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**INFANTS, YOUNG CHILDREN, PREGNANT WOMEN
& THE ROLE OF MIDWIVES IN EMERGENCIES
IN NEW ZEALAND**

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2025

**INFANTS, YOUNG CHILDREN, PREGNANT WOMEN,
& THE ROLE OF MIDWIVES IN EMERGENCIES
IN NEW ZEALAND**

A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
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Abstract

In 2023, New Zealand (NZ) experienced the North Island Severe Weather Events (NISWE) which began with the Auckland Anniversary flooding and culminated in Cyclone Gabrielle, the latter of which caused significant flooding in the Hawke's Bay. While the NZ government commissioned several reports assessing the response to the NISWE, none of these reports assessed the emergency management response for infants, young children, and pregnant women (IYCP). IYCP have unique vulnerabilities during an event which need to be accounted for in emergency management planning and procedures. The aim of this research is to improve outcomes for IYCP in future events by learning from NZ's IYCP response to recent disasters.

Semi-structured interviews were held with emergency management professionals, midwives, and other responding organisations to determine:

1. How well did the emergency management response meet the needs of IYCP after NISWE?
2. Based on interviews with midwives, what were the experiences of their patients in recent events in NZ, including NISWE?
3. How might the needs of IYCP be better met during and after an event?

With the data gathered from the interviews, a focus group was held to discuss the research findings and discuss potential solutions in a collaborative environment. The interview and focus group questions were developed in response to the literature review findings and case studies.

The key findings from this research include the following:

- Lead maternity carer (LMC) midwives are not routinely included in emergency

management planning and preparedness in NZ, and the needs of IYCP may not be met before, during, and after an event. It would be beneficial to include an LMC midwife in welfare group meetings.

- Emergency management would benefit from IYCP training to ensure international legislation and best practices are being followed. Midwives would benefit from training and tailored planning to ensure they can continue to provide care during and after an event.
- Existing emergency preparedness resources for IYCP in NZ do not align with international legislation and best practices and are often difficult to use.
- Evacuation centres are often unsafe for infants and very young children, and breastfeeding mothers may find it difficult to continue feeding. Emergency management should plan for evacuation centres to have a baby friendly space which includes a safe place for young children to play, supports safe infant sleep, private space for mothers to breastfeed, and allows for the distribution of infant formula and necessary supplies to those who need it.

The findings of this study are consistent with other research suggesting that NZ emergency management does not have appropriate planning to meet the needs of vulnerable populations in emergencies. If emergency management and LMC midwives can develop a collaborative relationship, IYCP vulnerability in future events could be significantly decreased.

Preface

In 2023, when I was 8.5 months pregnant, after spending several hours of the afternoon fruitlessly searching for ponchos for the next day's Elton John concert, I watched as the downstairs of my house flooded, one of the thousands affected by the Auckland Anniversary floods. I realised I was no longer going to be attending the concert, despite it still being scheduled to go on as Elton John is well known for refusing to cancel due to weather and no one had yet declared a state of emergency which would force him to cancel.

Ultimately, we were very lucky that the flooding was minor, and I was well equipped to oversee remediation work on my house, having spent several years teaching classes on the subject. This experience made me realise even with a background in both emergency management and human nutrition I was ill-prepared for an event, particularly once the baby arrived. Speaking with other expectant and new mothers showed me disaster preparedness was rarely, if ever, discussed as part of preparation for a new baby. If I was unprepared, it stands to reason others are as well, and I wanted to know how emergency management is prepared to meet the needs of a vulnerable group which is often neglected.

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Abbreviations

ACF	Action Contre la Faim/Action Against Hunger
ACOG	American College of Obstetricians and Gynecologists
BFS	Baby Friendly Spaces
BMS	Breast-Milk Substitutes
CDC	United States Centers for Disease Control and Prevention
CDEM	Civil Defence Emergency Management Act 2002
DHB*	District Health Board*
DRR	Disaster Risk Reduction
EMC	Emergency Maternity Clinic
HSZ	Hikurangi Subduction Zone
IDP	Internally Displaced Persons
IFM	International Federation of Midwives
IPV	Intimate Partner Violence
IYCF	Infant and Young Child Feeding
IYCP	Infants, Young Children, and Pregnant Women
LMC	Lead Maternity Carer
MoH	Ministry of Health
NEMA	National Emergency Management Agency
NISWE	North Island Severe Weather Events
NZ	New Zealand
NZDF	New Zealand Defence Force
OG-IFE	Operational Guidance for Emergency Relief Staff and Programme Managers
QF2011	QF2011 Queensland Flood Study
Sendai Framework	The Sendai Framework for Disaster Risk Reduction
the Code	The Code of Marketing of Breast-milk Substitutes

the Strategy	Global Strategy for Infant and Young Child Feeding
TWO*	Te Whatu Ora/Heath NZ*
UN	United Nations
UNDRR	United Nations Office for Disaster Risk Reduction
UNHCR	United Nations High Commission on Refugees
US	United States
WFP	World Food Programme
WHA	World Health Assembly
WHO	World Health Organization

*In 2022, TWO replaced the 20 regional DHBs as the national publicly funded healthcare system in NZ. In 2024, the current government changed the name of TWO from Maōri to English (Health NZ/TWO). This paper primarily uses the name TWO, as this was its name during the bulk of the research, however DHB and Health NZ are used in reference to specific documents.

Chapter 1: Introduction

In the last two decades the frequency and severity of extreme weather events has increased dramatically (Lavell et al., 2012). In 2023, Europe experienced its warmest year on record, and had a 94% increase in heat-related deaths (United Nations (UN), 2024). In 2020 in California, after years of drought, wildfires burned 4.3 million acres killing 33 people (Hassan, 2024). The 2020 monsoon season in Bangladesh, Bhutan, India, and Nepal affected 9.6 million people and killed over 700 people (English, 2020). The effects of extreme weather have impacted nearly every, if not every, country around the globe, including New Zealand (NZ).

In 2023, Cyclone Hale, Auckland Anniversary flooding due to an atmospheric river, and Cyclone Gabrielle, known collectively as the North Island Severe Weather Events (NISWE), were the most destructive and severe weather in NZ's recent history, resulting in 15 casualties and an estimated \$9-14.5 billion dollars in damages to property and infrastructure (Stats NZ, 2023). While the 2023 NISWE are currently NZ's most expensive weather-related disasters on record, the frequency and intensity of severe weather due to atmospheric rivers is expected to increase by the end of the century (Goddard et al., 2025). Severe weather and NZ's susceptibility to geophysical hazards including earthquakes, volcanic eruptions, and tsunamis mean events of equal or greater scale are likely to happen in the future (Insurance Council of NZ, 2024).



Figure 1.0 *Regions Affected by 2023 NISWE*

The NISWE prompted the Minister of Emergency Management to declare the third State of National Emergency in NZ history, the previous two being the 2011 Christchurch earthquake and the 2020 Covid-19 pandemic (Mitchell et al., 2023). In theory, this declaration should have allowed for national resources to be more effectively allocated and distributed to affected areas. In practice, there was a lack of coordination and situational awareness between councils, National Emergency Management Agency (NEMA), and emergency responders, prompting the Crown Inquiry to conclude, “The current emergency management system is not fit for purpose. It does not have the capacity or capability to deal with significant, widespread events that impact multiple regions at once” (Ombler et al., 2024).

1.1 Emergency Management Structure

The current emergency management system in NZ operates formally across local, regional, and national levels. Locally, councils are responsible for ongoing planning and implementation of the “4Rs”: reduction, readiness, response, and recovery (NEMA, 2020;

Ombler et al., 2024). When an event caused by a natural hazard occurs, the local council (Auckland council, Napier City Council, etc.) leads the response. If an event exceeds the council's ability to cope, a local state of emergency can be declared. Regionally, the Civil Defence Emergency Management (CDEM) Group is composed of either the Mayor/Council Chair or an appointed representative from each council in the region and provides emergency management coordination in the region. Nationally, NEMA coordinates local, regionally, and national emergency management during an event. NEMA may also support councils in implementing the 4Rs.

During response (and to a lesser extent, readiness and recovery), CDEM uses a Coordinated Incident Management System (CIMS) based on similar structures used in Australia and North America (NEMA, 2019). The principles of CIMS are the basis on which all event management is based. These principles are:

- Responsiveness to community needs: response personnel must allow communities to be active participants in response, not just bystanders. Response needs to account for the needs of individuals, families, and communities.
- Flexibility: CIMS needs to be adaptable and scalable to events of any size and type.
- Unity of effort: all CDEM functions and organisations must meet common goals by coordinating activities while maintaining their own authorities.

Within CIMS, the lead agency is the agency with the expertise, and legislative authority or mandate, to manage a hazard caused by a specific event type. The role of the lead agency is to monitor and assess the situation, plan and coordinate response, provide updates to

governance, and coordinate and share information to the public through use of a Controller. Support agencies serve to support the lead agency and it is the lead agency Controller that coordinates and delegates roles and responsibilities during an event. When an event results in overlapping agency jurisdictions, two or more controllers from different organisations can be integrated as Unified Controllers.

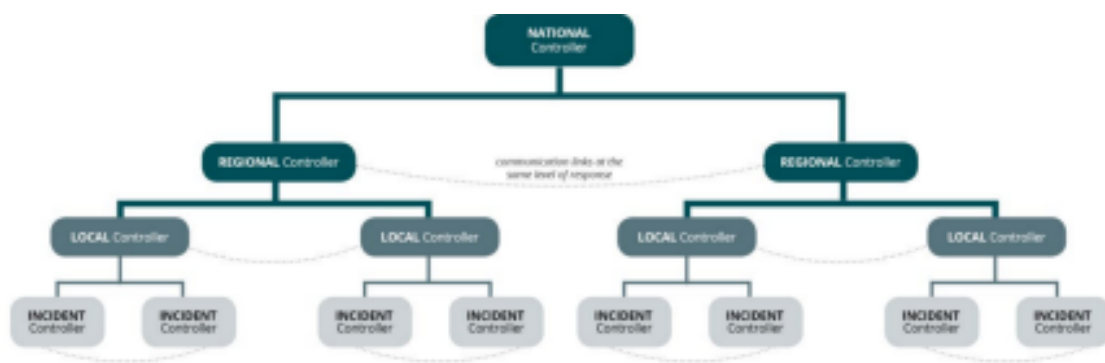


Figure 1.1 CIMS Controller Structure
(from CDEM, 2019)

In addition to local councils, CDEM, and NEMA, emergency management roles are shared with other organisations including lifeline utility providers (e.g., power, water, roads, etc.), emergency services (e.g., police, fire, ambulance), and welfare services (e.g., health and disability services). Of primary concern for this research is the workings of the Group Welfare function. The welfare function provides welfare and psychosocial support and is comprised (at a minimum) of:

- Te Whatu Ora/Health NZ (TWO)
- Ministry of Business, Innovation, and Employment
- Ministry for Primary Industries
- Ministry of Social Development
- Ministry of Health (MoH)

- Oranga Tamariki/Ministry of Children
- Red Cross
- Iwi Māori
- Local community groups

In Auckland, for example, the Welfare Group is made up of 25 named organisations, plus additional unnamed non-governmental organisations (NGO) and additional agencies (Auckland Emergency Management, 2019). This complex structure may make it difficult, especially in councils which lack the budget or resources to employ dedicated emergency management staff, to operate effectively during an event.

1.2 Vulnerability, Exposure, and Risk

One of the goals of emergency management, across all levels, is to decrease community and individual hazard risk by reducing exposure and vulnerability. Exposure is the number of people, buildings, infrastructure, and other assets in a hazard prone area (United Nations Office for Disaster Risk Reduction (UNDRR), 2017). Many people in NZ have exposure to hazards, including, but not limited to tsunamis (coastal living), flooding (e.g., living on floodplains), and earthquakes.

NEMA (2022) uses the UNDRR (n.d.b) definition of vulnerability, “The conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards”. Vulnerability is multifaceted, comprised of susceptibility to a hazard, lack of coping skills, and lack of adaptive capabilities (Hilft, 2023a). Individuals and a community can have high susceptibility due to socio-economic status, societal disparities, and belonging to vulnerable populations. There may be little individuals can do to decrease their

susceptibility. For example, most children who are born into poverty will remain in poverty as adults (Boston et al., 2012; Ratcliffe & Kalish, 2017). Therefore, it is the role of the government to implement policies, programmes, and resources to decrease susceptibility, improve coping skills, and increase adaptive capabilities.

While NZ has high exposure to geophysical and hydro-meteorological hazards, it has very low susceptibility and low vulnerability (Hilft, 2023b). In both 2023 and 2024, NZ was considered very high risk overall due to hazard exposure, at number 36 out of 193 countries (Hilft/IFHV, 2023, 2024). Despite overall low vulnerability, individuals and communities may still be vulnerable to the impacts of a hazard due to physical limitations (e.g., disability, advanced age), living or residing in places with high exposure (e.g., flood plains or unstable slopes), or socio-economic status (UNDRR, n.d.b). When vulnerable populations have high exposure to a hazard the event has significant impacts on the affected population. Some populations will always have greater vulnerability relative to the general population, including infants, young children, and pregnant women (IYCP) (Newnham et al., 2022).

1.3 Gender and Disaster

The experiences of women and girls during and after an event are significantly different from men due to pre-existing vulnerabilities including biological differences and socio-cultural factors (Ariyabandu, 2009). Women and girls are significantly more likely to die than men, particularly women and girls of lower socioeconomic status (Neumayer & Plümper, 2007). This mortality difference between males and females is true globally. In NZ, females comprised 65% of the deaths, and 64% of hospitalisations in the 24 hours immediately after the Christchurch earthquake (Johnston et al., 2014; Vallance, 2024). Globally higher mortality rates in disasters are attributed to gender norms where women are

more likely to work indoors in unsafe structures (Neumayer & Plümper, 2007); wear clothing which restricts movement; and may not be taught skills necessary for survival, such as swimming (Oxfam International, 2005).

Displaced women are also at increased risk of sexual and/or domestic violence during and after an event (Cazabat, 2019; Neumayer & Plümper, 2007). While this violence can be committed by opportunistic strangers, it is often perpetuated by intimate partners, with disasters exacerbating the severity of existing intimate partner violence (IPV) and increasing emergence of first-time violence (Medzhitova et al., 2023). This is especially true amongst internally displaced people, with an estimated 17% of women affected by sexual abuse and 25% affected by IPV (Anastario et al., 2009). Medzhitova et al's., (2023) review identified risk factors for IPV post-disaster, including amount of direct contact with the event, loss of social networks, and resource limitations which forced women to reunite with previously abusive partners.

1.4 Pregnancy

Whilst pregnancy does not necessarily make a woman more vulnerable during and after an event, it does require special consideration to ensure the needs of both the mother and foetus are being met.

1.4.1 Nutrition and Hydration

Lack of access to nutritious food and safe drinking water is a significant concern when pregnant. Birthweight and other birth outcomes have direct correlation to maternal nutrition, and the required daily intake for many micronutrients, including iodine, folate, iron, and calcium is increased (Abu-Saad & Fraser, 2010). Brief lack of access to necessary supplements and nutrient dense foods may be safe for the developing foetus; however it may

cause significant additional worry for the pregnant woman.

There may also be food shortages due to infrastructure damage or significant flooding. During Cyclone Gabrielle, many bridges and roads sustained significant damage, isolating rural communities from grocery stores and disrupting the supply chain to grocery stores (Plummer, 2023). Those who could reach grocery stores were often unable to pay as power and communication outages made EFTPOS and other electronic payment methods impossible.

Many pregnant women have strong food aversions and a long list of foods to avoid. The available food may not be palatable, or may be considered dangerous to eat during pregnancy due to higher risk of microbial contamination. For example, pregnant women are told to avoid cold processed meats (e.g., salami, chicken, pastrami) and packaged salads due to potential contamination with listeria which can result in miscarriage or premature labour (Ministry for Primary Industries, 2024). Pregnant women have increased caloric needs, yet may struggle to find food which is both safe to consume and palatable.

During pregnancy, fluid needs increase to support foetal development, amniotic fluid, and a significant increase in maternal blood volume (Montgomery, 2002). Dehydration during pregnancy may increase the risk of adverse birth outcomes, including low birth weight, small for gestational age, and low head circumference (Mulyani et al., 2021). The Ministry of Health (MoH) recommends women drink nine cups of fluids (roughly two litres) of water per day, while Mulyani et al. (2021) recommend three litres per day to improve birth outcomes. During pregnancy, the mother's immune system is suppressed, which can make her more susceptible to illnesses caused by contaminated drinking water (Montgomery, 2002).

1.4.2 Displacement

As pregnancy progresses, women face new physical challenges which may make safely evacuating and staying at an evacuation centre difficult. When evacuating, women later in pregnancy can have problems with balance, and less physical stamina as a result of decreased physical activity (Jang et al., 2008). This may make it difficult to even access an evacuation centre, particularly if roads are blocked or terrain is unstable.

Stressors related to displacement can physically manifest during pregnancy as pre-eclampsia (Poursafa et al., 2015). Displacement can also increase rates of negative birth outcomes including premature delivery, small for gestational age, low birth weight, and low five minute APGAR scores (Bussi res et al., 2015; Cordero, 1993; Dancause et al., 2011; Menclova & Stillman, 2020; Murphy et al., 2021; O'Donnell & Behie, 2013). Displaced pregnant women are less likely to access prenatal, delivery, and postnatal care and are at increased risk of malnutrition, communicable diseases, violence, and poor hygiene conditions which can result in adverse birth outcomes including premature death (Cazabat, 2019; Chu et al., 2010; Harville et al., 2021).

Many displaced pregnant women will have procured items needed to bring home a baby which may no longer be accessible. These items may be covered by insurance, however they can be very expensive and families may not have the financial resources to replace them until their insurance claim has been paid. If insurance companies are inundated with claims, payments may take several months or years to be resolved.

1.5 Infants and Young Children

Of IYCP, infants (under 12 months of age) are the most vulnerable group because they are entirely dependent on others for every aspect of their survival. Infants and young

children (considered in this research to be 23 months or younger) are vulnerable to the effects of inappropriate or unsafe food and fluids and displacement.

1.5.1 Nutrition and Hydration

From birth to six months of age, the nutritional needs of infants can be met through exclusive breastfeeding, breast milk substitutes like infant formula, or a combination of both. In a large-scale emergency, use of formula is associated with increased exposure to gastrointestinal and respiratory infection due to lack of clean water and/or power for sterilising (Calderon-Rodriguez & Noble, 2022; Hargest-Slade, 2015). Parents would also need to have access to an adequate supply of age-appropriate formula, which may be difficult if grocery stores are inaccessible (e.g., due to road closures, loss of public transportation, store closures).

During an event, a significant advantage of breastfeeding is that it is highly protective against gastrointestinal and respiratory infections. Breast milk is highly reactive and will modulate the contents of the milk so it contains the antibodies necessary for the infant's current environment (Atyeo & Alter, 2021; Heinrichs et al., 2002). As long as mothers can remain sufficiently hydrated, milk supply is unaffected by short-term food shortages or stress (Gribble et al., 2019). In an emergency, breast-fed infants have a safe, sustainable, and easily accessible source of nutrition and hydration, perfectly tailored to their unique needs. A breastfed infant is significantly less vulnerable in an emergency than a comparable formula fed infant.

Unfortunately, many women who are exclusively breastfeeding will wean during an emergency, believing the myths that stress decreases milk supply or causes the milk to go “bad” (Bartle, 2011; Gribble & Berry, 2011; Grubestic & Durbin, 2022; Hargest-Slade, 2015; Hwang et al., 2021; Ratnayake Mudiyanseelage et al., 2022). Hargest-Slade & Gribble found

following the 2011 Queensland floods and Cyclone Yasi, both in Australia, 7% of women breastfeeding introduced formula for the first time, and 50% weaned completely, with most citing one or both of the aforementioned myths as the reason.

Young children are less vulnerable in an emergency than infants, but are still more vulnerable than older children. One vulnerability is a young child's susceptibility to contracting diarrhoea and having more severe effects from diarrhoea (Hoffman, 2008). According to the World Health Organization (WHO) (2017), diarrhoea is the second leading cause of death globally for young children as it can cause severe dehydration and/or malnutrition. If the potable water supply is contaminated with pathogens, for example after a flood or tsunami, young children used to getting themselves drinking water from the tap may struggle to adapt to new water restrictions, increasing the risk of infection.

Another source of diarrhoeal infection could be from poor hand washing. One common source of diarrhoea is by contamination of ready-to-eat foods (which will not be further processed before eating) by unwashed hands, however this risk is lessened by 39% in high income countries when proper hand-washing technique is promoted (Ejemot et al., 2009).

In 2015/16, one in five children in NZ was considered food-insecure (Pannekoek & Ree, 2019), which would likely be significantly increased following a natural hazard event (De Haen & Hemrich, 2007). Food-insecurity has been linked with psychological distress in young children, and can increase the risk of long-term emotional and behavioural problems including sadness, worry, and anger (Fram et al., 2011; Rucklidge et al., 2012; Shankar et al., 2017).

1.5.2 Displacement and Separation

When young children are displaced, they may develop behavioural and psychological problems, particularly if separated from their parents. This can include impaired self regulation and forming of attachments, difficulty sleeping, and memory difficulties (Drolet et al., 2021; Masten & Osofsky, 2010; Pfefferbaum et al., 2016). One reason for this may be because children no longer have their parents as a source of emotional security, as their parents' primary time and energy is spent procuring food, organising shelter, and other immediate necessities. This loss of security can result in traumatisation in children as young as 2 (Hoffman, 2008; Longhurst, 1995; Masten & Osofsky, 2010). One way children may be able to cope better is through play, which is crucial for stress regulation in children (Henniger, 1995), but children in an evacuation centre may not be able to play for a number of reasons (e.g., lack of toys, limited space, concern about noise levels).

Evacuation centres are meant to offer displaced populations a temporary safe location to stay until alternative accommodation can be sorted. Hosoda (2014) as cited in Kako et al., (2020), found there were not enough evacuation centres to accommodate pregnant women and children, despite planning in Japan which includes opening and operating centres tailored to the needs of vulnerable groups.

A significant safety concern in evacuation centres is keeping infants and young children safe. One easily overlooked safety concern is safe sleep. Infants under 12 months of age should be put to sleep on their back on a firm, flat, level surface which is free of other objects (University of the Sunshine Coast et al., 2024). Unsafe sleep in evacuation centres can include: sleeping in the arms of a sleeping parent, sleeping on a soft surface, sleeping on a crowded surface, in places where adults or older children may roll on the infant, and

places they can fall or be stepped on. Sleeping in unsafe settings can result in infants not receiving enough oxygen which can result in brain damage or death.

Another concern is keeping children safe from other evacuees and animals. Mothers who evacuated in the 2019/20 Australia wildfires cited safety concerns about inebriated adults, dog fights, and cigarette smoke exposure (Gribble et al., 2024). In the same study, evacuation centre staff had numerous safety concerns including low electrical outlets, balcony steps, busy roads, cords, cables, poorly lit spaces, and weapons brought in by other evacuees being accessible to children.

Despite the known vulnerabilities of IYCP during and after an event, little is done to account for their specific needs in most countries, regardless of the level of development. In many countries, more planning has been done to meet the needs of animals than the needs of IYCP (Gribble et al., 2019).

1.6 International Legislation, Policy, and Recommendations

While few countries have developed and implemented IYCP in emergency plans, most are signatories to policies developed by the United Nations and other intergovernmental organisations. Most of these relate to infant feeding, due to the increases in morbidity and mortality associated with formula use after an event.

1.6.1 WHO Code of Marketing of Breastmilk Substitutes (1981)

During the 1981 World Health Assembly (WHA), the WHO drafted and published “The Code of Marketing of Breast-milk Substitutes” (henceforth referred to as “the Code”), a code of conduct for WHO member countries, including NZ. During the drafting of the Code the NZ representative, Dr. John Hiddleston, took time to emphasise NZ’s strong support for the Code, stating he believed it would be more effective than a regulation.

Whether or not this belief was correct is discussed in Section 1.7.1.

Since the Code was published in 1981 a number of additional resolutions have been adopted including WHA 69.9 in 2016 which prohibits donations from companies selling infant formula and complementary foods (i.e., solids) to health care systems. In complex emergencies, the Code is especially relevant for controlling infant formula donations and outlining appropriate distribution of infant formula. The Code specifically states that donations of infant formula should only be made if requested by the relevant governmental authority and are to be “distributed only through the healthcare system” (WHO, 1981, p.16). This means formula donations should not be accepted by anyone involved in the event response, regardless of the origin of the donation (infant formula manufacturer or well meaning citizen) and is not to be given to parents other than by healthcare providers.

1.6.2 Infant Feeding in Emergencies Booklet (1997)

The WHO published this booklet following what was, at the time, the last war in Europe, the Bosnian War. It was written for mothers and caregivers, and while dated, the information is consistent with more recent publications published by the Interagency Working Group on Infant and Young Child Feeding in Emergencies (2001) (discussed next) and the WHO’s Guiding Principles for Feeding Infants and Young Children During Emergencies (2004) (discussed in Section 1.6.5).

At nearly 30 pages, the WHO’s Infant feeding in emergencies is likely too long to be used in a true emergency when time is at a premium. Based on available research, the use or effectiveness of the book does not appear to have been evaluated. A better resource would be a pamphlet available both online and in print with pertinent information easily understood by readers of all literacy levels. Ideally this resource would be available in several mediums,

including visual and auditory forms, which would make the information more accessible to people with disabilities, low literacy, and people who do not speak, or are not fluent in the available published languages (D. Blake et al., 2017; Uzair et al., 2022).

1.6.3 Infant and Young Child Feeding in Emergencies: Operational Guidance for Emergency Relief Staff and Programme Managers (OG-IFE) (2001-2017)

OG-IFE was developed in 2001 by the Interagency Working Group on Infant and Young Child Feeding Emergencies, an inter-agency collaboration that includes members from organisations within the United Nations (e.g., World Food Programme, UNICEF, WHO), international charities (e.g., USAID, ACF, Médecins Sans Frontières, Samaritan's Purse, La Leche League International) and the US Centers for Disease Control and Prevention (CDC). The target demographics for OG-IFE are policy and decision makers working in positions related to emergency preparedness and response, including governmental agencies, charities, and NGOs. The document is a multidisciplinary approach to IYCF in emergencies, with a particular focus on nutrition. A key aspect of OG-IFE is the importance of implementing policies to protect infant and young child feeding in emergencies (IYCF-E) that comply with the Code.

Other important aspects of OG-IFE are related to preparedness, including IYCF-E training for responding personnel. The document specifically notes governments are the lead coordination authority and are responsible for generating policies, keeping policies up to date, and disseminating the information to volunteer groups, the military, and the media.

1.6.4 Baby Friendly Spaces (2014)

In 2014, the Action Contre la Faim (ACF), also known as Action Against Hunger, released the Baby Friendly Spaces (BFS) intervention (Brabandere et al., 2014). The BFS

was designed to lessen the risk of adverse health outcomes due to under-nutrition, improve family resiliency, and promote breastfeeding in an emergency while offering sustainable alternatives for infants who require infant formula. Ultimately, “the BFS’s main objective and line is to take care of the mother/caregiver in order to support her/him to take care of the child/infant” (p. 13).

According to the ACF, taking care of women (pregnant and not), infants, and young children in an emergency includes:

1. Care for Women

Care for women includes prenatal care, physical health and nutritional status, and stress and mental health (Brabandere et al., 2014). IYCP should be considered a priority in emergency response and monitored for overall well being. Accommodations may need to be made to ensure women have the time and resources to care for their children.

2. Breastfeeding and Feeding Practices

Given the numerous benefits associated with breastfeeding in an emergency (Abimibayo Adeoya et al., 2022; Dall'Oglio et al., 2020; Grubestic & Durbin, 2022; Hirani et al., 2019; Khajehaminian et al., 2019; WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality, 2000; Walker, 2010), it is important an appropriate space is available for women to breastfeed. This space should offer both privacy and necessary support. This chapter also provides information about complementary feeding and weaning.

3. Psychosocial Care

Psychosocial care is related to a child's development, and can be facilitated by paying attention to children, giving affection, and providing an opportunity to learn and grow through play and exploration (Brabandere et al., 2014). In an emergency, parents may be unable to provide psychosocial stimulation for optimal development as they are attending to needs necessary for survival (food, shelter, etc.). Shelters may need to implement policies which facilitate psychosocial development.

4. Hygiene Practices

As any parent of a child attending daycare will tell you, young children are particularly susceptible to communicable diseases. In emergency settings, it may be difficult to sustain good hygiene practices, however good hygiene, particularly handwashing, can decrease risk of diarrhoeal disease significantly.

5. Meal Preparation and Conservation

Food preparation does not just refer to cooking food, it also encompasses procuring food, storing food, and food hygiene. Caregivers may need to be taught how to best deal with food constraints presented by an emergency, for example, how to prepare foods using a minimal amount of water or best food storage practices when power is not guaranteed to be available.

6. Home Health Practices

Other than the importance of breastfeeding in an emergency, which has already been discussed, other important home health practices include ensuring pregnant women receive antenatal care, immunising children before

their first birthday, treating wounds, and utilising health care facilities when necessary.

According to ACF, BFS should be implemented immediately following an event, even if the risk or rate of malnutrition in an area is low. A BFS should be a place where IYCP and caregivers are welcomed and supported. ACF provides a comprehensive list of expectations for a BFS, but the list can be summarised as: safe and secure areas children for children to be in with necessary resources, private areas for nursing and mental and physical healthcare checks, and easy access to food and safe water for drinking and preparing infant formula if needed. An issue which may arise in BFS as designed by ACF is the age limit.

Not all aspects of the ACF intervention will be necessary in NZ, as the programme has an emphasis on refugee camps and developing countries. This intervention would likely be a good starting point for NEMA or CDEM to develop context appropriate BFS plans for future events.

1.6.5 Guiding Principles for Feeding Infants and Young Children During Emergencies (WHO, 2004)

This publication by the WHO provides both quick reference and in depth guidelines for infant and young child feeding in emergencies. It does this by first outlining the 10 principles of safe feeding in emergencies. The principles are:

1. Infants should be exclusively breastfed for the first six months of life.
2. The environment should support and encourage breastfeeding for children up to 2 years of age (or older).
3. Formula quantities and distribution should be strictly controlled.
 - a. When formula is necessary, it should be fed by cup, only to infants

who have to use it.

- b. Formula needs to be able to be prepared and used safely.
 - c. The availability of formula to a minority of infants should not impede or interfere with breastfeeding for the majority.
 - d. Infant bottles and artificial teats should be actively discouraged.
4. For children over 6 months of age, foods which are easy and safe to eat and nutritionally complement breast milk need to be available.
 5. Caregivers need continued access to nutrient rich ingredients to prepare meals for older infants and young children.
 6. Strategies for improving a caregiver's coping ability need to be implemented.
 7. The health of infants and children needs to be protected to ensure they are eating.
 8. Infants and young children need to be monitored for signs of malnutrition so interventions can be implemented early.
 9. To minimise an event's impact on feeding, interventions to meet the nutritional needs of children need to begin immediately.
 10. The approach to promoting optimal feeding needs to be flexible, while adhering to best practices.

These principles were designed with decision makers in mind, as the feeding of infants and young children should be included in any event response. This document assumes women as primary caregivers, however it is unique in noting that many people including fathers, older siblings, and strangers may have to look after small children for the first time.

Despite being over 20 years old, these principles of infant feeding are still relevant and appropriate to use as a starting point for planning. Some aspects of the principles may not be necessary in NZ, for example, safely breastfeeding with HIV. NZ has low HIV rates (<0.1% of the population), and there have been no reported cases of vertical transmission (from mother to child) since at least 2010 (UNAIDS, 2024). Application of these principles in NZ should focus on protecting and encouraging breastfeeding, safe and appropriate distribution of formula, and caring for caregivers.

1.6.6 Sendai Framework for Disaster Risk Reduction (DRR) 2015-2030 (2015)

The primary UN resolution for disaster risk reduction is the Sendai Framework, which was written as the successor to the 2005-2015 Hyogo Framework which NZ is a signatory to (UNDRR, 2015). Unlike the previously discussed international legislation, the Sendai Framework is not exclusively focused on IYCP. Rather, it encompasses understanding disaster risk and governance, and improving readiness, recovery, and resilience. That being said, the Sendai Framework does recognise that infants, young children, and women are disproportionately affected by disasters, and encourages proactively involving women in emergency preparedness planning and response.

One of the guiding principles of the Sendai Framework is shifting from reactive disaster management to proactive risk management, including assessing and reducing exposure and vulnerability (CDEM, 2019). The 2019 resilience strategy for NZ released by the Ministry of CDEM highlights ways in which the Sendai Framework is being used in DRR efforts. While the goal of reducing vulnerabilities is discussed, there is little mention of who should assess and manage vulnerabilities in NZ (Saunders et al., 2020). It is unsurprising Saunders found a significant gap in legislation to address vulnerability. If no

organisation(s) is explicitly tasked with assessing and managing vulnerabilities, the needs of vulnerable groups, including IYCP, will not be accounted for in DRR planning.

1.7 IYCP in Emergencies in New Zealand

1.7.1 Implementation of the Code

NZ is a signatory to the Code, as discussed in Section 1.6.1, however it is a voluntary agreement between infant formula manufacturers and the MoH (MoH, 2007). A 2022 assessment conducted by the WHO gave NZ a score of 27/100 for implementation and compliance with the Code (WHO, 2022). This score is significantly lower than many countries in Africa, Southeast Asia, and South America where there are more legal measures in place to enforce more components of the Code. This score is unlikely to improve in the immediate future. In 2024, it was announced NZ would not be implementing new, more stringent trans-Tasman labelling standards after 11 years of development following lobbying by formula companies including Danone, the a2 Milk Company, and industry lobbying groups (Bradley, 2025).

Unsurprisingly, countries like NZ with little or no legal commitments to enforcing the Code have high rates of violations (Barry et al., 2024; Becker et al., 2022; Lutter et al., 2022; Slesak et al., 2016). Reporting potential violations of the Code in NZ is difficult for members of the general public to do as it requires familiarity or the ability to decipher which organisation to report to and appropriately choose the violation.

Currently, the only legislation related to the Code in NZ is with respect to the labelling of infant formula and is part of the Food Standards Act (Gontijo de Castro et al., 2018; MoH, 2007). This makes it easy for NZ manufacturers and marketers to violate the Code, for example by donating or marketing formula, as long as they are adhering to

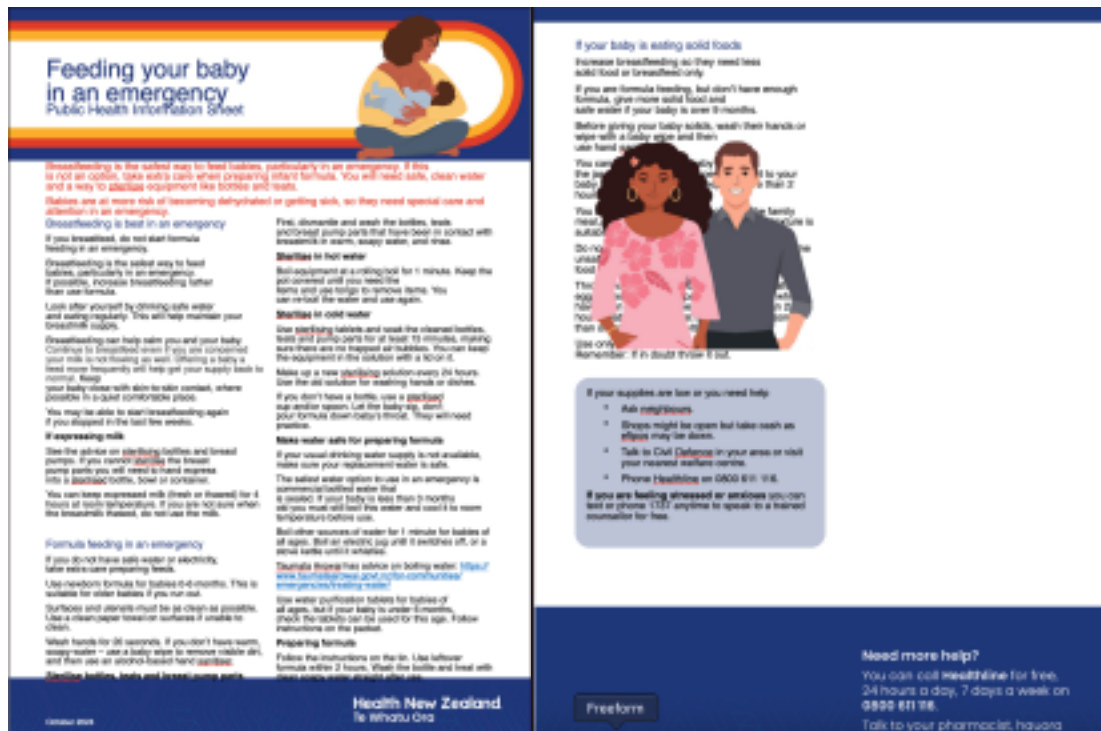
labelling laws. Violations of the Code during an event may endanger infants by inadvertently promoting the use of formula rather than breastmilk. Donated formula may not be suitable if it is not age appropriate, is close to expiring or expired, or if the label is in a language other than English. Additionally, it may be difficult to track donations which would in turn make it difficult to report violations of the Code.

NZ has implemented some of the policies as recommended by OG-IFE, including the WHO/UNICEF Baby-Friendly Hospital Initiative. This initiative is not specific to emergencies, however it does promote exclusive breastfeeding which, as discussed, can be lifesaving in emergencies.

1.7.2 Emergency Preparedness for Families (MoH, 2015; TWO, 2024)

At a national level in NZ, the “Get Ready” website, produced by NEMA, provides little information about IYCP. “Get Ready” has an option to “Tailor your plan”; however, the process to tailor a plan is convoluted. The user has to go to a different website, which is published by MoH. From this page, users should be able to access publications regarding infant feeding in an emergency, however not all of the documents are relevant to a given user as some documents are related to households while others are for TWO. In September 2024, the links on getready.govt.nz resulted in a “Page not found” message on the MoH website instead of Feeding your baby in an emergency: for babies aged 0-12 months (MoH, 2015).

As of March 2025, “Get Ready” now links to a document, Feeding your baby in an emergency (TWO, 2024) as well as tabs on the general website. The document has several issues, including failure to upload it as a PDF. When downloaded, some of the information may be blocked by graphics and is hard to read due to formatting.



tablets. No alternatives are provided, yet much of the advice is dependent on sterilised equipment being available. Other sterilising options include boiling, steaming, or using a dishwasher. If these are unavailable, unscented household bleach can be diluted and used to sterilise cups, bottles, and teats at a ratio of 0.25 teaspoons bleach to one litre of water (CDCc, 2024). TWO does not offer guidelines specific to sterilising infant feeding tools with bleach, but recommends drinking water be sterilised with a ratio of five drops of bleach per litre of water (HealthEd, 2019). It is unclear if the lower amount recommended by TWO is also appropriate for sterilising feeding equipment for infants.

While the 2015 document was not perfect, it was far more accurate and comprehensive than the 2024 updated resource. It included information related to necessary supplies for both hygiene (nappies, wipes, trash bags, etc.) and for feeding (commercially prepared water and suggested quantities, container for storing boiled water, etc.). It also encouraged relactation, and reiterated frequently the importance of breastfeeding and the difficulties of formula feeding. Like the 2015 document, the 2024 document is still difficult to access, but unlike the previous version does little to help those wanting to be proactive in emergency preparedness and provides recommendations which may be unsafe or difficult to follow.

1.8 Key Problems

While there are ample recommendations and legislation for best infant and young child feeding practices in an emergency, many countries struggle to implement them during an event. The response to the 2023 NISWE and other recent events provides the opportunity to assess whether NZ has followed best practice for the care of IYPC. If best practices were not followed, what factors and circumstances led to these decisions? How can the needs of

IYCP be met in future disasters?

At a national level, there is a lack of leadership regarding IYCP during and after an event, which then leaves regional and local emergency management groups responsible for developing their own guidance. As many smaller councils and regions do not employ full time emergency managers, those tasked with creating and implementing plans may be ill equipped to do so.

In international planning, the care of pregnant women is rarely accounted for, despite having specific health and safety concerns as previously discussed. This is likely due to the wide range of healthcare structures and accessibility. Those responsible for planning related to human health in an event (i.e., the regional welfare groups), need to ensure the care of pregnant women is included.

1.9 Research Aims and Objectives

This research aims to improve outcomes for IYCP in future hazard events by learning from NZ's IYCP response to recent disasters. This will be done by assessing the strengths and weaknesses of NZ's IYCP response to the 2023 NISWE. The findings from this research could help with planning for future emergency responses to disasters.

The research questions are:

- How has emergency management, both internationally and domestically, planned to meet the needs of IYCP in an event?
- How well did the emergency response to Cyclone Gabrielle align with international best practices for IYCP? What were the experiences of IYCP in recent events in NZ, with particular interest in Cyclone Gabrielle in the Hawke's Bay?
- How might the needs of IYCP be better met in an event?

These questions will be addressed by analysing and assessing existing literature, news, and research related to IYCP in emergencies to determine best practices and conducting interviews and focus groups with representatives from emergency management, welfare group functions, and community organisations.

1.10 Thesis Outline

This thesis is comprised of five chapters:

In Chapter 1, the context for researching IYCP in emergencies in NZ was introduced. The unique food, nutrition, accommodation, and safety needs of IYCP were described; existing international IYCP in emergencies legislation and policy reviewed and current NZ recommendations evaluated against these international legislation for adherence.

Chapter 2 discusses the data collection and analysis methods used in this research. The data collection includes the literature review and interview data. The analysis includes transcription, coding, and the interpretation of the results.

Chapter 3 is the literature review, and provides context for the necessity of using international IYCP in emergency legislation in developed countries through case study analysis. Events from other countries which contributed to IYCP in emergencies guideline development are also discussed, albeit in less detail.

Chapter 4, the results and discussion, is structured using the 4Rs. The results were categorised based on which “R” they best fit. The discussion and potential solutions for improving IYCP in emergencies response are included in this section. The discussion reflects on the findings, and potential solutions are aimed at aligning NZ with the international legislation and practices discussed in this chapter.

The final chapter revisits the research questions, discusses unexpected research

findings, identifies gaps and areas for future research related to IYCP in emergencies in NZ, and makes recommendations for improving outcomes.

Chapter 2: Research Methodology

2.1 Introduction

This chapter focuses on the methodologies used for data collection and analysis in this study. A qualitative approach comprising four components was undertaken:

1. A preliminary scoping literature review to develop a knowledge of international and domestic IYCP in emergencies practices and legislation (discussed in Chapter 1).
2. A second more detailed literature review and a corresponding news review to develop the case studies in Chapter 3.
3. Ten semi-structured interviews with representatives from both responding organisations and community organisations likely to work with IYCP or provide necessary supplies for IYCP. These interviews were coded and analysed for pertinent recurring themes.
4. A final focus group to bring together emergency management practitioners and community organisations to discuss the developed recommendations and solutions and their practicality in a future hypothetical event.

Mixed-method research was first considered as an option as it can result in a deeper and more nuanced understanding by overcoming limitations of single method research (Almeida, 2018). Ultimately, however, as the research depended on participants' lived experiences (Braun & Clarke, 2013), it was decided a purely qualitative approach would be more effective as it would provide flexibility to adapt the research as the interviews progressed. This proved especially true when interviewing groups not traditionally involved in emergency management response, as discussed in more detail in the interview questions.

2.2 Literature Review

2.2.1 Phase One

A two-phase literature review was conducted. The first phase sought to determine what, if any, legislation and policies existed for IYCP in emergencies. Once found, the documents were sorted chronologically to determine how the documents had evolved and their use in international events. Having previously studied Human Nutrition, I already knew the WHO had published legislation for infant feeding, however I did not know if there were specific documents for infant feeding in emergencies. I was also already aware of the importance and safety of breastfeeding from my previous studies.

These articles were primarily sourced through Google Scholar, PubMed, and WHO's Institutional Repository for Information Sharing using the phrases "infant feeding in emergencies" and "infant and young child feeding in emergencies". Once the history was established, the literature review shifted to look at if and how these standards and protocols, to which NZ is a signatory, have been followed in recent emergencies in both domestically and internationally in countries with similar levels of socioeconomic development (e.g., Australia, United States, United Kingdom) to NZ. Finally, this portion of the literature review looked at suggestions for improving the existing standards and protocols to assess what, if any, suggestions could be implemented in NZ to improve future emergency responses

2.2.2 Phase Two

In order to develop the case studies in Chapter 3, a more detailed literature review was conducted using Google Scholar and PubMed, however the latter did not generate any additional articles. The search terms were sourced from existing literature reviews.

Table 1.0 Search Terms Used in Initial Literature Review

Target Population	Potential Problem	Event Description
Infant	Feeding	Emergencies
Child	Breastfeeding	Disasters
Pregnancy	Nutrition	
Pregnant	Formula	

The criteria for inclusion in the case studies were time of publication (2000-2024), country, and relating to a natural event. The initial Google Scholar search for “Infant feeding in emergencies” yielded 465 results. Once papers focused on public health emergencies (e.g., COVID, HIV/AIDS, cholera), war or conflict (e.g., Gaza and Ukraine), and country (i.e., developing countries) were removed, 71 papers remained, 20 of which were not relevant. Of the 51 remaining papers, eight were not in English. The other keywords resulted in either duplicate papers or papers which did not meet the criteria.

The 51 papers were read for relevance and sorted according to country in order to develop the case studies. Many of the countries of interest had experienced multiple events, but some events were mentioned with notable frequency, including the 2009 Black Saturday bushfires in Australia, Hurricane Katrina in the US in 2005, the 2016 Fort McMurray Wildfire in Canada, and the L’Aquila earthquake in Italy in 2006. The 2010 Haiti earthquake was not used as a case study, because of the factors unlikely to be relevant in a NZ context.

As the analysis progressed, it became apparent the initial search terms had been too restrictive, as all articles identified were related only to infant and young children feeding considerations in emergencies. To broaden the scope, additional search terms were added (Table 1.1).

Table 1.1 *Additional Search Terms Used in Literature Review*

Target Population	Potential Problem	Event Description	Legislation/ Guidelines
Baby	Evacuation	Emergencies	the Code
Mother	Displacement	Disasters	OG-IFE
Midwife	Safety	Natural Hazard(s)	Baby Friendly Spaces
Parent	Development	Specific Natural Hazard	Mother Baby Area
Caregiver	Labour/Delivery		Sendai Framework
	Birth Outcomes		
	Disaster Risk Reduction		
	Health		
	Infection		
	Stress		

The additional search terms provided a more comprehensive picture of the difficulties faced by IYCP and those who care for them during and after an event. With this deeper understanding, it was possible to develop nuanced case studies with a holistic view of IYCP in emergencies, rather than just infant feeding. This was also when the potential role midwives could have in future event response was brought to light.

Both phases of the literature review were used to develop the interview questions. The first phase was primarily used when interviewing emergency management professionals to determine if they knew or were aware of international legislation (discussed in Chapter 1), and if said legislation were being followed in events in NZ. The second phase was used in both sets of interviews, especially the literature related to baby friendly spaces and infant

health.

2.2.3 Gender and Disaster

This paper intends to be inclusive of all family/whanau structures and recognises not everyone who becomes pregnant will identify as female/wahine. Gribble et al. (2022), argues that while inclusive language is important, desexed language can: decrease inclusivity; be dehumanising; can include people who should be excluded; is inaccurate, imprecise, or misleading; and undermines breastfeeding. Giacomozzi et al. (2025), argue that Gribble's view of gender does not align with current research and the arguments against gender inclusive language rely heavily on rhetorical strategies. For clarity and continuity's sake, I have chosen to use terms which may not be considered inclusive including, but not limited to, pregnant women, breastfeeding, and mothers. These terms were chosen in order to be consistent with the terminology used in existing emergency management and/or disaster literature, research, resources, and policy.

2.3 Ethical Approval

Prior to the research commencing, a low risk application was submitted to the Massey University Human Ethics Committee to ensure the research adhered with guidelines. The application included research aims, a project summary, data collection methodologies, and how potential ethical considerations would be minimised. The application was approved under Ethics Notification Number 4000028174, and is valid for three years from 10 October 2023.

For this research to be conducted ethically, the following three principles were followed (Silverman, 2017):

1. Privacy, which includes both confidentiality and anonymity (Sim & Waterfield,

2019). Confidentiality is how the gathered information is used and shared with others, and anonymity refers to whether or not a participant can be identified in the final reporting. It will be possible to maintain both confidentiality and anonymity of the semi-structured interview participants by removing any identifying data prior to inclusion for publication.

In the focus groups, every effort was made to ensure confidentiality, but it is not possible to monitor what other participants share outside the group. Furthermore, some of the participants were familiar with each other which limited anonymity. Focus group participants were made aware of these limitations in advance of participating.

2. Informed consent, which includes disclosure, comprehension, competence (the participant's ability to give or withhold consent), and voluntariness (Sim & Waterfield, 2019). Three information sheets (Appendix 1) were developed in accordance with the Massey guidelines, and were as follows:

- a. For Emergency Managers: the information sheet did not include the interview questions, as it was expected their professional experience would be adequate to answer the questions.
- b. For ICYP Professionals: the interview questions were included in the information sheet to give participants time to organise their thoughts prior to the interview.
- c. For focus group participants: the information sheet addressed the potential ethical risks specific to focus groups (Braun & Clarke, 2013).

All of the information sheets had information about privacy and process consent, which allows participants to withdraw from involvement at any time (Silverman, 2017). As the interviews were conducted remotely, participants were read the consent form and agreed verbally to participate and be recorded rather than signing a consent form.

3. Harm Avoidance

As participants were being interviewed in their professional rather than personal capacity, it was expected there would be minimal opportunities for harm; however, in both the semi-structured interviews and focus groups, there was the opportunity for harm in the form of distressing or emotionally challenging memories resurfacing. Had a participant found it difficult to continue, they would have been encouraged to do whatever they needed to protect their mental health, including ending the interview early and/or resources for support. No participants requested the interview be stopped or requested resources for support.

In the focus groups, another potential source of harm to participants would be a breach of confidentiality and/or anonymity (Sim & Waterfield, 2019).

Participants were warned of this risk in the focus group information sheet and again before starting the focus group.

2.4 Data Collection

Data collection consisted of ten semi-structured interviews followed by one focus group discussion. The data gained from the semi-structured interviews was used as the basis for an audit of existing IYCP in emergencies practices and development of IYCP in emergencies response guidelines and potential solutions for future events. The guidelines and potential solutions were presented to the focus group for discussion and evaluation.

2.4.1 Semi-Structured Interviews

Semi-structured interviews were chosen as the initial data collection method because of the importance placed on personal experience as a means of gaining a deeper understanding of a topic (Galletta & Cross, 2013). In practice, this means a semi-structured interview emphasises open-ended questions and personal narrative, and participants are encouraged to bring up related topics not explicitly asked about.

One of the aims of the interviews with emergency management practitioners was to gain a comprehensive picture of what planning, if any, has been done specifically for IYCP. Another aim was to see if international legislation and protocols have been used or followed in NZ in recent event response. In addition to emergency management practitioners, representatives from organisations not traditionally involved in emergency response were interviewed to determine what, if any, role they or their organisation could play in the future.

Given the differing perspectives of the interviewees, two sets of questions were drafted to ensure the questions were appropriate and relevant for the interviewee. As described by (Galletta & Cross, 2013), a well organised semi-structured interview has three segments. The first segment establishes rapport and asks broad questions to learn about the participants' experience; the second segment draws on what was learned in the first segment

with greater specificity to add nuance, and the final segment allows the researcher to ask questions related to future hypothetical scenarios.

2.4.1.1 Interviewee Selection

Interviewees for the semi-structured interviews were chosen to represent a variety of perspectives and experiences related to IYCP in emergencies. There were two categories of interviewees. The first category were people employed by, or involved in, an organisation directly involved in emergency response in NZ. The second category was individuals, or representatives from community organisations, with significant experience working with IYCP in the community.

Table 1.2 Interview Participant Organisations

Organisation	Number of Interviewees	Identifier
Regional CDEM Welfare Manager	5	<i>Welfare (A,B, or C)</i>
NZ Defence Force (NZDF)	1	<i>NZDF A</i>
TWO Emergency Management	1	<i>TWO A</i>
Midwifery Organisation	2	<i>Midwife C</i>
Hawke's Bay Lead Maternity Carer (LMC) Midwives	2	<i>LMC LMC Midwife A or B</i>
Change for Our Children (a safe sleep organisation)	1	

2.4.1.2 Contacting and Enlisting Participants

A list of organisations considered beneficial to interview was drafted based on the literature review and existing knowledge of emergency management practices in NZ.

Known contacts within an organisation were used as a primary contact. For organisations

with no known contacts, emails were sent to the “contact us” email address listed on the website. Included in the initial email to all potential interviewees was the information sheet, and the ethical application and approval was provided upon request.

As this research was time-intensive, with each interview lasting about an hour, purposive sampling, in which participants are selected according to specific criteria, was used to ensure participants were as informative as possible (Bamberger & Mabry, 2020). Many participants were found using snowball sampling, as the last question of the semi-structured interviews was “Do you know anyone we should get in touch with about this research?”. This was particularly useful for finding individuals with first hand experience working with IYCP following an emergency, including midwives in the Hawke's Bay after Cyclone Gabrielle. In total, 10 interviews were conducted (although two of the interviews had more than one interviewee participating, for a total of 14 interviewees), which is close to the 15 to 30 suggested by Braun & Clarke (2013). Once a participant confirmed their involvement, a calendar invite with an agreed upon date and time with the Zoom link was sent.

At the conclusion of each semi-structured interview, each participant was asked if they would be available to participate in a focus group which would allow for open collaboration between organisations and give feedback on potential solutions developed in response to the research findings.

2.4.1.3 Interview Questions

Initially, a single set of interview questions was developed using the literature and news reviews. The questions were reviewed by the research supervisors for feedback, pilot tested with academics from the Joint Centre for Disaster Research and Victoria University,

and revised to reflect their insights. This set of interview questions seemed adequate until it was field tested with a representative from the NZ College of Midwives, which revealed that the interview questions were only relevant for emergency management professionals as questions were focused primarily on logistics and protocols. A second set of questions was developed to be relevant for IYCP professionals, and was focused more on necessary resources and the experiences of IYCP in an event. Both sets of questions were put into a presentation which was used during interviews. This allowed interviewees to reference the current or previous question easily, and allowed imagery to be used. One such photo, of an evacuation centre opened after Cyclone Gabrielle, was shown to IYCP professionals as a prompt for identifying and discussing difficulties IYCP may face in a shelter. For a full list of questions and the presentations, please see Appendix 2.

The interview started with *whakawhanaungatanga*, or the building of relationships, which is a key component of Māori research (Rata & Al-Asaad, 2019). The *whakawhanaungatanga* gave me a chance to share why I had chosen the topic and history which shaped my perspective, including the birth of my daughter. The interviewee was then prompted to share a bit about themselves. This not only helped build familiarity between myself and the participant, it also provided me a chance to warn them my daughter might be joining the call if naptime ended early. This relationship building occurred with all participants regardless of organisational affiliation.

From there, interviewees from emergency management agencies were asked questions focused on:

- If and how the organisation planned to meet the needs of ICYP;
- IYCP in emergencies coordination mechanisms;

- Availability of IYCP in emergencies training to staff; Infant feeding and protocols;
- How groups focused on IYCP could support emergency response.

These questions were designed to gauge whether IYCP were being accounted for in governmental and organisational planning and reduction, readiness, response, and recovery colloquially referred to as “the 4 Rs” (NEMA, n.d.).

The questions asked to groups with IYCP experience, but not traditionally involved in emergency management, focused on:

- How could your organisation be involved in response?
- What concerns do you have about IYCP in evacuation centres?
- Are there licensing concerns or requirements to be aware of?
- If you have been involved in some capacity following a disaster, what was your experience like?

2.4.1.4 Choice of Interview Method

To conduct this research, 10 interviews and one focus group were held over the course of roughly six months.

All interviews were held over Zoom, which was necessitated by the geographic spread of the participants. While in- person interviews have long been held as the gold standard of qualitative research, recent research suggests that Zoom interviews can also result in rich and nuanced data, with proper preparation and coordination (Boland et al., 2022; Oliffe et al., 2021). Archibald et al., (2019) found a majority (69%) of their interview participants preferred Zoom over other interview methods including in-person and telephone interviews due to convenience, particularly access and time efficiency, and user friendliness.

The use of Zoom allowed participants to choose a location and time for the interview they found comfortable, generally their office or home, which may have allowed them to be more forthcoming in their answers (Braun & Clarke, 2013). The interviews were overall found by researchers to be high quality and a similar experience to face-to-face interactions since all participants had become comfortable using Zoom following NZ's COVID lockdowns.

All interviews were recorded using Zoom and an additional digital audio recorder. Recording the interviews allowed for a more natural conversation, negating the need for note taking. Finally, Zoom's closed captioning feature was used, which had the benefit of automatically generating a transcript of the interview, although it may have initially distracted interviewees.

In accordance with Massey University's ethical guidelines, all participants were notified that they could decline to be recorded or ask for the recording to be stopped at any time during the interview. All participants were sent a transcript of their interview with the option to elucidate further or remove a remark from the transcript completely.

Boland et al., (2022) identified five potential problems when using Zoom to conduct qualitative research: establishing rapport, technical issues, planning, privacy, and equity. Of these, only rapport and technical issues were experienced during these interviews. Efforts to improve rapport included beginning the call with a whakawhanaungatanga and using screen sharing which helps simulate face-to-face interactions (Archibald et al., 2019). Technical issues included connecting to the wrong meeting or lagging internet. As annoying as technical issues can be, they can also help build rapport with interviewees through joint problem solving.

Most of the interviews lasted approximately one hour, with the shortest interview

lasting half an hour and the longest exceeding 90 minutes. Of the semi-structured interviews, the longest were generally IYCP professionals, rather than emergency managers. As expected due to the number of participants and inherent nature, the focus group lasted nearly two hours.

2.4.2 Focus Groups

A focus group was chosen as the second data collection method because they are effective at evaluating policies and programmes (Ryan et al., 2014). The data is primarily gathered as a result of interactions between participants, and between participants and the facilitator (Plummer-D'Amato, 2008; Ryan et al., 2014; Wilkinson, 1998), which can improve the depth and nuance of the discussion when compared to individual interviews (Plummer D'Amato, 2008; Rabiee, 2004). This “structured eavesdropping” (Wilkinson, 1998) may provide unexpected insights to the topic as concerns the researchers were not aware of are raised during the focus group session (Bamberger, 2020). According to Krueger (2015) a focus group is useful when focus group participants have diverse backgrounds and perspectives. It was expected the presence of IYCP professionals and emergency managers would highlight gaps in planning and resources, and foster new connections and potential solutions.

It was determined that one focus group would be held, with three to five individuals who had previously participated in the semi-structured interviews. While focus groups can have up to 12 participants, six to eight is widely considered the ideal number, particularly if the participants have significant experience with the topic (Krueger, 2015; Ryan et al., 2014; Silverman, 2017; Wilkinson, 1998). Although all interviewees expressed interest in participating in the focus groups, due to scheduling conflicts and availability, the focus

group consisted of one representative from CDEM and two midwives. While below the ideal number of participants, the participants all had first-hand experience of Cyclone Gabrielle in the Hawke's Bay. Ultimately, we hoped this smaller focus group would facilitate relationship building between two normally disparate groups of people who will likely need to work together in an emergency to facilitate IYCP response. In order to conduct the focus group, questions were based on East Coast Lab's Hikurangi Subduction Zone (HSZ) scenario (2020), which is discussed in the following section.

In addition to the scenario, potential solutions including an emergency "baby box", "Get Ready" quiz, and baby tent information and resources were used as stimuli. The stimuli were developed in response to the semi-structured interviews, and one purpose of the focus group was to refine the solutions. Please see Appendix 3 for the focus group materials.

2.4.3 HSZ Scenario

In the HSZ scenario, there is a magnitude 8.9 earthquake off the coast of the Hawke's Bay followed by a tsunami (East Coast Lab, 2020). In addition to the tsunami, other secondary hazards include earthquake aftershocks, uplift/subsidence, liquefaction, and landslides. The earthquake and secondary hazards would cause: communicable disease due to damaged sanitation facilities; contaminated water supplies; infrastructure damage and delays in accessing medical treatment; and disaster waste and debris which may include contaminated hazardous waste. These events would isolate Napier and rural communities in the region from the hospitals, making access difficult for those requiring emergency or core (e.g., maternity care, routine surgery, illness) medical care.

It is estimated the earthquake and tsunami would result in anywhere from hundreds to thousands of deaths and thousands to tens of thousands of injuries (East Coast Lab, 2020).

Tens of thousands of buildings will be irreparably damaged, resulting in displacement of tens of thousands of people. The demand for welfare support, including evacuation centres, is expected to be significant and create long-term demands for CDEM staff, and others from around the country.

Within the HSZ scenario, the focus group was presented with the situation of a mother of a three week old baby, neither of whom were harmed in the event, but their home was destroyed and they had few social connections in the community. This served as a prompt for the participants to interact with each other with the questions “opening out” (Braun & Clarke, 2013).

2.5 Data Analysis

To understand whether or not NZ has planned to meet the needs of IYCP in an emergency and how IYCP professionals could be involved, the interview and focus group data collected between December 2023 and June 2024 was transcribed and analysed. This process is described below.

2.5.1 Transcription

First drafts were generated using transcripts generated from Zoom’s closed captioning or TurboScribe, an artificial intelligence (AI) transcript generator, was used in instances where the Zoom transcript failed to generate. Initially, it was thought an orthographic or verbatim style of transcription would be used (Braun & Clarke, 2013), but ultimately a naturalised style of transcription was deemed to be more appropriate.

Naturalised transcription removes the utterances, pauses, grammatical errors, and redundancies of normal speech to adhere to written norms without altering the meaning (Mojadeddi & Rosenberg, 2024). All of the transcripts were denaturalised when generated,

then naturalised by the researcher (myself) for accuracy and clarity. The AI transcription software chosen encrypts files at rest, does not train AI models using the transcripts, and could only be accessed by myself. During this process, the transcripts were stored securely on a computer requiring password access and in a Google Drive only accessible to myself and my academic advisors.

The use of AI transcription software has both benefits and limitations, some of which will likely be mitigated with time. AI software allows researchers more time to dedicate to analysis as an hour-long conversation can be transcribed in minutes with high accuracy, rather than the six to seven hours it would take to do manually (Britten, 1995). As transcription can be a tedious deterrent to qualitative research, the use of AI could increase the number of researchers using qualitative research.

One of the limitations of AI software is that it is more accurate when transcribing native English speakers (Herdiyanti, 2024), and struggled to accurately transcribe te reo Māori commonly used by English speakers in NZ including words like ‘whanau’, ‘marae’, and ‘kia ora’. Another limitation is the risk of a data breach which puts the anonymisation of participants at risk (Mojadeddi & Rosenberg, 2024). One way to lessen this risk is by anonymising the participant data before uploading for transcription.

AI transcript generation is a useful tool for expediting the creation of interview transcripts. However, it is crucial researchers treat the transcript as a rough draft in need of review and editing. Each transcript contained several errors that needed to be remedied before coding, and could only be identified by listening to the interview while reading the transcript. As AI was only used as a tool to expedite transcription (similar to paying a transcriber or using EndNote to expedite referencing), and was not used to aid in the

analysis or writing of this research, it adheres to Massey’s current AI policy (University, 2023).

2.5.2 Coding

Coding is the process of turning interview data into usable and trustworthy narrative by identifying segments of meaning and assigning them to a category or theme (Skjott Linneberg & Korsgaard, 2019). Properly coded data promotes repeatability in research, improves confidence in the findings of the research, and reduces surplus data (Adu, 2019) When coding qualitative data, the first step is gaining a nuanced, and in-depth knowledge of the data (Drisko et al., 2015). With this knowledge, the data is then coded by looking for keywords, phrases, and themes.

Research Themes Identified		
Maternity care availability and accessibility in an emergency, especially rural areas		
Midwife C	LMC	"I don't think that the organization as such is part of an emergency management response system. But certainly, in terms of maternity support and medical services, our midwives tend to often be the only people who are actually going out into the community; certainly in the Christchurch earthquake, that was the experience here."
Midwife A	LMC	"But this time it was like the traffic, it was taking an hour and a half to get from Napier to Hastings. And there is no ability on our roads to overtake. It's a dual carriageway with only one lane on each side of the road. So there was no ability to let somebody in an emergency go past, which I think is really ridiculous."

Figure 1.3 Inductive Coding Methodology

To code this data, a spreadsheet was created with a page each for readiness, reduction, response, and recovery (the “4Rs”). Each page had headings with a sentence or two identifying a potential theme. Under each theme, relevant quotes from the interview transcripts were copy-and-pasted. Each quote had information identifying the interview and the speaker’s job title. Keywords and phrases were extracted from a quote, then searched for in other transcripts. Themes with limited discussion in interviews were deleted. This resulted in 11 key findings and actionable recommendations.

2.5.3 Reliability and Validity

In order to effect change about the handling and treatment of IYCP in an event, the

research needed to be rigorously conducted and presented in a way that the conclusions and recommendations presented would be tenable to policy makers, who rely on academic research when making policy decisions (Merriam & Tisdell, 2015). To test and strengthen the validity or trustworthiness of the data, triangulation was attempted (Golafshani, 2003); (Merriam & Tisdell, 2015) by comparing findings from the interview data to the news review and the conclusions in reports made to the government regarding emergency management responses in the Hawke's Bay (Bush International Consulting, 2024) and the North Island (Ombler et al., 2024).

2.5.4 Researcher Biases and Assumptions

When the NISWE happened, I was 8.5 months pregnant, my house flooded, and I had tickets to the Elton John concert that was cancelled at short notice when the venue had flooded. This convergence of these events may have biased my beliefs in the efficacy of emergency management in Auckland. This bias should be limited as the majority of interviewees were involved in the Hawke's Bay response to Cyclone Gabrielle or other parts of the North Island, the decision was made to focus on the Hawke's Bay, rather than the North Island as a whole. This should lessen researcher bias as I have no substantive ties to the Hawke's Bay and did not have any preconceived beliefs about the efficacy of the area's emergency management response.

Additionally, my daughter was born just before I commenced this research project. This provides another potential source of bias as I am probably more sympathetic to the plight of IYCP, especially mothers with young infants, than a researcher with no children or grown/older children. My daughter (often referred to as my research assistant) may have biased interviews by distracting me mid-interview or forcing me to expedite an interview

(e.g., crying mid-interview or refusing to nap). I was also incredibly fond of midwives, having benefited from their care before, during, and after her birth.

2.5.5 Limitations to Research Methodology

Like all research methods, semi-structured interviews and focus groups have limitations. Chief among the limitations is they are time-consuming and labour-intensive to conduct (Adams, 2015). Another limitation is the risk of participants saying what they expect the interviewer wants to hear (Karatsareas, 2022). An earlier limitation of semi-structured interviews has been the time or cost of transcribing interviews, however this limitation is likely to decrease as AI transcription is improved and embraced by researchers.

Like semi-structured interviews, focus groups have limitations. One limitation is that they can result in consensus, or the tendency toward groupthink (MacDougall & Baum, 1997). In our focus group, there was a low risk of consensus as participants were sharing their opinions, not coming to a decision (Söderström, 2011). Dominant voices can result in the group veering off topic, or not allowing quieter members of the group to contribute (Bamberger, 2020). Another limitation is privacy as anonymity and confidentiality cannot always be guaranteed, especially when participants are from a field where everyone typically knows everyone. In our focus group, two of the participants were close colleagues. Despite the limitations, focus groups are becoming an increasingly popular way for governments and researchers to guide policy changes (Krueger, 2015).

Often limitations of focus groups can be lessened through using a well-trained moderator. The researcher (myself) moderated the focus group, despite having very little experience in facilitating focus groups. This did not seem to impact the quality of the data obtained from the focus group, likely due to the small number of participants and having

pre-existing rapport.

2.6 Summary

This chapter discussed the three methodologies used in this research. The first method was the literature review of international and domestic research, news, and protocols related to IYCP in an event. This provided the knowledge necessary to critically assess NZ's IYCP response during Cyclone Gabrielle in the Hawke's Bay.

The knowledge gleaned from the literature review was then used to write a preliminary set of interview questions. These questions were evaluated and refined through internal testing, expert assessment, and field testing. The interview questions were based on the best practices and legislation from the literature review. The findings from the interviews then informed the focus group. Once interviews and the focus group were completed, the interviews and focus group discussions were transcribed, coded, and analysed.

Chapter 3: Literature Review of IYCP in Recent Events

3.1 Introduction

This chapter contextualises and provides the theoretical foundation for researching the IYCP response following Cyclone Gabrielle. The purpose of this chapter is to review the available information about IYCP in events via specific event case studies from NZ and countries with similar levels of socioeconomic development and healthcare systems, and provide a brief review of events which have contributed to current knowledge of IYCP best practices. The case studies are:

- 2005 Hurricane Katrina, USA
- 2009 L'Aquila Earthquake, Italy
- 2010-2011 Canterbury Earthquakes, NZ
- 2011 Queensland Flood, Australia
- 2011 Great East Japanese Earthquake, Japan
- 2016 Fort McMurray Wildfire, Canada

Other events covered in less detail are:

- 2010 Pakistan Flood, Pakistan
- 2010 Haiti Earthquake, Haiti
- 2015 European Migrant Crisis, Greece 2023
- Türkiye Earthquake, Türkiye

3.2 Events

According to the UN, in 2024 nearly 300 million people across 72 countries needed

humanitarian assistance and protection due to conflict, natural hazards, and health crises (European Commission, 2024). IYCP are a vulnerable population with highly specific needs, but are often overlooked in emergency management planning and response.

3.2.1 Hurricane Katrina, USA

A Category 3 hurricane, Hurricane Katrina killed over 1800 people and directly affected an estimated 56,000 pregnant women and 75,000 infants (Callaghan et al., 2007; Harville et al., 2009; Pfeiffer et al., 2008). The women most likely to be significantly impacted by the hurricane were those more at risk of experiencing adverse pregnancy outcomes, as the affected states of Alabama, Louisiana, and Mississippi had the poorest health statuses in the country. In Alabama and Mississippi, there were large increases in women receiving late or no prenatal care, and increases in caesarean sections despite a sharp decrease in hospital obstetric facilities (Hamilton et al., 2009). While many women will see the same obstetrician or midwife throughout their maternity care, some hospital networks in the US, use a system which pairs a patient with whoever is on duty (Monteblanco & Leyser Whalen, 2019). Many hospitals lost power during Hurricane Katrina, making patient records inaccessible and leaving carers with little-to-no knowledge of a patient's history, whereas a home-based midwife or obstetricians who operate under a continuity of care model, may be more likely to prioritise building close relationships and can offer better continuity of care without access to medical records.

To address the needs of IYCP, the CDC provided a fact sheet to aid non-obstetric healthcare providers in triage and treatment of pregnant women (Callaghan et al., 2007). Free tele-counseling about pregnancy and lactation was made available to women and their healthcare providers. The CDC also provided information about infant feeding which

emphasised continued breastfeeding. Women with high exposure to the hurricane were less likely to breastfeed or still be breastfeeding at six months when compared to national averages (Callaghan et al., 2007; Harville et al., 2009). According to the Federal Emergency Management Agency, infants and toddlers will comprise as much as 10% of an evacuation centre, but breastfeeding in centres was not addressed until 2023 (Russell et al., 2025). Callaghan et al. (2007), found women were concerned about breastfeeding after walking through floodwater, citing their exposure to toxins or developing gastro-intestinal illness, but breastfeeding was still the recommended and safest way to feed, as contaminated water meant powdered and concentrated formulas could not be safely prepared for consumption resulting in a formula shortage.

Two weeks after the hurricane there were more than 600 shelters accommodating more than 200,000 evacuees, at least 10,000 of whom were estimated to be pregnant (Harville et al., 2009). Callaghan et al. (2007), recommends all women arriving in centres should be asked about their pregnancy status as part of intake, “Are you or do you think you could be pregnant?”. Women who are unsure should be provided with pregnancy tests, and healthcare staff can ensure pregnant women are given medications, supplements, and vaccinations that are safe and/or necessary during pregnancy.

Those staying in shelters often faced “oppressive heat, darkness from downed power lines...and widespread devastation.” (Fisher Wilson, 2006, p.1). Many shelters lacked clarity about the safety of their water supply, and considered turning off the water entirely which would have created new health concerns as evacuees used portable toilets without the ability to wash their hands. More than 50% of those using evacuation centres in Houston, Texas reported there was not enough food or water to meet demand (Brodie et al., 2006).

The combination of high temperatures, high humidity, and limited water increased the risk of dehydration for IYCP.

3.2.2 L'Aquila Earthquake, Italy

On 6 April 2009 at 3:32 am, L'Aquila, the capital city of Abruzzo, was shaken by a shallow 6.3 magnitude earthquake with an epicentre 3.4 kilometres away from the city. Of the 72,800 people living in the city, 308 were killed, 202 were seriously injured, and 1300 were injured (Alexander, 2010). One of the 60,000 seriously damaged buildings was the local hospital and trauma centre, San Salvatore (Casarotti et al., 2009).

Some residents of L'Aquila were without power for up to three days, however most (80%) had power restored by the morning after the earthquake (Kongar et al., 2017). The water supply was not significantly impacted outside of the historic city centre, however as that was where most of the severely damaged buildings were, few residents remained to be impacted.

In total, 67,500 people were displaced, roughly a third of whom were accommodated in nearby hotels, another third in one of the 171 tent camps, and the final third found their own accommodation (Alexander, 2010). Another 6,000 people in rural villages and municipalities were accommodated in temporary housing through the Moduli Abitativi Provvisori project.

Giusti et al. (2022), found that in the aftermath of the L'Aquila earthquake, pregnant and breastfeeding women were often unable to find shelter which provided for their physical and privacy needs. In emergency accommodation, emergency management was unable to facilitate social support, and often required partners to be separated; however, within eight months of the earthquake, earthquake-resistant eco-sustainable housing complexes were

built throughout L'Aquila by the Complessi Abitativi Antisismici ed Ecosostenibili (CASE) housing initiative to accommodate 12,000 of the displaced (Giovinazzi et al., 2012). Furthermore, breastfeeding women reported a lack of breastfeeding support, which resulted in infant formula being prescribed unnecessarily, resulting in premature cessation of breastfeeding. It was also found that infant formula donations were made and distributed without conducting a needs assessment, which contradicts international guidelines.

Since the earthquake, many municipalities in Italy have included specific plans and systems for IYCP in their emergency preparedness efforts (Colaceci et al., 2018). One such preparedness effort is the development of an operational guide for first aid personnel and coordinators (Iellamo et al., 2019). The guide contains six core interventions:

1. Governments should ensure they have developed and enacted policies which:
support the continuation or reinitiation of breastfeeding after an event;
account for the handling and distribution of formula; support the nutritional needs of pregnant or breastfeeding women; discourage donations and manage distributions of infant formula; and consider managing infant feeding in the face of public health emergencies.
2. Appropriate training for all personnel involved in event management.
3. Determine the coordinator for Infant Feeding in Emergencies to identify vulnerabilities and shortcomings in infant feeding management.
4. Evaluate and monitor interventions to ensure the infant feeding in emergencies response is adequate. This data should be disaggregated by age of children younger than 2 and the number of breastfeeding or pregnant women.

5. Protect and support optimal feeding through multisectoral interventions between hospitals, community services, and government.
6. Reduce the risks of using infant formula by procuring infant formula through official channels, provide supplies to safely prepare infant formula, and refuse donated formula.

Since the release of this intervention, Italy has experienced severe flooding in Emilia-Romagna in 2023 and 2024, but at the time of writing, there was no published research I could find related to IYCP in either event.

3.2.3 Canterbury Earthquakes, NZ

Beginning 4 September 2010, the Canterbury region was plagued by a series of earthquakes, starting with a magnitude 7.1 earthquake 11 kilometres below the rural town of Darfield on 4 September, and numerous aftershocks, including the Christchurch earthquake with a magnitude 6.3 and a depth of 5 kilometres on 22 February 2011 (Potter et al., 2015). At the time the Canterbury region was home to just over 550,000 residents, with roughly 67% (357,000) of those living in Christchurch. Of the nearly 60,000 residential buildings which were inspected after the earthquake, roughly 3% were deemed unsafe (red-stickered), and 7% could be accessed, but required further assessment to determine safety (yellow-stickered), resulting in high levels of displacement (Newell et al., 2012).

Immediately after the 4 September earthquake, several evacuation centres were opened around affected areas of Canterbury. All were closed within two weeks (Giovinazzi et al., 2012). After the 22 February 2011 Christchurch earthquake, evacuation centres were immediately opened in several locations throughout Christchurch and many remained open for several weeks. By April, the government made 350 camper vans available to rent to

accommodate the displaced, however this option was reportedly only used by one individual (Burton et al., 2015). Most people preferred to live with families, friends, or in their damaged homes as the areas were often viewed as having higher liveability (close to schools, grocery stores, health care facilities, etc.) (Giovinazzi et al., 2012). The Earthquake Commission, which insures homes against earthquakes in NZ, received more than 750,000 claims for building, land, and contents damage and rebuilding was expected to take up to 15 years (Giovinazzi et al., 2012; Potter et al., 2015).

In Timaru, all women on the maternity ward at Timaru Base Hospital were discharged in anticipation of the arrival of evacuees from Christchurch (Hargest-Slade, 2015). Hargest Slade, who worked as a breastfeeding advisor at the hospital, was asked to deliver a message for the arriving families with new or young infants.

“If you are here from Christchurch with a new baby or a breastfeeding baby of any age, please continue to breastfeed your baby. Keep putting the baby to the breast. Even mothers who are stressed can breastfeed. The safest way to feed your baby is still breastfeeding. You can contact any one of our midwives and breastfeeding advisors on this number...” (Hargest-Slade, 2015, p.8)

This message was played repeatedly for several days and was crucial as up to 75% of Christchurch would have been unable to safely prepare formula due to damage to utilities. When drinking water was tested, it was found to have high levels of *Escherichia coli*, which functions as an indicator there are high levels of pathogenic contamination (Kongar et al., 2017). This finding resulted in a “boil order” being put in place for over six weeks in most of the city. Roughly 50% of Christchurch residents were without water for a few days, and a third had no water for over a week. Much of the city was without power due to damage to the power network and additional automatic shutdowns to prevent fires, which would have made it difficult to sterilise bottles and other formula feeding supplies (Kongar et al., 2017;

Kwasinski et al., 2014; Potter et al., 2015). Additionally, 80% of water and sewage lines were severely damaged, and the Christchurch City Council urged residents to use backyard latrines while a management system for human waste disposal was implemented (McColl & Burkle, 2012; Wareham & Bourke, 2013). The city council ultimately delivered 38,000 chemical toilets, which residents could empty at one of 550 disposal tanks near their home (Wareham & Bourke, 2013). An additional 2900 portable toilets were delivered to strategic locations, and were a supplement to chemical toilets for more isolated areas.

Infant formula was included as a standard component of aid distributions across the region during the Canterbury earthquakes (Bartle, 2011). Rather than being procured by the government as recommended, donations were accepted from manufacturers and distributed by emergency management and response organisations. This formula was often near its expiration date, inappropriate for local contexts, or had directions for preparing the formula in another language. Information about the importance of breastfeeding was not distributed. Additionally, it is not clear if additional instructions, which accounted for the boil order across the city, were provided (Bartle, 2011).

3.2.4 Queensland Floods, Australia

Between December 2010 and January 2011 the state of Queensland, Australia, received prolonged heavy rainfall which, coupled with already full catchments, resulted in historic flooding which killed at least 33 people (Holmes, 2012). Of these fatalities, several were young children, one of which occurred during an attempted rescue due to responders not having the correct flotation device for the child.

The flood resulted in over 78% of Queensland being declared a disaster zone with 20,000 homes inundated with floodwaters (King et al., 2015). In total, 12,000 people utilised

the evacuation centres throughout Queensland between 2010 and 2011(Suncorp, 2021). At a 1000 person evacuation centre established at a Cairns school, one woman gave birth in a small, windowless room aided by a midwife who happened to be visiting from Britain (Rourke, 2011).

There was widespread damage to the electricity network, and power outages occurred in areas which were not damaged as a precautionary safety measure to prevent both further damage to the network and electrocutions should a live electrical source come into contact with floodwater resulting in thousands being without power for several days (Teague et al., 2010). Sewage systems were affected in all areas with major flooding, making it necessary to warn the public about the risk of sewage contamination in public spaces and waterways. Three hundred roads and highways were closed, and rail systems were severely damaged (Herald, 2010).

Through the QF2011 Queensland Flood Study (QF2011), the effects of a disaster on pregnancy, birth outcomes, and children's early development have been intensely studied (King et al., 2015). The study recruited 230 women who were pregnant at the time of the flood and lived in or near Brisbane on 10 January 2011. The women were all having singleton pregnancies, were at least 18 years old, and spoke English fluently. The QF2011 study found the infants born to mothers who experienced sustained, high levels of stress as a result of the flooding were more likely to have adverse psychosocial outcomes including:

- Increased incidence of anxiety as children (McLean et al., 2018),
- Worsen a child's theory of mind¹ (Simcock et al., 2017)
- Inhibit development of motor skills in children depending on gestational age at

¹ Theory of mind is a child's understanding of their own mind and the minds of others (i.e., other people also have thoughts and feelings) and is necessary to socialise with others. Impaired theory of mind is seen in children with autism.

- time of exposure (Moss et al., 2017),
- Increase the need for high maternal emotional availability to support language development (Austin et al., 2017),
 - Be linked to inattention, aggression, and lower vocabulary in boys (Ambeskovic et al., 2022),
 - And have higher sleep problem scores (Simcock et al., 2019).

The behavioural changes seen in the QF2011 studies may be the result of foetal programming caused by stress hormones crossing the placenta during pregnancy (Simcock et al., 2019). Beyond behaviour, epigenetic changes from foetal programming can have lifelong effects, including increased risk of: cardiovascular diseases like hypertension and atherosclerosis, diabetes mellitus type II, and Alzheimer's disease (Faa et al., 2024).

Separately, but concurrently for the same disaster event, a randomised control study was undertaken evaluating the differences in maternity care for women over the age of 18 and less than 24 weeks pregnant (Tracy et al., 2013). Women were either allocated a caseload midwife they saw through pregnancy, birth, and postpartum (an LMC midwife in NZ) , or were assigned to the control group with a rostered midwife who changed with each visit (a community or core midwife in NZ). It was found the women assigned a caseload midwife were less likely to have infants with behavioural problems associated with prenatal maternal stress (Simcock et al., 2018). Caseload (LMC) midwives provided continuity of care which may have served as a form of social support, which can mitigate some of the effects of sustained stress. Thus far, Australia has been unable to implement policies which increase midwifery continuity of care (Bradford et al., 2022).

After the Queensland floods, there were higher incidences of fever, runny noses and

colds, and coughing or wheezing in children who were over six months old at the time of the flooding, compared to infants who were less than six months (Newby et al., 2012). This is possibly attributable to breastfeeding as breast milk provides antibodies and other immunomodulating components as required by an infant (Masi & Stewart, 2024). The children over six months may have had increased incidence due to no longer being exclusively breastfed (having started complementary feeding as recommended), or breastfeeding had been switched to formula as mothers returned or prepared to return to work as paid parental leave in 2011 was 18 weeks (four months) (Baker, 2011). Infants who were exclusively breastfed were the least likely to need to visit a doctor compared to infants who were fed infant formula or mixed feeding methods (Newby et al., 2012).

3.2.5 Great East Japanese Earthquake and Tsunami, Japan

On 11 March 2011, a 9.0 magnitude earthquake occurred in the Pacific Ocean roughly 177 kilometres from Fukushima and 373 kilometres from Tokyo at an underwater depth of 32 kilometres (Norio et al., 2011). The main earthquake triggered a tsunami over 20 metres high, which reached land within minutes of the earthquake, and went as far as 10 kilometres inland. By April 13, there were 13,392 deaths, 15,133 people missing, and over 335,000 people displaced. The event damaged 190,000 buildings, of which nearly 46,000 were destroyed. Power facilities were damaged, most significantly the 11 nuclear power plants in northeast Japan (Norio et al., 2011). The nuclear power plant in Fukushima automatically stopped working, but because of the impact of the tsunami the cooling system also stopped working causing the temperature to rise in the reactor. Despite the work of Tokyo Electric Company employees and the Japanese government, the event escalated to a level 7 nuclear event, equivalent to the Chernobyl disaster.

Many of the survivors of the event sheltered in schools and stadiums, and by 14 March there were 1,183 emergency shelters to support the evacuated (Du et al., 2015). Many evacuees lived in shelters for more than four months and nearly 80% of surveyed emergency shelters had shortages of milk and dairy products, meat, produce, beans, and seafood (Tsuboyama-Kasaoka et al., 2014). When shelters did have a surplus of food, it was often carbohydrates and high in sodium and/or sweeteners (Tsuboyama-Kasaoka et al., 2021). A month after the event, roughly 7% of shelters were only providing one or two meals per day due to continued food shortages or due to continued high numbers of evacuees and limited cooking facilities.

After the event, there was a decrease in the mean body mass index of six month old boys in Miyagi, an affected prefecture compared to an unaffected group (Yokomichi et al., 2018). Researchers attributed these changes to mothers switching to formula due to concerns breast milk was contaminated with radioactive substances, difficulty in safely preparing infant formula, and focus on survival (Kyoizuka et al., 2016; Yokomichi et al., 2018). Women also reported difficulty in finding diapers, particularly for older infants and toddlers, as well as infant formula (Yonekura et al., 2013).

Women from Shichigahama who were pregnant or newly postpartum at the time of the event reported difficulties in accessing information related to obstetric and/or paediatric care, and were unsure if medical services were accessible (Kobayashi et al., 2020). In Rikuzentakata, communication systems were down over a wide area making it difficult to provide information for paediatric care (Yonekura et al., 2013). Based on interviews with healthcare providers Kobayashi et al. found:

- Supplies for IYCP should be distributed separately from goods for the public at

large so pregnant or postpartum women do not have to wait in long lines.

- Because small children are messy, their families required additional water for daily life, above the suggested amounts for adults, in addition to drinking water.
- A dedicated place to talk and gather with other affected mothers a month or more after the event would promote post-traumatic growth.
- In evacuation centres, mothers of infants and young children need access to warm, dedicated rooms away from other evacuees. This would decrease the stress of calming a crying baby and encourage breastfeeding

3.2.6 Fort McMurray Wildfire, Canada

On 1 May 2016, the Fort McMurray wildfire (also referred to as the Wood Buffalo or Horse River wildfire) began, and by 3 May had grown into one of Canada's most devastating fires burning nearly 600,000 hectares of land (Adu et al., 2022). It forced 88,000 people to evacuate with little notice, the largest evacuation in recent history. The fire destroyed 2400 homes and businesses at an estimated cost of \$6 billion. Fort McMurray's drinking water supply was severely contaminated with ash and soil, resulting in 20 times the recommended limits of 19 different toxic elements and compounds (Hyde et al., 2021). Contaminated air and water can have significant impacts on the health of IYCP, as wildfires release carcinogenic and teratogenic pollutants into air, water, and soil. Wildfire smoke can also affect indoor air quality, and can have a significant impact on prenatal and early childhood development and health (Gheissari et al., 2022; Korsiak et al., 2022; Lan et al., 2024).

There is evidence wildfire smoke exposure during pregnancy may adversely affect birth outcomes like low birth weight and premature delivery, and exposure in utero was

found to increase the rates of respiratory infections in infants; however, exposure to particulate matter can be decreased 80% by wearing an N95 respirator (Amjad et al., 2021; Holm et al., 2021; Lan et al., 2024). It is recommended maternity carers be proactive in counselling patients on signs of preterm labour and ways to mitigate exposure risk (Boudova et al., 2025). Recommendations in remaining indoors with HVAC systems and air filters running (if possible), avoid going outside and use an N95 mask and protective eyewear if unavoidable, make evacuation centre staff aware of pregnancy, be prepared to evacuate, and stay cool and hydrated (Boudova et al., 2025; CDC, 2024b).

Children are at increased vulnerability to the effects of wildfires on air and soil as they have higher exposure (i.e., children generally spend more time outside), breathe more air relative to body weight, and particulate is more likely to enter the lungs rather than be trapped in the nasal cavity (Holm et al., 2021). Implemented policies in childcare centres and schools may be a cost-effective way to decrease children's exposure to smoke by keeping children indoors with HVAC systems running. While masks and respirators can be worn by children over 2 years old, they do not come in sizes appropriate for younger children (CDC, 2024a).

Of the evacuees, there were roughly 3000 mother/infant dyads, 900 breastfeeding infants, and an estimated 1250 pregnant women (Health, 2015; Initiative, 2016; Olson et al., 2019). At least seven infants were born during the evacuation, including two at oil refinery camps north of the city (Snowdon, 2017; Thériault et al., 2021). The local hospital, Fort McMurray's Northern Lights Regional Health Centre, had to evacuate the nine babies in its neonatal intensive care unit (as well as 96 other patients) to oilsands (an area mined for petroleum) north of the city before being flown to other hospitals in Edmonton (Goh, 2016).

Mothers who evacuated reported decreased social support, pressure from family to stop breastfeeding during the evacuation, stress, and frequent moves as sources of stress (DeYoung et al., 2018). Many families were accommodated in locations with limited food choices, and many mothers struggled to keep volunteers and family members from feeding infants inappropriate solids. Additionally, some breastfeeding mothers cited lack of privacy as a reason for switching to infant formula, and exclusive breastfeeding rates decreased from 64% to 36%. Despite the aforementioned difficulties, DeYoung et al. (2018) found women who continued breastfeeding women reported improved coping ability, a greater sense of safety and security, easier soothing of infants while evacuating, and less worry about infant feeding while in evacuation centres or emergency accommodation with limited (or non-existent) kitchen facilities compared to parents with formula fed infants or older children requiring solid foods.

3.2.7 Other Events

Research and experiences from countries in addition to those previously discussed contributed to the recommendations in Chapter 4, but were excluded from the case studies due to differences in development levels, lack of national healthcare systems, type of event, or lack of available research (World Population Review, 2024a, 2024b). These systemic differences limited the relevance to the NZ context, but offered evidence supporting international best practice recommendations and potential areas of improvement.

3.2.7.1 Pakistan Floods, Pakistan

In 2010, Pakistan experienced rainfall 70% and 102% above normal in July and August, respectively, resulting in significant flooding primarily around the Indus River watershed (Scott, 2011). The flooding killed nearly 2000 people and affected 20 million people. Of the 20 million affected, 12.5 million needed urgent humanitarian assistance

(Relief Web, 2011). Prior to the flooding, Pakistan already had many refugee camps in operation to house the 1.7 million refugees from Afghanistan, 1.4 million affected by conflict, and 1.95 million internally displaced.

Government and NGOs in Pakistan operated relief camps which provided services to a large number of IYCP (Hirani, 2014). These camps were established away from cities (and therefore city services), and did not have safe drinking water, electricity, and sanitation facilities, which allowed communicable diseases to flourish. Primary caregivers are often busy acquiring necessities and cannot care for infants and young children. Promoting, supporting, and protecting breastfeeding in relief camps was found to be as important as vaccination programmes for promoting health and preventing disease in infants and young children; yet, breastfeeding was often difficult for mothers due to lack of privacy in evacuation centres (Hirani, 2014; 2019).

3.2.7.2 Port-au-Prince Earthquake, Haiti

A 7.0 magnitude earthquake struck roughly 25 kilometres from Port-au-Prince, the capital of Haiti (DesRoches et al., 2011). The earthquake killed 220,600 people and displaced 1.5 million. While poor building quality was at fault for many of the initial fatalities, lack of healthcare infrastructure substantially contributed to overall mortality rates. Infectious diseases were one of the largest killers of children, notably cholera (Dube et al., 2018). Cholera, which is spread by consumption of food or water contaminated with faecal matter, was able to flourish as 40.5% of evacuation camps did not provide water, and 30.3% did not have toilets (Sheller et al., 2017).

The use of baby tents after the earthquake was the largest coordinated effort to implement BFS in an emergency context (Ayoya et al., 2013). Between February 2010 and June 2012, 193 BFS were established to serve the needs of 180,499 mother-infant dyads and

52,503 pregnant women. The BFS provided mothers a safe and secure place to breastfeed, or receive ready-to-use infant formula for non-breastfed infants. Of the infants less than 6 months of age enrolled in the BFS programme, 70% were exclusively breastfed, and 10% who had been fed a mix of breastmilk and formula transitioned to exclusive breastfeeding, significantly higher rates of breastfeeding than normally seen in Haiti (Ayoya et al., 2013). In addition to feeding resources and support, the BFS provided health checks and care for IYCP. A nurse was in charge of each tent, supported by a social worker and a guard. BFS which provided psychosocial care also had a psychologist on staff .

3.2.7.3 Ongoing European Migrant Crisis, Greece

Over 1 million refugees have arrived in Greece, primarily from the Middle East and North Africa, fleeing armed conflicts (including the Syrian war), mass killings, and sexual and gender based violence (UNHCR et al., 2016). Whilst ongoing, in 2015-2016 there was an especially high number of refugees, which coupled with Greece's economic crisis, threatened to overwhelm Greek healthcare and social services.

IYCP were prioritised for accommodation in refugee camps, where international NGOs implemented baby tents run in conjunction with local partners (Kousoulis et al., 2016; Svoboda, 2017). Between August 2015 and March 2016, 4,091 children under age 2 used the baby tents. These areas afforded mothers/caregivers and children under 2 a private place to breastfeed and rest. The baby tents had breastfeeding counsellors to support ongoing breastfeeding. Messaging about breastfeeding was tailored to the needs and priorities of the women, for example not having to carry heavy containers of food and supplies (Svoboda, 2017). Infant formula and directions for safe preparation were distributed out of sight from breastfeeding mothers.

It is estimated 10% of the female refugees arriving in Greece were pregnant (Scott

& Wallis, 2021). Pregnant migrants face worse pregnancy outcomes, are less likely to have had any antenatal care, and are at greater risk of malnutrition. Once in Greece, it was difficult for pregnant women and healthcare providers to communicate due to lack of translators, availability of safe spaces for women depended on the refugee camp, and the Greek healthcare system was overwhelmed, which increased the number of cesarean births as there were not enough staff to monitor natural labour.

3.2.7.4 Türkiye-Syria Earthquake, Türkiye

On 6 February 2023, southern Türkiye and northern Syria were struck by a magnitude 7.8 earthquake and aftershocks, which killed over 50,000 people and levelled entire cities (AFP, 2024). The earthquakes affected at least 15.2 million, 5.4 million of which were children, and an estimated 2840 infants were born in the affected area in the five days following the earthquake (Erat Nergiz et al., 2025). A year after the earthquake, hundreds of thousands of people remained displaced, living in metal containers the size of small studios which have access to water and power (AFP, 2024).

After the earthquake, infant feeding was often difficult, even for women who were exclusively breastfeeding (Mizrak Sahin & Kabakci, 2024). 44.8% of mothers in areas affected by the earthquake reported difficulties breastfeeding, primarily due to a perceived decrease in milk supply, compared to 28.6% of mothers in unaffected regions (Erat Nergiz et al., 2025). Due to the significant damage to infrastructure, many women reported they could not access adequate fluids and nutrition to sustain breastfeeding, however this was unlikely to be true as even mild to moderately malnourished women can sustain breastfeeding (Mizrak Sahin & Kabakci, 2024). Additionally, mothers who wanted to breastfeed often could not due to societal norms regarding the presence of men. Better breastfeeding support and information may have allowed many of these women to continue breastfeeding.

Mothers using formula also encountered difficulties. Despite formula donations and distribution in violation of OG-IFE and the Code, 38% of women using formula in affected areas experienced shortages (Erat Nergiz et al., 2025; Guan et al., 2024). As the earthquake impacted potable water supplies, sanitation infrastructure, and access to fuel, powdered formula was unlikely to be able to be safely prepared, however it is unclear if the formula donations were ready-to-use (Guan et al., 2024).

3.3 Key Themes

By reviewing the case studies alongside the summaries from other recent events, several key themes emerged related to IYCP in an event. The emergency management response of each case study event differed in accordance with local contexts and policies, but guidelines for best IYCP practices are an international standard. While much can be learned from past events, IYCP best practices are often ignored in initial event response.

3.3.1 Infant Feeding

Much of the research related to IYCP in an event relates specifically to infant and young child feeding practices, and the best practices for infant feeding were not followed in recent events in NZ and internationally. Infant feeding has a significant impact on health outcomes and, as such, infant feeding was a theme in every case study. The best practices for infant feeding in an event are clear: support continued breastfeeding (or reinitiation of breastfeeding), do not accept or distribute donations of formula, and only provide infant formula to those who need it (Brabandere et al., 2014; Group; Organization, 1981). Yet infant formula was included as a standard part of aid distributions for those with infants across a number of disaster situations including in NZ (Bartle, 2011; DeYoung et al., 2018; Giusti et al., 2022; Gribble et al., 2019; Kyojuka et al., 2016; Yokomichi et al., 2018). In

many of the case studies rates of exclusive breastfeeding decreased after the event, due in part to the implicit messaging that formula must be safe or better than breastmilk since it was included as part of humanitarian aid.

3.3.2 Failure to Plan for IYCP

One reason many of the case study countries are failing to adhere to infant feeding best practices is lack of planning for IYCP. Most countries have plans for unattended children in evacuation centres, but have not planned for the feeding and care of infants, perhaps assuming parents will have brought all of the necessary supplies with them (Gribble et al., 2019). As of 2020, the only country in Europe with a national policy for IYCF-E compliant with OG-IFE (discussed in Section 1.6.3) was North Macedonia (Zakarija-Grković et al., 2020). Accordingly, North Macedonia was also the only country in Europe to have an appointed person responsible for national IYCF-E coordination.

While a dedicated IYCP coordinator would be ideal, at a minimum emergency management response planning needs to account for the feeding, care, and protection of IYCP during and immediately after an event. This role would fit into the welfare function of CIMS, under the purview of TWO or MoH.

3.3.3 Difficulties Evacuating

Evacuating is often difficult, even more so with an infant (DeYoung et al., 2018; Gribble et al., 2024). During the Fort McMurray fires, some women reported removing infants from car seats to feed or change nappies while in the slow moving procession so as not to lose their place in line. One evacuating mother reported that emergency management delayed the start of their convoy so she could feed her infant before leaving.

3.3.4 Unsafe Conditions in Evacuation Centres

Once evacuated, safe and private accommodation was often lacking for IYCP which compounded stress, especially for breastfeeding mothers who, due to cultural norms, were unable to breastfeed in mixed-gender settings, including in Pakistan and Türkiye (Hirani, 2019; Sahin & Kabakci, 2024). When emergency accommodation was provided for mothers and infants, male partners were often required to stay in separate accommodation. This left mothers doing all of the childcare with little support, or staying with their partners in accommodation in which they did not have the privacy necessary to comfortably breastfeed.

Evacuation centres are unlikely to be equipped to safely accommodate infants due to infant's safe sleep requirements (University of the Sunshine Coast et al., 2024). Infants need to sleep on a firm, flat, safely-enclosed surface free of suffocation hazards. Car seats and strollers are not considered safe to sleep in, although the latter can be used if necessary with proper precautions. Young children do not have the same concerns regarding safe sleep, but their increased mobility brings new concerns. Evacuation centres may have power cords running through them, exposed outlets at children's levels, and other hazards.

Pregnant women may also face difficulties in evacuation centres. Pregnancy may increase sensitivity to smell, a hypothesised source of morning sickness (Cameron, 2014). The smells and odours of people and pets in the evacuation centres may trigger morning sickness. While some councils in NZ require pets to be housed in separate facilities, during the NISWE, Auckland CDEM allowed those using evacuation centres to bring leashed dogs and crated cats into the centres (Auckland Council, 2023).

Pregnancy increases the need to urinate across all trimesters, but especially in the first and third (Waltzer, 1981), and lines for the toilet may be significant. During Hurricane Katrina, toilets and appropriate hygiene facilities were unavailable due to water

contamination. Finally, sleep may be difficult, especially in later stages of pregnancy when it can be difficult to find a comfortable position, even with the ideal mattress and sleep accessories.

3.3.5 Maternity Care

During the Queensland floods, it was shown that continuity of maternity care can improve birth outcomes. Bradford et al. (2022), found continuity of midwifery care can reduce risk of adverse birth outcomes in refugee and evacuee populations, women living in rural areas, and socioeconomically disadvantaged women. Furthermore, Kildea et al. (2018) found continuity of midwifery care mitigated the adverse effects of stress experienced by pregnant women on foetal health. However, work needs to be done in many countries to ensure obstetricians and midwives can continue to support their patients during and after an event.

Amongst countries where midwives provide the bulk of maternity care, NZ is the only country which has scaled continuity of midwifery to a national level (Bradford et al., 2022); however, after a significant event, midwives may be unable to continue to provide care for their patients due to injury, infrastructure damage, evacuations, etc. For example, after the Christchurch earthquake, many pregnant women evacuated to Timaru, several hours away, where it was impossible to maintain continuity of care. If continuity of care can be maintained in NZ following an event, babies are likely to be in better health and have improved long-term psych cognitive outcomes.

During an event, there is likely an increased need for medical care while simultaneously there is decreased ability of healthcare systems to provide care, as seen in Hurricane Katrina when many hospitals lost power (Allen et al., 2007). Additional training

and resources for midwives and nurses may lessen the burden of care at hospitals, improving outcomes (Monteblanco & Leyser-Whalen, 2019).

3.3.6 Long-Term Health Impacts

Failure to develop and implement planning for IYCP in emergencies in response and recovery may have significant, long-lasting impacts. Researchers in Queensland, Japan, and Canada found exposure to disasters resulted in adverse health outcomes, both physical and psychological, in infants and young children (Chen et al., 2020; Lan et al., 2024; Yokomichi et al., 2018).

The QF2011 Flood Study consistently found high maternal stress levels or high flood exposure impacted foetal health and development (Bussi res et al., 2015; Dancause et al., 2011; Garner & Shonkoff, 2012; McLean et al., 2018; Menclova & Stillman, 2020; Murphy et al., 2021; O'Donnell & Behie, 2013; G. Simcock et al., 2017; Gabrielle Simcock et al., 2017; St-Pierre et al., 2016). These impacts include: epigenetic changes in fetuses which can have lifelong health implications; changes in psychosocial behaviour in infants and young children; and difficulty forming strong, secure relationships between infants and parents.

Events may also increase the rates of adverse birth outcomes including premature birth, small for gestational age, and low-birthweight. Depending on the type of event, there may be additional health implications, for example, increased asthma rates and breathing difficulties due to smoke and ash inhalation or unsafe drinking water resulting in gastrointestinal illness. As the long-term impacts can have lifelong consequences for affected IYCP, efforts to decrease maternal stress need to be included in emergency management event planning.

3.4 Summary

This chapter discusses the literature related to IYCP in one recent NZ event and five international events in countries which met the inclusion criteria. Additionally, recent international events in dissimilar contexts and their contribution to IYCP in emergencies knowledge were outlined. Findings from one event were often found in other events, and related directly to event response. These findings were:

- International legislation and best practices for infant feeding were not followed in recent disasters in NZ and internationally. This is likely due to a generalised failure to plan for IYCP needs in emergencies.
- IYCP face difficulties in evacuating. In Canada, infants had to be removed from car seats while in a moving vehicle in order to be fed, or parents risked losing their place in line.
- Evacuation centres are often unsafe for IYCP due, in part to: limited food, lack of clean water, and high temperatures.
- High maternal stress levels can result in adverse birth outcomes, but some stressors could be lessened with planning and continuity of maternity care.

The case studies contextualise the response to Cyclone Gabrielle and were used in the development of the semi-structured interview questions and the research design. These can be found in Appendix 2.

Chapter 4: Results and Discussion

4.1 Introduction

This chapter presents, analyses, and discusses the themes and observations gathered during the interviews. A large volume of data was collected during the interviews and focus group, and the findings considered key to this research were mentioned by multiple interviewees, generally both midwives and emergency management. The results are categorised according to the 4Rs of emergency management, as described in Section 1.1.

4.2 Reduction

NEMA (2020, Reduction section) defines risk reduction as “identifying and analysing long-term risks to human life and property from hazards; taking steps to eliminate these risks if practicable, and, if not, reducing the magnitude of their impact and the likelihood of their occurring.”. Reduction efforts lowers hazard risk to often more tolerable levels, such as building codes requiring earthquake retrofitting or implementing catchment management to lessen flood exposure. Risk reduction is done at local, regional, and national levels by CDEM, NGOs, and individuals.

4.2.1 Roles and Responsibilities

In an emergency, no one person or agency can manage every aspect of the emergency. As part of reduction efforts, welfare managers must proactively work to build relationships and lines of communication with community stakeholders before an emergency (Coppola, 2020). In some ways, NZ welfare managers are already building lines of communication through the legislatively mandated quarterly welfare coordination group meetings. Welfare group meetings are between CDEM and organisations involved in the welfare sub-function, including TWO, Oranga Tamariki, NZ Police, NZ Red Cross, and St

John (ambulance services) (Auckland Emergency Management, 2019).

Some welfare managers may believe TWO is actively communicating with LMCs about their patients in an event, likely due to not fully understanding the terminology around midwifery services in NZ, which includes LMCs, core midwives, and community midwives. LMCs are self-employed contractors to the government. Core midwives work rostered shifts in maternity, birthing, and postnatal hospital units. Community midwives are core midwives who work in the community, for example, if a patient is unable to find an LMC, or requires specialised care (i.e., due to drug use, mental health, or frequent follow-up).

When LMCs were asked if TWO could collate information about their patients for use by emergency management after Cyclone Gabrielle, the LMC Midwives were emphatic that TWO does not have access to their records. TWO further clarified,

“We didn't provide [CDEM] with lists of anything, and the lists we pulled together were basically only people who have had access or contact with a [community midwife or other service] in the last two years, which is a long way short of people who are vulnerable.” {TWO A}

If CDEM is unaware of the different types of midwifery and their functions, it is easy to see how and why CDEM would believe the supplied lists included LMC patients. As one welfare manager shared,

“So an example with that would be that Te Whatu Ora would supply us with information on women who are due by working with [LMC] midwives to determine who is due around [the time of the emergency], or who have been booked in to be induced, or have identified that there is any medical complications. And so they would advise [CDEM] welfare of these individuals, and we would send frontline emergency services out to locate them and bring them to the hospitals where they can receive that care, especially if it is life-threatening.” {Welfare B}

When discussing this lack of communication between CDEM, TWO, and LMCs, LMC B, was justifiably very concerned as,

“The bulk of New Zealand's maternity care system is run by LMCs and we're not in the loop. We're not invited.”

For perspective, in 2022, LMCs provided primary care for 95% of pregnancies in NZ (TWO, 2024a), which is nearly 700 births per year in Napier alone (Stats NZ, 2024). This leaves the highly specific needs and vulnerabilities of pregnant women, and those who have very recently given birth and their infants, unaccounted for in DRR planning efforts by CDEM.

The important role LMC midwives could play in emergency response has been recognised by organisations including the WHO (2006) and the International Confederation of Midwives (2024), as well as researchers like Hays & Prepas (2015) and O'Malley Floyd (2013). Both organisations and researchers noted the need for pre-event inclusion of midwives in planning for DRR. As another welfare manager noted,

“So I certainly think that there's strength in relationships and building [relationships between CDEM and LMCs] in “peacetime”. Because that's what's really gonna pull you through in an emergency and it's what's gonna help the community and particularly you know the infants, the young children, and the pregnant woman if we have knowledge of those groups we can get support for them early on, and we can bring them into that planning piece, but then also in a response [LMCs] are involved straight away and they're able to provide us advice.” {Welfare A}

LMCs have a deep understanding of the circumstances, conditions, and needs of their community and are therefore well placed to predict the needs of IYCP in an emergency (International Confederation of Midwives, 2024). Yet despite recognising the role LMCs could and often do play in events, LMCs continue to be an under-utilised (if utilised at all) resource available to CDEM welfare managers.

By failing to include LMCs in welfare group planning, the needs of a large population of vulnerable women and infants are unaccounted for in emergency planning. This is likely

to be true in most countries where the bulk maternity care is provided by midwives as the systematic review by Beek et al. (2019), and my literature review, both found a paucity of research regarding the role of midwives in events.

Without pre-event planning, spontaneous volunteering, while well-intentioned, can quickly overwhelm response systems (Merchant et al., 2010). This was the case following Cyclone Gabrielle, where Hawke's Bay CDEM "struggled to direct and coordinate first responders, partner agencies, tangata whenua, volunteers, and other territorial local authorities" (Bush International Consulting, 2024). LMCs live and work in the communities they serve, and are well positioned in an emergency to provide not only maternity and newborn care, but also first aid and triage, particularly in rural and isolated communities.

"So as a midwife, I could see little people as well, like broken skin and fevers, and I can do a little bit of triage, which would help the other people there. You need the ability to take recordings, temperature and pulse and the blood pressure and things, so you can support diagnoses." {LMC A}

One way CDEM could proactively include LMCs would be by inviting local midwifery organisations, to have a representative attend quarterly welfare group planning meetings. At a national level, the NZ College of Midwives Policy Analyst could possibly be an ideal representative. For local or regional meetings, the local Regional or Sub-Regional Chairperson for the NZ College of Midwives could fill this role, as they would be well-positioned to disseminate necessary information both to the welfare group and to other midwives. As someone already in a leadership role, she is already well-positioned to serve as a primary point of contact for CDEM and midwives in an event.

Furthermore, a representative who has responded in previous events may be able to identify systemic shortfalls related to IYCP in emergency planning and assist in developing IYCP in emergencies training courses for emergency management professionals. By

attending welfare group meetings, LMCs would likely develop a deeper understanding of emergency management, enabling them to better work with CIMS and other responding organisations. Many welfare managers are new to the role, however it is possible the high turnover will decrease now that the COVID pandemic has been declared over (Sarker et al., 2023). If the high rate of turnover continues, it may have a significant impact on event outcomes, particularly in places where welfare group managers have worked to build relationships with LMCs and other members of the community.

4.3 Readiness

Readiness aims to ensure that systems and capabilities for an emergency are in place prior to an event occurring (NEMA, 2020). This includes the development of programmes to support community response and education for organisations responding to an event.

4.3.1 Planning, Preparedness, and Training

4.3.1.1 Specialised Training for Emergency Management

Many CDEM group welfare managers are new to the role. Some interviewees had only been in the position for a matter of months, if not weeks. A welfare manager who had been in the role for over a year mentioned the high rate of turnover and relative newness of most welfare managers attending the quarterly meetings. One benefit of this newness was their familiarity with training, having recently completed it. According to the welfare managers interviewed, there is currently no training specific to IYCP in an emergency.

“None? I mean, Care and Protection of Young People is one of, as the group welfare manager, or even just a welfare manager in general, is one of my 9 sub functions that I'm responsible for. So I speak to Oranga Tamariki quite frequently on their planning and what they're doing because they're technically the lead for that sub-function. So no. I don't think there's much training out there at all.” {Welfare A}

Interviewer: Have you received any training specific to IYCP?

“No, never.” {Welfare B}

While Oranga Tamariki is the lead for the Care and Protection of Young People, welfare managers thought specialised training would be beneficial.

“I think [lack of IYCP training] is a gap and there's a need there.” {Welfare A}

Training specific to IYCP may help welfare managers at all levels, may make it easier to implement BFS in evacuation centres (discussed more in Section 4.6.5), and ensure infant feeding policy and procedures are implemented in accordance with international legislation.

“[Infant feeding] is something that I would take into consideration as a welfare manager and as a person that is training the welfare managers at the local level to consider and ensure that that isn't mismanaged.” {Welfare B}.

The NZDF, which is often involved in emergency response in NZ and neighbouring Pacific islands, has implemented gender training to ensure their operations align with the UN Security Council resolution on Women, Peace and Security (NZDF, 2024). This training teaches service members to assess when and how gender affects event response and ensure the NZDF accounts for these differences when providing resources and aid, and train others within the organisation.

“I've done the gender focal point training, which again doesn't specifically talk about infants, but it does talk about children, men, women, boys and girls. I've also actually presented on a course and facilitated a group on the course.”
{NZDF A}

Nearly 200 people have completed the course, and it continues to be offered on a regular basis. During Cyclone Gabrielle, Gender Focal Points ensured the needs unique to IYCP were included in the NZDF's response (discussed more in Section 4.3.1.1).

4.3.1.2 Specialised Training for Midwives

As midwives interact and learn about the welfare group function and emergency management, it would enable them to develop specialised training for emergencies. Most experienced midwives would likely feel capable and prepared to continue providing

maternity care during an event, however there are competencies which would be valuable to include as part of a professional development curriculum (Lenny Stia et al., 2024).

Mirmohammad Ali Ie et al. (2022), found five competencies necessary for a midwifery in disasters programme:

1. Safe motherhood, which includes working with mothers who have experienced trauma, managing normal deliveries in emergency settings, and managing birth and pregnancy complications.
2. Women's health care, particularly the identification, management, and treatment of gynaecological infections.
3. Contraception to prevent pregnancies and unsafe abortions.
4. Management of sexually transmitted infections and sexual violence, including familiarisation with rape kit evidence collection procedures and post exposure prophylaxis.
5. Infant care including child cardiopulmonary resuscitation, tending to premature and low birth weight infants, and promotion of breastfeeding.

At the time of writing, there were no courses offered for midwives specific to midwifery after a hazard event. In 2023, Otago Polytechnic offered "Global Midwifery: Practical Steps" which included content related to "Exploration of the role of midwives during disasters and humanitarian emergencies" amongst other content (Thompson, 2023). This course is focused on working in an international context, particularly in developing countries. After reviewing the course materials, I believe some aspects of the course would be highly beneficial for midwives in NZ, particularly those in rural areas and/or places with high deprivation, but would need to be tailored to a domestic context. The midwives most

likely to benefit from such a course lack the time to complete it given the midwifery shortage in much of NZ which is especially pronounced in poor, rural areas.

I have also learned Auckland University of Technology is developing a postgraduate course related to childbirth in disasters, with plans to offer it in the latter half of 2025. It is unclear whether this offering will include, or plans to include, the aforementioned competencies as part of the course work.

4.3.2 Creating Planning for Events

4.3.2.1 Emergency Management Contracts and Procurement Planning

It is impossible to store all of the supplies which will be needed in an event response. Even items which seem non-perishable like nappies have expiration dates or can be damaged if not stored correctly. To ensure emergency management can access supplies needed by IYCP during and after an event, contracts and/or memorandums of understanding need to be in place with suppliers before an event occurs.

“We have good contracts in place with our suppliers and there are certain things that they know that they need to kind of jump to pretty quickly. If we were to call them and say we need you to deliver this, this, and this to the naval base, they'll normally be able to do it within 24 hours.” {NZDF A}

“What could be possible at the regional level with an understanding of what's required [in an emergency] and existing [memorandums of understanding] with suppliers that can be quickly enacted can definitely be done.” {Welfare C}

For example, a proposed safe sleep solution for infants in evacuation centres was the use of “baby boxes”. Baby boxes are sturdy cardboard boxes with a firm mattress at the bottom and are filled with necessities like diapers, clothes, and toys, and have been used in Finland for over 85 years (Lee, 2013). It was thought a foldable version could be stored vacuum sealed, however participants with experience in logistics and supply chain management said it would be impossible unless baby boxes became a standard part of birth care in NZ.

However, baby boxes could be used in an emergency if contracts and plans with the necessary manufacturers are in place to allow production to be implemented and scaled as needed.

4.3.2.2 Care of IYCP During and After an Event

In addition to participating in welfare group meetings, LMCs need to work to create event plans specific to their needs and the needs of their patients.

“I think that for us as a maternity organisation, what we can be doing is actually putting that loose plan together, ideally coming from our national level leadership and working in with TWO and CDEM as well so we’re all on the same page and we don't have that.” {LMC B}

An event plan based on accurate knowledge is likely to facilitate an appropriate and timely response (Perry & Lindell, 2003); however, a national-level emergency plan for midwives may prove to be too vague and fail to account for regional differences in hazard and risk. It may be more appropriate to develop a midwifery event plan which can then be tailored to local contexts. For example, as was seen during Cyclone Gabrielle, significant flooding in and road damage may make it impossible for those in Napier and rural parts of the Hawke’s Bay to access the hospital, whereas in Auckland there are several hospitals which are accessible through many routes. Planning in the Hawke’s Bay would need to account for the hospital being inaccessible, whereas planning in Auckland needs to determine which hospital to use should the closest be inaccessible.

4.3.2.3 Emergency Maternity Clinics

Once midwives are familiar with the workings of the welfare group function, it would likely be beneficial to develop a plan for the operation of emergency maternity clinics (EMC), as were used in Cyclone Gabrielle (discussed in more detail in Section 4.6.1). The figure below is a potential operational structure for EMC leadership. This structure is based

on the CIMs structure used by CDEM and was developed in response to the interviews with midwives and TWO.

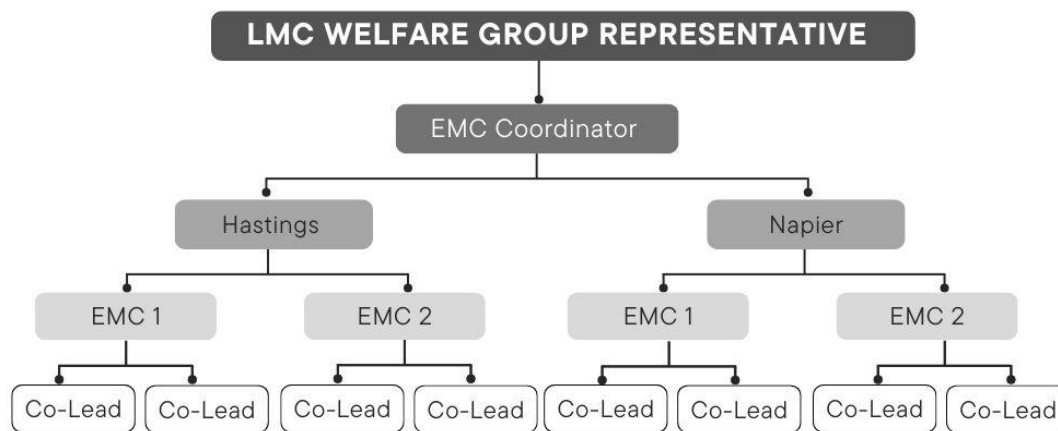


Figure 1.4 Potential Operational Structure for EMCs in Hawke's Bay

In this structure, the LMC welfare group representative is responsible for advocating for the needs of the EMCs and IYCP in evacuation centres with CDEM, TWO, and other welfare group members. The EMC Coordinator would liaise between the LMC Welfare Group Representative and the EMCs. A key role of the EMC coordinator would be communicating with local LMCs (if and when possible) that an EMC has reached capacity. The EMC coordinator would also ensure resources are appropriately distributed between the EMCs. The co-leads for each EMC would be responsible for creating rosters to ensure 24/7 staffing and communicating needs with the EMC coordinator. This structure could be adapted to fit local needs and constraints, including removing or adding positions and clinics as needed.

4.3.2.4 Emergency Medical Units

At regional level, TWO emergency management has completed planning for emergency medical units (EMU). As planned, an EMU is not part of an evacuation centre, but would be run by TWO and operate out of (or adjacent to) larger general medical

practices in the affected area. As a TWO programme, EMUs will likely be staffed by rostered core and/or community midwives from the local hospital(s).

"With large scale disasters like earthquakes we have a plan for what I call 'emergency medical units' in the community and these are generally sited around decent sized general practices and so and it obviously would be advertised this is where you go for medical attention so to speak and so having a midwife in each of those, there's four in Napier and four in Hastings, so having a midwife in each of those would be quite sensible because if I am a pregnant woman that has fallen over and hurt myself I probably want someone to have a listen to the baby and make sure all is well at the same time and if you can, so you want kind of like a one-stop shop so that I can get [medication], blankets, etc." {TWO A}

While it is important to have a midwife in each EMU, pregnant women and those with young infants may not feel comfortable using EMUs. After an event like the HSZ earthquake and tsunami scenario, an EMU is likely to be inundated with serious injuries and/or communicable diseases, the latter of which could be especially harmful for pregnant women and young infants.

Pregnant women who feel they need the baby checked due to a minor injury may face significant wait times, or feel as though their concerns are not valid in the face of injuries which may visibly appear more serious. While not all pregnant women will feel this way, when I was pregnant I fell on an e-bike which required an emergency department visit to check the baby was unharmed, have cuts and scrapes cleaned and bandaged, and get a tetanus shot. Not only was my wait time significant, but as injuries which appeared more severe arrived, I felt I was wasting available medical resources, although my concerns were valid. Had I known of an alternative option where I could receive the care I needed, I would have happily used it instead of the emergency department.

Thus, a critical step in the LMC planning should be planning for emergency maternity clinics (EMC) to be operated by LMCs. This planning needs to include where EMCs will be

located in the community, staffing, and necessary supplies for treating pregnancy to infancy. Knowing there is local help available may also decrease traffic congestion, as people may be eager to avoid sitting in traffic and may feel the wait times may be less in an EMC. With fewer people trying to reach the hospital, it may improve access for emergency service vehicles and those requiring hospital care.

"But this time it was like the traffic, it was taking an hour and a half to get from Napier to Hastings. And there is no ability on our roads to overtake. It's a dual carriageway with only one lane on each side of the road. So there was no ability to let somebody in an emergency go past, which I think is really ridiculous." {LMC A}

Discussions about widening roads are beyond the scope of this research, but lack of emergency access is a problem in many communities in NZ, including the Hawke's Bay.

4.3.2.5 Emergency Birth Kits

At a national level, LMCs could be provided the information necessary to create their own event specific birth kit with additional supplies not necessary for most births. LMCs already have birth kits for home births and are likely to be more prepared than the general public to handle an emergency.

"This sounds probably a bit funny, but even when I travel out of region on holidays, I'll always have my home birth kit in my car because I know if anything happens, I've got everything like the basics of everything that I need." {LMC B}

Following the 2011 Tōhoku event the Japanese Nursing Association realised there were no guidelines for providing care to birthing women in an emergency, and published guidelines for creating low-tech kits to support births (Ivry et al., 2019). In early 2025 the American College of Obstetricians and Gynecologists² (ACOG) released information for healthcare providers to better meet the needs of their patients during a disaster. It recommends

² In the US, 91% of maternity and birthing care is provided by obstetricians rather than midwives (Backes & Scrimshaw, 2020)

healthcare providers who normally provide birthing services in a birthing facility be prepared to attend to out-of-facility births by having emergency birthing kits. The supplies included in an LMC's birth kit may vary based on whether or not the LMC offers home birth services.

Planning by and for maternity organisations should consider what supplies would be needed to supplement a standard home birth kit to make an “emergency birth kit”. In addition to home birth kit staples like stethoscopes and scissors, the Japanese Nursing Association recommended having a headlamp helmet, emergency torches, blankets, and towels. ACOG (2025) recommends a battery powered radio be included as part of the emergency birth kit. Additionally, common household items like extension cords and batteries in a variety of sizes would be beneficial to have in the kit. The specialty supplies are unlikely to be needed regularly, but could be stored together in a grab bag for emergencies.

4.4 Community Preparedness

4.4.1 Preparedness for Pregnant Women and Mothers of Infants

NZ planning generally assumes evacuation centres will be in operation for no more than a few weeks (NEMA, 2024). There could always be a major event requiring a significant number of evacuation centres to open and remain in operation for several months, if not longer. NEMA's Catastrophic Event Handbook (2024) acknowledges a catastrophic event would require shelter and accommodation on a scale not previously seen, and assumes information for vulnerable patient groups would come from TWO. As discussed in Section 4.2.1., pregnant women, recently postpartum mothers, and young infants may not be accounted for in planning as TWO may not be responsible for their care.

As discussed in Section 1.7.2, the information in the new TWO guidelines (2024) for infant feeding in an emergency are not consistent with the internationally accepted and recognised best practices and policies, and may result in adverse health outcomes if followed. The resource does not contain information related to preparedness, such as how much water should be stored if formula feeding. As such, existing resources should be updated to be consistent with the Code and OG-IFE, and available in widely usable formats. An accurate and actionable resource could be given out by LMCs, Plunket nurses, antenatal classes, etc. to aid pregnant women and new parents in emergency preparedness.

Another potential option could be to develop an app for emergency preparedness, which focus group participants believed would be an effective way to reach new parents and communicate relevant information. A search of the NZ Apple App Store for “emergency preparedness”, “Disaster”, and “disaster preparedness” offered no results by NEMA, CDEM, or NGOs (Version 18.5; Apple Inc.; Cupertino, California USA). The search for “Hazard” resulted in the GeoNet Quake app, which offers information and the option to report recent earthquakes (among other technical features). Researchers in the US and Switzerland refer to the Red Cross’ multihazard apps as being among the most useful (Bachmann et al., 2015; Dallo & Marti, 2021), however at this time it appears to no longer be available in NZ.

When developing a disaster app, there are usability concerns which need to be accounted for including effective communication and design within the app and establishing and maintaining user trust (Tan et al., 2020). Most disaster apps are designed to collate disaster information from the public, provide a platform for collaboration, share official information before and during disasters, analyse data for situation preparedness, and allow

users to communicate or notify others (Tan et al., 2017). A multi-hazard app with interactive preparedness tools, including hazard safety information and a quiz to generate a custom list of emergency preparedness supplies, appropriate to the NZ context could be developed to aid in emergency preparedness (see Appendix 3).

“I think being interactive because the reality is, is those with younger children now are actually the next generation. Can I say that? And they've grown up with technology and they, uh, you know, like the ones who want to be a bit more on their phones and the more engaged. So to have something like that and it, you know, calculates, I reckon that actually speaks to the people. I reckon that's really cool.” {LMC B}

For purposes of this research, only aspects related to IYCP are discussed here, but an app could be beneficial for other households requiring tailored plans.

During future large events, telecommunications will probably be unavailable making it impossible to update apps with event specific information. During Cyclone Gabrielle, both power and internet were unavailable, meaning an app could only show information downloaded prior to losing communication and would be completely inaccessible if the phone's battery dies. This highlights the importance of communicating with diverse media, including radio, community noticeboards, and letterbox drops. MoH, with feedback from LMC midwives, could develop a pamphlet for IYCP with information related to if, and when, to call an ambulance or seek medical care during an event for which LMC midwives can distribute as part of regular maternity care, not just in emergencies. Having this information clearly conveyed may decrease the number of people unnecessarily using ambulances and other emergency medical transportation services.

“And what I saw in the cyclone, I was physically there, is one day a woman came in by ambulance and was considered high risk. And obviously, St. John's brought her in saying all this. And we were thinking, oh, like, you know, this sounds bad. And when she got in there, she literally said, ‘I've got gestational diabetes. And I'm really unsure because I'm supposed to have an induction in

two days time, what's happening?’

And we're like, ‘do you have medication?’

‘Yes.’

‘Is it stable?’

‘Yes.’

But [the registrar and I] were gobsmacked. I just, we almost, [the registrar] left the room. Like, I cannot believe that [an ambulance] has been used for this.”

{LMC B}

The brochure could be used by CDEM, police, fire and other emergency organisations for internal use (e.g., help with triaging pregnant patients) and external use (e.g., distributing to pregnant women as needed).

“I think we would have had more self-presenting without emergency management, if they knew where to go and how to seek help.” {LMC B}

In addition to patients self-presenting at clinics, having information about EMCs (either in an app or brochure) may help alleviate some of the anxiety felt by pregnant women. Yasunari et al. (2011), found pregnant women who were taught alternative hospital and maternity care locations as part of antenatal education were less anxious. Anxiety in pregnancy can result in adverse birth outcomes including preterm birth, low birth weight, and small for gestational age (Grigoriadis et al., 2018).

4.4.2 Rural Preparedness

While those living in rural areas may be more self-sufficient out of necessity, they are still highly vulnerable to an event. Households may have limited food available if an event occurs the day before a scheduled grocery trip, or may not store water, but their well becomes contaminated. For those who are socio-economically deprived, being prepared for an event is not possible for people with financial constraints (Blake et al., 2017). Families

should be prepared to be self-sufficient for at least 48 hours, ideally prepared for 72 hours, longer for residents of rural areas.

“There's a time limit that we give. Most people are saying that within the first 48 hours, at the very minimum, you won't hear from us.” {Welfare B}

In light of 2023's severe weather events, Ombler et al. (2024) suggest updating the emergency provision recommendation to one week for urban areas, and two weeks for rural areas. This recommendation is based on the expected time it will take emergency responders to reach rural communities, and gives people an idea of what their preparation should entail, however it is unlikely to be feasible for much of the population. Many of the places with the highest socioeconomic deprivation are rural areas in regions including Northland, the Hawke's Bay, Gisborne, the Eastern Cape, and the West Coast (Atkinson et al., 2019). In Feeding your baby (MoH, 2015a), it is suggested families using formula keep one unopened can as part of their emergency food rations. For low-income families dependent on infant formula, this is an unrealistic suggestion as many families live paycheque to paycheque and cannot afford an extra container, let alone a week or two of stored food. If those who are financially able to be prepared do so, it may enable emergency management and responders to focus on those who most need their assistance.

"So this man had full custody of a child, a baby really, like under six weeks old. He was working full time and his neighbour was looking after the child. Anyway, so every payday he would go from his emergency accommodation to the supermarket to buy the formula for the baby with his pay. And that happened on the day [Cyclone Gabrielle made landfall]...he was paid the day of the cyclone. So he walked with that baby inside his coat. It would probably be an hour's walk, maybe a little bit longer...an hour and a half's walk with that baby, and it got there and the supermarket was shut. So he came round to the health centre and they directed him to me because what other choice was there?" {LMC A}

Families with high deprivation levels are more likely to encounter difficulties when

feeding an infant. They are more likely to use formula at 2 weeks of age than less deprived families (TWO, 2023), and are simultaneously more likely to only have access to unsafe drinking water to prepare formula with (Hales et al., 2003). CDEM working in communities with high levels of deprivation should be aware of the obstacles faced in infant feeding in an event, and ensure families requiring formula are provided with an adequate supply of either ready to drink formula or canned formula and bottled drinking water for infants and young children. Unlike municipal water supplies which have to be boiled until 6 months of age, tank and well (bore) water has to be boiled until children are 18 months old (KidsHealth, nd).

4.5 Using Existing Resources

There is no point in allocating time, money, and personnel to develop tools and resources if said tools and resources are never used or implemented. MoH released preparedness guidelines for families and DHBs, as discussed in Section 1.7.2, however despite having existed for nearly a decade, neither publication seems to have garnered much traction as there was no awareness of them among the people interviewed for this study.

“I didn't even know that there was [Feeding your infant in an emergency] online from the MoH.” {LMC B}

“But I've never heard of [Feeding your infant in an emergency] before. You know, like, so that's interesting in itself, isn't it? You know, like people don't know about it. Yeah. And so that's the surprise is that TWO, MoH, made this document, which probably has pretty reasonable information in it, and it hasn't been sent out. And we've had disasters, you know...why did this not end up something?” {LMC A}

It is surprising Feeding your baby was not widely distributed or publicised, either in 2015 at the time of publication, or in 2016 after the Kaikōura earthquakes when New Zealanders

were likely to be more receptive to emergency preparedness messaging. Another resource which has never been used is an infant feeding in emergencies manual developed and written by Midwife C after the 2011 Christchurch earthquake for use by staff and volunteers at evacuation centres.

“When I wrote my manual, as it were, for infant feeding in emergencies, one of the primary focuses was on myth dispelling. It ended up being used in Japan by their Ministry of Health after the tsunami and it was translated into Japanese. I've got a published Japanese version of my handbook and nothing in New Zealand. No one was interested in the slightest. It's simplified so it could be used for handouts for people working in the centres that really don't know very much. The handbooks gave you a few key points.” {Midwife C}

As she notes, her resource was never promoted by MoH for use by CDEM and/or local emergency management during an event, but according to Midwife C, the resource has had regular updates by the author. It could be beneficial if it were made available for LMCs to share with patients via printed or digital means.

In the *Guide for DHBs*, the first page strongly encourages DHB/TWO emergency managers to seek out the advice of LMCs as they “will have business continuity plans for an emergency and may be in a position to provide these services during the response phase of an emergency” (MoH, 2015b). Some DHBs have heeded this suggestion and have worked or are working with LMCs and other community healthcare workers.

“We put together a plan for a Midwifery and Plunket hub probably six or seven years ago that hasn't had to have been enacted. That was in an effort to look at both sides of the coin because I really struggle with silos....I really struggle with silos and so looking at things in isolation doesn't make a lot of sense to me and so it needs to be part of a bigger picture and many women who are pregnant have small children who are needing some advice or support or whatever in a disaster. That obviously needs to be updated and better circulated through the district, but I think that that is the way to go to look at them as a larger group as opposed to a very distinct and quite small group.” {TWO A}

The Midwifery Plunket Hub was developed as a collaboration between TWO A and LMC A. This plan identified a local Plunket hub as being the best option for providing IYCP care in an emergency and is a comprehensive plan for a region-wide emergency. The Midwifery Plunket Hub was not activated in Cyclone Gabrielle, possibly due to its age (i.e., no one remembered it existed), or the relatively limited scope of the event meant it was unnecessary to activate.

4.6 Response

The part of emergency management most visible to the public, response includes all of the actions taken during and immediately after an event to minimise injuries and deaths, protect homes and businesses, and help with community recovery (NEMA, 2020).

4.6.1 Emergency Maternity Clinics

In the wake of Cyclone Gabrielle, LMC A realised that with telecommunications unavailable and the road to Hastings flooded, pregnant women in Napier would need a physical location to access midwifery care and advice.

“I went to Napier Health Centre and I walked in the door, so we're at 3.30, 4ish in the afternoon, and you could just see the relief on their faces. They had not thought about pregnancy, but actually seeing me, it's like, oh, here's a midwife, because they know me. Here's a midwife, that's great, because we hadn't even got that far and we got that.” {LMC A}

Upon securing a room, LMC A realised the room was without many of the necessary provisions for birth.

“So I got the space, no power, no running water. So then I left there and came home to my own place and got extension cords and double pin plugs and I went to the maternity resource centre and got my home birth kit [...], all resources that are at the Napier Maternity Resource Centre like the CTG (Cardiotocography) machine, multiple birth packs, woollies, you know, anything I could find. I just threw it into my car and then took it down to the health centre and then I got this space and I sort of tried to put it all in there and in a space that didn't look...great. ” {LMC A}.

As an experienced home birth midwife, LMC A was prepared to work with the available supplies and would call for a helicopter should a birth require transfer to a hospital, which was (possible since the Napier Health Centre's direct line to Hawke's Bay Fallen Soldiers' Memorial Hospital was still working). Once satisfied with the room and available resources, LMC A was able to allay concerns of pregnant women and provide maternity and postpartum services.

Once the locations of the EMCs have been determined, a plan for staffing the clinics will need to be devised. LMC B, who had maintained mobile phone reception, called the hospital after the cyclone and learned of LMC A's nearby EMC and went to offer her services. As a leader in a local midwifery organisation LMC B had access to member contact information.

"So I literally, after going down and talking with [LMC A], I said, 'Well, I'm best utilised if I go around and see [the local LMCs] and see if we can pull together and make a roster.' So it was effectively just old school going from house to house, checking, 'Are you all right? Can you help?' Because [LMCs] couldn't get to the hospital. So even the [LMCs and other midwives] were able to chip in." {LMC B}

While LMC B checked on LMCs and created a roster, other local, unaffected LMCs independently learned of the EMC and arrived looking for ways to help.

"The reason I stayed for [20 hours] was not because I was the only midwife there, but because midwives in the morning and the next day kept popping in and saying, 'what can I do, what can I do?' And so we set up a roster and we had this place staffed, but I stayed on to go to meetings and say, 'Over here, you know, this is maternity, the midwives, we need a room with running water and a loo.'" {LMC A}

The LMCs were able to organise and coordinate their own response to Cyclone Gabrielle as the event unfolded as the effects of the event were relatively isolated.

"I mean most of the problems that we had during Cyclone Gabrielle were a

lack of power and then, you know, because like the urban areas were not hard hit at all. We had a specific team that flew into rural isolated communities and they dealt with whatever they came across at the time, but Hastings was almost back to normal within a day and Napier struggled under lack of power for about six days all up, but houses were up and upstanding. The time of year meant that it wasn't extraordinarily cold and so the biggest thing really was access to health care because most of the places who would normally deliver it in Napier didn't have any power, so bringing things together." {WHO A}

An event on the scale of the HSZ scenario would benefit from having a pre-organised operational structure, as discussed in Section 4.3.2.2.

Based on the interviews with Midwives A and B, pre-planning would have likely expedited the set-up and opening of EMCs as locations would have previously been agreed on, and local LMCs would know where they were expected. Pre-planning could also ensure the EMCs and midwives receive necessary support from other organisations responding to the event. Midwives were not included in planning which resulted in their commandeering of facilities and supplies, and determining who would perform what role without preparation.

4.6.2 Access to Maternity Care After an Event

Lack of maternity care is another problem facing many rural or isolated NZ communities. The East Cape has a sole midwife covering 200 kilometres (Duff, 2019), and many rural LMCs travel significant distances in the course of seeing patients (Daellenbach et al., 2020). In severe weather, a rural LMC may not be able to reach a woman in labour due to flooding, subsidence, high winds, or mass movement. For birthing women in rural areas, a medical emergency is often compounded by extenuating circumstances, for example a helicopter may be unable to fly due to high winds when it is needed to transport a labouring mother to a hospital (Duff, 2019). An EMC is unlikely to be a viable emergency maternity care option for rural women due to the geographic spread and secondary hazards,

however, they should be given information about when to call for emergency services if their midwife is unavailable.

4.6.3 Communication

In an event, effective communication may literally be the difference between life and death (Fischer-Preßler et al., 2016). LMCs may have limited event experience and underestimate the need to prepare. During an event, governments may provide antithetical information, or information only relevant to a small proportion of midwives, for example, those working in hospitals, making it difficult to safely provide maternity care (Crowther et al., 2022). A prewritten email and/or text message should be sent out in advance of forecast severe weather with clear and consistent messaging with the basic steps LMCs should take to keep themselves, their families, and their patients safe.

“So I was prepared and being prepared was the biggest key here. I had all my electronics plugged in overnight knowing that the power would go off at some point. So everything was fully charged... I also had filled up my car with gas in case we had no petrol stations for a couple of days either.” {LMC B}

As part of preparedness, besides charging electronics and fuelling cars, LMCs could be reminded on a regular basis of: the local proposed EMC locations; key contacts; and to ensure their birth kits are fully stocked, including their emergency grab bag. CDEM could also be reminded of the EMC locations and radio broadcasts could be scheduled.

“I had the conversation with [CDEM], do we need to put comms out about the EMC? I think we need to put it on the radio...the conversation was very, very unsure from [CDEM] about what to do. Very unsure and also very, very, like holding back, because they weren't sure how it was going to play out. And what if we inundate [the road]? [CDEM decided] let's play it safe and say nothing.” {LMC B}

As not every event can be forecast, the developed plans should be disseminated on a regular basis by the LMC welfare group representative and/or regional leaders in midwifery

organisations, or at the very least when the plan is amended or updated. This communication may result in LMCs being better prepared for the spectrum of future events.

4.6.4 Safety of Evacuation Centres for IYCP

Even with the best reduction and readiness efforts, in a major future event such as a magnitude 8.9 HSZ earthquake followed by tsunami, there will need to be a coordinated response between CDEM and other organisations in the welfare group, LMCs, and community organisations including local iwi. In an event with mass evacuations, CDEM will open evacuation centres to accommodate evacuees in safe and secure locations.

“Usually when we're looking at evacuations, it's about [keeping people safe]. So that's what takes precedence. So when it comes to planning for infants, young children and pregnant women it's very minimal because it's about getting them out of an unsafe area and getting them to a safe area as soon as possible.” {Welfare A}

A safe evacuation centre for IYCP is not only out of the path of primary and secondary event hazards, but addresses their specific needs and concerns. When operating an evacuation centre, CDEM will ensure there is a safe space for unaccompanied minors, however, a separate baby friendly space (BFS) has previously not been implemented as a standard part of evacuation centre protocol, due to the physical constraints of the buildings generally used as evacuation centres.

“Ideally it would be nice if we had separate rooms for a priority, and separate rooms for those types of feeding areas, but it's not always the case, particularly if you're using a hall that was built in the seventies and it doesn't have breakout rooms.” {Welfare A}

“We do have an identified feeding room for babies, but obviously it's dependent on infrastructure. But I do know that the welfare managers and those in the evacuation centres and within our evacuation centre strategic document, it is mentioned that we do find suitable areas for women to breastfeed their children.” {Welfare B}

If BFSs were included as a standard part of planning, CDEM could reach out to community

groups or other organisations prior to an event to determine if they have spaces which would be more suitable for IYCP, for example, local marae, Playcentres, or schools.

Amongst those interviewed, the consensus, especially amongst midwives, was that a BFS would be beneficial for reasons including privacy, camaraderie, and mental health.

“Well, one of the reasons why women need their own space really. It is about safety and dignity and privacy for all the things that they may need to do. So, when everyone's jumbled in together [in an evacuation centre] it's a bit more difficult really to do that and it obviously gets very chaotic, but I think that having a private space is really essential for all those reasons. And I think safety and dignity are really important.” {Midwife C}

“I think it would be amazing. And for there to be literally a separate space for like a feed, like literally like a feeding, a breastfeeding tent area, because you know, you've got your privacy.” {LMC B}

While some mothers may feel comfortable breastfeeding in a mixed-gendered space, many do not, as breastfeeding in public spaces can still receive negative reactions or may be culturally inappropriate (Hauck et al., 2021). Given the importance of sustaining or reinitiating breastfeeding after an event, as many of the obstacles to breastfeeding as possible should be alleviated.

A BFS could help mothers' mental health in several ways.

“You're now socialising with other women who you can look at and you don't know them, but you all know you're going through the same thing. And I think that helps emotionally as well.” {LMC B}

This could create new social relationships which engender support and goodwill from others and may improve resilience (Adler & Kwon, 2002). Social capital could be developed in a BFS as mothers help each other emotionally and practically during their time together (Carmen et al., 2022). As De Brabandere, (2014), note a BFS is “a place to reinforce community links” (p. 54).

“The concept of bringing people with small children together because that's

supportive you know you can talk about where you're at and what's going on and how the kids are sleeping or not and you know that kind of thing so the concept itself is a really good one.” {TWO A}

In my personal experience, close relationships with other mothers have been formed simply through the sharing of supplies during a moment of need (i.e., not having enough nappies) or through the sharing of mutual, but different, experiences (i.e., childbirth). It is therefore reasonable that women who have evacuated with infants would turn to each other for camaraderie and emotional support.

From a logistical standpoint, BFSs could mean fewer resources are required to meet the needs of displaced IYCP. Healthcare providers would not have to travel to find IYCP needing aid, and goods for IYCP could be properly distributed.

“It's also easier for the people who are providing services to those women, whether [the women are] pregnant or breastfeeding or whatever that they're all in the same space together. It's much easier to manage delivering whatever services are needed. It's much easier if they're in one spot so you know where you can find them easily because it's such a jumble otherwise.” {Midwife C}

Additional services needed in a BFS could include: triaging minor injuries; diagnosing and treating health conditions common in infancy (e.g., asthma, gastrointestinal viruses), pregnancy (e.g., hypertension, gestational diabetes, pre-eclampsia), or in the postpartum period (e.g., mastitis, clogged ducts, infection); breastfeeding support and education.

"So, you know, a baby tent and young children, I mean, you've got to be able to treat your asthma, your infections, your... minor broken bones, I guess. You know, you've got to be able to dress wounds. You've got to be able to assess a baby for hydration and weigh it. Those would be the things I would think of. About resources. So that's resources and the people.” {LMC A}

In order to provide these additional services, the BFS would need additional resources specific to IYCP.

“So I think one of the things that would be helpful, hand pumps. So again, breastfeeding issues, obviously hand, not electric, because if you, for whatever

reason, are unable to be breastfeeding, you still need to be able to get that supply happening in the breast milk...The sterilisation equipment, formula, bottles, nappies, wipes, like sanitiser, even thrush would be a massive one to be spreading around if you can't wash your hands properly and you're changing baby's bums. And [infant safe sleep supplies] ." {LMC B}

A BFS could also provide support which allows mothers a time to take care of themselves.

Mothers are often rendered invisible in work related to childcare, and may struggle to ask for help.

"I love the idea in NZ, we have things called kaiawhinas, so helpers. I know that at other places they've put people in charge of making the cups of tea and being the support of people, they have them in ED even now, I think. Just helpers, you know, just to, you know, you don't need to use your trained professionals to give out woollies. There are other people that can help with some of those things. And as long as we're all saying the same thing, doing the same, I think that would be wonderful. And mothers are incredibly resourced in their own ability to keep going for their children. We know this. They will sacrifice everything of theirs for their kids." {LMC A}

For safety reasons, kaiawhinas would need to be vetted members of the community like teachers or nurses.

"But there's normally someone there that can support it. What we often find with the community in general is they'll normally be a teacher or a nurse or someone in the community who will step up and say, "Hey, this is me. Someone can vouch for me here", and I've seen this happen in many instances. Like, "Look, I'm the local principal. I can look after this section." {Welfare A}

4.6.5 Care and Feeding of Infants

The demand for many infant specific supplies (formula, bottles, sterilisation equipment, hand-pumps) could be lessened with appropriate breastfeeding support; therefore, it would be beneficial to have nurses, midwives, or peer counsellors available to support sustaining or reinitiating breastfeeding. Welfare managers have recognised the importance of breastfeeding support, but highlighted the difficulties of implementing it.

"Oh yeah, [breastfeeding support] would be amazing. It's just, it's hard enough getting staff into a scene when an emergency happens and Gabrielle was a

classic example of that. We could barely get staff or security to the [evacuation centres] and the shelters when we needed them. There's, you know, there's no way that we're going to be able to get the health promoters there which we normally use to check out the facilities to ensure that they're up to a healthy standard. It just wasn't going to happen. But yes, if we could." {Welfare A}

"Because breastfeeding comes natural to women, but in others it doesn't. And so [when it doesn't come naturally] they may need assistance or those wraparound services to come in and give them assistance. And that goes largely with even talking to whānau, Māori whānau, and those Māori services who had midwives in them to get involved with marae as well. And also, yeah, just information sharing, ensuring that we get that right amount of information to those people who need it the most." {Welfare B}

Midwives were keenly aware of the importance of breastfeeding after an event, and recognised that additional support would be necessary to help mothers, particularly for those who wished to reintroduce breastfeeding.

"Well, I think in an emergency, we've got to realise that breastfeeding is the best and we just need to support those women because that gives that child so much support and safety. So actually having some knowledge of that is really important...I think you need support for breastfeeding. Like if a woman is able to breastfeed and hasn't been breastfeeding, you can probably breastfeed for 24 hours and bring your milk in. And probably in a baby tent, you need somebody around with some breastfeeding information to know how to support that. Even if that's the only comment, just keep breastfeeding the baby, keep eating and drinking and breastfeeding the baby, it will all come right tomorrow. You know, like, it doesn't necessarily have to be a lactation consultant or something, it just means somebody who's aware that this can happen." {LMC A}

Even with support, some families will require formula, so it needs to be readily available, after being requested by CDEM or TWO and distributed in ways which conform to international legislation.

"I know we still have problems with very well-meaning people in these centres packing up things for families and putting in infant formula in there and other stuff like that, so we've got a lot of issues even though the Ministry has said that any donations should not be received and if anyone needs

formula it should be managed by one central organization. It's still not entirely clear that that will happen. I think it certainly didn't happen. I mean, the [Canterbury earthquakes] that's what sparked [the Ministry] into doing it.”
{Midwife C}

Based on the interviews with welfare managers, formula is often given out to anyone with an infant, whether or not it was requested by the parent or caregiver. This practice contradicts the distribution guidelines set out in the Code (WHO, 1981), which states feeding with infant formula should only be demonstrated to mothers or families who need it and should be given with information about the risks and hazards of improper use and preparation, and OG-IFE (2017, p. 23), “Distribution should be carried out in a discrete manner so as not to discourage breastfeeding mothers.”. Rather than including formula in all infant packages, it should be handled like a medication and only given upon request.

"A number of women will breastfeed for six months say and then go back to work and then find that pumping and that kind of stuff is just really hard and so that they will switch at that point to a formula...Say I've been bottle feeding my baby for I don't know four months or whatever since I went back to work and now you're telling me I have to justify why I'm [using formula] and so the chances of generating challenging behaviour are pretty high in somebody that's already stressed.” {TWO A}

When formula is requested, it should be given without judgement or delay, but with clear information about safely preparing and using formula in an emergency context (e.g., using cups instead of bottles, the importance of using bottled or boiled water). Ideally, this information would be available in several languages, not just English. Those requesting formula could be asked if they would like to meet with a midwife to discuss other feeding options, including relactation, especially if drinking water and power supplies have been significantly damaged in the event and are unlikely to be restored in the near future.

4.6.6 Decision-Making

Another theme that arose in interviews was the differences in decision-making processes between CDEM and healthcare professionals, including LMCs, and how these differences can affect response. LMCs are used to making decisions with limited information, changing course as needed, and do not view changing course as a mistake (Daemers et al., 2017). Rather, they are reacting and adapting to new information as it becomes available. In contrast, CDEM can be slow to adapt or change course, even when it becomes clear the original plan was or would not work as needed (Glarum & Adrianopoli, 2020).

One reason emergency managers may find it difficult to adapt could be due to how emergency management roles are typically staffed outside of major cities. Most councils employ few full-time emergency managers, and many of those tasked with emergency management in an event normally fill other full-time roles and may have little emergency management training, if any (Ombler et al., 2024).

“Predominantly that's because you have a pile of [staff] whose day job is very bureaucratic and they've got to ask the public what they think and you've got to jump through 10 hoops before any decisions are made and you suddenly put [staff] who think [bureaucratically] every day into a role where you're expecting them to make rapid decisions based on very little information and the information that you have may actually not be that accurate and that will affect people and then you are asking [that staff] to have the courage to change those decisions as new information comes to hand.” {TWO A}

During an event, emergency management is often tasked with making the “least-worst” decisions (Shortland et al., 2021). A least-worst decision is made when all of the available options are high risk, could have potentially negative outcomes, and choosing between the options is difficult (Shortland & Alison, 2020). In an event response, emergency managers are tasked with making time-critical decisions, often based on large volumes of

incomplete information (McLennan et al., 2024) and may end up deliberating too long and fail to make a decision, or may avoid making a decision in an attempt to avoid being blamed for negative outcomes.

“And so I think when you are trained to make, like those hard and fast decisions, it's a lot easier for us to recommend down and be like, ‘well, I would probably do that, or I would probably not do that’. Whereas I think for other people they're not used to working in [an environment requiring rapid decision making]. It's just so different. They're not used to that. Like, you just have to, you just have to make a call. I know, it's not good, like, I know, there's no good option, but you've got to make a call.” {Welfare C}

“And people in a disaster don't like to change their original decisions because they believe it maybe it's a reflection of their decision making being incorrect or you know not right and so oftentimes they'll go down a path that we all know is the wrong path because they can't courageously go ‘right this has come to hand we're heading in another direction’ and move things around and it's not their fault it's because it's not their bread and butter it's not what they do every day.” {TWO A}

Least-worst decisions are difficult to make even for practiced individuals, and may be near impossible for individuals who do not normally work in emergency management. It would be beneficial for emergency management across all levels to recruit and retain specialists who are better equipped to make least-worst decisions and provide ongoing training (Ombler et al., 2024). It may be easier for an individual from outside an affected region to make the least-worst decision, or change course as needed, since they will not be directly affected in the long term if a decision is unpopular (i.e., neighbours will not be complaining about their decisions within earshot).

When it comes to least-worst decisions which involve IYCP, it would be prudent to involve the LMC welfare group representative in response-related decision-making processes if possible. The LMC welfare group representative would know from their own planning efforts what resources are needed for the EMCs and LMCs still performing home

births in the community, and how best to allocate those resources.

4.7 Recovery

Recovery is the term for the actions taken after an event which look after an individual and community's cultural and physical well-being, decrease the risk of a disaster escalating, build resilience, and implement changes in communities to be better ready for future risk (NEMA, 2020). This research was conducted in the early phase of recovery for the NISWE, thus perspectives on recovery were not available. During the interviews, participants referenced the psychosocial needs, an important aspect of recovery.

4.7.1 Psychosocial Support and Resiliency

A key aspect of recovery is likely to be psychosocial support for women, young children, and midwives which is tailored to the population being served (Oloruntoba et al., 2018; Pfefferbaum & North, 2016; Ursano et al., 2017). The CDEM Act stipulates psychosocial support is one of the welfare group sub-functions, and is beneficial for individual and community recovery and improving resilience (MoH, 2016; Quinn et al., 2021). In recovery, the primary goal of psychosocial support is “minimise the physical, psychological and social consequences of an emergency” and to “enhance the emotional, social, and physical wellbeing of individuals and communities” (MoH, 2016 p. 11).

In children, a public health based approach aims to improve resilience and coping, as well as support and identify children who would benefit from additional services (Oloruntoba et al., 2018; Pfefferbaum & North, 2016; Ursano et al., 2017), whereas pregnant women and mothers may benefit from support groups tailored to their phase of life which foster collective problem solving and emotional support (MoH, 2016).

After the Canterbury earthquakes over 8000 households were displaced (Matthewman

& Goode, 2020). NZ is actively planning for severe to catastrophic events, including large earthquakes on the HSZ or Alpine Fault, which modelling suggests would result in significantly higher levels of displacement (Orchiston et al., 2016; East Coast Lab, 2020). In interviews with emergency managers, their expectation was that pregnant women and the parents of infants and young children would rely on friends, family, and community organisations for support after an event, and emergency management would function as a safety net for those without adequate social or community resources.

“A lot of the times we push the message of going to friends and family in the first place. And that a lot of the communities—a lot of the rural communities in New Zealand—will just absorb people and will support people that way and then it's those community groups that do that follow up support. The official response kind of comes in behind that and anyone that kind of falls through those cracks is where we come in and empower them to either make use of resources they have or support them when they don't have those types of resources.” {Welfare A}

Relying on friends, family, and community organisations for shelter may make displaced women feel helpless and precarious (Calderon-Rodriguez & Noble, 2022). Prolonged helplessness may result in adverse psychological outcomes in the mother, but strong social relationships are widely considered to be protective against psychological distress (McGuire et al., 2018; Nillni et al., 2013; Tracy et al., 2014).

Stress can be detrimental to pregnancy outcomes, especially when experienced in the first and/or third trimesters, but stress can be decreased with social support (Menclova & Stillman, 2020; St-Pierre et al., 2016). Social support may also improve the birth experience by alleviating the effects of prenatal depressive symptoms on labour (Tani et al., 2022). To improve psychosocial outcomes in recovery, the relevant welfare group subfunction lead should plan for the development, funding, and staffing of support groups for IYCP who were affected by the event, particularly those who had significant losses as a result of the

event.

“And I think just the connection with people when you're in something very similar, just that alone, I think is really helpful.” {LMC B}

Mothers are often rendered invisible in work that focuses on children. Mothers may find it difficult to ask for help, neglecting their own needs, as they work to ensure their children's needs are being met. With appropriate psychosocial support, they may feel more empowered to advocate for their own needs, which may be crucial for preventing burnout and continuing to provide emotional and physical care for their children.

“Mothers are incredibly resourced in their own ability to keep going for their children. We know this. They will sacrifice everything of theirs for their kids. And so we need to absolutely make sure their physical and mental health is supported. And that may be just educating the people around them.” {LMC A}

Support groups would offer mothers a chance to discuss their trials and tribulations with other women in a similar situation who may be able to offer their own solutions, experiences, or resources and could provide a place for children to play safely.

Displaced mothers may not be able to provide the psychosocial stimulation necessary to support infant growth and development while they focus on procuring necessities like long term shelter, processing the losses, and ensuring their children are safe (Brabandere, 2014). Support groups for similarly affected mothers could be an opportunity to foster child development by scheduling time and reiterating the importance of parent-child play sessions, infant massage, and/or psychomotor stimulation. Infants and young children are not immune to the effects of stress, but parental efforts to establish strong, secure, nurturing relationships may improve children's ability to cope with stress (Garner et al., 2021).

Children with engaged and attuned parents have improved resilience in the face of adversity, including many of those common in displacement, like housing insecurity, food insecurity,

and social isolation.

4.8 Summary of Key Research Findings

This chapter identified themes and key takeaways based on the interviews of LMCs, TWO emergency management, welfare group managers, aligned with relevant aspects from a thorough review of the literature.

Reduction

The roles and responsibilities of midwives and other healthcare providers need to be clarified within welfare group functions. Emergency and welfare group managers interviewed assume the care of pregnant women and very young infants (less than six weeks old) is being overseen by TWO, however this is not the case as LMC midwives are independent contractors who use patient tracking software separate from TWO. An LMC representative position within the welfare group would increase the involvement of LMCs in emergency planning.

Readiness

No training specific to IYCP in emergencies currently exists for emergency managers. This training could help ensure they are better able to meet the needs of IYCP and comply with international legislation during an event.

The development and teaching of specialised training for midwifery after a hazard event would be beneficial. While midwives are likely to be well-versed at working in difficult settings, having specific training could improve their readiness. Another means of improving readiness would be through the creation of emergency planning for midwives, particularly EMCs. This planning should include an operational structure which allows for easy integration within CIMS.

Other preparedness efforts include creating recommendations for an emergency birth kit, to supplement a midwife's normal birth kit.

The available public-facing resources for emergency preparedness for pregnant women, and the parents of infant and young children do not comply with international best practice and are unfit for purpose. A significant update to the existing resources is required, and should adhere to international legislation. With the prevalence of smartphones, an interactive multi-hazard and preparedness app specific to NZ would likely be beneficial to develop. As Dallo & Marti (2021) note, a multi-hazard app should exist because the public demands it, it allows emergency management and other authorities to reach larger audiences, and it can improve users' preparedness for hazards. The information in this app should include information about safe infant feeding and emergency preparedness. Users would likely want features including the ability to warn friends and family with a share function, a help button, an "I am safe" button, and a "Report an event" button (Dallo & Marti, 2021). The lead agency for the app should be NEMA, as it is essentially another version of their GetReady website. Other organisations should provide their expertise to ensure the information is not only accurate, but inclusive.

Expectant mothers, especially in rural areas, are likely to face difficulties in accessing maternity care during and after an event. Women in rural areas should be given detailed information, if they are not already, about when to call for emergency services if their midwife is unable to reach them.

Families need to be prepared to be self-sufficient for at least several days, and up to a couple weeks, depending on location. Families with infants and young children will need additional supplies to be emergency ready, and these supplies need to be conveyed in a clear,

easily understood way.

Response

If hospitals are inaccessible after an event, it would be beneficial to implement EMCs so women can access maternity care, advice, and labour safely. Prior to a forecasted event, LMCs should be reminded to charge all of their equipment, fuel their vehicle, and prepare their emergency birth kits. Since it is impossible to forecast every event, this information should be communicated regularly.

In order to keep IYCP safe in an evacuation centre, a BFS should be implemented. BFSs would provide a space for children to play, have the resources for infants to sleep safely, and provide support to mothers so they can continue to care for their families. A BFS may decrease the number of staff required by having all IYCP in a centralised area, rather than dispersed throughout the centre.

International legislation and best practices for the feeding of infants in an emergency have not been followed in recent emergencies. Mothers should be advised of the benefits of sustained breastfeeding and given support for reinitiating breastfeeding. Formula should only be given to those who request it, along with directions and supplies for safe preparation.

Outside of major cities, most staff involved in emergency management responses are not full time emergency managers, and may have little training in emergency management. This may make it difficult to make decisions, or change decisions, as new information becomes available. It would be beneficial for emergency management to create a roster of specialists to provide advice and decision making during an event.

Recovery

Pregnant women and mothers of infants and young children would benefit from ongoing support to decrease adverse psychosocial effects and improve birth outcomes. This could come in the form of support groups facilitated by healthcare professionals.

In summary, there are areas where improvement is needed for NZ to better adhere to international legislation to which it is a signatory. Such improvements could significantly improve the outcomes of IYCP in an event, and many of the suggested measures are practical ways emergency management can better work with the community, one of the overarching recommendations made by Ombler et al. (2024). In addition, many of the findings, particularly including regional representatives from midwifery organisations in welfare group planning and LMC specific event planning, could easily be adapted to work for other vulnerable groups in the community. Finally, the reduction and readiness solutions are likely cost effective, with time being the primary resource.

Chapter 5: Conclusion

5.1 Introduction

Emergency management in NZ often struggles to plan well to meet the needs of IYCP and other vulnerable groups. Hay & Pascoe (2019) found the specific needs of disabled people were not being planned for by emergency management, thus not meeting NZ's commitments to international legislation. When disabled people were discussed, they were lumped in with other vulnerable groups like children and the elderly, though their needs are disparate. For example, emergency mobile alerts are one of the ways event related information is conveyed, but elderly people may not have or use the necessary technology to receive the alerts (Tan et al., 2021; Tuohy & Stephens, 2011). Gray et al. (2022) found the suitability and accessibility of evacuation centres were a concern for big bodied people including whether beds and chairs would be able to hold their weight, if they would be able to use the toilet, and whether they would be able to use necessary medical equipment. Open communication and collaboration between emergency management and those with specific needs (or those who care for them) could improve outcomes should a large-scale event occur.

5.2 Summary of Research Objectives

The aim of this research was to examine the strengths and weaknesses of IYCP planning and response in NZ. The research questions were:

- How has emergency management, both internationally and domestically, planned to meet the needs of IYCP in an event?
- How well did the emergency response to Cyclone Gabrielle align with international best practices for IYCP?

- What were the experiences of IYCP in recent events in NZ, with particular interest in Cyclone Gabrielle in the Hawke's Bay?
- How might the needs of IYCP be better met in an event?

How has emergency management, both internationally and domestically, planned to meet the needs of IYCP in an event?

The bulk of planning for IYCP in emergencies internationally and in NZ is specific to infant feeding. Through the course of the interviews, it was determined that IYCP needs may not be accounted for in welfare group function planning due to lack of representation from those who provide the bulk of maternity care in NZ. While NZ welfare coordination groups have planning for unaccompanied children in evacuation centres, there is no planning for safely accommodating ICYP. There is no planning to ensure pregnant women and mothers of very young infants can access necessary care if hospitals are inaccessible or inundated with emergency patients.

How well did the emergency response to Cyclone Gabrielle align with international best practices for IYCP? What were the experiences of IYCP in recent events in NZ, with particular interest in Cyclone Gabrielle in the Hawke's Bay?

Based on the interviews with midwives, which may not be indicative of IYCP in affected areas, parents and pregnant women did not receive information about the locations of EMCs or safe infant feeding practices during or after the cyclone. The needs may have been largely met during the response to Cyclone Gabrielle, but not due to emergency management planning. Credit is overwhelmingly due to the LMCs, with no emergency management training or CDEM support, who opened and operated emergency maternity clinics under their own initiative. While LMCs are commended for operating EMCs and ensuring patients received ongoing care, their experiences highlighted gaps which could improve emergency management response in the future.

In recent events in NZ, infant feeding has not adhered to international legislation, as infant formula was given in all aid boxes to any parents with an infant. Providing formula to all infant parents, including breastfeeding mothers, may inadvertently communicate that formula is a better option for infant feeding than breastmilk.

The expectation of emergency managers is to only operate evacuation centres short term and relocate people to alternative accommodation. While in recent events evacuation centres have not been overrun, a future event like the HSZ earthquake and tsunami is predicted to displace significantly more people, forcing evacuation centres to scale up operations. If an event the scale of the HSZ scenario were to take place when there are a significant number of tourists (e.g., summer, Rugby World Cup, Art Deco Weekend), there may not be adequate vacancy in hotels or holiday rentals to accommodate the affected population. The expected hundreds to thousands of fatalities and tens of thousands of injuries would put significant strain on the availability of health services. IYCP requiring care, critical or otherwise, may find it difficult to access due to crowding and significant wait times. Parents of infants, especially infants too young to be vaccinated, may be especially hesitant to go to crowded healthcare facilities. Thus, it is important emergency management include specific plans for IYCP in regards to feeding, safe accommodation, and continuity of maternity care following a significant event.

How might emergency management better meet the needs of IYCP in an event?

The needs of IYCP could be better met though including LMCs in welfare group function planning. LMCs are likely to serve as first responders in an event, and having an existing relationship with CDEM would likely enable them to better meet the needs of not only IYCP, but those with minor injuries requiring care. The structure of maternity care and

healthcare systems in NZ could allow emergency management and TWO to work with LMCs to create and implement innovative planning for IYCP.

Alternatively, at a national level, an IYCP coordinator position could be created within NEMA, who would act as a consultant for CDEM and welfare groups in planning and event response and recovery. The responsibilities associated with this position would align with those outlined in the OG-IFE including, but not limited to: analysing and updating existing IYCP policy and guidelines, developing and implementing communication strategies, developing preparedness plans in collaboration with other sectors, coordinating infant feeding support and management during an event, and managing any conflicts of interest (IFE Core Group, 2017).

5.3 Recommendations

Based on the research findings, the following recommendations are intended to improve IYCP outcomes in future emergencies.

- It would be highly beneficial to include midwives in welfare group function meetings and plans. Midwives possess a deep and intimate knowledge of the community they work in, but are not involved in planning for risk reduction. It is likely assumed LMC midwives fall under the TWO umbrella in the welfare group function, however as self-employed contractors, they are a separate entity. Midwifery organisations should work with their members to identify appropriate regional LMC representatives to attend and advocate at welfare group meetings. The role could be funded by NEMA as part of their commitment to “direct a greater share of emergency management investment in community resilience initiatives” and “expand the number and quality of formal agreements with

businesses, community organisations, (...) to deliver assistance in times of emergency” (NZ Government, 2024, p.17-18).

- Emergency management would benefit from IYCP specific training, as currently none exists. Additionally, specialised training for midwives may make them feel more prepared and confident participating in welfare groups, CIMS, and responding to an event. The courses could be developed as a collaborative effort between NEMA and midwifery organisations or university midwifery lecturers.
- Midwifery organisations should create planning for EMCs, including an organisational structure with clear roles and responsibilities. If LMCs are able to open and operate EMCs immediately after an event, it may reduce IYCPs reliance on hospitals for maternity care and treatment of minor injuries, leaving hospitals better able to help those in need of critical care.
- During an event, additional supplies may be required to facilitate maternity care during an event. These additional supplies could be stored together as an emergency supplement to standard birth kits. Maternity organisations should develop a recommended list of items for members. LMCs should be reminded of these prior to a forecasted event (if possible to forecast) to charge their equipment and ensure emergency birth kits are stocked.
- Mothers of infants do not have access to accurate, functional emergency preparedness advice on infant feeding which adheres to legislation and best practices. It may be beneficial to develop information resources such as a multi-hazard disaster app with a corresponding physical pamphlet. At the bare minimum, the existing TWO (2024) guidelines need significant updating. This

document should be reviewed by an expert in infant feeding in emergencies to ensure it adheres to international legislation and best practices.

- Many regions of NZ do not have a full-time emergency manager employed as a member of council staff. Staff filling this role during an emergency may not feel comfortable or educated enough to make decisions for IYCP which align with legislation. This may be ameliorated by contracting with IYCP specialists to respond during an event.
- Evacuation centres may be dangerous for infants and young children who are at higher risk of injury as safe infant sleep may not be supported and there may be uncontrolled hazards such as power outlets and cables. A baby friendly space, accessible to parents of infants and young children, would have a space where children could play safely, breastfeeding is supported, and have the supplies necessary for safe sleep. A BFS could provide formula, supplies for use, and information on safe preparation on request.
- CDEM and/or TWO should ensure that culturally appropriate psychosocial support for pregnant women, mothers, and young children is available as part of recovery to improve resilience and decrease risk of adverse outcomes.

5.4 Limitations and Future Research

A limitation in the findings of this research was that, other than myself, the experiences and perspectives of pregnant women and parents of infants and young children during the severe weather events were not researched. To fit within the constraints of a Masters project, only the perspectives of professionals were considered. First hand accounts of pregnant women and the parents of infants and young children may provide a more

nuanced picture of their needs and concerns during and after an event. Additional research should be done to document their experiences, ideally before too much time has lapsed since the event they experienced following hazard events. Their perspectives may provide the context necessary to design guidelines tailored to local contexts.

Another limitation was the small sample size. With few participants from either category, it is difficult to extrapolate whether findings are likely to be true across NZ. As there were no more than a few participants from each organization or category, it was impossible to achieve data saturation (Marshall et al., 2013). Future research would benefit from more interviews with members of the welfare group function, midwives, and NEMA.

While research has shown the benefits of breastfeeding in an emergency, it may not be achievable for some mothers. Organisations providing formula should develop policies to ensure it is given appropriately and safely. Researchers could then assess the efficacy of these policies by evaluating if and how well the policies are followed after a future event.

As the NZDF plays a significant role in disaster relief in both domestic and neighbouring Pacific islands (Govt. New Zealand, 2022), an audit of their IYCP planning and procedures could be conducted. This would help ensure the NZDF provides IYCP with necessary humanitarian and disaster relief supplies in a safe and expedient manner.

5.5 Conclusion

This research has provided the first data from an exploratory study of NZ's preparedness and ability to meet the needs of IYCP in an event. These findings could be used to improve the outcomes for IYCP during and after an event by ensuring their needs are accounted for and planned for in each of the 4Rs. To reduce risk, roles and responsibilities of welfare group members should be clarified, LMCs need to be included in

welfare group planning, and LMCs need to create their own emergency plans. Readiness could be enhanced by ensuring patients and LMCs are prepared for an event by creating comprehensible, tailored plans with accurate information. During response, IYCP safety could be improved at emergency management centres through the use of baby tents with breastfeeding support, safe sleep areas, and formula with appropriate feeding implements. Once an event shifts to recovery, policies to maintain and strengthen psychosocial wellbeing can improve IYCP and community resilience.

During Cyclone Gabrielle, the initiative of LMCs enabled IYCP to access care and treatment when they were unable to access hospitals. Emergency management and other community responders should look to them as an example of resourcefulness, determination, and commitment to care during and after an event.

References

- Abimibayo Adeoya, A., Sasaki, H., Fuda, M., Okamoto, T., & Egawa, S. (2022). Child nutrition in disaster: a scoping review. *The Tohoku Journal of Experimental Medicine*, 256(2), 103-118. <https://doi.org/10.1620/tjem.256.103>
- Abu-Saad, K., & Fraser, D. (2010). Maternal Nutrition and Birth Outcomes. *Epidemiol Rev*, 32, 5-25. <https://doi.org/10.1093/epirev/mxq001>
- Adams, W. C. (2015). Conducting semi-structured interviews. In *Handbook of Practical Program Evaluation* (pp. 492-505). <https://doi.org/https://doi.org/10.1002/9781119171386.ch19>
- Adler, P., & Kwon, S. W. (2002). Social capital: Prospects for a new concept. *Academy of Management Review*, 27, 17-40. <https://doi.org/10.5465/AMR.2002.5922314>
- Adu, M. K., Eboreime, E., Shalaby, R., Sapara, A., Agyapong, B., Obuobi-Donkor, G., Mao, W., Owusu, E., Oluwasina, F., Pazderka, H., & Agyapong, V. I. O. (2022). Five years after the Fort McMurray wildfire: Prevalence and correlates of low resilience. *Behav Sci (Basel)*, 12(4). <https://doi.org/10.3390/bs12040096>
- Adu, P. (2019). *A step-by-step guide to qualitative data coding*. Routledge.
- AFP. (2024). Still in ruins: the 2023 Turkish earthquake then and now. *The Guardian*. <https://www.theguardian.com/world/2024/feb/02/2023-turkish-earthquake-then-and-now>
- Aldrich, D. P., & Meyer, M. A. (2015). Social capital and community resilience. *American Behavioral Scientist*, 59(2). <https://journals.sagepub.com/doi/abs/10.1177/0002764214550299>
- Alexander, D. E. (2010). The L'Aquila Earthquake of 6 April 2009 and Italian Government policy on disaster response. *Journal of Natural Resources Policy Research*, 2(4), 325-342. <https://doi.org/10.1080/19390459.2010.511450>
- Alberta Health. (2015). *Primary health care community profile: Fort McMurray*. <https://open.alberta.ca/dataset/1cc7e9cd-6cd2-4ae5-9314-9faad886a91b/resource/477e153e-ecba-4fe5-8d57-6a8c3ac6365c/download/PHC-Profile-FortMcMurray.pdf>
- Allen, A. T., Flinn, A. M., Moore, W. F., Allen, A. T., Flinn, A. M., & Moore, W. F. (2007). The 81st Medical Group obstetrics and gynecology flight's role during Hurricane Katrina. *Military Medicine*, 172(2), 199-201. <https://pubmed.ncbi.nlm.nih.gov/17357777/>
- Almeida, F. (2018). Strategies to perform a mixed methods study. 2018. <https://doi.org/10.46827/ejes.v0i0.1902>
- Ambeskovic, M., Laplante, D. P., Kenney, T., Elgbeili, G., Beaumier, P., Azat, N., Simcock, G., Kildea, S., King, S., & Metz, G. A. S. (2022). Elemental analysis of hair provides biomarkers of maternal hardship linked to adverse behavioural outcomes in 4-year-old children: The QF2011 Queensland Flood Study. *Journal of Trace Elements in Medicine and Biology*, 73, 127036. <https://doi.org/https://doi.org/10.1016/j.jtemb.2022.127036>
- American College of Obstetricians and Gynecologists. (2025). *Preparing for disaster: Addressing critical obstetric and gynecological needs of patients*. <https://www.acog.org/clinical/clinical-guidance/committee-statement/articles/2025/01/>

[preparing-for-disasters-addressing-critical-obstetric-and-gynecologic-needs-of-patients](#)

- Amjad, S., Chojecki, D., Osornio-Vargas, A., & Ospina, M. B. (2021). Wildfire exposure during pregnancy and the risk of adverse birth outcomes: a systematic review. *Environment International*, 156, 106644. <https://doi.org/10.1016/j.envint.2021.106644>
- Anastario, M., Shehab, N., & Lawry, L. (2009). Increased gender-based violence among women internally displaced in Mississippi two years post-Hurricane Katrina. In *Disaster Medicine & Public Health Preparedness* (Vol. 3, pp. 18-26). <https://pubmed.ncbi.nlm.nih.gov/19293740/#:~:text=GBV%20experience%20was%20significantly%20associated,the%20protracted%20phase%20of%20displacement>
- Ariyabandu, M. M. (2009). Sex, gender and gender relations in disasters. In E. Enarson & P. G. Chakrabarti (Eds.), *Women, gender and disaster: global issues and initiatives*. SAGE Publications India.
- De Brabandere, A. D., Dozio, E., & Bizouerne, C. (2014). *Baby friendly spaces: Holistic approach for pregnant, lactating women and their very young children in emergency*. <https://www.enonline.net/babyfriendlyspaces>
- Atkinson, J., Salmond, C., & Crampton, P. (2019). *NZDep2018 Index of Deprivation, final research report, December 2020*. University of Otago. https://www.otago.ac.nz/data/assets/pdf_file/0020/326711/nzdep2018-index-of-deprivation-research-report-final-dec-2020-823833.pdf
- Atyeo, C., & Alter, G. (2021). The multifaceted roles of breast milk antibodies. *Cell*, 184(6), 1486-1499. <https://doi.org/10.1016/j.cell.2021.02.031>
- Auckland Council. (2023). *Civil Defence centres and shelters open from 7pm*. <https://ourauckland.aucklandcouncil.govt.nz/news/2023/02/civil-defence-centres-and-shelters-open-from-7pm/>
- Auckland Emergency Management. (2019). *Welfare coordination in emergencies*. https://infocouncil.aucklandcouncil.govt.nz/Open/2019/03/SEN_20190318_AGN_8260_AT_files/SEN_20190318_AGN_8260_AT_Attachment_66727_2.PDF
- Austin, M.-P., Christl, B., McMahon, C., Kildea, S., Reilly, N., Yin, C., Simcock, G., Elgbeili, G., Laplante, D.P., & King, S. (2017). Moderating effects of maternal emotional availability on language and cognitive development in toddlers of mothers exposed to a natural disaster in pregnancy: the QF2011 Queensland Flood Study. *Infant Behavior and Development*, 49, 296-309. <https://pubmed.ncbi.nlm.nih.gov/29096237/>
- Ayoya, M. A., Golden, K., Ngnie-Teta, I., Moreaux, M. D., Mamadoulaibou, A., Koo, L., Boyd, E., Beauliere, J.M., Lesaver, C., & Marhone, J. P. (2013). Protecting and improving breastfeeding practices during a major emergency: Lessons learnt from the baby tents in Haiti. *Bull World Health Organ*, 91(8), 612-617. <https://doi.org/10.2471/blt.12.113936>
- Bachmann, D. J., Jamison, N. K., Martin, A., Delgado, J., & Kman, N. E. (2015). Emergency preparedness and disaster response: There's an app for that. *Prehospital and Disaster Medicine*, 30(5), 486-490. <https://doi.org/10.1017/S1049023X15005099>

- Backes, E. P., & Scrimshaw, S. C. (2020). *Birth settings in America: Outcomes, quality, access, and choice*. <https://www.ncbi.nlm.nih.gov/books/NBK555484/>
- Bailie, J., Matous, P., Apelt, B., Longman, J., Mcnaught, R., Morgan, G.,...Bailie, R. (2024). Flooding and health in Australia: a scoping review and coauthorship analysis of published research. *BMJ Open*, 14(12), e089039. <https://doi.org/https://doi.org/10.1136/bmjopen-2024-089039>
- Baker, D. (2011). Maternity leave and reduced future earning capacity. *Australian Institute of Family Studies*, 89, 82-89. <https://flosse.dss.gov.au/flossejspui/handle/10620/17383>
- Bamberger, M. & Mabry, L. (2020). *RealWorld evaluation: working under budget, time, data, and political constraints*. SAGE Publications, Inc.
- Barry, S., Buckle, H., Newhook, L. A. A., Roebbothan, B., Howell, B., Gates, H., & Twells, L. K. (2024). High rates of International Code violations: a cross-sectional study in a region of Canada with low breastfeeding rates. *BMC Research Notes*, 17(1), 71. <https://doi.org/10.1186/s13104-024-06725-8>
- Bartle, C. (2011). Infant feeding in emergencies: Reflections on the Christchurch earthquake. *Midwifery News*(61), 31-32.
- Becker, G.E., Zambrano, P., Ching, C., Cashin, J., Burns, A., Policarpo, E., Datu-Sanguyo, J., & Mathisen, R. (2022). Global evidence of persistent violations of the International Code of Marketing of Breast-milk Substitutes: a systematic scoping review. *Maternal and Child Nutrition*, 18(S3). <https://doi.org/10.1111/mcn.13335>
- Beek, K., McFadden, A., & Dawson, A. (2019). The role and scope of practice of midwives in humanitarian settings: a systematic review and content analysis. *Hum Resour Health*, 17(1), 5. <https://doi.org/10.1186/s12960-018-0341-5>
- Blake, D., Marlowe, J., & Johnston, D. (2017). Get prepared: Discourse for the privileged? *International Journal of Disaster Risk Reduction*, 25, 283-288. <https://doi.org/https://doi.org/10.1016/j.ijdr.2017.09.012>
- Blake, D., Miller, A., & Rampton, A. (2017). Get prepared for an emergency: an infographic. *Australasian Journal of Disaster and Trauma Studies (Online)*. https://trauma.massey.ac.nz/issues/2017-1/AJDTS_21_1_Blake.pdf
- Boston, J., McIntosh, T., Cram, F., Henaghan, M., Howden-Chapman, P., O'Reilly, P., Poulllton, R., Prescott, J., Roberts, C., & Stephens, R. (2012). *Solutions to child poverty in New Zealand: Evidence for action*. Office of the Children's Commissioner, NZ. https://ourarchive.otago.ac.nz/esploro/outputs/report/Solutions-to-Child-Poverty-in-New/9926478794401891?institution=64OTAGO_INST
- Boudova, S., Han, C., Hughes, B. L., & Joseph, N. (2025). Wildfires and air quality. *Society for Maternal Fetal Medicine*. <https://www.smfm.org/wildfires-and-air-quality>
- Brabandere, A., David, A., & Dozio, E. (2014). *Baby friendly spaces: Holistic approach for pregnant, lactating women and their very young children in emergency*. Action Against Hunger. <https://www.actionagainsthunger.org/publications/baby-friendly-spaces-technical-manual>
- Bradford, B. F., Wilson, A. N., Portela, A., McConville, F., Fernandez Turienzo, C., & Homer, C. S. E. (2022). Midwifery continuity of care: a scoping review of where, how, by whom and for whom? *PLOS Global Public Health*, 2(10), e0000935. <https://doi.org/10.1371/journal.pgph.0000935>
- Bradley, A. (2025). How pulling out of a long-planned new infant formula standard left the

- government with an expensive problem. RNZ. <https://www.rnz.co.nz/news/in-depth/562965/how-pulling-out-of-a-long-planned-new-infant-formula-standard-left-the-government-with-an-expensive-problem>
- Braun, V., & Clarke, V. (2013). *Successful qualitative research: a practical guide for beginners*. SAGE.
- Britten, N. (1995). Qualitative interviews in medical research. *BMJ (Clinical research ed.)*, 311, 251-253. <https://doi.org/10.1136/bmj.311.6999.251>
- Brodie, M., Weltzien, E., Altman, D., Blendon, R. J., & Benson, J. M. (2006). Experiences of Hurricane Katrina evacuees in Houston Shelters: Implications for future planning. *American Journal of Public Health*, 96(8), 1402-1408. <https://doi.org/10.2105/ajph.2005.084475>
- Bündnis Entwicklung Hilft/IFHV. (2024). *World Risk Report*. https://weltrisikobericht.de/wp-content/uploads/2023/10/WRR_2023_english_online161023.pdf
- Burton, J. R. A., Mora, K., Rive, G. C., & Thomas, J. A. (2015). Can the disaster displaced overstay their welcome? Temporary accommodation and billeting in the Canterbury, New Zealand earthquake sequence. *International Journal of Emergency Management*, 11(3), 240-261. <https://doi.org/10.1504/ijem.2015.071708>
- Bush International Consulting (2024). *Hawke's Bay civil defence and emergency management group response to Cyclone Gabrielle*. <https://www.hbemergency.govt.nz/assets/Uploads/HBCDEM-Response-to-Cyclone-Gabrielle-Final-Report.pdf>
- Bussi eres, E.-L., Tarabulsky, G. M., Pearson, J., Tessier, R., Forest, J.-C., & Gigu ere, Y. (2015). Maternal prenatal stress and infant birth weight and gestational age: a meta-analysis of prospective studies. *Developmental Review*, 36, 179-199. <https://doi.org/10.1016/j.dr.2015.04.001>
- Calderon-Rodriguez, C., & Noble, L. (2022). Infant feeding after a disaster. In R. A. Lawrence & R. M. Lawrence (Eds.), *Breastfeeding* (pp. 695-703). Elsevier. <https://doi.org/10.1016/b978-0-323-68013-4.00023-7>
- Callaghan, W. M., Rasmussen, S. A., Jamieson, D. J., Ventura, S. J., Farr, S. L., Sutton, P. D., Mathews, T. J., Hamilton, B. E., Shealy, K. R., Brantley, D., & Posner, S. F. (2007). Health concerns of women and infants in times of natural disasters: Lessons learned from Hurricane Katrina. *Maternal & Child Health Journal*, 11(4), 307-311. <https://doi.org/10.1007/s10995-007-0177-4>
- Cameron, E. L. (2014). Pregnancy and olfaction: a review. *Frontiers in Psychology*, 5. <https://doi.org/10.3389/fpsyg.2014.00067>
- Carmen, E., Fazey, I., Ross, H., Bedinger, M., Smith, F. M., Prager, K., McClymont, K., & Morrison, D. (2022). Building community resilience in a context of climate change: the role of social capital. *Ambio*, 51(6), 1371-1387. <https://doi.org/10.1007/s13280-021-01678-9>
- Casarotti, C., Pavese, A., & Peloso, S. (2009). Seismic response of the San Salvatore Hospital of Coppito (L'Aquila) during the 6th April 2009 earthquake. *Progettazione Sismica*, 3, 159-172.
- Cazabat, C. (2019). *Sex matters: a gender perspective on internal displacement*. https://api.internal-displacement.org/sites/default/files/publications/documents/201902-gender-dimension.pdf?_gl=1*16f4mca*_ga*MTkzNjI5NjI5Ny4xNzQzMTI0NzAx*_ga_PKVS5L6N8V*cz

- E3NDY0OTg4MDAkzIkZzEkdDE3NDY0OTg5OTMkajQ5JGwwJGgw
- CDC. (2024a). *Wildfire smoke and children*. <https://www.cdc.gov/wildfires/risk-factors/wildfire-smoke-and-children.html>
- CDC. (2024b). *Wildfire smoke and pregnancy*. <https://www.cdc.gov/wildfires/risk-factors/wildfire-smoke-and-pregnancy.html>
- CDC. (2024c). *How to clean, sanitize, and store infant feeding items frequently asked questions*. <https://www.cdc.gov/hygiene/faq/index.html>
- Chu, K., Trelles, M., & Ford, N. (2010). Rethinking surgical care in conflict. *The Lancet*, 375(9711), 262-263. [https://doi.org/https://doi.org/10.1016/S0140-6736\(10\)60107-9](https://doi.org/https://doi.org/10.1016/S0140-6736(10)60107-9)
- Colaceci, S., Raparelli, I., Cerizzo, M., Oliva, C., Dibello, A., Tiberi, P., Carbonelle, M., De Caroli, A., & Guisti, A. (2018). *Adhering to and developing strategies for infant feeding in emergencies: the experience of the Municipality of Marino (Rome) for a participatory municipal emergency plan*. <https://www.epicentro.iss.it/ben/2018/settembre/alimentazione-infantile-emergenze-marino>
- Cook, V. (2010). Infant feeding in emergencies. *British Journal of Midwifery*, 18(1), 32-36.
- Coppola, D. P. (2020). *Introduction to international disaster management* (Fourth ed.). Butterworth-Heinemann.
- Cordero, J. F. (1993). The epidemiology of disasters and adverse reproductive outcomes: Lessons learned. *Environ Health Perspect*, 101 (Suppl 2), 131-136. <https://doi.org/10.1289/ehp.93101s2131>
- Crowther, S., Maude, R., Zhao, I. Y., Bradford, B., & Gilkison, A. (2022). New Zealand maternity and midwifery services and the COVID-19 response: a systematic scoping review. *Women and Birth*, 35(3), 213-222. <https://doi.org/https://doi.org/10.1016/j.wombi.2021.05.008>
- Daellenbach, R., Davies, L., Kensington, M., Crowther, S., Gilkison, A., Deery, R., & Rankin, J. (2020). Rural midwifery practice in Aotearoa/New Zealand: Strengths, vulnerabilities, opportunities and challenges. *New Zealand College of Midwives Journal*(56).
- Daemers, D. O. A., van Limbeek, E. B. M., Wijnen, H. A. A., Nieuwenhuijze, M. J., & Vries, R. G. (2017). Factors influencing the clinical decision-making of midwives: a qualitative study. *BMC Pregnancy and Childbirth*, 17(1), 345. <https://doi.org/10.1186/s12884-017-1511-5>
- Dall'Oglio, I., Marchetti, F., Mascolo, R., Amadio, P., Gawronski, O., Clemente, M., Dotta, A., Ferro, F., Garofalo, A., Salvatori, G., Tarantino, A., Tiozzo, E., & Giusti, A. (2020). Breastfeeding protection, promotion, and support in humanitarian emergencies: a systematic review of literature. *J Hum Lact*, 36(4), 687-698. <https://doi.org/10.1177/0890334419900151>
- Dallo, I., & Marti, M. (2021). Why should I use a multi-hazard app? Assessing the public's information needs and app feature preferences in a participatory process. *International Journal of Disaster Risk Reduction*, 57, 102197. <https://doi.org/https://doi.org/10.1016/j.ijdrr.2021.102197>
- Dancause, K. N., Laplante, D. P., Oremus, C., Fraser, S., Brunet, A., & King, S. (2011). Disaster-related prenatal maternal stress influences birth outcomes: Project Ice Storm. *Early Hum Dev*, 87(12), 813-820. <https://doi.org/10.1016/j.earlhumdev.2011.06.007>
- De Haen, H., & Hemrich, G. (2007). The economics of natural disasters: Implications and

- challenges for food security. *Agricultural Economics*, 37(s1), 31-45. <https://doi.org/https://doi.org/10.1111/j.1574-0862.2007.00233.x>
- CDEM (2019). *Coordinated incident management system (CIMS)*. Officials' Committee for Domestic and External Security Coordination.
- CDEM & NEMA. (2019). National disaster resilience strategy. *Rautaki ā-Motu Manawaroa Aituā*.
- DesRoches, R., Comerio, M., Eberhard, M., Mooney, W., & Rix, G. J. (2011). Overview of the 2010 Haiti Earthquake. *Earthquake Spectra*, 27(1_suppl1), 1-21. <https://doi.org/10.1193/1.3630129>
- DeYoung, S. E., Chase, J., Branco, M. P., & Park, B. (2018). The effect of mass evacuation on infant feeding: the case of the 2016 Fort McMurray Wildfire. *Maternal & Child Health Journal*, 22(12), 1826-1833. <https://doi.org/10.1007/s10995-018-2585-z>
- Drisko, J. W., Maschi, T., Drisko, J., & Maschi, T. (2015). Qualitative Content Analysis. *Content Analysis*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780190215491.003.0004>
- Drolet, J. L., McDonald-Harker, C., Lalani, N., McGreer, S., Brown, M. R. G., & Silverstone, P. H. (2021). Early childhood development in the aftermath of the 2016 wildfires in Alberta, Canada. *Journal on Education in Emergencies*, 7(1), 54-79. <https://doi.org/10.33682/u3ar-wwzm>
- Du, X., Zhang, J., Xu, J., He, Z., Lai, J., Li, Y., Kimura, R., Hayashi, H., Hosokawa, M., & Sakurada, Y. (2015). Comparative analysis of earthquake emergency response in China and Japan based on timeline: 311 Earthquake vs 512 Earthquake. *Journal of Disaster Research*, 10(2), 276-287. <https://doi.org/10.20965/jdr.2015.p0276>
- Duff, M. (2019). The last midwife, and the first babies born in the world. *Stuff*. <https://www.stuff.co.nz/national/health/114367158/the-last-midwife-and-the-first-babies-born-in-the-world>
- East Coast Lab (2020). *Hikurangi response planning: Life at the boundary*. <https://www.eastcoastlab.org.nz/assets/Reports-and-documents/HRPlanning-Toolbox.pdf>
- Ejemot, R. I., Ehiri, J. E., Meremikwu, M. M., & Critchley, J. A. (2009). Cochrane review: Hand washing for preventing diarrhoea. *Evidence-Based Child Health: A Cochrane Review Journal*, 4(2), 893-939. <https://doi.org/https://doi.org/10.1002/ebch.373>
- English, J. (2020). *Millions of children affected by devastating flooding in South Asia, with many more at risk as COVID-19 brings further challenges*. UNICEF. <https://www.unicef.org/press-releases/millions-children-affected-devastating-flooding-south-asia-many-more-risk-covid-19>
- Erat Nergiz, M., Barutçu, A., Güneş, B., Almış, H., Yılmaz Öztörün, Z., Tezol, Ö., Karabayır, N., Kabakoğlu Ünsür, E., Örün, E., & Yalçın, S. S. (2025). Breastfeeding problems and associated factors: a cross-sectional study after the 2023 Türkiye earthquake. *International Breastfeeding Journal*, 20(1), 32. <https://doi.org/10.1186/s13006-025-00724-6>
- European Commission. (2024). *8 crises the world must not look away from in 2024*. https://civil-protection-humanitarian-aid.ec.europa.eu/news-stories/stories/8-crises-world-must-not-look-away-2024_en
- Faa, G., Fanos, V., Manchia, M., Van Eyken, P., Suri, J. S., & Saba, L. (2024). The fascinating theory of fetal programming of adult diseases: a review of the

- fundamentals of the Barker hypothesis. *Journal of Public Health Research*, 13(1), 22799036241226817. <https://doi.org/10.1177/22799036241226817>
- Fischer-Preßler, D., Posegga, O., & Fischbach, K. (2016). *Communication barriers in crisis management: a literature review*. Twenty-Fourth European Conference on Information Systems, https://www.researchgate.net/publication/301770566_Communication_Barriers_in_Crisis_Management_A_Literature_Review
- Fisher Wilson, J. (2006). Health and the environment after Hurricane Katrina. *Annals of Internal Medicine*, 144(2), 153-156. <https://doi.org/10.7326/0003-4819-144-2-200601170-00029>
- Fram, M. S., Williams, R. C., Frongillo, E. A., Jones, S. J., Burke, M. P., Blake, C. E., & DeLoach, K. P. (2011). Children are aware of food insecurity and take responsibility for managing food resources. *Journal of Nutrition*, 141(6), 1114-1119-1119. <https://doi.org/10.3945/jn.110.135988>
- Galletta, A., & Cross, W. E. (2013). *Mastering the semi-structured interview and beyond: from research design to analysis and publication*. NYU Press. <https://doi.org/10.18574/nyu/9780814732939.001.0001>
- Garner, A., & Yogman, M. (2021). Preventing childhood toxic stress: Partnering with families and communities to promote relational health. *Pediatrics*, 148(2). <https://doi.org/10.1542/peds.2021-052582>
- Garner, A. S., & Shonkoff, J. P. (2012). Early childhood adversity, toxic stress, and the role of the pediatrician: Translating developmental science into lifelong health. *Pediatrics*, 129(1), e224-231. <https://doi.org/10.1542/peds.2011-2662>
- Gheissari, R., Liao, J., Garcia, E., Pavlovic, N., Gilliland, F. D., Xiang, A. H., & Chen, Z. (2022). Health outcomes in children associated with prenatal and early-life exposures to air pollution: a narrative review. *Toxics*, 10(8), 458.
- Giacomozi, M., Muntinga, M., & Pezaro, S. (2025). Commentary: Effective communication about pregnancy, birth, lactation, breastfeeding and newborn care: the importance of sexed language. *Frontiers in Global Women's Health*, 5. <https://doi.org/10.3389/fgwh.2024.1519979>
- Giovinazzi, S., Stevenson, J. R., Mitchell, J., & Mason, A. (2012). *Temporary housing issues following the 22nd Christchurch Earthquake*, NZ. Proceedings of the New Zealand Society for Earthquake Engineering Conference, Christchurch, New Zealand,
- Giusti, A., Marchetti, F., Zambri, F., Pro, E., Brillo, E., & Colaceci, S. (2022). Breastfeeding and humanitarian emergencies: the experiences of pregnant and lactating women during the earthquake in Abruzzo, Italy. *International Breastfeeding Journal*, 17(1), 45. <https://doi.org/10.1186/s13006-022-00483-8>
- Glarum, J., & Adrianopoli, C. (2020). Decision making in emergencies, disasters, and catastrophic events. In J. Glarum & C. Adrianopoli (Eds.), *Decision Making in Emergency Management* (pp. 61-131). Butterworth-Heinemann. <https://doi.org/10.1016/B978-0-12-815769-5.00004-X>
- Goddard, F. W., Gibson, P. B., & Rampal, N. (2025). High-resolution climate change projections of atmospheric rivers over the South Pacific. *Journal of Geophysical Research: Atmospheres*, 130(6), e2024JD041572. <https://doi.org/https://doi.org/10.1029/2024JD041572>
- Goh, S.L. (2016). 9 babies from intensive care unit evacuated from Fort McMurray hospital

- during fire. *Global News*. <https://globalnews.ca/news/2679758/9-babies-from-intensive-care-unit-evacuated-from-fort-mcmurray-hospital-during-fire/>
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report*, 8(4), 597-607.
- Gontijo de Castro, T., Araujo Teixeira, J., Gerritsen, S., Grant, C. C., Marchioni, D. M., Morton, S. M. B., Pillai, A., & Wall, C. R. (2018). *Infant feeding in New Zealand: adherence to food and nutrition guidelines among the growing up in New Zealand cohort*. Ministry of Social Development.
- Govt. New Zealand (2022). *Update on NZDF support to Tonga: 22 January 2022* <https://reliefweb.int/report/tonga/update-nzdf-support-tonga-22-january-2022>
- Gray, L., Becker, J. S., MacDonald, C., & Johnston, D. (2022). Sizing up disaster risk reduction: a qualitative study of the voices of big bodied people in Aotearoa New Zealand. *International Journal of Disaster Risk Reduction*, 74, 102922. <https://doi.org/https://doi.org/10.1016/j.ijdr.2022.102922>
- Gribble, K., Peterson, M., & Brown, D. (2019). Emergency preparedness for infant and young child feeding in emergencies (IYCF-E): an Australian audit of emergency plans and guidance. *BMC Public Health*, 19(1), 1278. <https://doi.org/10.1186/s12889-019-7528-0>
- Gribble, K. D., & Berry, N. J. (2011). Emergency preparedness for those who care for infants in developed country contexts. *International Breastfeeding Journal*, 6(1), 16. <https://doi.org/10.1186/1746-4358-6-16>
- Gribble, K. D., Bewley, S., Bartick, M. C., Mathisen, R., Walker, S., Gamble, J., Bergman, N.J., Gupta, A., Hocking, J.J., & Dahlen, H. G. (2022). Effective communication about pregnancy, birth, lactation, breastfeeding and newborn care: the importance of sexed language. *Frontiers in Global Women's Health*, 3. <https://doi.org/10.3389/fgwh.2022.818856>
- Gribble, K. D., Hamrosi, M., & Tawia, S. (2024). Experiences and support for caregivers of infants and young children: 2019-20 bushfires. *The Australian Journal of Emergency Management*, 39(3), 34-41.
- Gribble, K. D., & Palmquist, A. E. L. (2022). ‘We make a mistake with shoes [that's no problem] but...not with baby milk’: Facilitators of good and poor practice in distribution of infant formula in the 2014–2016 refugee crisis in Europe. *Maternal & Child Nutrition*, 18(1), e13282. <https://doi.org/https://doi.org/10.1111/mcn.13282>
- Grigoriadis, S., Graves, L., Peer, M., Mamisashvili, L., Tomlinson, G., Vigod, S. N., Dennis, C.L., Steiner, M., Brown, C., & Cheung, A. (2018). Maternal anxiety during pregnancy and the association with adverse perinatal outcomes: systematic review and meta-analysis. *The Journal of Clinical Psychiatry*, 79(5), 813.
- Grubestic, T. H., & Durbin, K. M. (2022). Breastfeeding, community vulnerability, resilience, and disasters: a snapshot of the United States Gulf Coast. *International Journal of Environmental Research and Public Health*, 19(19), 11847.
- Guan, J., Iellamo, A., Chase, J., & Ververs, M. (2024). Infant formula donations and code violations during earthquake relief efforts in Türkiye in 2023: an observational study. *International Breastfeeding Journal*, 19(1), 62. <https://doi.org/10.1186/s13006-024-00670-9>
- Hales, S., Black, W., Skelly, C., Salmond, C., & Weinstein, P. (2003). Social deprivation and

- the public health risks of community drinking water supplies in New Zealand. *Journal of Epidemiology and Community Health*, 57(8), 581-583. <https://doi.org/10.1136/jech.57.8.581>
- Hamilton, B. E., Martin, J. A., Mathews, T., Sutton, P. D., & Ventura, S. J. (2009). The effect of Hurricane Katrina: Births in the US Gulf Coast region, before and after the storm. <https://stacks.cdc.gov/view/cdc/5550>
- Hargest-Slade, A. C. G., K.D. . (2015). Shaken but not broken: Supporting breastfeeding mothers after the Christchurch earthquake. *Breastfeeding Review*, 23(3), 7-13.
- Harville, E. W., Beitsch, L., Uejio, C. K., Sherchan, S., & Lichtveld, M. Y. (2021). Assessing the effects of disasters and their aftermath on pregnancy and infant outcomes: a conceptual model. *International Journal of Disaster Risk Reduction*, 62, 102415. <https://doi.org/10.1016/j.ijdr.2021.102415>
- Harville, E. W., Xiong, X., & Buekens, P. (2009). Hurricane Katrina and perinatal health. *Birth*, 36(4), 325-331. <https://doi.org/https://doi.org/10.1111/j.1523-536X.2009.00360.x>
- Hassan, A. (2024). What are the largest wildfires in U.S. history? *The New York Times*. <https://www.nytimes.com/2024/03/01/us/largest-wildfires-us.html?searchResultPosition=4>
- Hay, K., & Pascoe, K. M. (2019). Disabled people and disaster management in New Zealand: examining online media messages. *Disability & Society*, 34(2), 253-275. <https://doi.org/10.1080/09687599.2018.1545114>
- Hays, K. E., & Prepas, R. (2015). The professionalization of international disaster response: it is time for midwives to get ready. *Journal of Midwifery & Women's Health*, 60(4), 348-359. <https://doi.org/https://doi.org/10.1111/jmwh.12339>
- HealthEd. (2019). *Protecting your health in an emergency*. <https://healthed.govt.nz/products/protecting-your-health-in-an-emergency>
- Heinrichs, M., Nuemann, I., & Ehler, U. (2002). Lactation and stress: Protective effects of breast-feeding in humans. *Stress: The International Journal on the Biology of Stress*, 5(3), 195-203. <https://doi.org/10.1080/1025389021000010530>
- Henniger, M. L. (1995). Play: Antidote for childhood stress. In *Early Child Development and Care* (Vol. 105, pp. 7-12).
- Herdianti, A. (2024). The use of automatic AI-based notes and transcription services in qualitative research: Ethical and methodological concerns. Proceedings of the ALISE Annual Conference. <https://doi.org/10.21900/j.alise.2024.1717>
- Hirani, S. A. A. (2019). Facilitators and barriers to breastfeeding practices of internally displaced mothers residing in disaster relief camps in Pakistan: A critical ethnography [University of Alberta]. https://era.library.ualberta.ca/items/b275caab-a9c9-48ad-ae12-b843578f6128/view/b20d405a-4372-4edf-89f0-31d7beb75f41/Hirani_Shela_Akbar_Ali_201906_PhD.pdf
- Hirani, S. A. A., Richter, S., Salami, B. O., & Vallianatos, H. (2019). Breastfeeding in disaster relief camps: an integrative review of literature. *Advances in Nursing Science*, 42(2), E1-E12. <https://doi.org/10.1097/ANS.0000000000000231>
- Hoffman, S. (2008). Preparing for disaster: Protecting the most vulnerable in emergencies. *UC Davis Law Review*, 42, 1491-1547.
- Holm, S. M., Miller, M. D., & Balmes, J. R. (2021). Health effects of wildfire smoke in

- children and public health tools: a narrative review. *Journal of Exposure Science & Environmental Epidemiology*, 31(1), 1-20. <https://doi.org/10.1038/s41370-020-00267-4>
- Holmes, C. E. (2012). *Final report: Queensland Floods Commission of Inquiry*. <https://knowledge.aidr.org.au/media/3456/qfci-final-report-march-2012.pdf>
- Hosoda, S. (2014). *The situation and issues of evacuation centre for vulnerable people during the 2011 Disaster: the investigation report [in Japanese]*. [Translated by Google].
- Hwang, C. H., Iellamo, A., & Ververs, M. (2021). Barriers and challenges of infant feeding in disasters in middle- and high-income countries. *International Breastfeeding Journal*, 16(1). <https://doi.org/10.1186/s13006-021-00398-w>
- Hyde, A., Verstraeten, B. S. E., Olson, J. K., King, S., Brémault-Phillips, S., & Olson, D. M. (2021). The Fort McMurray Mommy Baby Study: a protocol to reduce maternal stress due to the 2016 Fort McMurray Wood Buffalo, Alberta, Canada Wildfire. *Frontiers in Public Health*, 9. <https://doi.org/10.3389/fpubh.2021.601375>
- Iellamo, A., Guisti, A., Zambri, F., Colaceci, S., Possenti, V., Brillo, E., Cordani, F., Chapin, E. M. (2019). The 6 steps of infant feeding in emergencies. <https://www.epicentro.iss.it/ben/2018/settembre/alimentazione-infantile-emergenze>
- IFE Core Group (2001). Operational guidance on infant feeding in emergencies (OG-IFE) version 3.0. <https://www.enonline.net/operationalguidance-v3-2017>
- International Confederation of Midwives (2024). The role of midwives in humanitarian crises. <https://internationalmidwives.org/resources/role-of-the-midwife-in-disaster-emergency-preparedness/>
- Insurance Council of New Zealand. (2024). *Cost of Natural Disasters Table*. <https://www.icnz.org.nz/industry/cost-of-natural-disasters/>
- Ivry, T., Takaki-Einy, R., & Murotsuki, J. (2019). What disasters can reveal about techno-medical birth: Japanese women's stories of childbirth during the 11 March, 2011 earthquake. *Health, Risk & Society*, 21(3-4), 164-184. <https://doi.org/10.1080/13698575.2019.1643827>
- Jang, J., Hsiao, K. T., & Hsiao-Wecksler, E. T. (2008). Balance (perceived and actual) and preferred stance width during pregnancy. *Clinical Biomechanics*, 23(4), 468-476. <https://doi.org/10.1016/j.clinbiomech.2007.11.011>
- Johnston, D., Standring, S., Ronan, K., Lindell, M., Wilson, T., Cousins, J., Aldridge, E., Ardagh, M.W., Deely, J.M., Jensen, S., Kirsch, T., & Bissell, R. (2014). The 2010/2011 Canterbury earthquakes: context and cause of injury. *Natural Hazards*, 73(2), 627-637. <https://doi.org/10.1007/s11069-014-1094-7>
- Kako, M., Steenkamp, M., Ryan, B., Arbon, P., & Takada, Y. (2020). Best practice for evacuation centres accommodating vulnerable populations: a literature review. *International Journal of Disaster Risk Reduction*, 46, 101497. <https://doi.org/https://doi.org/10.1016/j.ijdrr.2020.101497>
- Karatsareas, P. (2022). Semi-structured interviews. *Research Methods in Language Attitudes*, 99-113.
- Khajehamini, M. R., Hosseni Boroujeni, S., Vahid, G., & Marjan, D. (2019). Breastfeeding in Disasters: A Reminder for Policymakers. *Journal of Disaster and Emergency Research*, 2(2), 110-114.

- KidsHealth. (nd). *Making formula: a checklist*. <https://www.kidshealth.org.nz/formula-feeding/making-formula-a-checklist#:~:text=In%20cities%20and%20towns%2C%20you,baby%20is%2018%20months%20old>.
- Kildea, S., Simcock, G., Liu, A., Elgbeili, G., Laplante, D. P., Kahler, A., Austin, M.P., Tracy, S., Kruske, S., Tracy, M., O'Hara, M.W., & King, S. (2018). Continuity of midwifery carer moderates the effects of prenatal maternal stress on postnatal maternal wellbeing: the Queensland flood study. *Archives of Women's Mental Health*, 21(2), 203-214. <https://doi.org/10.1007/s00737-017-0781-2>
- King, S., Kildea, S., Austin, M.-P., Brunet, A., Cobham, V. E., Dawson, P. A., Harris, M., Hurriion, E.M., Laplante, D.P., McDermott, B.M., McIntyre, H.D., O'Hara, M.W., Schmitz, N., Stapleton, H., Tracy, S.K., Vaillancourt, C., Kruske, S., Dancause, K.N., Kruske, S., Reilly, N.,... & Yong Ping, E. (2015). QF2011: a protocol to study the effects of the Queensland flood on pregnant women, their pregnancies, and their children's early development. *BMC Pregnancy & Childbirth*, 15(1), 109. <https://doi.org/10.1186/s12884-015-0539-7>
- Kobayashi, N., Nemoto, H., Seto, M., Sato, S., Kikuchi, S., Honda, N., Suzuki, T., Sato, K., Sugawara, J., Ito, K., Kayano, R., Ozaki, N., Beadling, C.W., Kelman, I., Imamura, F., Matsuoka, H., & Tomita, H. (2020). Experiences of perinatal women and public healthcare providers in a community affected by the great east Japan earthquake and tsunami: Concerns that must be considered for the mental healthcare of perinatal women in postdisaster settings. *International Journal of Disaster Risk Reduction*, 51, 101767. <https://doi.org/https://doi.org/10.1016/j.ijdr.2020.101767>
- Kongar, I., Esposito, S., & Giovinazzi, S. (2017). Post-earthquake assessment and management for infrastructure systems: learning from the Canterbury (New Zealand) and L'Aquila (Italy) earthquakes. *Bulletin of Earthquake Engineering*, 15, 589-620.
- Korsiak, J., Pinault, L., Christidis, T., Burnett, R. T., Abrahamowicz, M., & Weichenthal, S. (2022). Long-term exposure to wildfires and cancer incidence in Canada: a population-based observational cohort study. *The Lancet Planetary Health*, 6(5), e400-e409. [https://doi.org/10.1016/S2542-5196\(22\)00067-5](https://doi.org/10.1016/S2542-5196(22)00067-5)
- Kousoulis, A. A., Ioakeim-Ioannidou, M., & Economopoulos, K. P. (2016). Access to health for refugees in Greece: Lessons in inequalities. *International Journal for Equity in Health*, 15(1), 122. <https://doi.org/10.1186/s12939-016-0409-6>
- Krueger, R. A. (2015). *Focus groups: a practical guide for applied research* (5th edition ed.). SAGE.
- Kwasinski, A., Eidinger, J., Tang, A., & Tudo-Bornarel, C. (2014). Performance of electric power systems in the 2010–2011 Christchurch, New Zealand, earthquake sequence. *Earthquake Spectra*, 30(1), 205-230. <https://doi.org/10.1193/022813eqs056m>
- Kyozuka, H., Yasuda, S., Kawamura, M., Nomura, Y., Fujimori, K., Goto, A., Yasumura, S., & Abe, M. (2016). Impact of the Great East Japan Earthquake on feeding methods and newborn growth at 1 month postpartum: results from the Fukushima Health Management Survey. *Radiation and Environmental Biophysics*, 55(2), 139-146. <https://doi.org/10.1007/s00411-016-0636-7>
- Lan, Q., Weinberger, K., Luke, S., Lavigne, E., Weichenthal, S., & Henderson, S. B. (2024). Wildfire seasons, prenatal PM2.5 exposure, and respiratory infections by age 1 year: a

- population-based case-control analysis of critical developmental windows. *ACS ES&T Air*, 1(11), 1483-1494. <https://doi.org/10.1021/acsestair.4c00213>
- Lavell, A., Oppenheimer, M., Diop, C., Hess, J., Lempert, R., Li, J., Muir-Wood, R., Myeong, S., Moser, S., Tekeuchi, K., Cardona, O., Hallegatte, S., Lemos, M., Little, C., Lotsch, A., & Weber, E. (2012). Climate change: New dimensions in disaster risk, exposure, vulnerability, and resilience. In C. B. Field, V. Barros, T. F. Stocker, & Q. Dahe (Eds.), *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change* (pp. 25-64). Cambridge University Press. <https://doi.org/DOI:10.1017/CBO9781139177245.004>
- Le Leche League International. (2020). *Infant feeding in emergencies: cup feeding*. <https://lilii.org/news/cup-feeding/>
- Lee, H. (2013). Why Finnish babies sleep in cardboard boxes. *BBC News*. <https://www.bbc.com/news/magazine-22751415>
- Pusporini, L. S., Ambarsari, W. N., Judijanto, N. Q. L., Ambarwati, E. R., Direja, A. H. S., & Herdiani, T. N.. (2024). Midwives, nurses crucial for disaster-resilient maternal care and preparedness strategies. *Journal of Angiotherapy*, 8(5). <https://doi.org/10.25163/angiotherapy.859715>
- Longhurst, R. (1995). Nutrition and care of young children during emergencies. *Food and Nutrition Bulletin*, 16(4), 1-6. <https://doi.org/10.1177/156482659501600414>
- Lutter, C. K., Hernández-Cordero, S., Grummer-Strawn, L., Lara-Mejía, V., & Lozada-Tequeanes, A. L. (2022). Violations of the International Code of Marketing of Breast-milk Substitutes: a multi-country analysis. *BMC Public Health*, 22(1), 2336. <https://doi.org/10.1186/s12889-022-14503-z>
- MacDougall, C., & Baum, F. (1997). The devil's advocate: a strategy to avoid groupthink and stimulate discussion in focus groups. *Qualitative health research*, 7(4), 532-541.
- Marshall, B., Peter, C., Amit, P., & Fontenot, R. (2013). Does sample size matter in qualitative research? A review of qualitative interviews in research. *Journal of Computer Information Systems*, 54(1), 11-22. <https://doi.org/10.1080/08874417.2013.11645667>
- Masi, A. C., & Stewart, C. J. (2024). Role of breastfeeding in disease prevention. *Microbial Biotechnology*, 17(7), e14520. <https://doi.org/https://doi.org/10.1111/1751-7915.14520>
- Massey University (2023). *Use of artificial intelligence in assessment policy*. https://www.massey.ac.nz/documents/1445/Use_of_Artificial_Intelligence_in_Assessment_Policy.pdf
- Masten, A. S., & Osofsky, J.D. (2010). Disasters and their impact on child development: Introduction to the special section. *Child Development*, 81(4), 1029-1039.
- Matthewman, S., & Goode, L. (2020). City of quakes: Excavating the future in Christchurch. *New Zealand Sociology*, 35, 77-98.
- McColl, G. J., & Burkle, F. M. (2012). The new normal: Twelve months of resiliency and recovery in Christchurch. *Disaster Medicine & Public Health Preparedness*, 6(1), 33-43. <https://doi.org/10.1001/dmp.2012.8>
- McGuire, A.P., Gauthier, J.M., Anderson, L.M., Hollingsworth, D.W., Tracy, M., Galea, S., & Coffey, S. F. (2018). Social support moderates effects of natural disaster exposure

- on depression and posttraumatic stress disorder symptoms: Effects for displaced and nondisplaced residents. *Journal of traumatic stress*, 31(2), 223-233.
- McLean, M. A., Cobham, V. E., Simcock, G., Elgbeili, G., Kildea, S., & King, S. (2018). The role of prenatal maternal stress in the development of childhood anxiety symptomatology: the QF2011 Queensland Flood Study. *Development and Psychopathology*, 30(3), 995-1007. <https://doi.org/10.1017/S0954579418000408>
- McLennan, J., Hayes, P., Bearman, C., Penney, G., Butler, P. C., & Flin, R. (2024). Training to improve emergency management decision-making: What the research literature tells us. *The Australian Journal of Emergency Management*, 39(4), 33-45.
- Medzhitova, Y., Lai, B. S., Killenberg, P., Riobueno-Naylor, A., & Goodman, L. A. (2023). Risk factors for intimate partner violence in the context of disasters: a systematic review. *Trauma, Violence, & Abuse*, 24(4), 2265-2281. <https://doi.org/10.1177/15248380221093688>
- Menclova, A. K., & Stillman, S. (2020). Maternal stress and birth outcomes: Evidence from an unexpected earthquake swarm. *Health Econ*, 29(12), 1705-1720. <https://doi.org/10.1002/hec.4162>
- Merchant, R. M., Leigh, J. E., & Lurie, N. (2010). Health care volunteers and disaster response: First, be prepared. *The New England Journal of Medicine*, 362(10), 871-873. <https://doi.org/10.1056/NEJMp1001737>
- Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative Research: A Guide to Design and Implementation*. John Wiley & Sons, Incorporated.
- Ministry for Primary Industries (2024). *Food and pregnancy*. https://www.mpi.govt.nz/food-safety-home/food-pregnancy/?utm_source=Google&utm_medium=paidsearch&utm_campaign=NZFS&gad_source=1&gclid=Cj0KCQJw4cS-BhDGARIsABg4_J01JevuR6QqEFtLhcn9t7uSDQmFIK-UzbyY9Ox_ehe6IjDiKUszaDMaAj5NEALw_wcB#highriskfoods
- Mirmohammad Ali Ie, M., Nikbakht Nasrabadi, A., Sohrabizadeh, S., & Khani Jazani, R. (2022). Essential professional competencies for basic midwifery practice in disasters: a qualitative study. *Disaster Medicine and Public Health Preparedness*, 16(5), 2015-2019. <https://doi.org/10.1017/dmp.2021.148>
- Mitchell, J., Hayward, J., & Hopkins, J. (2023). *National state of emergency activated for third time in history: Expert reaction*. Science Media Centre. <https://www.sciencemediacentre.co.nz/2023/02/14/national-state-of-emergency-activated-for-the-third-time-in-history-expert-reaction/>
- Mizrak Sahin, B., & Kabakci, E. N. (2024). Breastfeeding experiences of mothers staying in temporary shelter areas in disaster-affected provinces in the 2023 Türkiye Earthquake. *Journal of Human Lactation*, 40(4), 613-622. <https://doi.org/10.1177/08903344241273367>
- MoH. (2007). *Implementing and monitoring the International code of marketing of breast-milk substitutes in New Zealand: the code in New Zealand*. Ministry of Health. <https://www.health.govt.nz/system/files/2011-11/breast-milk-substitutes-marketing-code.pdf>
- MoH. (2015a). *Feeding your baby in an emergency: for babies aged 0-12 months*.
- MoH. (2015b). *Guide for DHB emergency management staff: Infant feeding in an emergency for babies aged 0-12 months*.
- MoH. (2016). *Framework for psychosocial support in emergencies*. Wellington. Retrieved

from <https://www.health.govt.nz/system/files/2016-12/framework-psychosocial-support-emergencies-dec16-v2.pdf>

- Mojadeddi, Z. M., & Rosenberg, J. (2024). Automated transcription of interviews in qualitative research using artificial intelligence: a simple guide. *Journal of surgery research and practice*, 5(2), 1-6. <https://athenaeumpub.com/automated-transcription-of-interviews-in-qualitative-research-using-artificial-intelligence-a-simple-guide/>
- Monteblanco, A. D., & Leyser-Whalen, O. (2019). Thinking outside of the hospital and nurse-midwife paradigms: a qualitative examination of midwifery in times of natural disasters. *International Journal of Mass Emergencies & Disasters*, 37(2), 138-173. <https://doi.org/10.1177/028072701903700204>
- Montgomery, K. S. (2002). Nutrition column: an update on water needs during pregnancy and beyond. *J Perinat Educ*, 11(3), 40-42. <https://doi.org/10.1624/105812402x88830>
- Moss, K. M., Simcock, G., Cobham, V., Kildea, S., Elgbeili, G., Laplante, D. P., & King, S. (2017). A potential psychological mechanism linking disaster-related prenatal maternal stress with child cognitive and motor development at 16 months: the QF2011 Queensland Flood Study. *Developmental psychology*, 53(4), 629. <https://pubmed.ncbi.nlm.nih.gov/28333525/>
- Mulyani, E. Y., Hardinsyah, Briawan, D., Santoso, B. I., & Jus'at, I. (2021). Effect of dehydration during pregnancy on birth weight and length in West Jakarta. *Journal of Nutritional Science*, 10, e70, Article e70. <https://doi.org/10.1017/jns.2021.59>
- Murphy, V. E., Karmaus, W., Mattes, J., Brew, B. K., Collison, A., Holliday, E., Jensen, M. E., Morgan, G. G., Zosky, G. R., McDonald, V. M., Jegasothy, E., Robinson, P. D., & Gibson, P. G. (2021). Exposure to stress and air pollution from bushfires during pregnancy: Could epigenetic changes explain effects on the offspring? *Int J Environ Res Public Health*, 18(14). <https://doi.org/10.3390/ijerph18147465>
- NEMA. (2020). *The 4 Rs*. <https://www.civildefence.govt.nz/cdem-sector/the-4rs>
- NEMA. (2022). *Risk assessment: Guidance for CDEM planning*. NEMA.
- NEMA. (2024). *Catastrophic event handbook*. NEMA. <https://www.civildefence.govt.nz/assets/Uploads/documents/publications/Cat-plan/NEMA-Catastrophic-Event-Handbook-V1.pdf>
- Neumayer, E., & Plümpert, T. (2007). The gendered nature of natural disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981–2002. *Annals of the Association of American Geographers*, 97(3), 551-566. <https://doi.org/10.1111/j.1467-8306.2007.00563.x>
- Newby, R., Brodribb, W., & Davies, P. (2012). Infant and young child feeding during Queensland's summer of disasters: challenges and outcomes. *Australasian Medical Journal*, 5(12). <https://research.usc.edu.au/esploro/outputs/abstract/Infant-and-young-child-feeding-during/99450635102621>
- Newell, J., Beaven, S., & Johnston, D. M. (2012). Population movements following the 2010-2011 Canterbury earthquakes: Summary of research workshops November 2011 and current evidence. In (Vol. 44): GNS Miscellaneous Series. <https://libcattest.canterbury.ac.nz/Record/1789297>
- New Zealand College of Midwives (2016). *Consensus statement: Infant feeding in*

emergencies and disasters.

- Newnham, E. A., Ho, J. Y., & Chan, E. Y. Y. (2022). Identifying and engaging high-risk groups in disaster research. In R. Kayano, V. Murray, M. Clarke, & E. Y. Y. Chan (Eds.), (pp. 88-103). WHO Centre for Health Development.
- Nillni, Y. I., Nosen, E., Williams, P. A., Tracy, M., Coffey, S. F., & Galea, S. (2013). Unique and related predictors of major depressive disorder, posttraumatic stress disorder, and their comorbidity after Hurricane Katrina. *The Journal of Nervous and Mental Disease*, 201(10), 841-847. <https://pmc.ncbi.nlm.nih.gov/articles/PMC6554025/>
- Norio, O., Ye, T., Kajitani, Y., Shi, P., & Tatano, H. (2011). The 2011 eastern Japan great earthquake disaster: Overview and comments. *International Journal of Disaster Risk Science*, 2(1), 34-42. <https://doi.org/10.1007/s13753-011-0004-9>
- NZDF. (2024). *New Zealand Defence Force incorporates gender perspectives on military operations*. <https://www.nzdf.mil.nz/media-centre/news/new-zealand-defence-force-incorporates-gender-perspectives-on-military-operations/>
- NZ Government. (2024). Strengthening disaster resilience and emergency management: Government response to the Report of the Government Inquiry into the response to the NISWE. <https://www.dpmc.govt.nz/sites/default/files/2024-10/Strengthening-disaster-resilience-and-emergency-management.pdf>
- O'Connor, M. E., Burkle, F. M., & Olness, K. (2001). Infant feeding practices in complex emergencies: a case study approach. *Prehospital and Disaster Medicine*, 16(4), 231-238-238. <https://doi.org/10.1017/S1049023X00043351>
- O'Malley Floyd, B. (2013). Lessons learned preparing volunteer midwives for service in Haiti: after the earthquake. *Journal of Midwifery & Women's Health*, 58(5), 558-568. <https://doi.org/https://doi.org/10.1111/jmwh.12021>
- Oloruntoba, R., Sridharan, R., & Davison, G. (2018). A proposed framework of key activities and processes in the preparedness and recovery phases of disaster management. *Disasters*, 42(3), 541-570. <https://doi.org/https://doi.org/10.1111/disa.12268>
- Olson, D. M., Brémault-Phillips, S., King, S., Metz, G. A. S., Montesanti, S., Olson, J. K., Hyde, A., Pike, A., Hoover, T., Linder, R., Joggerst, B., & Watts, R. (2019). Recent Canadian efforts to develop population-level pregnancy intervention studies to mitigate effects of natural disasters and other tragedies. *Journal of Developmental Origins of Health and Disease*, 10(1), 108-114. <https://doi.org/10.1017/S2040174418001113>
- Ombler, J., Green, J., Hunia, R., & Mtaparae, J. (2024). *Report of the government inquiry into the response to the North Island severe weather events*. Retrieved from [https://www.dia.govt.nz/diawebsite.nsf/Files/Government-Inquiry-into-Severe-Weather-Events/\\$file/Report-of-the-Government-Inquiry-into-the-Response-to-the-North-Island-Severe-Weather-Events.pdf](https://www.dia.govt.nz/diawebsite.nsf/Files/Government-Inquiry-into-Severe-Weather-Events/$file/Report-of-the-Government-Inquiry-into-the-Response-to-the-North-Island-Severe-Weather-Events.pdf)
- Orchiston, C., Davies, T., Langridge, R., Wilson, T., Mitchell, J., & Hughes, M. (2016). Alpine Fault magnitude 8 hazard scenario. <https://af8.org.nz/af8-scenario>
- Oxfam International. (2005). *The tsunami's impact on women*. <https://oxfamlibrary.openrepository.com/bitstream/handle/10546/115038/bn-tsunami-impact-on-women-250305-en.pdf>
- Ozanne, L. K., & Ozanne, J. L. (2016). How alternative consumer markets can build

- community resiliency. *European Journal of Marketing*, 50(3/4), 330-357.
- O'Donnell, M. H., & Behie, A. (2013). Effects of bushfire stress on birth outcomes: a cohort study of the 2009 Victorian Black Saturday bushfires. *International Journal of Disaster Risk Reduction*, 5, 98–106. <https://doi.org/10.1016/j.ijdrr.2013.08.002>
- Pannekoek, L., & Ree, D. (2019). *Household food insecurity among children*. Ministry of Health/Manatū Hauora.
- Perry, R. W., & Lindell, M. K. (2003). Preparedness for emergency response: guidelines for the emergency planning process. *Disasters*, 27(4), 336-350. <https://doi.org/https://doi.org/10.1111/j.0361-3666.2003.00237.x>
- Pfefferbaum, B., Jacobs, A. K., Van Horn, R. L., & Houston, J. B. (2016). Effects of displacement in children exposed to disasters. *Current Psychiatry Reports*, 18(8), 1-5. <https://doi.org/10.1007/s11920-016-0714-1>
- Pfefferbaum, B., & North, C. S. (2016). Child disaster mental health services: a review of the system of care, assessment approaches, and evidence base for intervention. *Current Psychiatry Reports*, 18(1), 1-7. <https://doi.org/10.1007/s11920-015-0647-0>
- Pfeiffer, J., Avery, M. D., Benbenek, M., Prepas, R., Summers, L., Wachdorf, C. M., & O'Boyle, C. (2008). Maternal and newborn care during disasters: thinking outside the hospital paradigm. *Nursing Clinics of North America*, 43(3), 449-467. <https://doi.org/https://doi.org/10.1016/j.cnur.2008.04.008>
- Plummer, B. (2023). My Cyclone Gabrielle: Lifeline SH35, East Cape by Kim Webby. *NZ Herald*. <https://www.nzherald.co.nz/nz/my-cyclone-gabrielle-lifeline-sh35-east-cape-by-kim-webby/T3NBHVLEXVDDHFWGNZU7M54JDY/>
- Plummer-D'Amato, P. (2008). Focus group methodology part 1: Considerations for design. *International Journal of Therapy and Rehabilitation*, 15(2), 69-73. <https://doi.org/10.12968/ijtr.2008.15.2.28189>
- Potter, S. H., Becker, J. S., Johnston, D. M., & Rossiter, K. P. (2015). An overview of the impacts of the 2010-2011 Canterbury earthquakes. *International Journal of Disaster Risk Reduction*, 14, 6-14. <https://doi.org/https://doi.org/10.1016/j.ijdrr.2015.01.014>
- Poursafa, P., Keikha, M., & Kelishadi, R. (2015). Systematic review on adverse birth outcomes of climate change. *J Res Med Sci*, 20(4), 397-402.
- Quinn, P., Gibbs, L., Blake, D., Campbell, E., D., J., & Ireton, G. (2021). *Guide to disaster recovery capitals (ReCap)*. https://img1.wsimg.com/blobby/go/14945843-fbb9-4d61-9e27-e6d9f730ae67/ReCap_NZ_Final_Online_Sep21.pdf
- Rabiee, F. (2004). Focus-group interview and data analysis. *Proceedings of the nutrition society*, 63(4), 655-660.
- Rata, A., & Al-Asaad, F. (2019). Whakawhanaungatanga as a Māori approach to indigenous-settler of colour relationship building. *New Zealand population review*.
- Ratcliffe, C., & Kalish, E. (2017). *Escaping poverty*. <https://www.urban.org/sites/default/files/publication/90321/escaping-poverty.pdf>
- Ratnayake Mudiyansele, S., Davis, D., Kurz, E., & Atchan, M. (2022). Infant and young child feeding during natural disasters: a systematic integrative literature review. *Women Birth*, 35(6), 524-531. <https://doi.org/10.1016/j.wombi.2021.12.006>
- Rourke, A. (2011). Queensland baby arrives in cyclone Yasi shelter. *The Guardian*. <https://www.theguardian.com/world/2011/feb/03/queensland-baby-cyclone-yasi-shelter>
- Rucklidge, J. J., Andridge, R., Gorman, B., Blampied, N., Gordon, H., & Boggis, A. (2012).

- Shaken but unstirred? Effects of micronutrients on stress and trauma after an earthquake: RCT evidence comparing formulas and doses. *Human Psychopharmacology: Clinical & Experimental*, 27(5), 440-454. <https://doi.org/10.1002/hup.2246>
- Russell, J. H., Haushalter, A., & Rhoads, S. J. (2025). Supporting breastfeeding women amid natural disasters in the US: A Scoping Review. *Disaster Medicine and Public Health Preparedness*, 19, e24, Article e24. <https://doi.org/10.1017/dmp.2024.323>
- Ryan, K. E., Gandha, T., Culbertson, M. J., & Carlson, C. (2014). Focus group evidence: implications for design and analysis. *American Journal of Evaluation*, 35(3), 328-345-345. <https://doi.org/10.1177/1098214013508300>
- Sarker, R., Roknuzzaman, A. S. M., Nazmunnahar, Shahriar, M., Hossain, M. J., & Islam, M. R. (2023). The WHO has declared the end of pandemic phase of COVID-19: Way to come back in the normal life. *Health Sci Rep*, 6(9), e1544. <https://doi.org/10.1002/hsr2.1544>
- Saunders, W. S. A., Kelly, S., Paisley, S., & Clarke, L. B. (2020). Progress toward implementing the Sendai Framework, the Paris Agreement, and the Sustainable Development Goals: Policy from Aotearoa New Zealand. *International Journal of Disaster Risk Science*, 11(2), 190-205. <https://doi.org/10.1007/s13753-020-00269-8>
- Scott, M. (2011). *Heavy rains and dry lands don't mix: Reflections on the 2010 Pakistan flood*. NASA. <https://earthobservatory.nasa.gov/features/PakistanFloods>
- Seal, A., Gostelow, L., Taylor, A., & McGrath, M. (2001). Review of policies and guidelines on infant feeding in emergencies: Common ground and gaps. *Disasters*, 25(2), 136-148-148. <https://doi.org/10.1111/1467-7717.00166>
- Shankar, P., Chung, R., & Frank, D. A. (2017). Association of food insecurity with children's behavioral, emotional, and academic outcomes: a systematic review. *J Dev Behav Pediatr*, 38(2), 135-150. <https://doi.org/10.1097/dbp.0000000000000383>
- Sheller, M., Galada, H. C., Montalto, F. A., Gurian, P. L., Piasecki, M., Ayalew, T. B., & O'Connor, S. (2017). Gender, disaster, and resilience: Assessing women's water and sanitation needs in Leogane, Haiti, before and after the 2010 earthquake. *wH20: the Journal of Water and Gender*. <https://repository.upenn.edu/server/api/core/bitstreams/a09db38d-b16e-42b5-af1b-8cef3c14c982/content>
- Shortland, N., & Alison, L. (2020). Colliding sacred values: a psychological theory of least-worst option selection. *Thinking & Reasoning*, 26(1), 118-139. <https://doi.org/10.1080/13546783.2019.1589572>
- Shortland, N. D., McGarry, P., Thompson, L., Stevens, C., & Alison, L. J. (2021). The effect of a 3-minute mindfulness intervention, and the mediating role of maximization, on critical incident decision-making. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.674694>
- Silverman, D. (2017). *Doing qualitative research* (5th ed.). SAGE.
- Sim, J., & Waterfield, J. (2019). Focus group methodology: some ethical challenges. *Quality and Quantity*, 53(6), 3003-3022-3022. <https://doi.org/10.1007/s11135-019-00914-5>
- Simcock, G., Cobham, V. E., Laplante, D. P., Elgbeili, G., Gruber, R., Kildea, S., & King, S. (2019). A cross-lagged panel analysis of children's sleep, attention, and mood in a prenatally stressed cohort: the QF2011 Queensland flood study. *Journal of Affective Disorders*, 255, 96-104. <https://doi.org/https://doi.org/10.1016/j.jad.2019.05.041>

- Simcock, G., Kildea, S., Elgbeili, G., Laplante, D. P., Cobham, V., & King, S. (2017). Prenatal maternal stress shapes children's theory of mind: the QF2011 Queensland Flood Study. *Journal of Developmental Origins of Health and Disease*, 8(4), 483-492. <https://doi.org/10.1017/S2040174417000186>
- Simcock, G., Kildea, S., Kruske, S., Laplante, D. P., Elgbeili, G., & King, S. (2018). Disaster in pregnancy: midwifery continuity positively impacts infant neurodevelopment, QF2011 study. *BMC pregnancy and childbirth*, 18, 1-9. <https://pubmed.ncbi.nlm.nih.gov/30053853/>
- Simcock, G., Laplante, D. P., Elgbeili, G., Kildea, S., Cobham, V., Stapleton, H., & King, S. (2017). Infant neurodevelopment is affected by prenatal maternal stress: the QF2011 Queensland Flood Study. *Infancy*, 22(3), 282-302. <https://doi.org/https://doi.org/10.1111/inf.12166>
- Skjott Linneberg, M., & Korsgaard, S. (2019). Coding qualitative data: a synthesis guiding the novice. *Qualitative research journal*, 19(3), 259-270.
- Slesak, G., Barennes, H., Goyet, S., Aaron, P., & Srour, L. M. (2016). Enforcing the International Code of Marketing of Breast-milk Substitutes for better promotion of exclusive breastfeeding: Can lessons be learned? *Journal of Human Lactation*, 32(1), 20-27. <https://doi.org/10.1177/0890334415607816>
- Snowdon, W. (2017). Children of the fire: Babies born during Fort McMurray wildfire bring joy amid chaos. *CBC*. <https://www.cbc.ca/news/canada/edmonton/fort-mcmurray-wildfire-firefighter-rebuilds-anniversary-1.4082785>
- Söderström, J. (2011). Focus groups: safety in numbers? In K. Höglund & M. Öberg (Eds.), *Understanding peace research: methods and challenges* (pp. 146-164). Routledge.
- Stats NZ. (2023). *New report highlights pressures on Aotearoa New Zealand's climate*. <https://www.stats.govt.nz/news/new-report-highlights-pressure-on-aotearoa-new-zealands-climate/#:~:text=Treasury%20estimates%20that%20the%20cost,between%20%249%2D%2414.5%20billion>
- Stats NZ. (2024). *Babies born in Napier City, New Zealand: 1991-2023 number of live births per year*. F. NZ. <https://figure.nz/chart/2IHZyVDwywc2c2zo-pEWK6DfYS52kjp6j>
- St-Pierre, J., Laurent, L., King, S., & Vaillancourt, C. (2016). Effects of prenatal maternal stress on serotonin and fetal development. *Placenta*, 48 Suppl 1, S66-s71. <https://doi.org/10.1016/j.placenta.2015.11.013>
- Suncorp. (2021). *2011 Queensland Floods*. <https://www.suncorpgroup.com.au/corporate-responsibility/resilient-people-and-communities/queensland-floods-10-years-on#:~:text=In%20the%20summer%20of%202010,were%20displaced%20by%20devastating%20floodwaters>.
- Svoboda, A. (2017). *Retrospective qualitative analysis of an infant and young child feeding intervention among refugees in Europe*. <https://www.enonline.net/fex-article/retrospective-qualitative-analysis-infant-and-young-child-feeding-intervention-among>
- Sydney Morning Herald. (2010). Hundreds of roads closed in flooded Qld. *Sydney Morning Herald*. <http://news.smh.com.au/breaking-news-national/hundreds-of-roads-closed-in-flooded-qld-20101228-198z7.html>
- Tan, M., Leonard, G., & Johnston, D. (2021). Hawke's Bay Regional Alerting Systems

- review. <https://mro.massey.ac.nz/server/api/core/bitstreams/8dec0a16-8dfa-4894-819e-6725841d861a/content>
- Tan, M. L., Prasanna, R., Stock, K., Doyle, E. E. H., Leonard, G., & Johnston, D. (2020). Understanding end-users' perspectives: Towards developing usability guidelines for disaster apps. *Progress in Disaster Science*, 7, 100118. <https://doi.org/https://doi.org/10.1016/j.pdisas.2020.100118>
- Tan, M. L., Prasanna, R., Stock, K., Hudson-Doyle, E., Leonard, G., & Johnston, D. (2017). Mobile applications in crisis informatics literature: a systematic review. *International Journal of Disaster Risk Reduction*, 24, 297-311. <https://doi.org/https://doi.org/10.1016/j.ijdr.2017.06.009>
- Teague, B., McLeod, R., & Pascoe, S. (2010). *Final report: Volume 2: Fire preparation, response, and recovery*. Melbourne: Parliament of Victoria Retrieved from <http://royalcommission.vic.gov.au/Commission-Reports/Final-Report/Volume-2/Intro-pages/Introduction.html>
- Thompson, T. (2023). *Global midwifery: Practical steps*. Retrieved from <https://www.op.ac.nz/assets/Schools/School-of-Midwifery/Documents/2023-Midwifery-Postgraduate-Courses.pdf>
- Thériault, L., Belleville, G., Ouellet, M.-C., & Morin, C. M. (2021). The experience and perceived consequences of the 2016 Fort McMurray fires and evacuation. *Frontiers in Public Health*, 9. <https://doi.org/10.3389/fpubh.2021.641151>
- Tofani, A. A., Lamarca, G. d. A., Sheiham, A., & Vettore, M. V. (2015). The different effects of neighbourhood and individual social capital on health-compromising behaviours in women during pregnancy: a multi-level analysis. *BMC Public Health*, 15(1), 890. <https://doi.org/10.1186/s12889-015-2213-4>
- Tracy, M., Morgenstern, H., Zivin, K., Aiello, A. E., & Galea, S. (2014). Traumatic event exposure and depression severity over time: results from a prospective cohort study in an urban area. *Social psychiatry and psychiatric epidemiology*, 49, 1769-1782.
- Tracy, S. K., Hartz, D. L., Tracy, M. B., Allen, J., Forti, A., Hall, B., White, J., Lainchbury, A., Stapleton, H., Beckmann, M., Bisits, A., Homer, C., Foureur, M., Welsh, A., & Kildea, S. (2013). Caseload midwifery care versus standard maternity care for women of any risk: M@NGO, a randomised controlled trial. *The Lancet*, 382(9906), 1723-1732. [https://doi.org/10.1016/S0140-6736\(13\)61406-3](https://doi.org/10.1016/S0140-6736(13)61406-3)
- Tsuboyama-Kasaoka, N., Hoshi, Y., Onodera, K., Mizuno, S., & Sako, K. (2014). What factors were important for dietary improvement in emergency shelters after the Great East Japan Earthquake? *Asia Pac J Clin Nutr*, 23(1), 159-166. <https://doi.org/10.6133/apjcn.2014.23.1.17>
- Tsuboyama-Kasaoka, N., Ueda, S., & Ishikawa-Takata, K. (2021). Food and nutrition assistance activities at emergency shelters and survivors' homes after the Great East Japan earthquake, and longitudinal changes in vulnerable groups needing special assistance. *International Journal of Disaster Risk Reduction*, 66, 102598. <https://doi.org/https://doi.org/10.1016/j.ijdr.2021.102598>
- Tuohy, R., & Stephens, C. (2011). Exploring older adults' personal and social vulnerability in a disaster. *International Journal of Emergency Management*, 8(1), 60-73. <https://doi.org/10.1504/IJEM.2011.040399>
- TWO. (2023). *Babies: breastfeeding status at two weeks by year and demographics*. <https://>

- tewhatuora.shinyapps.io/report-on-maternity-web-tool/
- TWO. (2024). Feeding your baby in an emergency: Public health information sheet. <https://info.health.nz/keeping-healthy/protecting-health-natural-disaster/during-an-emergency#feeding-your-baby-safely-during-an-emergency-6838>
- TWO. (2024a). *Report on maternity web tool*. <https://www.tewhatuora.govt.nz/for-health-professionals/data-and-statistics/report-on-maternity-web-tool/>
- United Nations (2024). *Heatwave deaths increased across almost all Europe in 2023, says UN weather agency*. UN News. <https://news.un.org/en/story/2024/04/11487960>
- UNAIDS. (2024). *Country factsheets: New Zealand*. <https://aidsinfo.unaids.org/databook>
- UNDRR. (2015). *Sendai Framework for Disaster Risk Reduction 2015-2030*. Sendai. <https://www.undrr.org/media/16176/download?startDownload=20250315>
- UNDRR. (2017). *Exposure*. <https://www.undrr.org/terminology/exposure#:~:text=The%20situation%20of%20people%2C%20infrastructure,located%20in%20hazard%2Dprone%20areas>.
- UNDRR. (n.d.b). *Vulnerability*. <https://www.undrr.org/terminology/vulnerability#:~:text=The%20conditions%20determined%20by%20physical,to%20the%20impacts%20of%20hazards>.
- UNICEF. (2022). *Feeding children under 2 years in emergency situations*. <https://www.unicef.org/ukraine/en/stories/feeding-children-under-2-years-emergency-situations>
- University of the Sunshine Coast, Kidsafe Queensland, Australian Breastfeeding Association. (2024). *Supporting safer sleep for babies in evacuation centres*. <https://www.breastfeeding.asn.au/sites/default/files/2024-09/INFO-BushfireProject-Safer%20sleep%20in%20emergencies-V1-WEB.pdf>
- Ursano, R. J., Fullerton, C. S., Weisaeth, L., & Raphael, B. (2017). *Textbook of disaster psychiatry*. Cambridge University Press.
- Uzair, Y., Balog-Way, S., Gupta, M., Phillips, E., & Krylova, Y. (2022). *Disability inclusion in disaster risk management: an exploration of good practices and resources*. <https://documents1.worldbank.org/curated/en/099025008152214591/pdf/P176516025211304f09f9201fb04c176943.pdf>
- Vallance, S. (2024). *Gender and “man-made” disasters: the role of women in recovery*. Manaaki Whenua/Landcare Research. <https://www.landcareresearch.co.nz/news/gender-and-man-made-disasters-the-role-of-women-in-recovery/>
- Walker, A. (2010). Breast milk as the gold standard for protective nutrients. *The Journal of Pediatrics*, 156(2, Supplement), S3-S7. <https://doi.org/https://doi.org/10.1016/j.jpeds.2009.11.021>
- Waltzer, W. C. (1981). The urinary tract in pregnancy. *The Journal of Urology*, 125(3), 271-276. [https://doi.org/https://doi.org/10.1016/S0022-5347\(17\)55008-9](https://doi.org/https://doi.org/10.1016/S0022-5347(17)55008-9)
- Wareham, D., & Bourke, M. (2013). The 2010–2011 Canterbury earthquakes: impact on the liquid waste management system of Christchurch, New Zealand. *Civil Engineering & Environmental Systems*, 30(1), 1-14. <https://doi.org/10.1080/10286608.2012.709507>
- WHO. (1981). *International code of marketing of breast-milk substitutes*. Geneva: WHO. <https://www.who.int/publications/i/item/9241541601>
- WHO. (2004). *Guiding principles for feeding infants and young children during emergencies*. Geneva: WHO. <https://www.who.int/publications/i/item/9241546069>

- WHO. (2006). *The Contribution of nursing and midwifery in emergencies*. Geneva: WHO.
- WHO. (2017). *The International Code of Marketing of Breast-milk Substitutes: Frequently asked questions*. <https://iris.who.int/bitstream/handle/10665/254911/WHO-NMH-NHD-17.1-eng.pdf>
- WHO. (2022). *Marketing of breast-milk substitutes: National implementation of the international code, status report*. <https://iris.who.int/bitstream/handle/10665/354221/9789240048799-eng.pdf?sequence=1>
- WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality. (2000). Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. *Lancet (London, England)*, 355(9202), 451-455.
- Wilkinson, S. (1998). Focus group methodology: a review. *International Journal of Social Research Methodology*, 1(3), 181-203. <https://doi.org/10.1080/13645579.1998.10846874>
- Wood Buffalo Baby-Friendly Initiative. (2016). *Wood Buffalo breastfeeding statistics*. <http://babyfriendlywb.ca/about/baby-friendly-initiative-wood-buffalo/wood-buffalo-breastfeeding-statistics/>
- World Population Review (2024a). *Countries with Universal Healthcare 2024*. <https://worldpopulationreview.com/country-rankings/countries-with-universal-healthcare>
- World Population Review (2024b). *Human Development Index by Country, 2024*. <https://worldpopulationreview.com/country-rankings/hdi-by-country>
- Yasunari, T., Nozawa, M., Nishio, R., Yamamoto, A., & Takami, Y. (2011). Development and evaluation of 'disaster preparedness' educational programme for pregnant women. *International Nursing Review*, 58(3), 335-340. <https://doi.org/10.1111/j.1466-7657.2011.00919.x>
- Yokomichi, H., Matsubara, H., Ishikuro, M., Kikuya, M., Isojima, T., Yokoya, S., Kato, N., Tanaka, T., Chida, S., Ono, A., Hosoya, M., Tanaka, S., Kuriyama, S., Kura, S., & Yamagata, Z. (2018). Impact of the Great East Japan Earthquake on body mass index, weight, and height of infants and toddlers: an infant survey. *Journal of Epidemiology*, 28(5), 237-244. <https://doi.org/10.2188/jea.JE20170006>
- Yonekura, T., Ueno, S., & Iwanaka, T. (2013). Care of children in a natural disaster: lessons learned from the Great East Japan earthquake and tsunami. *Pediatric Surgery International*, 29(10), 1047-1051. <https://doi.org/10.1007/s00383-013-3405-6>
- Zakarija-Grković, I., Cattaneo, A., Bettinelli, M. E., Pilato, C., Vassallo, C., Borg Buontempo, M., Gray, H., Meynell, C., Wise, P., Harutyunyan, S., Rosin, S., Hemmelmayr, A., Šniukaitė-Adner, D., Arendt, M., & Gupta, A. (2020). Are our babies off to a healthy start? The state of implementation of the Global strategy for infant and young child feeding in Europe. *International Breastfeeding Journal*, 15(1), 51. <https://doi.org/10.1186/s13006-020-00282-z>

Appendix 1: Information Sheets

Information Sheet For Emergency Management Interviewees



Infants, Young Children, and Pregnant Women in Emergencies in New Zealand

What is this research about?

In 2010, the World Health Assembly (WHA) recognized emergency preparedness plans of most member states were not addressing the unique needs of infants, young children, and pregnant women in emergencies (IYCP). As such, the WHA urged all member states to develop and implement plans for IYCP. Audits of IYCP planning have been conducted in Australia (Gribble, 2019) and the United Kingdom (WBTi, 2016), however no such audits have been performed in New Zealand.

This research, while not a full audit, aims to identify the strengths and weaknesses of New Zealand's IYCP response in recent emergencies, particularly Cyclone Gabrielle in the Hawkes Bay. To do this, we are interviewing representatives from responding agencies (e.g., NEMA, NZDF, MoH, Red Cross), organisations which could be beneficial in supporting IYCE response (e.g., NZ College of Midwives, Plunket), and academic experts.

After the interviews have been completed, we will be holding a limited number of focus groups to evaluate potential ways to improve New Zealand's IYCP response for future events.

What will this research involve?

The initial research will take place as an interview and is not expected to last more than an hour.

The themes and questions we will ask you about during the interviews include:

- What emergency did you respond to and what was your role?
- How has NZ prepared for IYCP?
- What training have you received regarding IYCP and evacuation of pregnant women and young children?
- How do you envision you (or your organisation) being involved in IYCP response in the future?

With your consent, the interview will be recorded for later transcription and analysis. Once transcribed, you will have the opportunity to review the transcript to ensure accuracy and clarify any information. Afterwards, you will be asked to sign a release of transcript for which gives the

researchers consent to use the interview data for the evaluation.

What will the information be used for?

The interviews will be analysed using thematic analysis. This is a common type of analysis in which researchers look for patterns in the data to find themes. From there, we aim to develop guidelines and potential improvements to strengthen New Zealand's IYCE response in future events.

How will privacy be maintained?

All data gathered will be stored in a secure, password protected drive accessible only to the researchers. Additionally, pseudonyms will be used in the final write up, unless otherwise requested. This research will be published as part of a Master's thesis, and may also be published in a peer reviewed journal in the future.

Do I have to take part?

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study (by 31 March 2024, before final write-up occurs);
- ask any questions about the study at any time during participation;
- be given access to a summary of the project findings when it is concluded;
- ask for the recorder to be turned off at any time during the interview.

Please reach out if you would like any further information.

Contact Details

Dr. David Johnston

Deanna Wells

Information Sheet For Responding Organisations



Infants and Young Children in Emergencies in New Zealand

What is this research about?

In 2010, the World Health Assembly (WHA) recognized that emergency preparedness plans of most member states were not addressing the unique needs of infants, young children, and pregnant women in emergencies (IYCP). As such, the WHA urged all member states to develop and implement plans for IYCP. Audits of IYCP planning have been conducted in Australia (Gribble, 2019) and the United Kingdom (WBTi, 2016), however no such audits have been performed in New Zealand.

This research, while not a full audit, aims to identify the strengths and weaknesses of New Zealand's IYCP response in recent emergencies, including Cyclone Gabrielle in the Hawkes Bay. To do this, we are interviewing representatives from responding agencies (e.g., NEMA, NZDF, MoH, Red Cross), organisations which could be beneficial in supporting IYCE response (e.g., NZ College of Midwives, Plunket), and academic experts.

After the interviews have been completed, we will be holding a limited number of focus groups to evaluate potential ways to improve New Zealand's IYCP response for future events.

What will this research involve?

The initial research will take place as an interview and is not expected to last more than 90 minutes. Additionally, we ask that, if possible, you read and have a think about the questions and attached Ministry of Health resource in advance.

Consent

With your consent, the interview will be recorded for later transcription and analysis. Once transcribed, you will have the opportunity to review the transcript to ensure accuracy and clarify any information. Afterwards, you will be asked to sign a release of transcript for which gives the researchers consent to use the interview data for the evaluation.

What will the information be used for?

The interviews will be analysed using thematic analysis. This is a common type of analysis in which

researchers look for patterns in the data to find themes. From there, we aim to develop guidelines and potential improvements to strengthen New Zealand's IYCE response in future events.

How will privacy be maintained?

All data gathered will be stored in a secure, password protected drive accessible only to the researchers. Additionally, pseudonyms will be used in the final write up, unless otherwise requested. This research will be published as part of a Master's thesis, and may also be published in a peer reviewed journal in the future.

Do I have to take part?

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study (by 31 March 2024, before final write-up occurs);
- ask any questions about the study at any time during participation;
- be given access to a summary of the project findings when it is concluded;
- ask for the recorder to be turned off at any time during the interview.

Please reach out if you would like any further information.

Contact Details

Professor David Johnston

Deanna Wells

Interview Questions

For reference, below is a picture of an evacuation centre in the Hawkes Bay after Cyclone Gabrielle in 2023.



Questions:

- Has your organisation been involved in something like this before? If not, how do you think your organisation could be involved?
- What challenges do you think the women and children could encounter in an evacuation centre? If you don't have first hand experience in an evacuation centre, please base your answers on the picture above.

Photo source: <https://www.newshub.co.nz/home/new-zealand/2023/02/cyclone-gabrielle-seasonal-workers-among-napier-residents-forced-to-flee-as-evacuations-continue.html>)

- A “baby tent” is a space designated for women with infants and young children and pregnant women. What resources (people, information, supplies, etc.) do you think would need to be available in a baby tent? What resources would you expect to have to keep infants and young children safe during the day and at night? How do you think a baby tent could encourage best feeding practices?
- Mothers are often rendered invisible in work that focuses on children, particularly in an emergency. How do workers in the tent ensure the physical and mental health of the mothers is looked after?
- How do you think your organisation could be involved specifically in a baby tent?
 - Are there any licensing or legal concerns? (For example, could a retired midwife or nurse provide lactation support if her licence is no longer valid?)

- Would training specific to IYCP in emergencies be useful for members (former or otherwise) of your organisation?
- Do you feel members of your organisation should discuss emergency preparedness as part of pre- or ante- natal care? If they should, what resources do you think they would need to feel confident in discussing it?
- What are your thoughts on the current MoH resource (starting pg. 5) or linked below?
[Feeding Your Baby in an Emergency: For babies aged 0–12 months](#)
- Do you have any additional comments you'd like to share?
- Is there anyone you think we should contact about participating in this research?

Feeding Your Baby in an Emergency: For babies aged 0–12 months

Introduction

Emergencies can happen at any time with little or no warning. Babies are at more risk of becoming dehydrated or getting an infection so they need special care and attention in an emergency.

To keep your baby safe and healthy:

- have a plan for what you will do in emergencies
- have emergency supplies ready.

Breastfeeding is the best way of feeding your baby in an emergency. Breast milk is safe and helps your baby fight off infections.

If you are using formula, you will need infant formula and clean water as well as feeding and sterilisation equipment to look after your baby in an emergency. You need to be able to deal with a:

- **cut in the water supply.** If you are using formula, a top priority is to have safe, drinkable water plus enough water for sterilising and cleaning equipment.
- **power cut.** You need a plan for how you will sterilise equipment and purify water if you are preparing formula without your usual power supply.

Discuss with your family how you can be prepared for an emergency so that everyone in the household stays safe and healthy.

There are 2 parts to this brochure.

- **Part 1** tells you how to **get ready** to care for your baby in an emergency.
- **Part 2** tells you how to **get thru** an emergency while caring for a baby aged 0–12 months.

Part 1: Get ready – Preparing for an emergency	Page 2
Part 2: Get thru – Feeding your baby in an emergency.....	Page 3
Checklist: Feeding your baby in an emergency	Page 6

Part 1: Get ready – Preparing for an emergency

Emergency supplies

This list of emergency supplies will be enough for 3–5 days. It will help you look after your baby when you do not have your usual water and electricity supplies.

For all babies – you will need:

- 30 disposable nappies
- one box of baby wipes
- one bottle of alcohol-based hand sanitiser
- rubbish bags for dirty nappies
- any medicines or creams your baby needs.

You may also choose to have:

- one box of disposable gloves
- spare clothes, a blanket or special toy.

For breastfeeding mums

You will need bottled water and nutritious snacks for mum (muesli bars, dried fruit and nuts, breakfast biscuits, crackers with peanut butter, tinned fish, baked beans).

For formula fed babies – you will need:

- one tin of unopened infant formula (900 g), **or**
- if your baby needs special infant formula (eg, because of an allergy), enough infant formula for two weeks. Always get your prescription in time before your supplies run low

Note: Swap the tin every time you buy a new one so that your emergency tin never gets too close to its use-by date

- 5 litres of commercially bottled water (non-carbonated) for preparing formula (if your baby is under 3 months, you will need to boil this water before using it to make up formula)
- a container with a lid to store boiled water
- two or more clean feeding bottles and teats or a cup if your baby can drink from it (easier to clean). Bottles labelled **EN14350** are good quality and marked with accurate measurements, which is important for making up formula
- one box of water purification tablets (such as Aquatabs).

To sterilise bottles and teats in an emergency, you need:

- one pot with a lid (large enough to fit two or more bottles) for sterilising in either hot or cold water
- one box of sterilising tablets (such as Milton 30 tablet box) for sterilising in cold water

- kitchen tongs.

To wash your hands and work surfaces, and to clean and sterilise bottles and teats, you will need:

- 15–20 litres of stored water. If your freezer is big enough, store some water in there.

Note: This 15–20 litres is just to feed formula to your baby. You will also need at least 3 litres of water each day for each other person in the family.

- two rolls of paper towels
- one small bottle of dishwashing liquid
- soap for hand washing
- one bottle of alcohol-based hand sanitiser.

Note: You need to have (or have access to) a gas stove, barbecue or wood burner to boil water for preparing formula. Make sure you have enough fuel for it in your emergency supplies as well.

For babies aged 6–12 months

To feed your baby, you will need:

- suitable emergency food supplies such as tinned fruit and vegetables, tinned fish and beans, plain cereals and crackers – get enough of this food for other members of the family too
- a can opener.

Having some jars or pouches of baby food is also helpful.

Getaway kit for leaving in a hurry

You need a packed kit ready for when you need to leave in a hurry. Your kit should have:

- nappies, baby wipes and hand sanitiser
- if you are feeding formula to your baby, 1 tin of infant formula, bottled water, clean bottle and teat and sterilising (Milton) tablets
- a few jars or pouches of baby food if your baby is eating solids
- spare clothing, a blanket and medicines that your baby needs.

Tip: If your baby often stays with family or carers, think about having some emergency supplies at their place as well as at home.

More information

For a full list of emergency items you need for all of your family, go to: <http://getthru.govt.nz/how-to-get-ready/emergency-survival-items>

For information on how to fill and store water containers safely, go to: <http://getthru.govt.nz/how-to-get-ready/how-to-store-water>

Part 2: Get thru – Feeding your baby in an emergency

If you are breastfeeding

- **Keep breastfeeding.** Do not start formula feeding and do not wean your baby from the breast in an emergency.
- If you are both breastfeeding and formula feeding, it is best to increase breastfeeding. If possible, only breastfeed your baby and stop formula feeding during the emergency.
- You need plenty of fluids and snacks. Remember: 'Looking after the mum is looking after the baby.'
- Breastfeeding can help calm you and your baby. A mum can make enough milk even when stressed. But stress can affect the flow of milk and make babies fuss at the breast. It helps if you feed your baby often. Keep your baby close and have skin-to-skin contact where possible.
- If you are in a Civil Defence Centre, ask for a quiet, comfortable place to breastfeed.

If you are using expressed breast milk

You can keep expressed breast milk (fresh or thawed) at room temperature for up to 4 hours. If you are not sure when it thawed, do not use it.

Keep any frozen breast milk deep in the freezer and only open the freezer when you need to.

If you are using a breast pump, you must be able to sterilise it. See the next page to find out how to sterilise feeding equipment including breast pumps in an emergency.

If you cannot sterilise the breast pump, you can express breast milk by hand.

If you are feeding formula to your baby

- If you have a safe water supply and electricity or gas, make formula as you usually do.
- If you do not have running water or electricity or gas, it is difficult to prepare formula. But you can do it.
- Always have an extra unopened tin of formula as part of your emergency supplies. Every time you buy a new tin, swap it with the one in your emergency supplies. Don't use formula that is past its use-by date.
- Use newborn formula for babies aged 0–6 months. This formula is also suitable for older babies.

Tip: If your emergency water is a strange colour, it may be because sterilising in cold water is not working properly. In this case, it is better to use the hot water method.

If you recently stopped breastfeeding

If you stopped breastfeeding in the last few weeks, you may be able to start making milk again, especially if your baby is under 4 months.

- Hold baby skin to skin, offering the breast as comfort.
- Have short breaks (1–2 hours) between trying to breastfeed your baby.
- Keep using formula until baby is getting enough breast milk.
- Get help from breastfeeding experts such as a lactation consultant, La Leche League or breastfeeding peer supporters.

If you are looking after a baby separated from breastfeeding mum

- Using another mother's breast milk may be an option for some women, family and whānau. You need to be sure this milk is safe as a very small number of serious infectious diseases can be passed on through breast milk.
- You can feed the baby with safe formula. Use clean equipment and follow the instructions on the next page.

How to prepare infant formula safely

Surfaces, hands and utensils must be as clean as possible to prevent your baby getting sick. Be absolutely sure that the water you use to make up formula is safe. Follow the steps below to prepare safe formula for your baby when you do not have your usual electricity, gas and water supplies.

Step 1: Clean surfaces and wash hands

1. Wet the work surface with clean water, squirt it with dishwashing liquid and rub it with a paper towel.
2. Put a clean paper towel down to work on if the surface is not normally used to prepare food or if it is too rough to clean.
3. Follow the 20/20 rule for hand washing: Wash your hands with warm soapy water for 20 seconds and dry them with a clean paper towel for 20 seconds. If you can't use warm, soapy water, wipe any visible dirt off your hands with a baby wipe and then wash your hands with an alcohol-based hand sanitiser.

Step 2: Sterilise bottles, teats and equipment, including breast pumps

1. Wash the bottles with warm, clean, soapy water. Always wash the bottles immediately after using them.
2. Sterilise in hot water or cold water.
 - a. Sterilising with hot water
 - Fill a pot with enough water to cover the items. Put the lid on.
 - Bring the water to the boil on a gas stove, barbecue or wood burner. Boil in a rolling boil for 1 minute.
 - Keep the pot covered until you need the items.
 - Use clean tongs to lift the items out of the pot.
 - Keep the pot covered so that you can re-boil the water and use it again the next day.
 - b. Sterilising with cold water and sterilisation tablets
 - In a clean pot, mix water with the right number of sterilisation tablets (for example, two Milton tablets are needed for 4 litres of water).
 - Plunge the bottles, teats and the measuring jug into the solution. Make sure there are no air bubbles.
 - Put the lid on and soak the items for at least 15 minutes. You can keep the items in the solution until you need them.
 - Make a new solution every 24 hours. You can use the old sterilising water for other things such as washing hands or cleaning surfaces.

Step 3: Make your replacement water safe

If your usual drinking-water supply is not available, make your replacement water safe in one of these ways.

1. The safest water for preparing formula is commercial bottled water that is sealed. If your baby is less than 3 months old, you must still boil this water and let it to cool to room temperature before using it.
 - If you are using stored or delivered water for preparing formula, you have to boil it for

babies of all ages.

- If you use an electric jug, boil a full jug until it cuts out.
 - If you use a stove top kettle, boil the water until the kettle makes a loud whistle.
 - If you use a pot on the stove or barbecue, bring the water to a rolling boil for 1 minute.
2. If you cannot boil the water, you can use water purification tablets (such as Aquatabs). Follow the instructions on the packet.

Once you have safe water:

- fill the sterilised bottle(s) with safe water and cool the water to room temperature
- add the formula powder to the bottle just before you need it
- cover any left over boiled water, store it away from direct sunlight in a sterile container or bottle and use it within 24 hours. After 24 hours, you will need to re-boil the water to make it safe again.

Step 4: Prepare infant formula

1. Follow the instructions on the formula tin, using safe water and sterilised equipment to feed.
2. If you have any formula left over, use it within 2 hours.

Tip: If you don't have a suitable bottle, you can try feeding your baby formula:

- from a sterilised cup. Let the baby sip, take your time and don't pour the formula down baby's throat. Babies need practice to drink from a cup and some find it difficult
- with a sterilised spoon.

Make sure the cup or spoon is sterilised.

3. Wash the bottle and teat with clean soapy water straight after you have used them.

If your baby is eating solid foods

- If you are breastfeeding, breastfeed more often so your baby needs less solid food, or only give your baby breast milk.
- If you are formula feeding but don't have enough formula, and your baby is over 9 months, give your baby more solid food and safe water.

Tip: Before feeding your baby solids, wash your baby's hands or wipe them with a baby wipe and then wash with hand sanitiser.

- You can use ready-to-eat baby food straight from the jar or pouch. Once you have opened it, give it to your baby straight away and do not keep it for more than 2 hours at room temperature.
- You can prepare food for baby from ingredients you have for the rest of the family. Make sure the texture and consistency of the food is suitable for the age of your baby.
- Do not give your baby food that has passed the best-before date or perishable food (food that can rot or go bad) that has not been chilled.
- If you have thawed foods, use foods that have stayed cold.
- Throw away high-risk foods that have been at room temperature for more than 2 hours. High-risk foods include meat, seafood, egg dishes, made-up baby cereals and rice. Heat food until it is piping hot to kill germs. Babies are at more risk of getting food poisoning than older children and adults. Remember: 'If in doubt, throw it out.'

If your supplies are low or if you need help

Listen to your local radio and follow Civil Defence instructions.

Ask neighbours for help. Some shops may be open. Take cash as Eftpos may be down.

Phone PlunketLine 0800 933 922.

Phone Healthline 0800 611 116.

Contact your midwife or local maternity unit if your baby is less than 6 weeks old.

Contact your Well Child Nurse or Plunket Nurse if your baby is older than 6 weeks.

Talk with Civil Defence staff operating in your area or contact or visit your nearest operating Civil Defence Centre.

Useful websites for everyone

Get Thru website for preparing an emergency kit:

<http://getthru.govt.nz/how-to-get-ready/emergency-survival-items>

How to fill water containers: <http://getthru.govt.nz/how-to-get-ready/how-to-store-water>

Keeping food safe during emergencies: www.foodsmart.govt.nz/elibrary/keeping_food_safe.htm

Useful website if you are breastfeeding your baby

www.health.govt.nz/your-health/healthy-living/babies-and-toddlers/breastfeeding

Useful website if you are feeding your baby formula

Ministry of Health's Feeding Your Baby Infant Formula gives detailed advice on feeding infant formula: www.health.govt.nz/resource/feeding-your-baby-infant-formula

Acknowledgement

The Ministry of Health (New Zealand) acknowledges that material in this resource has been adapted, with kind permission, from Food for Infants in Emergencies ©State of Queensland (Queensland Health) (2011)

Checklist: Feeding your baby in an emergency

- Be prepared with supplies for your baby for 3–5 days.
- Keep breastfeeding or breastfeed more in an emergency. Breastfeeding is the best and safest way to feed a baby in an emergency.
- To prepare infant formula safely, follow these steps.
 - Step 1: Clean your work surface and wash your hands.**
 - 20/20 rule: Wash with warm, soapy water for 20 seconds and dry with clean paper towel for 20 seconds Or use alcohol-based hand sanitiser.
 - Step 2: Sterilise bottles, teats and equipment.**
 - Hot water: Boil equipment in water for 1 minute.
 - or
 - Cold water: Use sterilising tablets and soak for at least 15 minutes.
 - Step 3: Make water safe for preparing formula.**
 - Use commercial bottled water that is sealed. Boil it if your baby is under 3 months.
 - or
 - Boil stored water for 1 minute (for babies of all ages).
 - or
 - Use water purification tablets (such as Aquatabs) (for babies of all ages).
 - Step 4: Prepare formula following the instructions on the tin.**
- If your baby is eating solids offer safe foods and 'if in doubt, throw it out'.
- Ask for help and support to keep your baby safe and healthy.
 - Listen to your local radio and follow Civil Defence instructions.
 - Ask neighbours for help.
 - Talk with Civil Defence staff in your area or contact or visit your nearest operating Civil Defence Centre.
 - Phone PlunketLine 0800 933 922.
 - Phone Healthline 0800 611 116.
 - Visit Civil Defence website: <http://getthru.govt.nz>

Focus Group Information Sheet



April 2024

Focus group: Infants, young children and pregnant women in emergencies

What is this research about?

In 2010, the World Health Assembly (WHA) recognised that emergency preparedness plans of most member states were not addressing the unique needs of infants, young children and pregnant women in emergencies (IYCP-E). As a result, the WHA urged all member states, including Aotearoa New Zealand, to develop and implement plans for IYCP-E. As part of my research towards a Masters in Emergency Management at Massey University, I have conducted interviews with a range of practitioners and policy experts working in this area to gain an understanding of how the current system has worked in recent disasters and its strengths and weaknesses.

Our initial findings suggest that an area which could be strengthened is for emergency management to work proactively with community groups, particularly midwives, to strengthen the 4Rs (reduction, readiness, response, and recovery) of emergency management. The importance of community involvement was also strongly emphasised in the “Government Inquiry Into the Response to the North Island Severe Weather Events” released earlier in April 2024. We have developed some potential solutions to strengthen readiness and response that we feel would benefit from group discussion and feedback.

The focus group will use the Hikurangi Subduction Zone scenario developed by East Coast Labs as a starting point for discussion. The full scenario can be found [here](#) and a video introducing it can be found [here](#). An IYCP-focused synopsis has been included on page 3 of this information sheet.

What will this research involve?

We expect the focus group to last up to two hours.

With your consent, the interview will be recorded for later transcription and analysis. Once transcribed, you will have the opportunity to review the transcript to ensure accuracy and clarify any information.

What will the information be used for?

The information collected will be used to refine the proposed solutions and in the development of any guidelines for collaborative emergency management to improve outcomes for IYCP in future

emergencies.

How will privacy be maintained?

As this is a group interview, it is impossible to guarantee anonymity as participants may work together or have previously met. We are therefore asking all participants treat the focus group as confidential.

All data gathered will be stored in a secure, password-protected drive accessible only to the researchers. Only generalised findings will be reported and no individual will be identifiable. Any quotes will be attributed to a pseudonym, unless otherwise requested. This research will be published as part of a Master's thesis, and may also be published in a peer-reviewed journal in the future.

Your rights as a participant

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study (by 15 June 2024, before final write-up occurs);
- ask any questions about the study at any time during participation;
- be given access to a summary of the project findings when it is concluded;
- ask for the recorder to be turned off at any time during the interview.

Please reach out if you would like any further information.

Contact Details

Professor David Johnston

Deanna Wells

Appendix 2: Interview Materials

Interview Questions

Abbreviations used:

IYCP: Infant, young children, and pregnant

IYCF-E: Infant and young child feeding in emergencies

IYCE: Infant and young children in emergencies

For responding organizations (e.g. NEMA, NZDF):

- Can you please tell us about yourself? What was/is your role? What emergencies have you responded to or been involved in recently (last 5 years)?
- What are some strengths of NZ's IYCP response?
- What training have you received regarding IYCP? (Evacuations, shelter, etc.)
- What mechanisms are in place for coordinating IYCP response?
- What, if any, considerations were given to sheltering IYCP?
- How was continued breastfeeding supported in shelters? Examples include: Baby tents, breastfeeding support (midwives, lactation consultants, etc.), availability of additional fluids and snacks, etc.
 - Is information about sustained breastfeeding available in multiple languages?
- How are breastmilk substitutes (i.e. formula) handled?
 - Are/were donations accepted?
 - How is formula handled (e.g. stored like medicine, given out in evacuation packs)?
- How do you feel you could be better supported in meeting the needs of IYCP?
- Is there anyone you think we should get in touch with about this research?
- Do you have any additional comments you'd like to share?

For groups potentially supporting response (e.g. NZ College of Midwives, Plunket)

- How were you or your organization involved in supporting IYCP? If you weren't involved, how do you see your organization as being utilized in IYCP response in the future?
- What concerns do you have regarding IYCP response?
- How do you envision being involved in IYCP response in the future?
- Healthcare specific (esp. Midwives, Plunket): Do you feel comfortable discussing IYCF-E as part of pre- or ante- natal care? How would you broach the subject?
- Is there anyone you think we should get in touch with about this research?
- Do you have any additional comments you'd like to share?

Emergency Management Interview Materials

Infants, Young Children, & Pregnant Women in Emergencies



Background

In an emergency, infants, young children, and pregnant women have unique needs, which is why the World Health Assembly has called on all member states, including New Zealand, to develop emergency plans which address the needs of infants, young children, and pregnant women (IYCP). This research aims to identify the strengths and weaknesses of NZ's response and develop potential solutions.



Consent

This interview is being conducted as part of a Master's thesis in Emergency Management. With your consent, we will be recording the interview for future transcription and analysis. You will have the opportunity to review the transcript for accuracy and clarity. Your participation will be kept confidential. You can refuse to answer any question or withdraw your consent at any time prior to the final write up being completed July 2024.



Whakawhānaukatanga

I'm Deanna Wells, and I'm originally from Southern California, so please know I have listened to how to pronounce Whakawhānaukatanga many times and it always sounds wrong, but I am trying.

I completed my BSc in Human Nutrition at Massey University in 2022, my PhD in Emergency Management in 2023, and I am currently completing my Master's in Emergency Management.

My research assistant, Mangot (seen right), has been with us for nearly 11 months, and inspired me to research IYCP. Her other contributions to this research have been minimally helpful at best, disruptive at the worst.



Can you please tell us about yourself?

What organisation are you with and what was/is your role?

What emergencies have you responded to or been involved in recently (within the last 5 or so years)?



How has your organisation planned for the needs of IYCP? What do you feel are the strengths of this planning?



Do you feel prepared to meet the needs of IYCP in an emergency?

What, if any trainings, have you received on IYCP?

What mechanisms are in place for coordinating IYCP response in an emergency?



- What, if any, considerations are given when sheltering IYCP?

- How are the feeding needs of IYCP met?

- How is continued breastfeeding supported in shelters? Examples include: baby tents, breastfeeding support (midwives, lactation consultants), information about the importance of breastfeeding in multiple languages

- How are breastmilk substitutes (formula) handled and distributed? Are/were donations accepted?



How do you think groups like the NZ College of Midwives or Plunket could support your organisation's IYCP response?



- How could you be better supported in meeting the needs of IYCP?
- Do you have any additional comments you'd like to share?
- Is there anyone you think we should get in touch with about this research?



Iycp Professionals Interview Materials

Infants, Young Children, & Pregnant Women in Emergencies



Consent

This interview is being conducted as part of a Master's thesis in Emergency Management. With your consent, we will be recording the interview for future transcription and analysis. You will have the opportunity to review the transcript for accuracy and clarity. Your participation will be kept confidential. You can refuse to answer any question or withdraw your consent at any time prior to the final write up being completed next year.



Whakawhānaukatanga

I'm Deanna Wells, and I'm originally from Southern California, so my primary experience with emergencies is wildfires and earthquakes.

I completed my BSc in Human Nutrition at Massey University in 2022, my PGdip in Emergency Management in 2023, and I am currently completing my Master's in Emergency Management.

My research assistant, Margot (seen right), has been with us for 8 months, inspired me to research IYCP in emergencies. Her other contributions to this research have been minimally helpful at best, disruptive at the worst.




Background

In an emergency, infants, young children, and pregnant women have unique needs, which is why the World Health Assembly has called on all member states, including New Zealand, to develop emergency plans which address the needs of infants, young children, and pregnant women (IYCP). This research aims to identify the strengths and weaknesses of NZ's response and develop potential solutions.



Can you please tell us about yourself?

For example:

- What organisation are you with and what is your role?
- How long have you been with the organisation?
- What does your organisation do?
- What made you want to work with your organisation?



Have you (or your organisation) been involved in emergency management response before? If not, how do you think you (or your organisation) could be involved?

What concerns do you have about IYCP emergency response?



Below is a photo of an evacuation centre that was opened by the Syrian diaspora in 2015.



What challenges do you think the women and children could encounter in an evacuation centre (also called a welfare or civil defence centre)?

If you don't have first-hand experience in an evacuation centre, please base your answers on the picture.



A "baby tent" is a space designated for women with infants and young children and pregnant women.

What resources (people, information, supplies, etc.) do you think would need to be available in a baby tent?



What supplies would you expect to have to keep infants and young children safe during the day and at night?

How do you think a baby tent could encourage best feeding practices?



How do you think your organisation could be involved specifically in a baby tent?

Are there any licensing or legal concerns? (For example, could a retired midwife or nurse provide lactation support if her licence is no longer valid?)

Would training specific to IYCP in emergencies be useful for members (former or otherwise) of your organisation?



Mothers are often rendered invisible in work that focuses on children, particularly in an emergency. How do workers in the tent ensure the physical and mental health of the mothers is looked after?



Do you feel members of your organisation should discuss emergency preparedness as part of pre- or ante- natal care?

If they should, what resources do you think they would need to feel confident in discussing it?



What are your thoughts on the current MoH resource?



Do you have any additional thoughts or comments you'd like to share?

Is there anyone you think we should contact about participating in this research?



Appendix 3: Focus Group Materials

Hikurangi Subduction Zone Earthquake and Tsunami Scenario

This scenario was developed by East Coast Labs to improve community resilience along the East Coast of the North Island through research, risk reduction, education, planning and community engagement. The scenario was developed for use by Civil Defence and Emergency Management groups, iwi, businesses, and hapū most likely to be impacted by an event on the Hikurangi subduction zone including the Hawke's Bay and Wellington.

Using this scenario, we would like to discuss how emergency management and midwives could work together to meet the needs of IYCP, particularly (but not limited to) those who have been displaced and are dependent on Civil Defence Centres (also known as evacuation or welfare centres).

To narrow the scope of this scenario, we will be focusing on Kate's first seven days following the earthquake and tsunami. Kate had her first child 3 weeks ago, with no complications. Neither Kate, nor the baby, were injured in the event, but did evacuate to the nearest CDC as their house was in the path of the tsunami.

The earthquake

At 9 AM on a winter school day, a Magnitude 8.9 earthquake occurs on the Hikurangi subduction zone, 70 kilometres off the coast of Porangahua in the Hawke's Bay. This is a catastrophic earthquake, and is considered credible based on geological evidence. Many weak buildings in regions between Wellington and the Eastern Cape will be destroyed after experiencing prolonged and strong shaking.

The tsunami

A set of tsunami waves triggered by the earthquake will arrive 13 minutes after the earthquake, with the largest waves arriving later. The tsunami is predicted to run up to at least 10 metres above sea level, and will cause damage to large portions of the coastline.

Main impacts on infrastructure

The Hawke's Bay region is expected to be without power, water supply, wastewater collection and treatment, and telecommunications for the first seven days. Hawke's Bay airport will be rendered permanently non-operational, and ports will be impacted. Road access to Hawke's Bay will be completely cut off for the first seven days after the initial earthquake.

Napier Health Centre, located less than a kilometre from the coast will be severely damaged and unusable for months. Hawke's Bay Fallen Soldiers' Memorial Hospital in Hastings is inaccessible to those in Napier due to damage to bridges.

Social impacts

Following these events, there could be hundreds of fatalities and thousands of injuries. The bodies of those who have died in the event may not be able to be gathered quickly, which may not only be traumatising for survivors, but may also increase the spread of disease. Families with unaccounted for loved ones will experience high stress levels while waiting for an answer.

Due to damage to the hospital in Napier and infrastructure damage on the route to Hastings, many of the injured are unable to access necessary medical care. Those who are severely injured or have pressing medical needs (i.e., a pregnant woman in or near labour) may have few options for care without a medical evacuation by helicopter. As telecommunications will be unavailable for the first seven days, it will be difficult for health professionals to keep track of their patients, especially if they are displaced in the event.

Thousands of people will be unable to return to their homes resulting in mass displacement. Many people will stay with family or friends in un or less affected areas, however many will utilise CDC. Families with infants may have left home with just their nappy bag (or even less). A CDC may not immediately have the necessary supplies (nappies, safe sleep options, food, etc.) to accommodate IYCP. These supplies will be difficult or impossible for families in and around Napier to purchase as the nearest open grocery stores will be in Havelock North and Hastings.

Weather conditions

Based on past weather records, the temperature will fluctuate between -1.8 to 20.7°C, and there will be about 108.3 mm of rainfall throughout the month.

Particular risks for IYCP

- Inaccessibility of hospitals, lead maternity carer offices, and neonatal units due to severe infrastructure damage
- Infection and disease transmission due to contaminated water
- Food insecurity
- Hypothermia due to exposure to inclement weather (rain, wind, cold)
- Privacy for pregnant and breastfeeding women
- Breastfeeding support
- Formula handling and availability
- Safe sleeping for infants
- Food accessibility and availability for IYCP

Solutions for Improved IYCP Outcomes

One of the solutions we would like to discuss is the use of a baby room or tent accessible to IYCP staffed by a midwife or Plunket nurse in addition to the necessary emergency management personnel.

Regarding safe infant sleep, a proposed solution would be staging/storing "[baby boxes](#)", a durable

cardboard box which doubles as a cot, at various locations throughout the country for distribution in an emergency.



Photo Source: The New York Times

These baby boxes would be lightweight, could be stored nearly flat, and would contain necessary nonperishable items including: an infant appropriate mattress, a sheet, nappies, and some clothing. These boxes could be stored vacuum sealed to keep the contents clean and dry until needed, and marked with the age the box is designed for. Once families leave the CDC, the baby box would provide a safe sleep space for the infant in their new accommodation.

Our final proposed solution relates to readiness, specifically changes to [Get Ready](#) to make the website more user friendly. This would be done by creating a quiz which generates a list of emergency supplies, with quantities, based on the given answers. (An example will be shown as part of the focus group).

Example Getready Quiz

Emergency Ready

TAILOR YOUR PLAN



How many people live in your home?

3



What are their ages?

- ☒ 1 0-6 months
- ☐ 6-23 months
- ☐ 2 - 18 years
- ☒ 2 18-65 years
- ☐ 65+ years



How is the 0-6 month old fed

- ☐ Exclusively breastfed
- ☐ Expressed (pumped) breastmilk
- ☐ Combination breastfed and formula fed
- ☐ Formula fed



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Do you live in a rural area?

- ☐ Yes
- ☒ No



Your 3 Day Emergency Kit:

1 unopened can formula

5 litres bottled water

For preparing formula

24-30 litres stored water

For adult drinking water and to sterilise bottles and wash hands

Shelf stable food and snacks

suitable emergency food supplies such as tinned fruit and vegetables, tinned fish and beans, plain cereals and crackers

Nappies and Wipes

Rubbish Bags

Water Purification Tablets

Dish soap & cleaning supplies

Hand Sanitiser

Disposable paper cups*

*bottles can be used if it is possible to boil water for sterilising

