efficacy of commercial insurance policies but suggest improvements relevant to residential policies and ultimately to residential mobility because of household damage or repair. These suggestions included having clearer phrasing in insurance policies, creating sector-specific polices, better systems for claim assessment, and policy incentives to reduce risk prior to a natural hazard-related event. Poontirakula et al. (2017) argued that prompt and full claim pay-outs resulted in improved recovery if the claim was adequate.

Land zoning also propelled residential mobility following the more damaging M6.2 Christchurch earthquake in 2011. Land was zoned to denote levels of damage and ongoing risk (red, orange, green, and white; Dickinson, 2013, 2021). Focussing on post-disaster residential mobility, Dickinson (2013) produced a typological analysis of 31 relocatees (within-city) who were forced to sell their homes following a government buy-back scheme for those in the red zone. Dickinson found that the majority were not keen on short-term relocation, and those who did relocate before the compulsory zoning decision had a social connection with someone outside of the earthquake area. Others potentially experienced push/pull drivers because they were without electricity or water. When purchasing a post-quake house, cost and safety were important elements. Housing relocations were also influenced by agency over moving, interactions with official government organisations and insurance companies, and time lived in the red-zoned areas.

Adams-Hutcheson (2015) studied a cohort of relocatees who moved from Christchurch to another Aotearoa New Zealand region in the North Island. Most of the people included in the study relocated from significantly damaged suburbs between 2010-2012 rather than in the immediate aftermath. The research focussed on emotion and affect to elucidate the trauma and ambiguity infusing decisions to relocate, offering insight into the lived reality of decisions on leaving a post-disaster city (Adams-Hutcheson, 2014, 2015, 2017). A participant summed up respondents' views on relocation by stating that:

> "[Relocation is] like being wrenched away from everything you know, our house was smashed, unliveable, we didn't know anyone up here [Waikato] but I moved for the kids. The kids are safe now and my relief at that is profound. But, we left behind everything, family, work, friends, yeah, everything. And it became very clear to me that the kids and I are alone in our grief and alone in our loss and that still really hurts." (Alexis; Adams-Hutcheson 2018, p. 151)

This narrative powerfully describes how people can feel "wrenched away" when houses are damaged and movement is forced. It also highlights how isolated people can feel in the process of moving. The Adams-Hutcheson (2018) study also found that relocating from Christchurch was considered a "blessing" because it meant no longer enduring instability, ongoing earthquake shaking, and the lack of familiar routine; instead, people were able to regain a sense of stability through school, work, and home life. Yet, the overpowering guilt of "leaving behind" friends and family and the difficulty adjusting to new surroundings, temperatures, and cultures left some relocatees emotionally wrought. People who moved continued to suffer mild to severe forms of post-traumatic stress disorder. Trauma was multi-located, in that some residents not only survived the earthquakes but relocated as well. Families who moved were separated from each other and their beloved city, such that relocating was trauma in and of itself (Adams-Hutcheson, 2014, 2015, 2017).

The research surrounding this case study speaks to the complexity of relocation and how it can influence moods and psychological states, and that relocation mostly impacts disadvantaged and marginalised communities with insurance processes and land zoning being highly emotive and stressfully laden events. Moving to another area can offer a reprieve from the challenges of ongoing disaster recovery but does not entirely negate ongoing emotional traumas. This work suggests that relational and contextual elements are connected to disaster mobility.

Case Study: Residential Mobility Following the Black Saturday Bushfires in Victoria, Australia

In the summer of 2008/2009, after a decade of severe drought, bushfires ravaged the Australian landscape. The worst of the fires occurred across the state of Victoria on the 7th of February, 2009. These fires are commonly referred to as the Black Saturday bushfires. They resulted in the loss of 173 lives and over 2,000 homes and caused widespread damage to townships, landscapes, and infrastructure (Victorian Bushfires Royal Commission, 2009). As a result, many people had to seek temporary alternative housing and make decisions about whether to rebuild and stay living in their community or relocate and begin a new life somewhere else. The State Government provided a range of housing assistance options, and 3 years after the fires introduced a non-compulsory buy-back scheme for high bushfire risk land where properties had been destroyed.

One of the immediate barriers to rebuilding damaged and destroyed homes after the Black Saturday bushfires was lack of resources. Chang-Richards and colleagues (2013) conducted a longitudinal mixed methods study after Black Saturday, collecting data in Marysville, Kinglake, Flowerdale, and Melbourne. This included a questionnaire with 22 respondents 16 months after the bushfires and interviews 6-, 16-, and 28-months post-disaster with 15, 27, and 10 participants respectively. Participants included government officials, rebuilding advisors, construction professionals, researchers, and community representatives. They found that 28 months after the bushfires, reconstruction was slow primarily due to changed building standards, risk perceptions by construction professionals, economic conditions in the building market, and the socioeconomic circumstances of those who had lost their homes. For example, changes in fire safety requirements for building materials undermined the affordability of rebuilding houses. These factors had a particularly strong impact on people who were financially vulnerable, such as those uninsured or underinsured, limiting options for decisions on whether to rebuild rather than relocate.

Ireton and colleagues (2014) note the importance of appreciating that deciding to stay locally would have required going through the process of rebuilding and that there were numerous reasons why this was not feasible or desirable for many. Despite prevailing assumptions and pressure from government and media, the process of planning and carrying out a rebuild and re-establishing gardens was something for which many were not physically, emotionally, or mentally fit or interested. Indeed, some people had tentative plans to relocate prior to the bushfires, and the hazard served as a catalyst for enacting those plans. Ireton and colleagues outlined considerations for improved support for people in the process of rebuilding or relocating after future disasters. These considerations include better temporary accommodation options that enable people to live more comfortably and retain their financial capital for longer periods so that decisions can be made more slowly and with less pressure.

Challenges for rebuilding included that people were more likely to move out of the community in the 3 years after the Black Saturday bushfires if their property was damaged or destroyed (Gibbs et al., 2016). The Beyond Bushfires (2021) study was a longitudinal mixed method study which focussed on individual and community resilience and recovery following the Black Saturday bushfires, initially focussing on the first 5 years (Gibbs et

al., 2013) and then extending to 10 years post-bushfires. It involved over 1,000 participants from 25 Victorian communities with varying levels of bushfire impact, categorised as high, medium, and low/no impact. A sub-study was conducted to compare experiences for those who stayed living within their communities compared to those who relocated, using interview and survey data 3 years post-bushfires. The quantitative analysis involved structural equation modelling of the relationship between bushfire exposure, major life stressors, sense of community, and wellbeing (Gibbs et al., 2016). While the analysis showed the relationship between property loss and relocation, it was the interview data that revealed that decisions relating to residential mobility were highly emotive due to people's fears about ongoing danger from bushfires conflicting with guilt about leaving neighbours and community recovery efforts. Conflicting push and pull factors for relocation were also described by Boon et al. (2012), who conducted a stepwise mixed methods study across four locations and disaster types, including a quantitative survey of 249 residents of Beechworth after the Black Saturday bushfires. Structural equation modelling revealed that amongst Beechworth participants, relocating was associated with infrastructure problems, low sense of place, low financial capacity, and prior disaster experiences.

The Beyond Bushfires interview data also showed that those who decided to stay living in their community described feeling abandoned by their friends and neighbours who decided to leave (Gibbs et al., 2016). A separate analysis of the survey data using a network statistical model showed that the risk of depression was higher for those who remained living in the community but whose close social contacts had relocated (Bryant et al., 2017).

A separate study situates these experiences and decisions within the complexity of people's lives, including dynamics within couples and families. Proudley (2013, 2018) offers a nuanced examination of residential mobility through a qualitative case study based on in-depth interviews with 33 adults in Gippsland after the Black Saturday bushfires. This study highlighted that residential mobility decisions were often made collectively rather than individually, yet people within a couple or family have different needs and desires regarding post-disaster residence. In many cases, this gave rise to tensions, compromises, and relationship breakdown in some cases. Proudley (2013) showed that age, gender, and socioeconomic factors (particularly insurance status) played important roles in residential mobility and recovery experiences for study participants. For example, for many older study participants, the decision to relocate was directly tied to their life stage as they felt that rebuilding would not be feasible or worthwhile for them given their age (Proudley, 2018). Similarly, an in-depth qualitative analysis of the 35 child and adult interviews in the Beyond Bushfires study revealed that family decisions about where to live included consideration of the recovery experiences of the children and teenagers and their need for a sense of safety and stability. For some families, this meant staying locally where people and place were familiar, whereas others felt that their children's wellbeing would be better supported if they relocated elsewhere away from the damage and disruption (Gibbs et al., 2015).

Reflecting on the role of government and service providers in the process of residential rebuilding after Black Saturday, Ireton and colleagues (2014) observed that decisions about rebuilding or relocating were made more difficult by the lack of evidence and guidance available. Consistent with the findings of Proudley (2018) and D. King et al. (2014), the authors posited that although post-disaster experiences would be different for those who relocated compared to those who rebuilt or remained locally after the bushfires, the most important influence on long-term wellbeing was likely to be whether people felt they had agency, control, and a range of options in making those decisions.

The Beyond Bushfires quantitative findings provided evidence to guide future decision making about relocation. They showed that, overall, the wellbeing levels of those who stayed and those who relocated were about the same 3 years after the bushfires, but for different reasons (Gibbs et al., 2016). Those who moved benefited from reduced post-disaster disruption in their lives but had a lower sense of community, and the trauma of the disaster event still affected their wellbeing 3 years later. Those who remained living in the bushfire affected community had to deal with a range of post-disaster stressors such as rebuilding and reduced income but also had the opportunity for shared processing of the disaster experience. Connection to place and community motivated some people to stay living locally.

Conversely, others were motivated to relocate due to changes to the local area, social tensions, or painful memories (Gibbs et al., 2015; Gibbs et al., 2016). Proudley's (2013, 2018) study adds to these findings by demonstrating the centrality of place attachment, identity, sense of control, loss, feelings of being unsettled, and the yearning for "home" in residential mobility experiences.

Similarly, D. King et al. (2014) reported that people who moved and people who stayed were both adaptable and demonstrated resilience. Relocation outcomes appeared to be better when people experienced agency and control over decisions to move.

In summary, the Victorian Black Saturday bushfires case study highlights the importance of a sense of agency in making decisions about rebuilding and residential location and the many considerations involved, including financial capacity, family circumstances, social ties, and community connections.

Discussion

These two case studies represent several push/pull themes. Both case studies featured psychological distress like risk of anxiety and depression for those who remained or returned to disaster affected areas. Emotional and trauma related responses also impacted decisions to move, stay, or return. Research following the Black Saturday bushfires, in particular, found that people who left experienced emotional turmoil, such as guilt for leaving, while those who stayed felt abandoned by those who moved. Both events demonstrated how belonging and community connection influenced decisions to leave, stay, or return. Both studies also highlighted how contextual and structural elements such as poverty, dwelling type (renting or owning), and housing damage impact actions around residential mobility. Financial issues such as adequate insurance featured in both case studies, which included the cost of rebuilding and whether people had the appetite to endure rebuilding. In particular, being uninsured or underinsured constrained people's decisions to rebuild or leave. Research following the Canterbury earthquakes demonstrated how land zoning and ongoing risks from hazards influenced moving decisions. One key influence on long-term wellbeing, as shown by longitudinal studies after the Black Saturday bushfires, was people's experiences of having agency or control and options. People needed to feel like they had agency or the ability to make decisions on staying or moving. Collectively, these push/pull elements were layered, interwoven, and complex, but all influenced the quality of social relationships and experiences of security.

While the two case studies are situated in different lands and represent different natural hazard events, both demonstrate the complexity of residential mobility and its key role in community flourishment and disaster recovery. Recognising the multi-layered and complex individual, social, cultural, and political elements that propel residential mobility should help inform actions and practices for emergency management and housing stakeholders after a disaster. There is no linear trajectory for people's mobility needs; some might initially relocate and return while others will permanently relocate or change residential location multiple times, moving in and out of the original community (Groen & Polivka, 2010).

Ongoing Research Considerations

According to a review of the literature by Scheele and colleagues (2019), relocation research is limited and often under-conceptualised. Comprehensive data on residential mobility following a natural hazard event can also be challenging due to the lack of specific details about events and ethics or regulations preventing release or access to personal information. More detail is needed about the specificity of residential mobility within studies, including directly exploring the complex processes (push/pull forces) that precipitate relocation actions. Previous studies of post-disaster residential mobility have relied on mobile phone information, postal address changes, and school roll data, but do not necessarily acknowledge the assumptions underlying those data sources. For instance, telecommunication data implies ownership of a mobile device or similar technology, and postal service data assumes a home. Similarly, school attendance to log residential location relies on a family-based household (Scheele et al., 2019).

Moving forward, this exploration of the push/pull of residential mobility shows the imperative to continue to explore the range of elements that intersect with residential mobility actions. This could entail looking beyond decision-making processes to include more in-depth knowledge about the role of physical safety, emotional and cultural attachment to land, and local and national government policy on people's experiences and residential mobility (D. King et al., 2014; Peek et al., 2011). In-depth narrative accounts may assist in shedding light on motivations to stay or relocate, future intentions, and counterfactual information (such as whether people would have relocated regardless of the disaster). Analysis of disaster recovery policies (e.g., property buy-back schemes in high-risk locations) and recovery services (e.g., location of temporary housing) would also provide useful contextual information.

Any narrative accounts should include community-driven research that is culturally appropriate and that centres Indigenous experience to gain insight to support safe mobility for all. This type of research could also encapsulate the longer-term effects of colonisation and

settler mobility regarding post-disaster relocation and the challenges it poses (Williamson et al., 2020). As profoundly acknowledged by Howitt et al. (2012), policies that mandate that Indigenous people move away from their places of connection are unjust. It causes undue strain on relationships that are founded on kinship, togetherness, and access to homelands.

Residential mobility and disaster research structured to include different residential circumstances based on solid study designs rather than opportunistic methods (Hogg et al., 2016) would make it possible to theorise residential mobility and broader housing issues more fully. This could involve exploring the impact of the housing crisis, including renting and overcrowding (Johnson et al., 2018), on people's ability to move or stay following a disaster or drawing on longitudinal designs (retrospective and prospective) to investigate the long-term consequences of the increasing severity and scale of disasters.

To reduce risk exposure and prevent the need for post-disaster residential mobility, environment and lifestyle push/pull elements (e.g., where we build, insurance bail-out culture) also require attention. People assume they will be protected or rescued by insurance, but policy and practices change. For example, current framing of insurance in Aotearoa New Zealand has shifted from total replacement cost to only replacing the sum insured (Dickinson, 2013; A. King et al., 2014) and, as uncovered by Miles (2012), insurance schemes can benefit corporate profits over the needs of people or economic recovery. Therefore, ongoing investigation into the impact of under-insurance or un-insurability on residential mobility (relocation and staying) in areas that are high risk could help people navigate any future disaster events.

Of course, as previously noted, this examination of residential issues occurred prior to the COVID-19 pandemic. In these current pandemic times, residential mobility (Mendolia et al., 2020) is likely reduced due to travel restrictions and/or health risks. It is important to ask how the widespread acceptance of mobile tracking, economic insecurity, technological changes, increased acceptability of remote working arrangements, and changes in the insurance sector due to COVID-19 will act as push/pull elements in residential mobility. Further, COVID-19 and multiple cascading disasters have implications for residential mobility and emergency management. How and why people relocate is complex, context-specific, and matters to disaster preparedness and recovery policies and practices (Peacock et al., 2018).

In this article, we have explored some of the push/pull elements that contribute to residential mobility, with a specific focus on natural hazard events in Aotearoa New Zealand and Australia. By presenting case studies about post-disaster residential mobility in Aotearoa New Zealand and Australia we demonstrate that relocation is complex, non-linear, and intimately tied to context. Understanding the various push/pull drivers of residential mobility would aid in supporting recovery and resilience for people and communities impacted by disaster.

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The limits of resilience: A discussion of resilience from the perspectives of critical disaster studies

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Abstract

Mechanistic and scientific approaches to resilience assume that there is a "tipping point" at which a system can no longer absorb adversity; after this point, it is liable to collapse. Some of these perspectives, particularly those stemming from ecology and psychology, recognise that individuals and communities cannot be perpetually resilient without limits. While the resilience paradigm has been imported into the social sciences, the limits to resilience have often been disregarded. This leads to an overestimation of "human resourcefulness" within the resilience paradigm. In policy discourse, practice, and research, resilience seems to be treated as a "limitless" and human quality in which individuals and communities can effectively cope with any hazard at any time, for as long as they want and with any people. We critique these assumptions with reference to the recovery case in Ōtautahi Christchurch, Aotearoa New Zealand following the 2010-11 Canterbury earthquake sequence. We discuss the limits to resilience and reconceptualise resilience thinking for disaster risk reduction and sustainable recovery and development.

Keywords: *Canterbury earthquake sequence, critical disaster studies, disaster risk reduction, disaster theory, limits of resilience, resilience, social capital, sustainable recovery*

Mechanistic, scientific, and interdisciplinary approaches to resilience have not only enriched resilience thinking in disaster research but also clouded its conceptualisation (Alexander, 2013). When resilience thinking was adapted to social sciences from various disciplines such as ecology, engineering, and psychology, the notion of the "limits of resilience" was somewhat disregarded. In some of these perspectives, particularly those stemming from ecology and psychology, there is a "tipping point" at which systems can no longer bend and absorb adversity and may collapse. As Manyena (2006) describes, in the current resilience paradigm in disaster research, "resilience is arguably about people's capacity far beyond the minimum of being able to cope" (p.438). Particularly drawing upon ecological and psychological perspectives, individuals and communities cannot be perpetually resilient to disasters – which may be triggered by natural or human-induced hazards – without limits. While tipping points may be contextual and variable, they typically manifest post-disaster as civic withdrawal, increased community distrust, decline in social activities, out-migration, fatigue, depressive symptoms, trauma, mental health issues, substance abuse, domestic violence, suicides, lonely deaths, and other psychological and social issues (e.g., Bonanno et al., 2010). This is particularly evident in residents of Ōtautahi Christchurch (Ōtautahi hereafter) in Aotearoa New Zealand who have gone through multiple disasters, including: major earthquakes (2010, 2011, and 2016), major floods (2014, 2017, and 2021), the 2017 Port Hills wildfire, the 2019 terrorist attack and, as with the rest of the world, the current COVID-19 pandemic. While physical infrastructure and the built environment can be rebuilt more sustainably, the current resilience approach does not seem to help people and communities recover from disasters as sustainably as intended.

In policy discourse, practice, and disaster research, resilience seems to be treated as a "limitless" human quality. It is unrealistically conceptualised as a convenient buzzword in disaster risk reduction (DRR), adaptation to climate change, and sustainable development strategies that individuals and communities can be resilient at any time, for as much and as long as they want and with any people. This popular concept has been heavily criticised for various reasons including the lack of clarity (Alexander, 2013; Manyena, 2006; Tierney, 2014), the

incommensurability of resilience (Chandler & Reid, 2016; Olsson et al., 2015), the tendency to disregard the issue of social vulnerability to disasters (O'Brien et al., 2006; Uekusa, 2018), and the neoliberalisation of resilience (Chandler & Reid, 2016). However, even these critiques have not properly addressed the issue of the limits of resilience, excepting a few social scientists who included "resilience thresholds" in their frameworks (e.g., Folke et al., 2011; Payne et al., 2019; Resilience Alliance, 2007; Wilson, 2012). Nonetheless, their works are not theoretically and empirically informed. Thus, it is critical to ask a further conceptual question: is it realistic and practical to theorise resilience as a "limitless" human and community quality? If so, how much and how long in reality do individuals need to be resilient and "endure", and how many layers of resilience do communities have to develop if community resilience refers to both built environment and people? We all need to remember that people in the first place aspire to be outside the disaster-prone areas, instead of being stuck and given the label of being "resilient" (Manyena, 2006). How then should this notion be included in a more realistic and practical conceptualisation of community resilience?

Referring to the case of Ōtautahi recovery in Aotearoa New Zealand, resilience theories need to carefully consider the fact that, while the city is physically recovering from the 2010-2011 Canterbury earthquake sequence (details of the sequence and subsequent damage are available elsewhere, e.g., Potter et al., 2015), residents have experienced and need to deal with the *wave* of (sometimes related) adversities. These include the disasters mentioned above, pre-disaster social problems, limited economic growth, working-age population exodus, mental health crises (i.e., heightened depression, substance abuse, and domestic violence), river and groundwater pollution, and sea-level rise. Following the 2010-2011 major urban disaster, people in Ōtautahi have generally shown remarkable resilience and exemplary social recovery as described in many research studies and international media reports (see for example Crowley & Elliott, 2012); however, such resilience is not pre-planned, engineered, politically enhanced, or limitless. Some of Ōtautahi's residents, particularly those who are more socially vulnerable and have taken longer to get back on their feet (such as the poor, the elderly, migrants, and refugees), have appeared to be "resilient" simply because they had no other options than withstanding the series of disasters and on-going social issues. Without healthy and sustainable recovery of all affected people, the very idea of community and built environment resilience may be an unattainable blueprint.

While experiencing varying degrees and speed of recovery and resilience, residents in the affected areas in Ōtautahi do not cease to cope with challenges. Thus, unlike built environment resilience, human resilience can be understood as a normative function of human adaptation to cultural, economic, environmental, ideological, political, and social changes and challenges (Masten, 2001) even though how well people adapt to such changes and challenges depends on the resources they possess and/or are able to access (Uekusa, 2018; Ungar, 2011). Have those in Ōtautahi, for instance, had any opportunities to stop (or take a "break" from) being resilient? Considering varying personal circumstances, some people in a disaster-affected community need to endure or be resilient more than others or for a more prolonged period of time, which again reflects the amount and types of resources they possess and to which they have access (Uekusa, 2018). It is unsurprising that some disaster survivors, especially the socially isolated and vulnerable such as older adults, experience heightened economic, mental health, political, and social challenges, often resulting in severe psychological distress and, in the worst cases, suicides and lonely deaths (Allen et al., 2018; Bonanno et al., 2010; Kunii et al., 2016; Orui et al., 2018; Yasumura, 2019). Drawing upon previous empirical research, this paper will explore the limits of resilience and call for further theoretical and empirical discussions. It is hoped that the notion of the limits of resilience will help researchers, practitioners, and policymakers reconceptualise the already troubled resilience thinking for more effective DRR and sustainable recovery and development.

The Notion of the Limits of Community Resilience vs. Individual Resilience

The major criticism of the resilience approach includes: 1) the lack of conceptual clarity and measurement (e.g., what kind of resilience for whom?; Alexander, 2013; Tierney, 2014); 2) the mystification of social agency and human resourcefulness, which disregards the resource-dependent, multidimensional, and contextual nature of resilience (MacKinnon & Derickson, 2013; Robinson & Carson, 2016; Uekusa, 2018); and 3) the tendency that, in combination with a heavy emphasis on social capital, the concept has been used, deliberately or unintentionally, in a way that leads to the neoliberalisation and individualisation of resilience, causing the *responsibilisation* (where someone or

a group is made responsible for a task rather than another, typically an agency or state) of individuals and communities and the reproduction of social inequality (Chandler & Reid, 2016; Vilcan, 2017). These critiques have already provided sufficient reasons for researchers to reconceptualise resilience and its premises (please also refer to Alexander, 2013; Beccari, 2016; Manyena, 2006; Tierney, 2014 for further definitional discussions, criticisms, and existing indices and measurements). However, this reconceptualisation has not yet been realised. As such, the concept has been continually used as a convenient buzzword and translated into unrealistic and less costly political agendas and solutions, which largely depend on communities and their own resources to reduce social vulnerability, develop resilience capacity, and increase sustainability.

Despite the clouded conceptualisations, the multidimensional nature of resilience – described as a set of adaptational capacities – has lately been well conceptualised (e.g., Obrist et al., 2010). Such a composite and multi-layered approach is pragmatic to conduct a holistic assessment of community resilience, which is "the collective ability of a neighbourhood or geographically defined area to deal with stressors and efficiently resume the rhythms of daily life through cooperation following shocks" (Aldrich & Meyer, 2015, p.255). In community contexts, different resilience variables in different dimensions (e.g., built-environment, cultural, economic, environmental, institutional, and social) may compensate for each other (Masterson et al., 2014; Wilson, 2012). A clear example of this is that social capital tends to compensate for the lack of economic, cultural, environmental, institutional, and other forms of resources/resilience, and more durable social capital generally increases community resilience to disasters (Aldrich, 2012; Klinenberg, 2002).

However, aggregating resilience indicators at different dimensions with equal weighting to measure community resilience can be problematic (Tierney, 2014). This is mainly because, in certain contexts, missing just one particular quality such as trust or social capital (as in social dimension of resilience) can cause greater post-traumatic stress disorder (PTSD) and depressive symptoms among disaster survivors (Adeola & Picou, 2014; Bonanno et al., 2010) and a community to lose solidarity and collapse. These mental health issues are typically seen in the wake of contagious diseases such as Ebola and COVID-19 (Rao & Greve, 2018) or technological disasters (Gill & Picou, 1998; Picou et al., 2004). Technological disasters or natural hazard-triggering technological (natech) disasters "occur when breakdowns in technological and bureaucratic organization systems lead to destruction or contamination of the natural and built environment" (Gill & Picou, 1998, p.796). This type of disaster is often more psychologically stressful and the impact on community is more detrimental for various reasons (Picou et al., 2004). Kokorsch and Benediktsson's (2018) study showed that the disappearance of natural resources (i.e., environmental resilience) and decline of the fishery-based local economy (economic resilience) in a fishing village in Iceland triggered the out-migration of residents and declining economic and social services. This led to the dissipation of the fishing community itself and losing community resilience to the gradual environmental changes. Therefore, Payne et al.'s (2019) approach is crucial because their framework integrates the assumption that "communities must have a minimum level of resilience in each dimension to be resilient overall" (p.153). This is important when each dimension of resilience is conceptualised and assessed holistically instead of individually. Lack of resilience in one dimension such as individual-level psychological or natural/economic resilience can undermine resilience and adaptation capacity at other dimensions or community resilience overall (Alexander, 2013; Payne et al., 2019). Thus, multidimensional approaches should not overlook this point because the notion of the limits of resilience thus far does not seem to be properly integrated.

In many of these multidimensional frameworks of community resilience, the wellbeing of individuals in particular is not considered as a critical component. Beccari's (2016) comprehensive review of the existing resilience composite indicators demonstrates the lack of variables measuring the wellbeing of individuals and households; therefore, many existing composite indicators target communities but not households and individuals. It is reasonable to admit the challenge of developing a generalisable composite community resilience model which includes a measurement of individual- and household-level resilience as a contributing factor. Thus, there is a lack of linkage between individual-level resilience indicators (e.g., economic, physical, and mental wellbeing) and meso-/macro-level community resilience indicators with community being the smallest unit of analysis. What can be quite conceptually troubling here is that, despite varying definitions, a "community" is a collective of diverse individuals who are robustly, loosely, or spontaneously connected through shared interests, purposes, identities, and/or geographic proximities (Neal, 2012), which cause different degrees

and types of community members' social connectedness. Hence, community resilience in disasters can be highly affected by individual-level psychological resilience, demographic characteristics, personal circumstances, and other micro-level social factors (Lee et al., 2018; Masterson et al., 2014).

While demographic characteristics of community (e.g., age distribution, average income, racial composition, political affiliation, and religious views) are easier to quantify in a statistical model, it is nearly impossible to include psychological resilience and personal circumstances into a linear theoretical model to assess community resilience. However, Lyons et al. (2016) note that there is a strong relationship between individual resilience and collective resilience even though there is a lack of efforts to link psychological and sociological approaches. Hence, in addition to the standardised community resilience variables, the conceptualisation of community resilience would need to include the notion of the well-established link between community resilience and the mental health and wellbeing of residents (Adeola & Picou, 2014; Lee et al., 2018).

While there can be some community members who may experience job loss, other disruptions in daily life, severe stress, and limited resilience more than others, communities as collectives will most likely survive and recover from disasters. Individual-level struggles and endurance tend to be overlooked or even justified for collective good. If a relatively high proportion of community members severely struggle from heightened distress, fatigue, antagonism, and limited psychological resilience, logically the community may lose its function and its collective resilience. If a disaster, especially technological disaster or contagious disease such as COVID-19, causes excess environmental, economic, psychological, political, and social damages including community antagonism, community resilience is less likely, regardless of other dimensions of resilience (Lee et al., 2018; Picou et al., 2004; Rao & Greve, 2018). Indeed, in response to a disaster, some residents who are capable may simply out-migrate from their community; consequently, after a community reaches a tipping point in one dimension of resilience and starts losing its residents and functions, it can simply cease to exist (see Kokorsch & Benediktsson, 2018, for their case study of Icelandic coastal communities).

The dynamic nature of community itself needs to be better understood. While individual resilience remains high following the February 2011 Christchurch earthquake, functional communities have been lost due to "the forced and voluntary haemorrhaging of neighbours forced to leave as their houses have been demolished or zoned 'red'" (Wilson, 2013, p.209). Communities are dynamic and, even in non-disaster situations, community members move in and out for various reasons, depending on varying resource availability (Thiri, 2017). For example, refugee groups in Ōtautahi who were further traumatised by the Canterbury earthquake sequence (and later the 2019 Christchurch Mosque attacks) and left Ōtautahi for other cities in Aotearoa or Australia through their (transnational) ethnic networks (Emhail, 2019; Marlowe, 2015) because *they could not (or did not want to) take it anymore*. Out-migration from disaster affected communities has been quite normal as disasters are a significant "push" factor of migration (Adams-Hutcheson, 2015; Wilson, 2013). Ōtautahi initially lost 70,000 residents to other cities following the 2011 Christchurch earthquake due to uninhabitable housing, reduced economic and social services, and fear of aftershocks. When a substantial number of community residents leave (excepting the case of mass dislocation), there is little or no community left to try to increase collective resilience. If remaining residents are particularly socially vulnerable groups such as older people, it is logical that strong community resilience may not be expected.

Despite its importance, only a handful of the existing research on disaster resilience has addressed the conceptual issue of "resilience thresholds" (see, e.g., Folke et al., 2011; Resilience Alliance, 2007; Wilson, 2012). These studies, some implicitly, address that individuals and communities cannot be perpetually resilient without limits. A simple logic to suggest here is that there may be a point beyond which community resilience slows down or becomes no longer available (Olsson et al., 2015). Wilson (2012) explains that, in ecology, "resilience thresholds and tipping points linked to any form of disturbance will be associated with an inability of a community to recreate the original state before the traditional rupture, with the possible inability to implement a period of readjustment and recovery" (p.69). However, empirical evidence from social science research is insufficient to inform and add such a theoretical notion to the conceptualisation of community resilience. To emphasise the point, if we take psychological and ecological perspectives, it is evident that the community resilience curve should have the potential "break down". However, most resilience frameworks seem to assume that (existing and emergent) community groups can be resilient at any time, for as much and as long as

they want, and with any community members. To our knowledge, these theoretical notions are unfortunately not empirically informed by existing disaster research. Revisiting the engineering, ecological, and psychological approaches to resilience and their major features and premises can be critical in exploring and incorporating the notion of these limits into resilience thinking for more effective and practical use in future research and practice.

Engineering and Ecological Perspectives: The (Eco) Systems Cannot Bend, Absorb, or Transform Forever

Along with many other disciplinary origins, resilience thinking stems from physics (Gordon, 1978) and ecology (Holling, 1973), so it is understandable that engineering and ecological approaches have had a prominent role in conceptualising disaster resilience. In engineering and physics, resilience simply refers to the "capacity of a material to absorb energy when it is deformed elastically and then, upon unloading to have the energy recovered" (Callister & Rethwisch, 2012, p.216; see also Gordon, 1978). For this school of thought, after crossing the tipping point, there is no "bounce back". The object simply collapses. However, as social scientists later adapted the resilience concept from ecology, there was a shift in the focus from "resistance to change" to "adaptation and transformative capacities" (Berkes, 2007; Norris et al., 2009). Therefore, in an ecological perspective, resilience thresholds differ from engineering ones as the tipping point is relative and dynamic instead of static and absolute. In ecology, resilience refers to "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations and state variables" (Holling, 1973, p.14). In this sense, when the ecosystem approaches a tipping point, the system generally "transforms" but may not necessarily "die down".

Ecosystems are often capable of absorbing a variety of disruption (e.g., climate change, natural hazards, pollutions, and other anthropogenic disruptions) and transforming themselves to adapt (Holling, 1973; Groffman et al., 2006). The Ōtautahi residential red zone is the abandoned former residential area in Ōtautahi which, due to liquefaction and increased flood risk, is uninhabitable and community rebuild is deemed impossible. This area is nearly twice the size of New York's Central Park and over the last decade has been transforming back to a swamp; the ecosystem has moved on after 10,000 human residents left the area (see Mitchell et al., 2019 for more details on the transformation). There is a very basic assumption in this approach that, unlike community, the ecosystem does not usually die, it keeps transforming until it reaches the absolute limit at which the system cannot absorb the drivers (Holling, 1973, p.7). Thus, the idea of "bounce forward" or "sustainability", instead of "bounce back", stems from such an ecological idea that communities have adaptive and enduring capacities in response to the external shocks and stress and (sometimes related) internal changes (Payne et al., 2019). As the earth system is dynamic, some changes are always expected after the system reaches the resilience tipping point (Moore, 2018). However, when cumulative stressors pass ecological resilience limits, recovery can be limited and ecosystem services can be degraded (Thrush et al., 2009). In some contexts, an ecological threshold exists and can be described as "the point at which the ecosystem loses its capacity to recover, or at which its resilience and integrity are lost" (Thompson, 2011, p.27).

When ecological resilience was expanded to include infrastructure, communities, and individuals and adopted to social sciences, researchers, practitioners, and policymakers alike somewhat disregarded the linkage between the earth, built environment, and social systems in the conceptualisation of community resilience (Folke et al., 2010; Mayer, 2019). Healthy ecosystems and environmental capital are critical components of a community, especially in less urbanised regions where local economy relies on the extraction and exploitation of natural resources. This was described in Kokorsch and Benediktsson's (2018) research in the Icelandic fishing villages. Moreover, Wilson's (2012) example of submerged farming and fishing villages in the Pacific and Indian Ocean due to climate change and sea-level rise shows an extreme form of loss of community resilience after the surrounding ecosystem crosses the ecological tipping point. Collective relocation and resettlement supported by transnational governmental efforts are underway in these locations, so the displaced residents can still be viewed as remarkably resilient while their "community" might have lost their identity and major functions and will never return to its original state. Further to consider in this particular case, while the displaced are viewed as resilient, they probably did not want to be resilient if they had the option not to be.

In response to environmental disruptions induced by natural hazards (including climate change) or human activities, whether gradual or rapid, the surrounding ecosystem keeps ecologically transforming until it reaches the tipping point. Community resilience, however, may approach multiple tipping points when

resilience in different dimensions such as economic and ecological is no longer available. The physical community might disappear while individual-level resilience may remain high, or vice versa can be true. This demonstrates why a multidimensional approach is beneficial in the conceptualisation and assessment of community resilience. Community and individual resilience is embedded in the wider ecosystem, built environment, and socioeconomic system. It is problematic that individual-level psychological resilience is still excluded from such meso or macro multidimensional approaches, as ecological approaches do not necessarily take micro perspectives to focus on the individual (species) as a unit of analysis in an assessment of the wider ecosystem.

Psychological Perspectives: A Tipping Point at which Human Beings Cannot "Endure" Anymore

Instead of putting exclusive analytical focus on individuals, our intention in this article is to take the critical perspectives, particularly using a sociological theory of "sociological imagination". This emphasises the convergence and puts more effort into synthesising macro, meso, and micro perspectives to increase our ability to look beyond individuals' personal circumstances to larger social forces (Mills, 1959). In disaster research, it is critical to recognise that larger social forces, including disasters themselves, have impacts on the wellbeing of individuals which affects the way communities experience, respond to, and cope with disasters. Indeed, there is clear merit in integrating the notion of the limits of psychological resilience into a radical reinterpretation and further problematisation of resilience thinking.

Like the ecological approach, adaptation is the main focus in (child) psychology. As Frerks et al. (2011) note, resilience in development psychology refers to an individual's adaptive capacity to respond to stress. Psychological resilience is defined as "the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma" (Windle, 2011, p.163) or "the ability to maintain mental health equilibrium in the presence of external shocks" (Zahran et al., 2011, p.1108). Examples of this approach and empirical evidence in psychological research are plentiful and useful for disaster researchers to consider the alternative or more nuanced conceptualisation of resilience for future research. This approach assumes that resilience is not a limitless human quality because adaptation to stress and external shocks depends on cognitive, situational, and sociocultural factors (Fletcher & Sarkar, 2013); thus, tipping points are dynamic, relative, and contextual.

Bonanno et al. (2010) stress that disasters unfortunately cause large-scale loss of life and livelihoods, so disaster researchers need to understand that "the death of a close friend or relation results in intense sadness, dysphoria, and intrusive preoccupation with the lost loved one as well as transient cognitive disorganization, health problems, and impaired role functioning" (p.6). Although Bonanno et al. (2010) argue that there is no significant increase in suicides following major disasters, it is undeniable that, in long-term recovery, suicidal ideation and substance abuse may increase. For example, Yasumura (2019) found that following the 2011 Great East Japan earthquake and tsunami ("Tohoku disaster" hereafter) the suicide rate decreased during the "honeymoon" disaster phase. The "honeymoon" disaster phase typically lasts a few weeks, during which "[m]edia attention, free medical aid, free food and shelter, VIP visits to the camp, administrations' sympathy, compensation package, rehabilitation promises provides immense sense of relief and faith in survivors that their community will be restored in no time and their loss will be accounted through monetary benefits" (Math et al., 2015, p.263). However, 3 years after the disaster (typically known as the "disillusionment" phase), the suicide rate eventually increased and exceeded the pre-disaster level.

Norris et al.'s (2009) psychopathological analysis of disaster victims based on longitudinal quantitative data shows the possible tendency of psychological resilience to sharply increase after disaster but start to decrease after a certain time. There were (small) groups of people who experienced "chronic dysfunction", implying that, while most people in the study coped well with the traumatic events, some experienced chronic PTSD and showed limited resilience (see also Kukihira et al., 2014). Kukihara et al. (2014) argue, based on their quantitative analysis, that the 2011 Tohoku disaster survivors endured the traumatic events relatively well but exhibited significant symptoms of depression and PTSD. Thus, through a psychological lens, both people's (short-term) remarkable resilience and (long-term) increased vulnerability are theoretically and empirically evident.

Despite the lack of empirical research, news media has reported that "chronic toxic stress" and other mental health issues (including related domestic violence, substance abuse, and suicides) increased in post-earthquake Ōtautahi (Beaglehole et al., 2019; Blundell, 2018; Hayward, 2013; Hayward, 2018; McClure, 2016; Rowney et al., 2014). While the mental health of the

Ōtautahi population was expected to recover after 5 years, as of 2016 "mental health problems [were] mounting in almost every measurable area" (McClure, 2016, para.1). Consequently, Blundell (2018) reported that mental health service professionals in Ōtautahi have been devastated due to the record-high demands. The city is physically "building back better" as a future, sustainable, and resilient city, while Ōtautahi's mental health crisis, which can be a manifestation of the limits of community resilience, has not been properly investigated. Indeed, it is unsurprising that, as Adams-Hutcheson (2015, p.136) and Wilson (2013, p.211) note, a series of major events in Ōtautahi dented residents' psychological resilience; consequently, approximately 70,000 residents decided to out-migrate from Ōtautahi to geologically more stable regions in Aotearoa New Zealand. Ōtautahi recovery and resilience following the 2010-2011 events has been portrayed as exemplary and remarkable by international media (Crowley & Elliott, 2012), yet, probably due to the delayed recovery and waves of disasters, potential effects of the recent mental health crisis on community resilience have been understudied. Although disaster-related severe stress may not directly cause the loss of community resilience, it clearly provides an important point to consider. Indeed, previous research findings revealed that, following Hurricane Katrina and the Deepwater Horizon oil spill in the Gulf Coast, higher rates of depression and anxiety were significantly associated with lower community resilience (Lee et al., 2019). Again, technological disasters and contagious diseases like Ebola and COVID-19 cause community distrust, civic withdrawal, increased stress, and mental health issues among community residents, thereby developing "corrosive communities" and weakening the bonds of social integration, instead of developing resilient communities (Picou et al., 2004; Rao & Greve, 2018).

What can be misleading is that, although some individuals in remarkably resilient communities in the wake of disasters may experience severe distress and other psychological issues, the *majority* of people do not give up coping with disaster-related and pre-existing difficulties and will keep adapting to the new normal. In fact, it could *increase* their resiliency; those who are exposed to adversities can "earn" strength, particularly psychological, to cope with future adversities (Masten et al., 1990). Although resilience is resource-dependent, the socially vulnerable – typically those with limited resources – can still develop strong resiliency by "earning strength" (McIntosh, 2007; Uekusa & Matthewman, 2017) as they deal and cope with various forms of social oppression ranging from poverty, racism, and violence to lack of resources on a daily basis – so-called "everyday disasters" (Matthewman, 2015).

Uekusa and Matthewman (2017) provide not only a theoretical argument but also an empirical example that (im)migrants and refugees, who had been exposed to previous disasters and earned strength, demonstrated somewhat unsurprising resilience to the Ōtautahi and Tohoku disasters. The oppressed, such as the poor and racial minorities, earn strength by going through everyday difficulties and social inequalities (McIntosh, 2007). A critical implication here is that the socially vulnerable may develop higher reference points – psychological thresholds for what actually counts as a difficulty – and therefore can withstand future adversities (Uekusa & Matthewman, 2017). This is evident in Pulvirenti and Mason's (2011) psychological study; refugee women developed resilience by surviving violence and social injustices. Roy et al. (2007) also found that their study respondents who had previously attempted to commit suicide showed significantly more psychological resilience than those who had never attempted to commit suicide. However, the earned strength of such socially vulnerable people can further mystify human resourcefulness and adaptation capacity to the new normal if its sources and potential limits are not properly analysed. While the whole community shows general resilience, such remarkable resilience can make some invisible, possibly a small number of more vulnerable people who struggle to withstand and cope with everyday hardships, let alone disasters.

We do not intend to convince disaster researchers to overemphasise psychological and individual resilience; rather, we need to build upon how psychological approaches to resilience can inform disaster researchers. As such, there is another reason to stop mystifying human resourcefulness and adaptation capacity; highly distressed and traumatised communities can remain resilient and may develop their higher reference points at the cost of individuals, some of whom may be reaching resilience tipping point(s). If resilience thinking keeps overgeneralising and mystifying human adaptation and endurance capacity, individual-level struggles are overlooked as "their problems" until psychological and social symptoms become severe enough as a community-level issue.

Community Resilience and Social Capital: Obscuring Individual-level Challenges to be Part of Resilience Building

Our discussion here does not necessarily suggest that we simply include individual-level psychological resilience indicators into resilience frameworks. Indeed, despite the importance of emphasising a psychological approach, we have no intention of *individualising* resilience. It is the opposite. We intend to address such an important issue that, while individuals are responsibilised to be self-efficient, sustainable, and resilient, multidimensional and holistic community resilience approaches tend to obscure the issues of individual-level social vulnerability and ignore personal circumstances in disasters. In other words, excluding the notion of the limits of resilience from the conceptualisation of community resilience can further entrench the neoliberalisation of resilience and the responsibilisation of communities and, especially, individuals. The following section examines how the current integration of a social capital approach further obscures the limits of resilience and mystifies human resourcefulness in the conceptualisation of community resilience.

One of the main reasons that individual resilience is often overlooked in community resilience is due to an assumption that *as a collective, we can all withstand and cope with it*. Social capital is a critical concept in resilience approaches, often providing explanations for positive post-disaster outcomes (Aldrich, 2012; Mayer, 2019), yet it can create a serious issue if misinterpreted. Despite the importance of critically assessing community resilience in relation to people's mental wellbeing and psychological resilience, community spirit, solidarity, engagement, and resource sharing, typically observed during the "honeymoon" phase, often distract our attention from personal-level vulnerability and challenges. This is mainly because people develop shared psychosocial identities – resulting in unique disaster phenomenon called "emergency togetherness" – and are more likely to look after each other (Bonanno et al., 2010; Drury et al., 2019). Such a shared psychosocial identity in disasters and emergencies – *everyone is in the same boat* – can encourage civic engagement and mutual help and thus increase individual psychological resilience. We often witness the emergence and stories of disaster improvisation, mutual help, and altruism in the wake of disasters; this unique disaster phenomenon, often called *communitas,* has long been well-documented in disaster sociology (Matthewman & Uekusa, 2021). Shared psychosocial identity in emergencies can facilitate remarkable community resilience (Drury et al., 2019), but this tends to obscure the barriers and challenges that more vulnerable individuals face. We thus tend to overlook the excluded and isolated and their personal circumstances, particularly shaped by pre-existing social inequalities. The further identification of barriers and enablers for emergency togetherness (what others may call "disaster communitas" [Jencson, 2001; Matthewman, 2015; Matthewman & Uekusa, 2021], "disaster social capital" [Uekusa et al., 2020], "extraordinary communities" [Solnit, 2009], or "therapeutic communities" [Barton, 1969]) is beyond the scope of this paper, yet it is highly recommended to empirically and theoretically explore why such unique solidarity and resource-sharing in the wake of disasters may or may not emerge (see Matthewman & Uekusa, 2021).

When a disaster strikes, people selflessly help others, the hungry are fed, enemies help each other, resources are shared, and people become "resourceful" (Matthewman, 2015; Solnit, 2009). However, isolated individuals face heightened challenges to get by in disasters as they hypothetically receive less support than better-connected ones. Cases in point include: a disproportionally higher fatality rate among poor African American elders living alone in North Lawndale during the Chicago heat wave (Klinenberg, 2002); more "lonely deaths" among middle-aged men living alone after the 1995 Great Hanshin-Awaji earthquake (Nukada, 1999); and the rate of excess deaths from COVID-19 in the U.S. was higher among communities with weaker social capital (Fraser et al., 2021). Hikichi et al. (2018) also found that, following the 2011 Tohoku disaster, elderly survivors with stronger social capital tended to suffer less from cognitive disabilities than the socially isolated ones. Overall, many studies clearly show that social capital (also termed "social infrastructure" [Klinenberg, 2002, 2018]) is a critical source of community and psychological resilience (Hikichi et al., 2018). Therefore, it makes perfect sense to enhance people's social capital and civic engagement as a resilience promotion and DRR strategy. However, can their social capital capacity be mechanistically engineered, or can individuals be responsible for increasing their networking capacity? Like resilience, social capital is also contextual, multidimensional, and resource dependent. Instead of responsibilising individuals to enhance their social capital capacity, research needs to critically examine how some social structural factors help or hinder people's social capital capacities in disaster contexts. This is another area that needs further research.

We have no intention of overly criticising the current social capital approach. Overall, it has been positive that, as MacKinnon and Derickson (2013) note, "[t]he recent upsurge of interest in community resilience is not only a product of the 'top-down' strategies of government, but also of the 'bottom-up' activities of a wide variety of community-groups and environmental campaigns" (p.257). Zebrowski and Sage (2019) also note that "the idea of 'community resilience' signalled a shift from the traditional focus on the individual and household preparedness to the role of social networks in assisting response and recovery efforts" (p.64). However, what current critics of resilience warn is that overemphasising social capital and community resilience tends to responsibilise communities for being resilient without providing proper power and resources (Peck & Tickell, 2002). As U.S. American sociologist Alejandro Portes (1998, p.3) noted, social capital, just like resilience, is a convenient concept for researchers, practitioners, and policymakers alike to come up with inexpensive, non-economic solutions to major social problems. Ignoring the limits of resilience simply facilitates the interpretation of resilience in such a way that everyone is affected equally and can collectively cope with the disasters at any time, for as long and as much as they want, and with any people. If a community appears to be resilient, the message the community members send and receive among themselves is that they are all supposed to be resilient and not to complain about their personal circumstances in disasters because *they are all in the same boat*. We cannot overlook the fact that communities as coherent collectives have withstood and recovered from historical disasters; however, in reality, people are affected by disasters differently due to differential social vulnerability and capacity to respond. Even psychological resilience is highly associated with social status (e.g., following Hurricane Katrina and Rita, more devastating psychological effects were seen among the socially vulnerable such as African Americans, the poor, and single mothers; Zahran et al., 2011).

Further Theoretical and Practical Considerations for the Limits of Community Resilience

When the level of an individual's stress and community distress crosses the tipping point, communities may collapse. So far, using interdisciplinary perspectives, we have tried to simplify this logic for the purpose of raising the inherent issues. As individual and community resilience is contextual and resource dependent, the tipping point should not be conceptualised as absolute. It is a dynamic and blurred point which may go higher or lower depending on the complex interaction of various adaptive capacities and multiple contributing factors. The theoretical notion that collective capacity for adaptation can reach a tipping point and decrease should be further examined, incorporating empirical evidence and synthesising the abovementioned critical perspectives.

There are different sources and manifestations of resilience in different times and spaces, so we should not emphasise unidimensional resilience and we need more holistic and flexible resilience theories. As discussed in previous sections, "community" resilience in disasters already assumes built-in support systems such that individuals help each other to cope with mental and emotional strains. This is why durable social capital is a crucial part of community resilience (Uekusa, 2018). However, as Bourdieu (1986) would argue, social capital in disaster contexts depends on other forms of capital and contextual factors. Uekusa and Matthewman (2017) argue that the socially disadvantaged had earned strength by coping with everyday disasters which became a critical resource, particularly manifested as social capital, for resilience to the 2010-2011 Canterbury and Tohoku disasters. However, for some of these residents with refugee backgrounds in Canterbury who had already gone through civil wars, displacement, poverty, and other forms of social oppression, these disasters were simply additional trauma that they did not want to deal with anymore and so they moved away from the affected areas. Thus, resilience could be understood as human nature, yet it is contextual, resource-dependent, and unpredictable even though durable social capital is often helpful as recently seen during the COVID-19 pandemic. Manyena (2006) argues that "[i]ndividuals, communities or nations have a degree of resilience, which can be defined in terms of their primary survival values or assets – life, livelihoods and culture" (p.439), and, without any adaptational capacities and resources, adaptation to adverse circumstances is less likely (e.g., Jedd, 2019; Kokorsch & Benediktsson, 2018). Even in ecosystems, "thresholds exist for populations of individual species and for individual processes within ecosystems, and ultimately for the ecosystems themselves" (Thompson, 2011, p.27).

Community resilience limits can be relatively higher if community members collectively cope with disasters. Those affected by disaster may be resilient for a certain period of time but may reach a point at which they cannot take it anymore and they "break", gradually or quickly decreasing their resilience. The resilience curve may have the potential break down or tipping

point. The logic here – that resilience can increase as adversity increases but only until it reaches the tipping point – can help disaster researchers to re-consider the concept of resilience. There is a hypothetical correlation between the level of disaster victims' mental wellbeing and the level of community altruism. The resilience tipping point is dynamic and likely to coincide with the end of the honeymoon disaster phase and during the disillusionment phase. In other words, when the level of community cohesion and public confidence is high, the level of resilience can generally increase. Indeed, during the initial lockdown period in response to the COVID-19 pandemic in 2020, we witnessed remarkable global resilience and some positives coming out of this adversity (Monbiot, 2020), but this did not seem to continue for a long time. We soon saw evidence of the limits to resilience ideas and discourse. As noted, this becomes more evident in technological and epidemic disasters in which community cohesion and resilience are less likely to emerge and residents often experience increased stress and mental health issues (McCormick et al., 2015; Palinkas et al., 1993). Then, as we see in Ōtautahi, what happens to long-term community resilience and recovery when stress is compounded by further disasters?

The obvious challenge here, in addition to a lack of empirical research, is the incommensurability of community resilience, unlike psychological studies which may focus on measurable factors such as stress, trauma, or mental health service access rates to capture the ups and downs of individuals' and groups' resilience in disasters. Indeed, in 2016, 5 years after the devastating earthquake in Ōtautahi, news media reported that mental health service providers were at breaking point (McLennan, 2016). We immediately wondered how much longer Ōtautahi residents need to endure and be resilient while the recovery governance took time to develop the recovery plans. In 2021, the situation had not improved much; rather, the 2019 terrorist attacks and the COVID-19 global pandemic have required residents to be more resilient and for longer. Following the initial COVID-19 lockdown in 2020, Harris (2020) reported that Ōtautahi, "the city of resilience", needed to embrace the tiresome burden of the resilience tag again: "The moniker that was once a badge of pride has now grown tiresome, a wearying arm around the shoulders that no-one wants anymore" (para.1). The recovery dilemma is widely discussed in the disaster recovery governance literature, referring to the conundrum of speed versus deliberation in disaster recovery (Olshansky, 2006). More democratic recovery processes take longer but rebuilding too quickly and randomly imposes massive long-term costs and risks on society (e.g., 2005 Hurricane Katrina). However, we argue that, as seen in Ōtautahi, recovery to *build back better but slower* assumes the residents' limitless resilience capacity to withstand and adapt to the waves of adversities. It is important, especially for practitioners and policymakers involved in recovery governance, to understand that there are people in the disaster-affected communities who might not have the option of not being (or taking a break from being) resilient. It is not uncommon for residents to sometimes exhibit burnout as they need to remain resilient in the face of perpetual crises (Donoghue & Edmiston, 2020).

Discussion and Conclusion

While what we present in this paper may not be novel, it has made a few simple but important points to consider for future research. It is likely that, in the wake of rapid or slow onset adversities due to natural hazards or human-induced events such as the current COVID-19 pandemic, human beings will not usually give up adapting to the new normal due to our collective as well as individual adaptation capacities. However, this does not mean that individuals and communities can be perpetually resilient or endure for as much as and as long as they want, with any people. Appropriate support is needed, and underlying issues such as resource scarcity and social inequality need to be properly addressed (Uekusa, 2018).

As argued in this research, disregarding the limits of resilience is another way of mystifying the power of social capital, human resourcefulness, and adaptation capacity in order to justify the neoliberalisation of resilience and responsibilisation of communities and individuals (Chandler & Reid, 2016; Vilcan, 2017). Many critics have already warned that both resilience thinking and social capital approaches in disaster research and practice tend to overemphasise social agency and to be used as a convenient concept for policymakers to seek less costly, non-economic solutions to disaster damages and social problems in general (Chandler & Reid, 2016; Portes, 1998; Tierney, 2014). The term resilience should be used to respect and admire the communities and individuals who coped with and recovered from disasters. However, our point is that people cope because that is what they do, and most people persist with adapting to changes and challenges. Again, does this necessarily mean that they are resilient?

Psychological indicators of individual responses to disasters are difficult to include in community resilience

frameworks, yet it is clear that community-focused, deductive, and quantitative approaches disregard personal circumstances and proportionally small groups. Many empirical models such as the Baseline Resilience Indicators for Communities (BRIC) by Cutter and colleagues (2010) are available in disaster research but suffer from the limitations of deductive approaches. Furthermore, we assume that the lack of notion of the limits of resilience is due in part to the opportunistic nature of disaster research and the reliance on convenience sampling (Bonanno et al., 2014). Disaster researchers could look more at *failure* cases, in which people experienced or showed a significant sign of fatigue, limits of endurance, or collapse of communities. Even if the wellbeing of the majority of community members is high, those who may reach the tipping point should not be ignored. As the community members in many case studies remind us, there is a need for all experiences of disasters and recovery to be present and heard, not just those that reinforce a positive message of resilience without limits.

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Conflict of Interest

The authors declare no conflict of interest.

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Understanding pandemic behaviours in Singapore – Application of the Terror Management Health Model

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Abstract

The novel coronavirus, now known as COVID-19, was first reported in China in December 2019 and became a global crisis by March 2020. Both adaptive and maladaptive behaviours were observed in response to aspects of the crisis, some of which appeared to be contradictory to coping and curbing the threat of COVID-19. For instance, the purchase and use of surgical masks and sanitisers could be understood as logical health-oriented behaviours relevant to coping with the COVID-19 pandemic. The breaching of social distancing measures and forwarding unverified news, however, might have done more harm than good. In applying the proximal and distal defences proposed within the Terror Management Health Model (TMHM), this article suggests explanations for these behaviours as individuals' attempts to alleviate anxiety arising from reminders of their mortality. Information from local newspapers and media is used to highlight and identify common behaviours observed in the pandemic, and the TMHM is applied to explain these behaviours. This paper briefly concludes with a call for empirical validation of the TMHM for the behaviours observed in relation to COVID-19, and for the use of TMHM conceptualisations to develop countermeasures to reduce maladaptive behaviours in the current, and future, pandemics in Singapore.

Keywords: *TMHM, COVID-19, health behaviours, Singapore, empirical validation*

The first cluster of the novel coronavirus was reported in Wuhan, China, in December 2019. By March 2021, this coronavirus, now known as COVID-19, had escalated to a global pandemic, infecting more than 110 million and killing 2.5 million worldwide (Johns Hopkins University Centre for Systems Science and Engineering, n.d.). Based on the Pandemic Influenza Severity Assessment (PISA), edited by the World Health Organization (2017), COVID-19 is a severe pandemic based on its transmissibility, symptom severity, and economic impact. This paper aims to explain behaviours observed in Singapore during the COVID-19 pandemic by applying the Terror Management Health Model (TMHM; Arndt & Goldenberg, 2017) to understand individual differences in responding to this prolonged crisis. This paper also hopes to encourage empirical research that applies TMHM to the behaviours observed during COVID-19 in Singapore. These findings can potentially feed back into strategies and policies to support the Singaporean community in continuing to cope in an evidence-based manner, both during these difficult times and in preparation for the next pandemic.

Terror Management Theory

Terror Management Theory (TMT) was first developed by Greenberg, Pyszczynski, and Solomon (1986) by applying an existential perspective in understanding variants of social behaviours. Philosophical knowledge and feedback from in vivo observations and experimental data have contributed to the evolution of the theory and its current definition. Essentially, TMT posits that humans, being born with advanced cognitive capabilities, recognise that their lives are finite. This recognition that our mortality is limited triggers death thoughts which conflict with our need for self-preservation, thereby inducing anxiety. Individuals would then alleviate this anxiety by extending their mortality in a literal or symbolic manner, represented by attempts to avoid or minimise threats, defend worldviews, enhance self-esteem, and seek close relationships (Plusnin et al., 2018).

The worldview defence and self-esteem pathways in reducing death thoughts following reminders of death have been widely researched and established in both

Asian and non-Asian cultures (Heine et al., 2002). Multiple studies have shown that after being reminded about death, individuals are more likely to defend their worldview by reporting less favourable opinions of those who represent or uphold a different worldview to themselves (Halloran & Kashima, 2004), as well as providing fewer resources (Tam et al., 2007) or meting out harsher punishment (Rosenblatt et al., 1989). People are also more likely to behave and make decisions that would bolster their self-esteem after reminders of death, for example by purchasing items reflective of higher status (Heine et al., 2002) or reporting higher positive regard from significant others (Cox & Arndt, 2012). Seeking close relationships has also been found to alleviate death thoughts following mortality salience. As summarised by Plusnin and colleagues (2018), individuals were more likely to initiate social contact (Taubman-Ben-Ari et al., 2002), seek out sexual intimacy (Birnbaum et al., 2011), and show more commitment to romantic relationships (Florian et al., 2002) after being reminded of their inevitable deaths.

Proximal and Distal Defences

From the perspective of TMT, individuals are likely to take actions and decisions to extend their mortality in a literal or symbolic manner after being reminded of their deaths. These actions and decisions may or may not be logical and relevant to the threats at hand. The determination of particular actions or decisions is based on the prominence of death thoughts in the individuals' focal attention, giving rise to the dual process model in TMT (Pyszczynski et al., 1999).

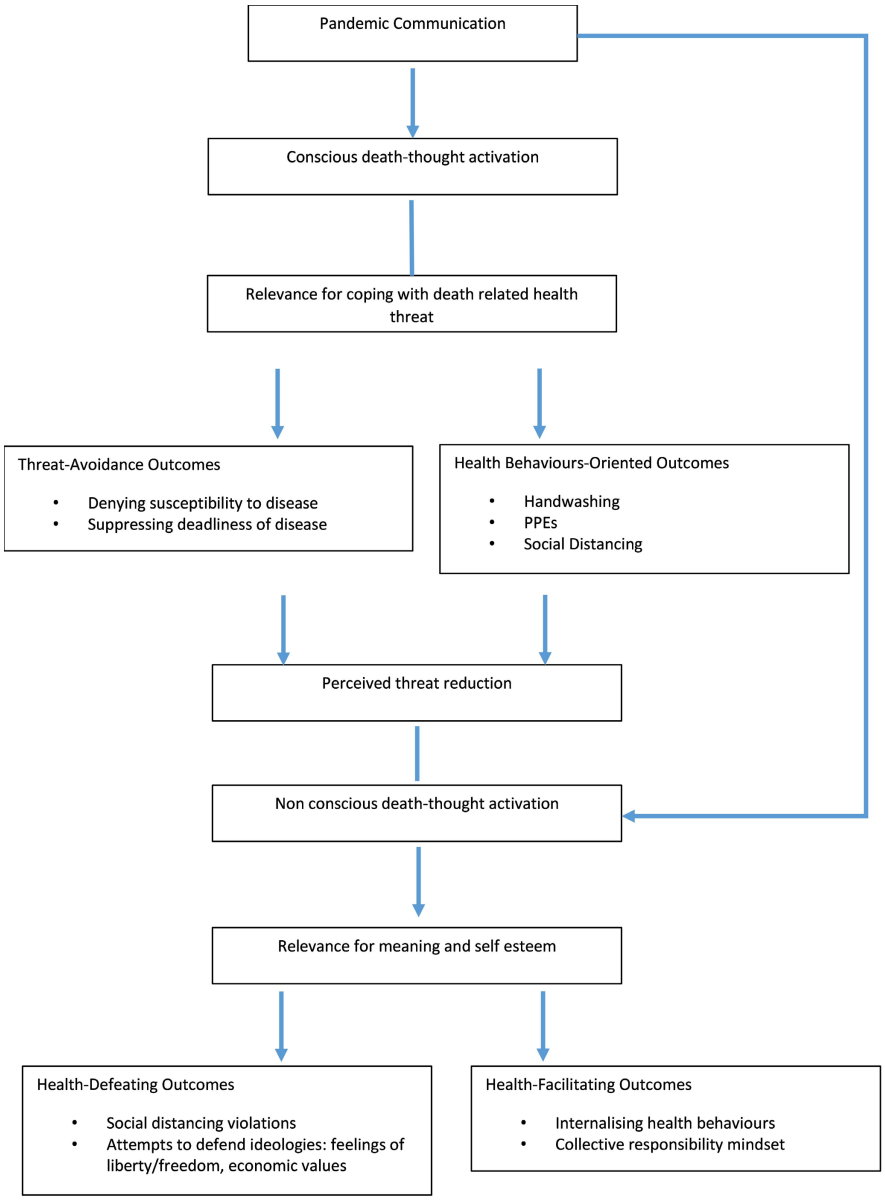
The dual process model suggests that if death thoughts are prominent in the individual's awareness, those individuals are more likely to engage in *proximal* defences. When individuals apply these defences, they are more likely to take actions seen as rational and relevant to the threats at hand, thereby regulating the triggered anxiety. These actions and decisions can be health-oriented responses that reduce the perceived threat by promoting good health, or threat-avoidant responses which deny vulnerability to or distract from life threatening conditions. However, as death thoughts recede into the background or linger at the periphery of consciousness after a delay, individuals will adopt *distal* defences. Distal defences are actions and decisions that may appear illogical and contradictory to the current threats but are consistent with the individuals' worldview, self-esteem, or relational needs (Kosloff et al., 2019). Pyszczynski et al. (1999) and Kosloff et al. (2019) provide comprehensive evidence and discussions on the dual process model and its role in TMT.

This dual process system of TMT was later applied to health behaviours (Arndt & Goldenberg, 2017), giving rise to the Terror Management Health Model (TMHM). A classic example to introduce the dual process model and the TMHM is the series of studies conducted by Routledge et al. (2004). The researchers applied TMHM to attitudes towards suntanning and sun protection. In their studies, they recruited female participants who valued being tanned and divided them into two groups. One group wrote about their deaths while the other wrote about dental pain (control condition). These groups were further divided into two, where half of each group was asked to indicate interest in purchasing sunscreens with a different sun protective factor (SPF) immediately after writing about their death or dental pain, or to indicate their preference after a time delay. Logically, when reminded of one's death, we would expect individuals to make rational decisions such as expressing more interest in sunscreens with better protective properties (i.e., higher SPF) regardless of the delay between the mortality salience induction and their interest in sun protection. As predicted, individuals in the mortality salience non-delay group did indicate significantly higher interest in sunscreens with higher SPF (i.e., proximal defence). However, those in the mortality salience delay condition did not show such a preference. This difference in interest in sunscreen products was not apparent in the dental pain control condition. This pattern of results suggests that individuals who valued being tanned adopted the distal defence by expressing significantly less interest in sunscreen products, as death thoughts recede into the background after a time delay. This discrepancy in attitude towards health decisions illustrated the dual process model of TMT in the TMHM, where individuals tend to adopt rational health-oriented responses immediately after death thoughts are triggered but this effect changes when there is a time delay between death reminders and responses. Instead, when death thoughts faded after a time delay, individuals are more likely to respond in ways consistent with their self-esteem, in this case being tanned, which seemed to contradict positive health outcomes.

Similarly, McCabe et al. (2014) demonstrated that individuals were more willing to pay more for bottled water and drank more water endorsed by medical doctors immediately after being reminded of their deaths while those who responded after a time delay preferred celebrity-endorsed bottled water. This suggested a

differentiation of proximal and distal defences within the TMHM, where individuals were more likely to adopt health-oriented behaviours immediately after mortality salience cues. In this case, individuals purchase or use products advocated by medical professionals after being reminded about their deaths, which implies direct positive impacts on their health. However, after a time delay they would make choices which enhance self-esteem such as demonstrating a preference for celebrity-endorsed products which make them look and feel good. These results have been replicated with other health behaviours such as exercise (Morris et al., 2019) and sexual behaviours (Bessarabova & Massey, 2020).

Figure 1
Terror Management Health Model in a Pandemic



Note. Reproduced with permission from Courtney et al. (2020).

More recently, Courtney et al. (2020) published a concept paper on the application of the TMHM to attitudes and behaviours observed during the COVID-19 pandemic (Figure 1). Shortly after, Pyszczynski et al. (2020) also published on the application of the dual process model in TMT to understand pandemic-related behaviours and attitudes in the United States (U.S.). These concept papers addressed motivations and meanings of the attitudes and behaviours including minimising COVID-19 earlier on in the pandemic, blaming the Chinese for the virus, and breaching social distancing measures.

Before turning to examine how the TMHM is applied to attitudes and behaviours observed in the COVID-19 pandemic in Singapore, it is important to note that while proximal and distal defences can be easily distinguished in experimental settings, this differentiation can be tricky in the real world. Firstly, the time delay before distal defences are triggered has not been quantified. Although Burke et al. (2010) have found that, experimentally, distal defences could be triggered with delays between 2 to 20 minutes (see also Cox et al., 2019), the time lapse is likely to be significantly longer between mortality salience and decision making and actions in the real world. Furthermore, one cannot control the exposure to other mortality threats following the initial exposure to death threats, especially with a long delay between initial exposure and eventual behavioural outcomes or decision making, thereby complicating the process of differentiating proximal and distal defences. As a start, this paper attempts to overcome these challenges by examining the underlying motivations for these behaviours and decisions, based on the Terror Management Health Model in a pandemic.

Applying Terror Management Theory During COVID-19 in Singapore

Singapore reported its first confirmed COVID-19 case of a 66-year-old Chinese national on the 23rd of January 2020. Subsequently, the country experienced the first COVID-19 deaths

of a 75-year-old Singaporean woman and a 64-year-old Indonesian man on the 21st of March 2020 (Yong, 2021). As the pandemic evolved, the Singapore government started mandating individuals to wear masks and implemented the drastic month-long lockdown, known as the "Circuit Breaker", on the 7th of April 2020 (Goh, 2020b). The country also saw a spike in cases in April 2020, with more than 1,000 new cases in a single day. Cases tapered to less than 20 a day by December 2020. At the time of publication (December 2022), 1,700 COVID-related deaths have been documented, and mass vaccination has been completed, with over 90% of the Singapore population having received the full vaccination regime (Hirschmann, 2022).

Since December 2019, there has been daily news on COVID-19, covering the nature of the virus, transmission, and lethality, as well as government policies related to the pandemic. Daily, individuals in Singapore were inundated with information on COVID-19 via newsfeeds and social media. Thus, COVID-19 and its death threat have been constantly in individuals' awareness. With the popularity of the Internet and social media in the digital era, individuals have had access to news on how COVID-19 has affected other countries and their daily death counts. Consequently, the Singaporean community was immersed in the threat of COVID-19, and the knowledge that it has killed many globally has created an association with death.

Proximal Defence

The knowledge that there had been local deaths in Singapore likely heightened the threat of COVID-19 for those living there. From the TMT perspective, the threat of COVID-19 on our mortality is in the spotlight of awareness. This then triggers proximal defences, which serve to alleviate anxiety through both health-oriented behaviours and threat avoidance behaviours to create a sense of safety from COVID-19.

Health-oriented behaviours. A health-oriented proximal defence behaviour was demonstrated by the creation of two petitions on Change.org 2 days after the announcement of the first COVID-19 case in Singapore, to urge the government to ban travellers from China entering Singapore in an attempt to protect the community from being exposed to potential virus hosts (Kim, 2020). There was also an increase in the number of people wearing surgical masks in public. This was despite earlier government statements to wear masks only for those who exhibited flu-like symptoms (Goh, 2020a; Singapore Government, 2020). The demand for face masks and sanitisers rose sharply a day after the first confirmed case of COVID-19 was announced, resulting in a heavy shortage of surgical masks within Singapore (Abu Baker, 2020). Many flocked to the pharmacies and supermarkets to purchase multiple boxes of surgical masks, sanitisers, and antibacterial wet wipes to protect themselves from the virus. There was also significantly more traffic in shops where these items were sold, as people lingered in the hope that stocks would be replenished, and long queues were observed where face masks and sanitisers were in supply. These behaviours appear to reflect attempts to reduce death anxiety by having access to and wearing personal protective equipment.

As shortages occurred with sanitisers and face masks, individuals focused their attention on vitamin C supplements (Koe, 2020), presumably hoping to assuage their anxiety related to COVID-19. Even though experts clarified that there was limited to no evidence regarding the protective strength of supplements such as vitamin C against COVID-19 (Ansorge, 2020; Cheng, 2020), demand for vitamin C increased five times over 2 weeks as the Singapore government escalated the risk level of COVID-19 (Koe, 2020). Some individuals coped by minimising expert opinions and scientific data on the efficacy of vitamin C as a protective measure against COVID-19 and continued to purchase this item as a way to keep themselves safe from COVID-19. This overestimation of the efficacy of vitamin C, and purchase of vitamin C, possibly helped them restore some sense of safety from the death threat posed by COVID-19.

Proximal defence was also apparent in individual choices towards vaccinations. From early 2021 (Ang, 2020), the Singapore government planned a vaccination schedule, aiming to inoculate the population by the third quarter of 2021 (Lai, 2021). According to two studies, the take up rate for vaccinations, if proven safe and effective, was expected to be between 48% (Teo, 2020) and 67.9% (Lazarus et al., 2021). The most common motivation for taking up the vaccine was protection from COVID-19, which directly facilitates health outcomes. However, there was a significant portion of the Singaporean population preferring to delay or decline the vaccination. They cited worries about the safety of the vaccination or uncertainties about the effectiveness of the vaccines (Teo, 2020). Given that unsafe and ineffective vaccinations would predispose them to severe or fatal side effects, as well as not reducing their risk of contracting COVID-19, these decisions to delay or decline the COVID-19 vaccines may

represent proximal defences that serve to allay anxiety from impending death.

Threat avoidance behaviours. Stockpiling could be construed as a threat avoidance behaviour. When the Singapore government announced a lockdown starting from the 7th of April 2020, the country went into a frenzy and started panic buying. Long queues and empty shelves were common sights in grocery stores and supermarkets, and major supermarket chains had to put a limit on the quantity that could be purchased for certain commodities. Apart from herd instincts (Yap & Chen, 2020) and scarcity heuristics (Norberg & Rucker, 2020), findings elucidated in M. Khan's study (2020) which are in line with TMHM could also account for stockpiling behaviours. M. Khan (2020) found a relationship between threat perception of COVID-19 and attitudes towards stockpiling. Specifically, Bangladeshis who perceived COVID-19 as more dangerous to their lives were more likely to endorse purchasing and reserving food. Similarly, Singaporeans' anxiety was likely raised when the government implemented the lockdown in April, as it implied an escalation of risk and threat of the COVID-19 situation. This would have likely increased fear in the Singapore community regarding their health and mortality, thus motivating them to engage in panic buying so that they could minimise the need to go out and therefore avoid exposure to the virus.

As Singapore slowly emerged from the lockdown period, many were still cautious about being outdoors and visiting crowded places such as shopping malls; the proportion of the Singapore community avoiding crowded places increased from 44% to 69% between February 2020 and January 2021 (Hirschmann, 2021a). Upward trends were observed after high numbers of new COVID-19 cases were reported and as of January 2021, 23% of those who participated in the survey expressed that they would avoid returning to work during the COVID-19 outbreak, up from 11% in February 2020 (Hirschmann, 2021b). Apart from the economic repercussions of COVID-19 (e.g., retrenchment) and potential recession (Heng, 2020), some individuals continued to express worries about being exposed to COVID-19 and preferred to stay home to keep themselves safe (Kok & Yip, 2020; Tee, 2020).

Distal Defences

As COVID-19 continues to exist in the public consciousness and remind people of the finite nature of their lives, individuals will likely continue to alleviate their anxiety by finding ways to extend their mortality in symbolic ways. As the distal defence pathway in TMHM proposes, when death thoughts fade into the background but are still accessible, individuals will respond in ways that are consistent with seeking close relationships, reinstating values and worldview, and bolstering self-esteem (Plusnin et al., 2018).

Seeking close relationships. As summarised by Teo and Tan (2020), several individuals had breached quarantine measures to meet loved ones or seek sexual intimacy. These behaviours are consistent with research examining mortality salience and intimate relationships (Birnbaum et al, 2011; Florian et al., 2002). In a series of studies, Birnbaum et al. (2011) found that, regardless of gender, individuals expressed more desire for romantic sex when reminded of their mortality. From the terror management perspective, Singaporeans could be coping with their heightened anxiety by seeking close relationships and sexual intimacy during the lockdown (Lam, 2020b; Tang, 2020) and when serving quarantine orders (Alkhatib, 2021; Tang, 2020).

Indeed, there were more than 360 breaches of quarantine measures, known as stay-home-notices (SHN), in Singapore between the beginning of the COVID-19 pandemic and February 2021 (Ang, 2021). While some of these breaches were clearly a result of mischief and irresponsibility (Lam, 2020a, 2020b), some people breached quarantine measures to seek out meaningful and intimate relationships to reduce loneliness, possibly alleviating anxiety triggered by mortality salience (Plusnin et al., 2018). Being placed in quarantine implied a risk of contracting COVID-19 as individuals were deemed to have had a reasonable chance of exposure to the COVID-19 virus. This would likely heighten death thoughts, which could then be amplified by the daily reports of infection numbers and death rates in Singapore and other countries. In the context of TMT, it is understandable for some of these individuals to breach social distancing measures and SHN, such as a British man breaching SHN to meet with his fiancée in the hotel in which he was quarantined (Alkhatib, 2021). Such quarantine breaches to seek out close relationships offer an anxiety buffer from mortality salience prompted by COVID-19, particularly as the 14 days of quarantine wore on and the death thoughts receded from awareness.

Besides seeking contact with close and loved ones, the sharing of unverified COVID-19 information with family and friends can be construed as a type of anxiety buffering measure when faced with mortality salience. The sharing of information, even before official

verification, could be a means to stay connected with loved ones. At the same time, it also possibly served as an attempt to extend symbolic mortality as sharing information in crisis could enhance survival of other in-group members.

Worldview and self-esteem. One way through which individuals protect in-group members appears to be the sharing of information in crisis, even before its verification. Misinformation related to COVID-19 circulated in the community from February to April 2020 (Ministry of Communications and Information, 2020a). This information was related to the nature of the COVID-19 virus, government guidelines on public service provision and utilisation, and social distancing measures. This is in line with the findings reported in studies by the National Centre of Infectious Diseases (NCID), Wee Kim Wee School of Communication and Information of the Nanyang Technological University, and the Saw Swee Hock School of Public Health of National University of Singapore, which examined the Singapore community's knowledge, perception, and behaviour during the COVID-19 pandemic (Chew, 2020).

These studies found a significant amount of unverified information circulating on messaging and social media platforms and reported that as many as 78% of their respondents forwarded information on messaging platforms to family and friends. Out of this 78% of respondents, about 14% would circulate information received on messaging platforms before verification (Oh, 2020). Individuals who tended to forward information on social media were more likely to endorse panic buying, suggesting that forwarding information and panic behaviours during pandemics serve common functions when death thoughts are accessible in individuals' minds. Such circulation of information, regardless of the authenticity of the information, is consistent with a symbolic extension of individuals' mortality by ensuring the survival of family and friends through information sharing. Such information sharing can be seen as providing family and friends with the ability to enact timely actions for self-preservation.

Besides bias towards in-group members, there has been a rise in negative attitudes among Singaporeans towards certain groups of non-Singaporeans. There has been an intensification of xenophobic sentiments as exemplified by a commentary published in the national Chinese newspaper scapegoating foreign workers for the ongoing pandemic in Singapore, attributing the high number of cases to their lack of personal hygiene (Mahmud, 2020). Singaporeans also criticised expatriates who congregated and flouted social distance measures as being "selfish" and called for the government not to apply "double standards" towards these expats (Tai, 2020). Anger was also directed at Indian nationals for pandemic-induced job losses suffered by Singaporeans (A. Khan, 2020).

Apart from the intensifying ingroup-outgroup split, another example of how individuals regulated their anxiety arising from mortality salience from COVID-19 was demonstrated by Paramjeet Kaur. As was widely covered by the media, Paramjeet Kaur expressed and upheld strong beliefs that she is "we the people" and "sovereign" (Alkhatib, 2020). While upholding her worldview as a "sovereign", Kaur violated the COVID-19 rules of Singapore and adopted health-defeating behaviours including not wearing a mask on at least two occasions in public areas and eating at a food stall during the lockdown, when individuals were banned from eating outside of their homes (Alkhatib, 2020). Her behaviour possibly illustrated a distal defence in which she upheld her worldview to regulate her anxiety arising from mortality salience even though this led her to adopt health-defeating behaviours.

Distal defences can also be adaptive and selfless. As the country coped with and adjusted to COVID-19, the Singaporean community also exhibited prosocial behaviours. The collective spirit, where looking out for each other and family orientation are important, is still common in the Singapore community even though the country is multicultural (Hofstede Insights, 2020).

With death thoughts likely prevalent in the Singaporean community during the COVID-19 pandemic, individuals showed kindness during the difficult times. As face masks and sanitisers ran out, there was news about and praise for kind and generous individuals who placed bottles of sanitisers and face masks in lifts for public consumption (Lee, 2020; Wong, 2020). Others decided to donate their personal pay-out from the Singapore government (the Solidarity Payment[1]) to non-profit organisations and started campaigns encouraging others to donate their Solidarity Payment to charities to help those whose livelihoods were affected by COVID-19 (Yuen, 2020). Some set up online platforms for people to share resources such as face masks (Wong, 2020), while others dedicated efforts to help low-income families by providing food and sewing and donating reusable face masks (Ministry of Communications and Information, 2020b;

1 Solidarity Payment is a one-off sum of SGD$600 given to all Singapore citizens aged 21 years and above to alleviate the impact of the COVID-19 pandemic.

Toh, 2020), demonstrating social responsibility to keep the community, which represents part of our collective mortality, safe. The empathy and generosity of these behaviours represent important values and worldviews; behaving in ways consistent with these values improves sense of self and reinforces self-esteem. Such altruistic behaviours as seen in Singapore in the early stages of the pandemic fit with the proposed mechanisms of TMHM to reduce anxiety from mortality salience.

Conclusion

Reflecting on a Terror Management Health Perspective of COVID-19 in Singapore

As reviewed in this paper, the TMHM can facilitate our understanding of health behaviours observed in Singapore during the COVID-19 pandemic, particularly in the early stages. While behaviours such as stockpiling, forwarding unverified news, and breaching of social distancing measures and quarantine orders occurred, kindness and generosity were also seen as individuals behaved in ways that were consistent with their worldviews. These behaviours are consistent with the TMHM, where they serve as proximal and distal defences against the anxiety triggered by death thoughts.

Nevertheless, one may question the generalisability of the TMHM as not everyone who is exposed to similar levels of COVID-19 risk responded in the same way. Hayes et al. (2010) provide an explanation to address this discrepancy. Their review highlights that other personal variables could have influenced individual responses following death reminders. For instance, individuals who were psychologically stable, religious, or reported a secure attachment style were less likely to defend their worldviews when reminded of their mortality, despite reporting an increase in death thoughts (Hayes et al., 2010). Also, as highlighted earlier in this discussion, the differentiation of proximal and distal defences is challenging in the real world as it is not possible to control one's exposure to other mortality threats following the initial exposure but before behavioural outcomes or decision making are assessed. Hence, we have focused on examining the underlying motivations for these behaviours and decisions in an attempt to overcome this challenge of clearly demarcating proximal and distal defences.

Understanding the types of behaviours discussed here from the TMHM perspective would allow for anticipation and planning for countermeasures. For instance, if the intent of forwarding unverified news is to symbolically extend mortality by ensuring the survival of the in-group, it could be highlighted how forwarding *authentic* official news can promote self-preservation. Similarly, public messaging could also appeal to the social responsibility and altruistic spirit of the collective Singapore community to regulate panic behaviours and encourage adherence to social distancing and quarantine measures. Considerations could also be made to allow safe face-to-face meetings during quarantine measures so that individuals can turn to close relationships to cope with the anxiety arising from mortality salience but in a controlled way which does not increase risk.

The TMHM offers a novel perspective to make sense of individual behaviours in a pandemic. Nevertheless, these are only observations and have not been rigorously and empirically studied in the Singapore context. This paper therefore serves as a starting point to encourage research into studying and validating the TMHM in a pandemic in Singapore. With new scientific evidence and understanding, Singapore will be able to cope with the next pandemic in a more evidence-based and effective manner.

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