

“OUR BODIES ARE MADE OF WATER”:

CO-CREATION OF KNOWLEDGE ABOUT WATER INSECURITY AND MATERNAL HEALTH WITH  
HAUDENOSAUNEE WOMEN AT SIX NATIONS OF THE GRAND RIVER.



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Degree Doctor of Philosophy

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## **Lay Abstract**

As a part of *Ohneganos Ohnegahde:gyo*' research project, funded through the Global Water Futures (GWF), this research was co-designed with the Six Nations Birthing Center (SNBC) at Six Nations of the Grand River (SN). We have bridged anthropological and Haudenosaunee knowledge to assess and analyze the interrelationships between water and maternal health. This research demonstrates that SN mothers include more-than-human beings in their understanding of water insecurity and maternal health. SN mothers have an interwoven and reciprocal relationship with water. These relationships between Haudenosaunee women and more-than-human beings, including water, have been jeopardized by settler colonialism, affecting SN mothers' health and wellbeing. SN mothers reported various multiple health impacts of water insecurity, such as dehydration, eczema, stress and anxiety, and loss of traditional food and medicines. However, SN mothers are resilient and have demonstrated culturally innovative coping strategies with limited water, such as rejuvenating and reclaiming connections with water and land.

## Abstract

This doctoral research co-created knowledge about water insecurity and maternal health and wellbeing in partnership with the Six Nations Birthing Center (SNBC). In this research, I sought to highlight Haudenosaunee understandings of water and maternal health to document mothers' experiences of water insecurity and how that affects their physical, mental, emotional, and spiritual health.

We took a decolonizing and Community-Based Participatory Research approach (CBPR) in our research and used a theoretical framework weaving Traditional Ecological Knowledge (TEK), Critical Medical Anthropology (CMA), and Environmental Anthropology. Indigenous research methods such as storytelling and anthropological methods such as semi-structured in-depth interviews were used for data collection from 55 participants consisting of mothers (n=41), grandmothers (n=10), and midwives (n=4), along with analysis of midwives' charts for the 41 mothers.

Data analysis reveals that severe water insecurity in the SN community, the second largest and most populous reserve in Canada, negatively affects mothers' holistic health. Stress, anxiety, sadness, lower self-esteem, dehydration, Urinary Tract Infections (UTIs) and eczema were reported. In addition, other profound impacts of water insecurity, such as concern over normalizing water insecurity, being forced to either become dehydrated or rely on less expensive and readily available sugary drinks, and growing frustrations over water inequality, were also revealed.

This research expands our knowledge about maternal health and water insecurity as it demonstrates that water insecurity is not limited to technical measurements communicated in water advisories and is not only limited to humans. SN mothers understand water insecurity as part of the interrelatedness and interdependence of all creations. Similarly, SN mothers' understanding of maternal health transcends narrow biomedical definitions to include the health of mother figures and Mother Earth. As such, our research contributes to expanding the definition of maternal health.

The research demonstrates that for Haudenosaunee mothers, maternal bodies are interconnected with Mother Earth, thus affecting and co-creating each other. These interconnections shape SN mothers' understanding and experiences with water insecurity. However, these interconnections are ignored and systematically eliminated by the settler colonialism that creates the conditions of persistent water insecurity at Six Nations of the Grand River.

## **Acknowledgement:**

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## **List of Abbreviations and Symbols:**

CBPR-Community Based Participatory Research  
CCIWQT-Co-Creation of Indigenous Water Quality Tools  
CMA-Critical Medical Anthropology  
DS-Digital Story  
EA- Environmental Anthropology  
GDM-Gestational Diabetes Mellitus  
GRCA- Grand River Conservation Authority  
GWF-Global Water Futures  
HCC-Haudenosaunee Confederacy Council  
IK-Indigenous Knowledge  
IRM-Indigenous Research Methods  
MMIWG-Missing and Murdered Indigenous Women and Girls  
MOU-Memorandum of Understanding  
MREB-McMaster Research Ethics Board  
MW-Midwives  
OCAP-Ownership, Control, Access and Possessions  
PAR-Participatory Action Research  
PE-Political Ecology  
PEH-Political Ecology of Health  
PEW-Political Ecology of Water  
SN-Six Nations  
SNBC-Six Nations Birthing Center  
SNEC-Six Nations Ethics Council  
SNHS-Six Nations Health Services  
TEK-Traditional Ecological Knowledge  
UTIs-Urinary Tract Infections

## **Declaration of Academic Achievement**

In addition to the introduction and conclusion chapters, this dissertation includes three original research papers submitted to peer-reviewed journals. The Introduction and Conclusion tie together all these original research papers and outline my overall research questions, objectives, and analytical framework.

### **Manuscript that is currently published is:**

Sultana A, Wilson J, Martin-Hill D, Davis-Hill L and Homer J (2022) Assessing the Impact of Water Insecurity on Maternal Mental Health at Six Nations of the Grand River. *Frontiers in Water* 4:834080. doi: 10.3389/frwa.2022.834080.

### **Manuscripts Submitted to Peer-reviewed journals are:**

#### **Chapter 2**

Sultana A, Wilson J, Martin-Hill D. Navigating across anthropological and Haudenosaunee knowledge: co-developing research using CBPR and Kaswenta (Two-Row Wampum) principles in partnership with Six Nations of the Grand River. Manuscript submitted to *International Indigenous Policy Journal* on May 22, 2022. The manuscript is currently under peer-review.

#### **Chapter 3**

Sultana A, Wilson J, Martin-Hill D. Lickers, A. Water Insecurity and Maternal Health among Haudenosaunee Women in Canada. Manuscript submitted to *Medical Anthropology* on January 4, 2023. The manuscript is accepted with minor revisions on April 5, 2023.

Both of these chapters were reviewed and approved by the Six Nations Elected Band Council in their general council meeting for proceeding with journal submissions.

The original research chapters were co-authored with my supervisor and Six Nations Community partners. As the first author I was responsible for data analysis, original draft writing, and final editing.

## Chapter 1: Introduction to the Research

### 1. Introduction

Braiding Traditional Ecological Knowledge (TEK), Critical Medical Anthropology (CMA), and Environmental Anthropology (EA), this research aims to identify the ways in which limited to no access to water affects the holistic health of Haudenosaunee mothers on the Six Nations of the Grand River (SN) by situating them in a larger political, economic and settler colonial framework.

Water has profound cultural and spiritual significance in many Indigenous communities that take water beyond the chemical compound of hydrogen and oxygen and make it a biocultural entity or a hydro-social being. (Latchmore et al., 2018; McGregor, 2012; Mosse, 2008; Neimanis, 2017; Stevenson; 2018). Water is interwoven in Haudenosaunee law and philosophy that maintain a respectful and reciprocal relationship with water and all creations. To Haudenosaunee, water is alive, sentient, working to fulfill its responsibilities bestowed by the Creator. Water is in their Thanksgiving Address, creation stories, and the formulation of the Great Law of Peace and treaties. Haudenosaunee women and water have a unique relationship as a carrier of lives (Cook, 2018; McGregor, 2012; 2008). This relationship is manifested through women carrying water in their wombs and breastfeeding future generations. Women and water are viewed as interwoven in the relationship of continuing life on Earth (Cook, 2008; Martin-Hill et al., 2022). Settler colonialism has worked to erase this relationship with nature and the environment to access Indigenous land and dispossess Indigenous people in the process. Western socio-economic structures were imposed on Indigenous communities. Colonial policies such as the Indian Act targeted women, denied their leadership in the community, forcibly took away

children from their care and outlawed their traditional practices such as midwifery. Water at SN has also been targeted by capitalist extractions, chemical contamination, and colonial exploitation. For example, companies like Nestlé and Blue Triton have been extracting millions of litres of water from SN territories without SN permission, and commercial farming and landfill runoff contaminates the Grand River, the source water for SN.

The resemblance and interconnections between women and water are often reflected with a phrase like “what happens to our land, happens to us (Hoover, 2017).” Several mothers from SN stated on repeated occasions that, “our bodies are made of water,” to express the importance of water and how profoundly and deeply water can impact our bodies, health, and wellbeing. Maternal health, therefore, is intertwined with understanding these crucial relationships and roles that water plays in women’s bodies, especially during pregnancy, childbirth, and breastfeeding. The colonial structures that have altered these relationships must also be understood as impacting maternal health.

It is well established that water insecurity disproportionately affects women and their health and wellbeing, primarily in their responsibilities as caregivers (Collins et al., 2019; Ennis-McMillan, 2001; Hanrahan et al., 2014; Wutich, 2009; Wutch & Ragsdale, 2008; Tallman et al., 2022). Research mainly focused on the Global South has demonstrated that women are more affected by water insecurity than men due to discrimination in the gender division of labour in households, lack of access to resources, and women’s neglected leadership and exclusions from decision-making and policy-making processes (Parker et al., 2016; Tandon et al., 2022; Tallman et al., 2022). Women have experienced severe health impacts from water insecurity, including physical and domestic violence, miscarriage, extreme stress and anxiety (Collins et al., 2019; Mushavi et al., 2020; Stevenson et al., 2017; Workman & Ureksoy, 2017). However, a literature



review reveals that very few studies have assessed the impact of water insecurity on Indigenous maternal health (McGregor, 2015; Dennis and Bell, 2020). An exception is the work of Elizabeth Hoover (2017), who documents the effects of water contamination on reproductive health in Akwesasne, a Mohawk community at the US border of the colonial state. In Canada, considerable research has focused on water issues in Indigenous communities and health (Bradford et al., 2016; Dupont et al., 2014; Hanrahan et al., 2014; Ilyniak, 2014; McGregor & Whiteker, 2001; Simpson et al, 2009) but very few studies have systematically investigated the interrelationship of water insecurity with Indigenous mothers' health. This research is one of the first studies to document the impact of water insecurity on maternal health in Canada. Drawing from our co-developed project with the Six Nations Birthing Center (SNBC), we discuss the ways water affects the holistic (physical, mental, emotional, and spiritual) wellbeing of Haudenosaunee mothers at Six Nations of the Grand River, the second largest and most populous First Nations reserve in Canada.

### **Research Questions and Objectives:**

This research project is community led which helped to shape the research questions and objectives. Following the guidance of the SNBC, I investigate how limited to no access to water affects holistic maternal health at Six Nations of the Grand River. Two interrelated questions broadly shape this research: **i)** How do SN mothers understand the relationship between water and maternal health? **ii)** What roles do settler colonial structures play in creating water insecurity and affecting SN mothers' holistic health? There are four objectives of this research:

1. To develop a methodological and analytical framework across medical anthropology and Indigenous knowledge to better understand maternal health in relation to water in a settler colonial state.
2. To co-create knowledge about the relationship between water and maternal health as SN mothers understand this relationship.
3. To investigate how the existing water situation in the community affects the holistic health and wellbeing (physical, mental, emotional, and spiritual) of Haudenosaunee women.
4. To critically examine how settler colonial structures and political economy shape water insecurity and the health and wellbeing of Haudenosaunee mothers.

**Who Am I? Positioning self in the research:** Research is always biased and influenced by the researcher's worldviews, practices, and political positions. Therefore, situating the researcher in the research is crucial to highlight those biases. For decolonizing methods, especially working with Indigenous communities, it is crucial to state how I, a non-western, non-Indigenous woman in Canada, anthropologist, navigated Haudenosaunee knowledge. My experience as a Muslim, Brown, non-western woman with a national history of being colonized shaped how I carried out this research in partnership with the Six Nations Birthing Centre (SNBC) (*Tsi Nón:we Ionmakerátstha*) at Six Nations of the Grand River.

How I would like to identify or tell my story has been a question I have been reflecting on for a while. As Liboiron (2021) points out, one cannot tell their stories without telling other people's stories. I am created through relations, and my stories involve stories of all my relations, starting from my Creator. I was born in a Muslim family in Bangladesh, where I grew up with my extended family: parents, brother, kin, friends, and neighbours. My mother and grandmothers also trained me to maintain strong connections to our Creator and be thankful for every aspect of

life, including the challenges. I was taught to be respectful and co-exist peacefully with people with different worldviews. My culture taught me to treat my country, land, and rivers as a mother.

Long before I was born, Bangladesh or the then East Pakistan was liberated from British colonization, or I would like to say from physical colonization. In 1971, ten years before I was born, Bangladesh was liberated from West Pakistan to reclaim our political rights and sovereignty. We take pride in our language, Bangla/Bengali. On the 21st of February 1952, university students were killed by the Pakistani Army as they demanded Bangla as the state language. Now, the 21st of February is celebrated as International Mother Language Day declared by the United Nations. To us, people who speak Bengali in Bangladesh, it is not our first language; it is our mother language, the language spoken and taught by our mothers. International Mother Language Day calls for respecting all languages, especially those our mothers speak.

While there were some structural gender and class discriminations I experienced growing up in Bangladesh, being a majority Muslim and Bengali speaking, I enjoyed more privileges than other religiously and linguistically minority communities in Bangladesh. However, my experience as a majority dramatically changed when I moved to Canada for higher studies as I became an immigrant in Canada. I became a minority and was categorized as a person of colour. I started to obtain firsthand experiences of living as a minority, marginalized, and stereotyped in a white supremacist settler-colonial country. As a mother of a seven-year-old daughter, I relate to the worries that mothers of colour have for the safety of their children associated with their

visible skin colour and religious and cultural background. I understand the importance of mothers' sound health in raising a healthy generation.

Having a history with ancestors who fought for our liberation, language and land, I feel strongly about Indigenous people's struggles to reclaim their land rights and sovereignty. Since I have experienced life as both a member of the majority and minority and raising a child in a settler-colonial nation, I empathize with Haudenosaunee mothers' struggles to provide the best for their children and build a society for future generations. Likewise, I feel strongly about Indigenous self-determination and sovereignty and Indigenous peoples' fight to save the natural environment.

Academically, I am trained in cultural and medical Anthropology. My research experience with Haudenosaunee women raised my consciousness about the insidious nature of colonialism's impacts on education. I relearned myself in the process.

## **2. Background and Context:**

Despite the fact that Canada possesses 20% of the world's fresh water, many Indigenous people in Canada have been living without clean running water for decades, with detrimental health impacts (Bradford et al., 2016; Dupont et al., 2018; Hanrahan et al., 2014; Ilinyak, 2014). One in five Indigenous communities in Canada faces boil water advisories at any given time (Baird et al., 2015; Meehan et al., 2020). From the mercury poisoning in the English-Wabigoon River system between 1962 and 1970 to the current millions of litres of water extractions in the Six Nations of the Grand River, water issues in Indigenous communities in Canada are rooted in systematic colonial assimilationist policies, structural inequalities, paternalistic attitudes, and

“epistemic violence” (White et al., 2012; McGregor 2012; Arsenault et al., 2018; 2021; Latchmore et al., 2018). As such, water issues in Indigenous communities in Canada are historical (Human Right Watch, 2016) and colonial, linked to chronic illnesses such as physical injuries, obesity, diabetes, physical violence, sexual violence, and adverse mental health (Rosinger & Young, 2020; Hanrahan et al., 2014; Ilyniak, 2014).

Throughout Canada lack of adequate water supplies and contaminated source water forced many Indigenous people to abandon or transform their traditional economies and choose poorly nutritious western diets causing different chronic and life-threatening illnesses. For example, Hanrahan et al.’s (2014) research show that the 80% obesity rate in Southern Inuit of Labrador is linked to the inaccessibility of drinking water as the community is forced to drink comparatively inexpensive Coke over expensive bottled water. Similarly, Ilyniak (2014) argues that mercury poisoning in the English-Wabigoon River system forced the people of Grassy Narrows, whose main diet was fish, to change their diet habits and purchase food that “... lead to imbalanced diets contributing to type 2 diabetes, cancer, thyroid disease, and plastic-illnesses-never seen in the community previously (da Silva, 2008, cited in Ilyniak, 2014: 50).” Lack of access to clean drinking water forces the SN community to rely on purchased water creating financial barriers and affecting food habits and the health and wellbeing of SN residents (Duignan et al., 2022; Dupont, 2015).

Globally, researchers identified systematic barriers to accessing water. For example, water insecurity is linked to poor infrastructure, insufficient funds, commercial farming, forced dislocation, the market-based economy, resource extraction, and unequal distribution of

resources (Phare, 2009; Latchmore et al., 2018; Bulled, 2016; Tallman, 2019; Weis et al., 2020; Sarkar et al., 2015; Bradford et al., 2016). Several interrelated issues can be identified from the literature for persistent water issues in Indigenous communities in Canada, such as i) Colonial assimilationist or eliminationist agendas, ii) bureaucratic complexity in water governance, iii) ignorance of Indigenous knowledge about water, and iv) exclusion of key Indigenous people and their leadership in water governance and policy making.

### **2.1 Colonialism as a cause of water insecurity:**

Colonial projects have many dimensions that have subjugated Indigenous communities, such as assimilation, negation, denial, misrepresentation, and elimination (Palmater, 2014; Wolfe, 2006). The Indian Act of 1876 is considered a significant colonial weapon of control and elimination used to reduce Indigenous communities into one racial category and deny the diversity of Indigenous nationhood (Palmater, 2014). Historically, the Indian Act confined Indigenous communities to Reserves, destroyed their traditional economies, encroached on their lands, disrupted their reciprocal relationship with land and water, and outlawed their traditional social and governance structures. The Indian Act imposed laws that removed Haudenosaunee matrilineal socio-political organizations. Indigenous women were the most attacked by settler colonialism (Leason, 2018), which diminished women's leadership roles in their societies. At SN, Haudenosaunee traditional hereditary confederacy was forcibly replaced by the elected Band council in 1912, removing women from their leadership and traditional roles (Hill, 2017).

Another colonial control mechanism was residential schools with the agenda of “killing the Indian in a child” (Stevenson, 2014). The Canadian government set up residential schools

operated by various churches to assimilate Indigenous peoples into mainstream culture brought by European settlers. The assumption was that Indigenous people were savages who needed to be civilized. Consequently, they structurally built a system through residential schools to eliminate all aspects of Indigenous cultures, including language and traditions. The residential schools operated between the 1870s and 1990s, with the last residential school closed in 1996 (the Union of Ontario Indians, 2013). Approximately 150,000 Indigenous children were forced to attend residential schools and many experienced physical and sexual violence (the Union of Ontario Indians, 2013). Residential schools were established to assimilate Indigenous children by removing them from mothers, clan mothers and community care (Leason, 2018; The Union of Ontario Indians, 2013). Use of the English language was forced by forbidding the children in residential schools from using their own language and keeping them away from traditional teachings. The agenda of elimination of “Indians” is systematically structured in colonial policies to gain access to and control of Indigenous land (Wolfe, 2006; Stevenson, 2014). Physical and sexual abuse of children by clergy and teachers took place in residential schools, causing intergenerational trauma (Truth and Reconciliation Commission [TRC], 2015). Recently more than 4,000 children’s bodies were found in over 150 unmarked graves throughout Canada tangibly disclosing the assimilative torture and neglect of Indigenous children (Hopper, 2021; Voce et al., 2021).

Violating treaties is another manifestation of the colonial legacy of exploitation of Indigenous peoples. Treaties were made with the agreement of respecting Indigenous peoples’ dignity, sovereignty, and uniqueness and a promise of mutually resolving issues that affect First Nations, Inuit, and Metis. However, after the formation of the Canadian State in 1867, treaties

have been neglected and violated. New laws and regulations outlawed Indigenous people's access to their ancestral land, negatively affecting their traditional economy and relationship with the land and natural environment. As a result, new issues and diseases arose that were not solved effectively and mutually (Hill, 2017).

The root cause of the water issues in Indigenous communities lies in the negligence of the nation-to-nation treaty agreement (Dyck, 2017; McGregor, 2012). Research has demonstrated a direct link between colonialism and water insecurity in Indigenous communities in Canada (Simpson et al., 2009; Cave & McKay, 2016; White et al., 2018; Arsenault et al., 2018). White et al. (2012) argue that the Royal Proclamation in 1763 established European or the British Crown's control over Indigenous sovereignty and created severe dependency in the process. They contend that the first issues with water quality emerged with the first displacement of Indigenous people onto reserved lands (White et al., 2012). Forced relocation to the reserves affected traditional food, economy, and medicines and replaced knowledge keepers with "barely trained water plant workers" (White et al. 2012, 11).

**2.2 Ignorance of Indigenous knowledge of water:** Ignorance and subjugation of Indigenous knowledge by the settler colonial State of Canada are linked to the current water situation in Indigenous communities in Canada (White et al., 2012; McGregor, 2012; Arsenault, 2021). Indigenous Knowledge helped people learn about the water flow patterns and differentiate water that is dangerous to drink from safe water (White et al., 2012). While measuring water quality in Canada involves technical procedures such as water advisories, for Indigenous Peoples, water quality is also relational. They gather knowledge of water quality through their respectful



relationship with water. Most Indigenous communities have experienced some boil-water advisories as obvious signs of water insecurity. However, their profound understanding about the impact of water insecurity on Indigenous communities is linked to their spiritual connections with water (Arsenault et al., 2018).

The exclusion of Indigenous leaders, especially women, is a significant reason for persistent water problems in Indigenous communities in Canada (Dyck, 2017; McGregor, 2012; Cave & McKay, 2016; Arsenault, 2021). Although Indigenous women play significant roles in protecting water and are spokespersons for water (Anderson, 2010; 2011; Baird et al., 2015; Longboat, 2015; McGregor, 2012), women are not included in the decision-making process about water. For example, Indigenous women were not included in the National Expert Panel in Canada on water governance in Ontario in 2006 (Cave & McKay, 2016). Another example of the government's colonial and paternalistic approach and ignorance of Indigenous Knowledge is Bill S-11, proposed in 2010. Bill S-11 was created without having an in-depth consultation with Indigenous community leaders, and it gave power to third parties over First Nations' water issues (McGregor, 2012; White et al., 2012). Bill S-11 was hugely criticized and resisted by Indigenous leaders and communities, and they were ultimately able to stop Bill S-11.

Despite several plans adopted by the federal government, such as First Nations Water Management Strategies in 2002, the Plan of Action for Drinking Water for First Nations in 2005, the First Nations Water and Wastewater Action Plan in 2008, and the Safe Drinking Water for First Nations Act 2013, and millions of dollars allotted to maintaining safe drinking water, including the 4.6 billion dollars announced by the prime minister of Canada in 2016, safe

drinking water in Indigenous communities remains far from being achieved. The problems lie in the federal government's continuing oxymoron attitude and the exclusion of Indigenous leaders from the decision-making process, ignoring Indigenous knowledge related to water (White et al., 2012; McGregor, 2012; Arsenault et al., 2018). The federal government drafted the Safe Drinking Water for First Nations Communities Act in 2019 to collaborate with Indigenous leaders and communities but failed to provide effective results due to the exclusion of Indigenous knowledge and insufficient funding and capacity building in communities (Latchmore et al., 2018).

**2.3 Bureaucratic complexity of water governance:** Canada's complex bureaucratic structures of water governance are a cause of persistent water insecurity in Indigenous communities (Arsenault et al., 2018; Collins et al., 2017; Phare, 2009). For instance, provincial governments are responsible for ensuring water quality off-reserve, whereas ensuring clean water on-reserve is the federal government's responsibility. Three federal departments, Aboriginal Affairs and Northern Development Canada (AANDC), Health Canada, and Environment Canada are responsible for delivering safe drinking water to Indigenous communities (White et al., 2018; Arsenault et al., 2018; Bradford et al., 2016).

Arsenault (2021) demonstrates that water insecurity in Indigenous communities in Canada is due to developmental extraction, environmental and water contamination, bureaucratic complications, inadequate funding, and exclusion of Indigenous communities from the decision-making process. Indigenous scholars argue that incorporating Indigenous knowledge is essential for sustainable solutions to water insecurity in Indigenous communities (Longboat, 2015; Dyck

et al., 2015, Arsenault, 2021). The federal government must work with provincial governments and Indigenous leaders to establish sustainable solutions to water problems (Chambers & Burnett, 2017; Collins et al., 2017; Dyck et al., 2015; Arsenault, 2021), along with restoration of Indigenous identities and recognition of Indigenous sovereignty (Simpson et al., 2009; Latchmore et al., 2018).

### **3. *Onkwehonwe*/The Haudenosaunee: A brief introduction through teachings and treaties:**

The Haudenosaunee means “people of the Longhouse” or “people who build the Longhouse” (MacDougall 2005, 2-3). The Peacemaker established the Great Law of Peace among the five Haudenosaunee nations: *Kanien'kehá:ka* or Mohawk, *Ononta'kehá:ka* or Onondaga, *Tsonontowane'á:ka* or Seneca, *Kahoniokwenhá:ka* or Cayuga and *Onenioté'á:ka* or Oneida; later, *Thatihskarò:roks* or the Tuscarora took refuge and joined the Confederacy in 1722 (Hill, 2017; Barbeau, 1917). The principle of kinship binds all these Nations.

The Haudenosaunee are a matrilineal society that are instructed by the Great Law to live in balance and harmony with all creations: humans and non-humans, while keeping connected with the spiritual world. Haudenosaunee believe that health and wellbeing are best achieved by maintaining balance and respecting all aspects of the natural world (Martin-Hill et al., 2021). When the Europeans first encountered the Haudenosaunee, they occupied most of the land from the Great Lakes to Carolina (Barbeau, 1917; Weaver, 1978). Most parts of New York State, Northern Ohio, Pennsylvania, Southern Ontario, and Quebec were part of Haudenosaunee traditional lands (MacDougall 2005, 2-3).

Kinship is central to Haudenosaunee political organization, especially the exogamic totemic clan (Ganter, 2009). Each Nation has from three to nine clans (Tooker, 1970; Barbeau, 1971; Ganter, 2009). There was no marked distinction between different families within the clan. The Haudenosaunee also group their clans into a larger unit called moieties and phratries (Abler, 2004; Meyers, 2006). Similar to the clan, members in one moiety call each other “brother” and those in another moiety “cousin” (Barbeau, 1971; Abler, 2004). Chiefs are hereditary and are selected from kin by nominated clan mothers. Certain qualities and duties are essential for someone to be qualified as a chief: a chief should be a protector, put others first, be patient, generous, fearless in pursuing justice, and respectful to women (Vecsey 1986: 88-89; Ganter 2009, 130; Wagner, 2001).

The Haudenosaunee underwent some rapid changes in terms of technology, disease, and religion after encountering the Europeans. Half of the Haudenosaunee were wiped out between 1640 and 1680 by diseases that the Europeans brought, such as smallpox and influenza (Hill, 2017). Further, the Indian Act, residential schools and the imposition of a patriarchal sociopolitical structure brought significant changes to Haudenosaunee society. However, despite the changes in village form, houses, economy and land holdings, Haudenosaunee core principles persisted (Shimony, 1994; Hill, 2017). They continued to see the Earth as a mother and understood their dependence on it for their survival and continuation of life. Furthermore, they upheld their traditions, traditions that are linked to the past and woven into the future (McCarthy, 2016). In this section, I will briefly introduce the Haudenosaunee through teachings and treaties such as the Creation story, the Thanksgiving Address, the Great Law of Peace, and the *Kaswenta* or Two-Row Wampum treaty.

**3.1 Tsi kiontonhwentsison or The Creation Story:** I do not intend to re-tell the sacred creation story; nevertheless, this section highlights the main elements necessary to understand Haudenosaunee relations with their environment and spiritual world. The Creation Story emphasizes kinship bonding, creating balance, establishing peace, and living in peace and harmony with all creations. It tells of the Sky Woman, muskrat, turtle, and beaver working together to create land for the Sky Woman on turtles' back thus referring to North America as Turtle Island. The Haudenosaunee creation story not only celebrates the creation and continuity of life but also provides a “cosmological map” connecting the physical world with the Sky World (Hill, 2017, p. 24). It celebrates women and their life-giving power in connection to nature (Hill, 2017; Hoover, 2017). It maintains a non-hierarchical and sacred relationship with nature through thanksgiving and ceremonies (Vecsey, 1986; Bedford & Workman, 1997). Haudenosaunee observe different ceremonies all year long to show respect and gratitude to all creations. For example, the Seed Blessing or Planting Dance offers thanks to the three sister spirits: Bean, Squash, and Corn. The Maple Dance is to give thanks for the return of sweet water; the Thunder Dance is an appreciation of the arrival of the life-giving season; and the Sun Dance offers thanks to the warmer Sun that allows the plants to grow (Hill, 2017). The Creation Story teaches that nothing is endlessly evil. Unlike the western worldview, dualism in the Haudenosaunee worldview is complex; it is not binary but a “complementary dualism” (Vecsey, 1986, p. 92). The Haudenosaunee expect humans to help each other as part of the kinship system.

**3.2 Ohen:ton Karihwaterhkwen or the Thanksgiving address:** *Ohen: ton Karihwaterhkwen* or the “Words That Come before All Else”, the Haudenosaunee Thanksgiving Address, is considered as one of the original instructions that is used in the openings of all ceremonies and important events (Hoover, 2017; Martin-Hill et al., 2022). The Thanksgiving Address shows gratitude to all creations, human and non-human, for bringing minds into one: “*now our minds are one.*” Giving thanks reinforces stewardship. Thanks are also given daily at a personal level to all relational families in their physical and spiritual land. It is the worldview of Haudenosaunee. It reassures their relationship and interdependence with their land and environment. The Haudenosaunee Thanksgiving Address includes the creator, people, animals, trees, water, thunder, the moon, and the sun, as they are all essential for maintaining balance and peace in the land. Below is a part of the thanksgiving address focusing on water:

*Ohneka'shon: 'a Onen ehnon:we ientsitewakie: ra'te ne ohneka'shon: 'a tsi rawe:ren tsi enkahnekonionke ne tsiionhontsia:te. Ne ehnon:we nitewehtha ne aionkwaha'tana:wen non:nen enionkwania'tathen. Nia'teka' satstehsra:ke tewaienete:ri-tsi ieiohneken:shon, tsi iokenno:res, tsi iaonhawi:nes tanon' tsi kaniatarahron:nion. Khenska tsi entewahwe'non:ni ne onkwa'nikon:ra ne iorihwa:ke tsi entewatka'we ne kanonhwaratonhtshera. Ehtho niohtonha'k ne onkwa 'nikon: ra.”* Meaning, “*We give thanks to all the Waters of the world for quenching our thirst and providing us with strength. Water is life. We know its power in many forms-waterfalls and rain, mists and streams, rivers and oceans. With one mind, we send greetings and thanks to the spirit of water. Now our minds are one*” (Annunziata et al., 1995 cited in King, 2007, pp. 449-450, italicized added).

**3.3 Kayaneren'kowa or the Great Law of Peace:** The Great Law of Peace teaches Peace, Power, and Righteousness and emphasizes the importance of good minds in creating and maintaining Peace (Hill, 2017; Mann, 2018). The Great Law of Peace serves as the foundation, and structural, political, and spiritual directions for the Haudenosaunee confederacy brought to them by the Peacemaker (Lightfoot, 2021). The Haudenosaunee Confederacy is believed to have been established between 1400 and 1600 BC based on kinship loyalties and reciprocities,

reemphasizing spiritual connection to nature and all creations (Tooker, 1978; Vecsey, 1986; MacDougall, 2005, pp. 2-3). Some historians believe that the confederacy was established as early as 1142 BC (Legends of America, 2023). Two significant parts of the Great Law are uniting the Five Nations and establishing peace (Hill, 2017; Bedford & Workman, 1997). Brotherhood, sisterhood and unanimity were created among the chiefs. The Peacemaker, with the help of Jigohsase, a woman, Haiwantha/ Ayenwahtha and Tadahaho/ Tekarihoken established peace among nations (Vecsey, 1986; Hill, 2017; Mann, 1997). Symbolic representations of the Confederacy and the Great Law of Peace include the Longhouse, Wampum Belt, a Tied Arrow, and the Dish with One Spoon treaty. The Longhouse represents five fireplaces but one family; and the Dish with One spoon signifies a shared hunting ground without violence. The Dish with One Spoon treaty was extended to other Nations before European contact (Hill, 2017). The Five Tied Arrows symbolize the strength and power of togetherness (Vecsey, 1986; Hill, 2017). All these together symbolize the unity and power of the League or the Confederacy.

The establishment of the Great Law of Peace was about restoring balance, avoiding feudalism, and living in peace and harmony. Further, the Great Law teaches about collective rights and responsibilities and emphasizes the importance of considering future generations in decision-making (Hill, 2017). It declares the right of the natural world and that humans have a responsibility to protect those rights (Martin-Hill et al., 2022). After establishing Peace and the Great Law, the founders concentrated on foreign policy and foreign nations' rights. The League door was kept open for refugees from other Nations, and many from other Nations took refuge under the Great Tree of Peace. The founders also established rules about dealing with foreign aggression and encouraged treating enemies with kindness (Bedford & Workman, 1997; Ganter,

2009). Wampum belts serve as communication infrastructure with other nations. The Wampum Belt can also be used as a device to soothe or console oneself, as an expression of the alliance, to demonstrate the truth, and as medicine. The Wampum also works as a constitution to codify the Haudenosaunee Law (Vecsey, 1986).

**3.4 Haudenosaunee Kaswenta or Two-Row Wampum Belt Treaty:** More detail about the *Kaswenta* treaty is provided in Chapter two. The *Kaswenta* or Two Row Wampum belt is believed to be the first treaty between Native Americans and the Dutch, representing friendly relationships between two nations traveling side by side. The Haudenosaunee are on one side, and the Dutch are on the other, following the principle of peace, friendship, and mutual respect, never crossing paths but remaining connected (Hill, 2017, pp. 85-86). Later this principle of the *Kaswenta* treaty or Two-Row Wampum relationship was extended to the British and established the Covenant Chain of Friendship. The British also promised the same protection as the Dutch and recognized the distinct status of both parties as sovereign and allies, never to become subject to the other. The relationship continued to develop and was described as a silver chain holding British and Haudenosaunee ships to the Great Mountain, symbolizing their independence from each other. Six Nations made its first treaty with the British Crown in 1664 and allied with the British as a sovereign Nation, later entering many more treaties to maintain peace and to share access to natural resources (Hill, 2017). The Six Nations fought many wars, including the First World War, alongside the British.

However, the Covenant Chain was not kept intact and was declared broken by chiefs because of the unkept promises of the British. The British negotiated the Paris Peace Treaty after



the American Revolution with their thirteen colonies and excluded the Haudenosaunee as allies, which resulted in many Haudenosaunee losing their lands. By 1830 the Iroquois/Haudenosaunee were no longer considered allies by the British, and an active assimilation policy was developed to “civilize” them. For example, in the 1880s residential schools were created with an agenda of “killing the Indian” in a child (Stout & Kipling, 2003), and patrilineal systems were imposed, ignoring the matrilineal lineage structure of the Haudenosaunee. The Indian Act was created in 1876 to demolish or replace traditional governments with elected Band Council or elected governments. Despite all the attempts to destroy the Confederacy, the traditional government remained in place until 1924 and still plays a vital role in Haudenosaunee society (Bedford & Workman, 1997).

#### **4. Haudenosaunee women as leaders and spokespersons for the land and**

**water:** Haudenosaunee knowledge and philosophy make inseparable connections between women and the Earth as the first environment of life, caretaker, life sustainer, and source of original food (Martin-Hill et al., 2022; Hill, 2017; Hoover, 2017). As Katsi Cook (2016, pr-1) puts it, “woman is the First Environment. In pregnancy, our bodies sustain life. At the breast of women, the generations are nourished. From the bodies of women flows the relationship of those generations, both to society and the natural world. In this way, the Earth is our mother. In this way, we as women are Earth.”

Haudenosaunee women are responsible for protecting their relationship with Mother Earth. As a matrilineal society, female lineage founded the political and social structures of the Haudenosaunee, and Haudenosaunee women performed significant social, political, economic,

and spiritual roles in their society (Wagner, 2001; Hill, 2017; McCarthy, 2016; Martin-Hill et al., 2022). From decision-making to peacemaking and treaties, Haudenosaunee women significantly influence every aspect of Haudenosaunee lives. The Great Law also re-established women as leaders of the Confederacy based on equality and mutual respect with men. Clan mothers are an essential part of the Great Law. They choose and can take away the positions of a leader if they find the leaders are not fulfilling their duty and responsibilities. In addition, they are responsible for making major decisions that can affect their clans, naming the people in their clan, nominating the leader and ensuring everyone in their clan is fed (Haudenosaunee Guide, 2009). Women are responsible for declaring war and nominating chiefs (Wagner, 2001; Hill, 2017; Martin-Hill et al., 2022). Haudenosaunee women work to guard their sovereignty against assimilation and protect their land and water to protect their families and future generations.

Traditionally children were raised by women under the supervision of clan mothers. The longhouse was comprised of the women's family and men moved into their longhouse. The older women aided in supervising the children. An economy of agriculture and gathering was the area of women whereas men did the hunting. Children are considered a medium of the sky and the physical worlds, especially in mothers' wombs. The Mohawk word for midwife is *Iewirokwas*, meaning she brings life from water or Earth (Cook, 2003). The Creation Story provides the foundations of women's roles in society. Sky Woman, pregnant, carried seeds when she fell from the sky world and founded Turtle Island (North America) with the help of other animals. Haudenosaunee core principles of collective responsibilities, keeping balance, and living in peace and harmony are also reflected in their understanding of pregnancy and maternal health. Haudenosaunee believe they are connected with the Sky World. Pregnancy is one example of

that connection where the child and mother live in two different spiritual worlds but remain connected (Kandasamy et al., 2017). As a result, pregnancy is regarded as a sacred, natural, and spiritual journey (Oliveira et al., 2013; Kandasamy et al., 2017). The entire pregnancy and childbirth are believed to be controlled by the Great Power (Oliveira et al., 2013). Thus, the connection between the physical world to the sky and the spiritual world is reasserted in pregnancy. Following the core principle of keeping balance, the Haudenosaunee emphasize listening to and learning from one's own body and maintaining balance to ensure maternal health and wellbeing (Kandasamy et al., 2017).

Colonialism attacked Haudenosaunee women by replacing the matrilineal system with patriarchy and imposing the Indian Act, taking women's decision-making power and erasing their authority in their community. Residential schools took children away from their families, Clan mothers, and community care. Today, the numbers of missing and murdered Indigenous women and girls are alarming (NIMMIWG, 2019). Children are still stolen in state welfare or child welfare, where Indigenous children between 0 to 4 years old are overrepresented in foster care (Denison et al., 2013).

Despite all these erasures through direct attack, assimilation, colonial elimination, and genocide by settler colonial state of Canada, Haudenosaunee women still maintain their relationship with and continue their responsibilities for their environment, land and water and seek to protect them for future generations. For example, Haudenosaunee women are always at the forefront of defending their land, as seen in the recent 1492 Land Back movement that took place in 2006 at Caledonia, Ontario. It was mobilized and organized by Haudenosaunee women

to stop further land encroachment (McCarthy, 2008). *Ohenganos* youth leader and Six Nations woman Makasa Looking-Horse is fighting giant water extraction companies like Nestlé and Blue Triton that are extracting water from SN territory (Martin-Hill et al., 2022). Haudenosaunee midwives reclaimed reproduction by bringing birth back to the community and rejuvenating traditional practices and medicines related to reproductive health, pregnancy, childbirth, and postpartum care (SNHS, 2022). Clan mother Louise McDonald successfully worked to reconnect Haudenosaunee youth with Mother Earth through ceremonies called *Ohero:kon*, a rite of passage, to guide and teach youth about the connections of women's bodies to Mother Earth (Hoover, 2017; Martin-Hill et al., 2022).

### **5. Six Nations of the Grand River: A Brief Introduction:**

Six Nations of the Grand River is the most populous and the second largest First Nations reserve in Canada, with 27,660 band members, 12892 of whom live on the reserve (Six Nations Development Corporation [SNDC], 2022; Six Nations, 2021). The reserve is legally known as Six Nations Indian Reserve no. 40. As mentioned above, initially, there were five nations: Mohawk, Cayuga, Onondaga, Seneca, and Oneida; later, Tuscarora took refuge and joined the Confederacy in 1722 (Hill, 2017; Barbeau, 1917). Therefore, they are also known as the Six Nations. Six Nations is situated close to major Canadian cities such as Hamilton, Brantford, and Toronto. In the American Revolution, the Haudenosaunee sided with the British respecting their treaties, but British colonizers broke the treaties and surrendered Haudenosaunee land without consulting them in the Treaty of Paris (McCarthy, 2016). As compensation, General Frederick Haldimand offered six miles on each side along the Grand River, which was 950000 square kilometres (McCarthy, 2016; Tooker, 1970; Weaver, 1978). Before the Haldimand Proclamation

of 1784, the Six Nations' land right to the Grand River was also acknowledged in many treaties between the Haudenosaunee and the Crown, such as the Albany Treaty or Beaver Hunting Ground Treaty in 1701 (Hill, 2009; McCarthy, 2016). However, by the early 1800s, settler colonizers had disposed of over 600,000 acres of Haudenosaunee land (Hill, 2009, p. 485). Within only 63 years, the settler colonizers grabbed most of their lands; currently, only 4.8 percent of their land remains (McCarthy, 2016) (Figure 1).



Figure 1. The Haldimand Tract and Six Nations Reserve. Nations Land and Resources. [Six Nations Lands and Resources](#). Used with permission.

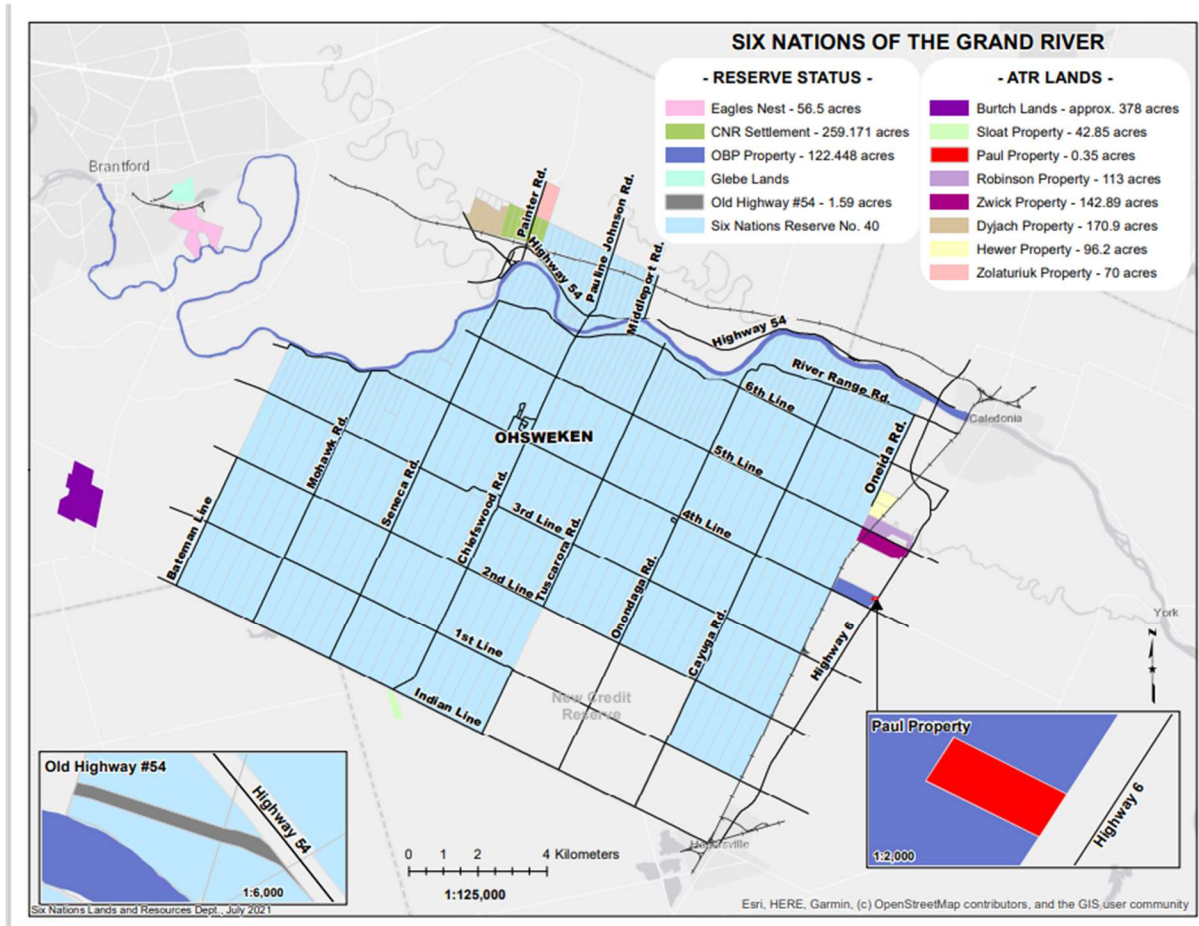


Figure 2. Six Nations of the Grand River Reserve. Six Nations Land and resources. [Six Nations Lands and Resources](#). Map used with permission.

Moreover, toxic chemical industries were purposefully built along the Grand River, disclosing environmental racism (Duignan, 2021). In addition, runoff from animal farms and commercial agriculture contaminated the Grand River, the water source for SN. Currently, more than 85% of households at Six Nations do not have access to clean running water (Dupont et al., 2014). A water treatment plant was established at Six Nations in 2014; however, it only serves 12% of the households (Figure 3). Many SN households have cisterns and wells and rely on

purchasing bottled water or truck in their water to fill in their cisterns and wells for daily uses (Duignan et al., 2021).

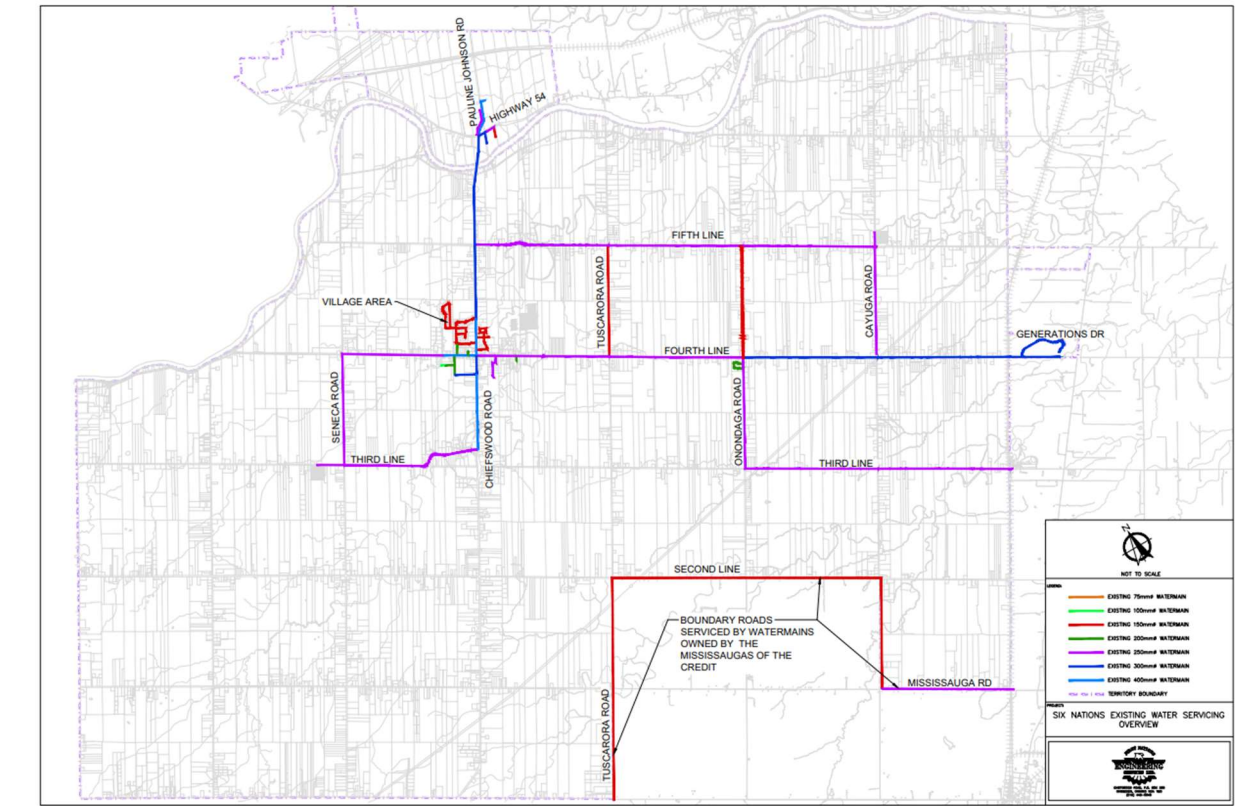


Figure 3. Existing water service by the SN water treatment plant. The map acquired and used with permission from the Six Nations Public Works.

**6. The Grand River as a hydrosocial and biocultural being:** Research in anthropology has demonstrated that water has cultural, political, and economic significance (Wutich et al., 2019; Walker, 2017). Similarly, Indigenous scholars have emphasized the spiritual significance of water (Todd, 2017; Hoover, 2017). In Haudenosaunee Knowledge, water is life and alive, sentient, medicine, and performs its responsibilities as assigned by the creator (McGregor & Whiteker, 2001; Cooke, 2008). Water is a spiritual being, active, shaping, and shaped by human actions and interactions. The Grand River has profound meaning to the SN community, influenced by traditional teachings. These teachings make the water and the Grand River a

“hydrosocial” or “biocultural” being. To understand how water affects SN mothers’ health, it is crucial to examine the local meanings and interrelationships with water by situating them in broader socio-economic, political, and historical contexts.

Water has been a target of exploitation by colonialist and capitalist policies and agendas (Murphy, 2017). Both the SN and the Grand River have been experiencing the dominance and exploitations of the settler-colonial state of Canada. However, water is not a passive recipient of human actions and politics but also an active agent that shapes social relations and politics (Mosse, 2008; Linton & Budds, 2014; Murphy, 2017; Todd, 2017). Water demands “flexibility and negotiability in social relations” (Mosse, 2008, p. 944). It resists the western idea of private property as it crosses human-made land boundaries and requires communities and societies with different knowledge and worldviews to work together as they share the water (Mosse, 2008; Stevenson, 2018; Todd, 2017). Water shapes and reshapes geographies, thus challenging dualistic thinking about water and land or water and society (Linton & Budds, 2013; Neimanis, 2017). “Because water moves,” as Mosse puts it, “it erases as well as makes social boundaries; it changes the landscape, provides the basis of new claims and threatens established orders (2008, p. 944).”

The Grand River is shared by Indigenous and non-Indigenous communities and multiple species of fish and animals. The Mohawk name for the Grand River is *O:se* or *Ose’kowáhne*, meaning the Willow River (The Decolonial Atlas, 2015). The Grand River watershed is the largest in Southern Ontario, almost the same size as the province of Prince Edward Island (Grand River Conservation Authority [GRCA], 2023; Veale et al., 2014) (Figure 4). It is 310 kilometres



long, starts in Dufferin County and ends at Lake Erie. It includes the major cities of Brantford, Cambridge, Guelph, Kitchener, and Waterloo. Seventy percent of the watershed is farmland (GRCA, 2022), and about 5 percent of the land is in cities, towns and villages (Drinking Source Water Protection [DWSP], 2022). The Grand River crosses four different climate zones and two forest zones and is home to diverse animals and species. It supports intensive agriculture. Sixty-four to 70 per cent of the land of the southern Grand River is used for agriculture (Loomer & Cooke 2017, 122).

The Grand River is a water source for 50 municipal drinking water systems as well as for the Six Nations of the Grand River Community (DWSP, 2022). It serves one million people and assimilates 30 wastewaters from different communities (Veale et al., 2014). These plants remove 95 percent of the pollutants, releasing the wastewater into the river (GRA, 2022). However, the river cannot break down all the pollutants from the 30 wastewater treatment plants. Research has found various contaminants in the Grand River mainly caused by commercialized animal farms and landfill runoff (Huck, 2016). For example, some research reported high opioid and artificial sweetener levels in the Grand River (Shetty, 2021, Spoelstra et al., 2013). Various kinds of garbage is found in the Grand River, including styrofoam, plastic bottles, and old tires (Thompson, 2017). The Grand River water is reported to be of poor quality, with low oxygen levels (Loomer & Cooke, 2011). However, the water quality has been improved through positive efforts and initiatives, such as being designated as a Canadian Heritage River in 1994 (GRCA, 2020; Thompson, 2017).

In addition, to providing drinking water supplies, the Grand River is also popular for recreation such as paddling and kayaking and tailwater fishery ([2020-09-16-WWTP-Summary-Report.pdf \(grandriver.ca\)](#)). The Grand River for the Haudenosaunee has been a “repository” of their knowledge and cultural traditions (Hill, 2017). It has also been a site for colonial assimilationist policies and land encroachment. Haudenosaunee relations with water from the Grand River have been an important site of their political struggles, for declaring their rights and sovereignty, and reclaiming traditional knowledge and practices (Stevenson, 2018). As such, the Grand River is not a passive recipient of social processes but actively shapes and is shaped by social and political relations and structures (Linton & Budds, 2014; Stevenson, 2018). In this research, water has been understood as hydrosocial in biocultural terms, an active sentient agent.

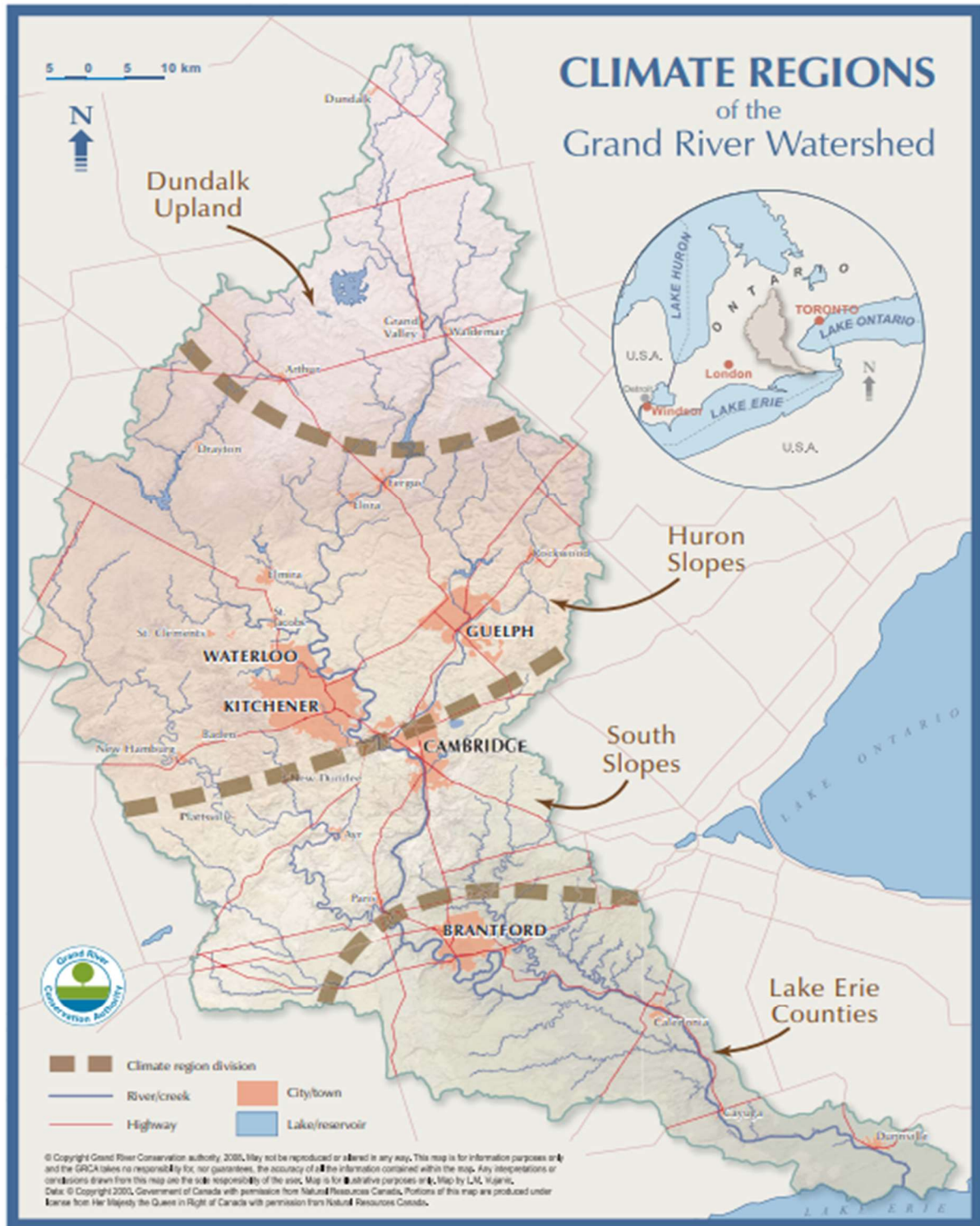


Figure-4. Map of the Grand River watershed. Used with permission from the Grand River Conservative Authority [GRCA], source: [Index - Grand River Conservation Authority](#).

## **7. Materials and Methods:**

### **7.1. Ohneganos: the larger project:** The Co-creation of Indigenous Water Quality Tools

(CCIWQT) project used Indigenous or Local Knowledge and western science to co-create knowledge about ecosystems and human health in relation to contaminated water in partnership with the Six Nations of the Grand River, Ontario and the Lubicon Cree Nation of Little Buffalo, Alberta. Community partners identified three main areas of pursuits: bridging traditional ecological knowledge with western science to train and build capacities to manage future environmental challenges; building youth mental health resilience related to water security; training youth and assisting the community in water governance, rights, and responses inclusive of Indigenous laws. This led to the project called *Ohenganos Ohnegahde:gyo*—Water is Life led by Indigenous and academic co-principal investigators (Figure 5).

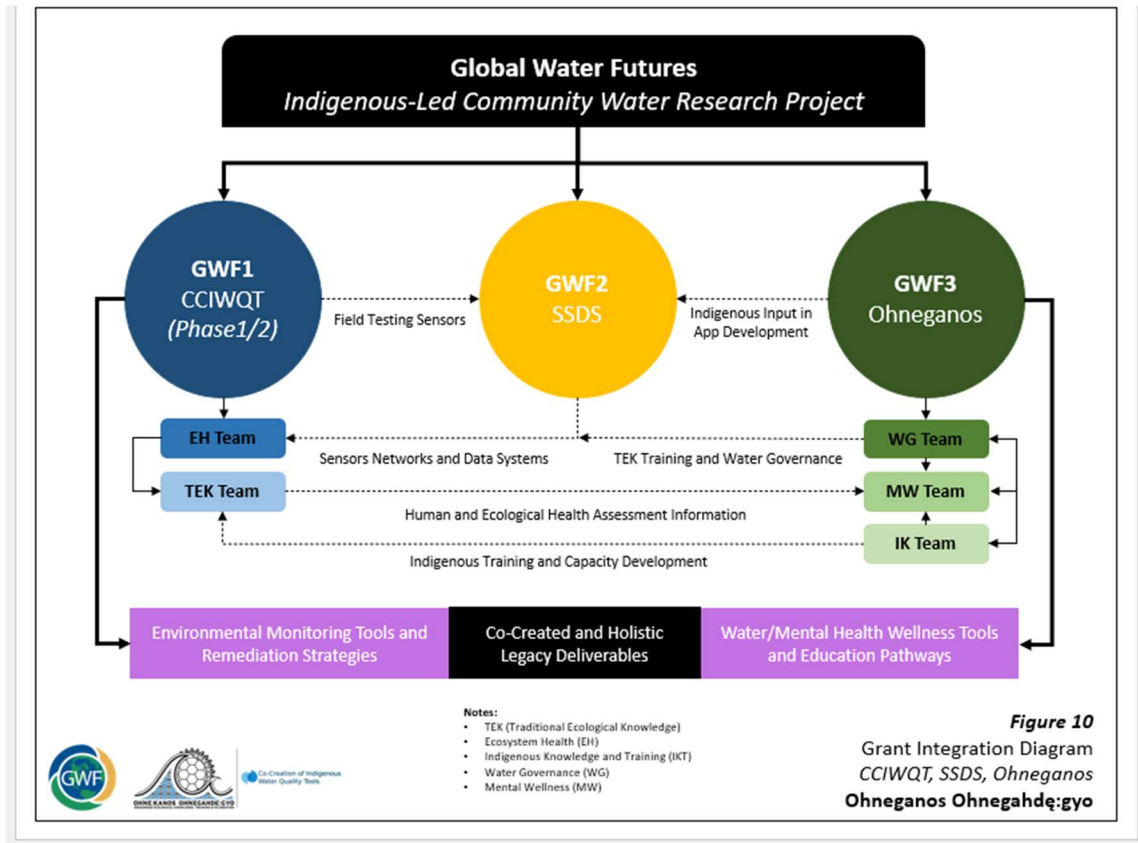


Figure 5. GWF grant integration diagram, created by Colin Gibson, project manager, used with permission.

The Ohneganos project led by the SN applies mixed methods to solving water insecurity in the community, emphasizing self-determination and sovereignty. The project focuses on Indigenous knowledge of human-nature linkages or interconnections, emphasizing women’s traditional relationship with water (Martin-Hill et al., 2021). The project is helping to build capacity in the SN community by providing training on source water monitoring and water management. The project takes anti-colonial steps by celebrating women’s leadership in the project and in the community, where Haudenosaunee women have guided and led the project. The three main foci are Indigenous Knowledge or Traditional Ecological Knowledge (TEK), mental wellness, and water governance. *Ohneganos* is also doing archival mapping known as “terrastories”. (Figure 6)

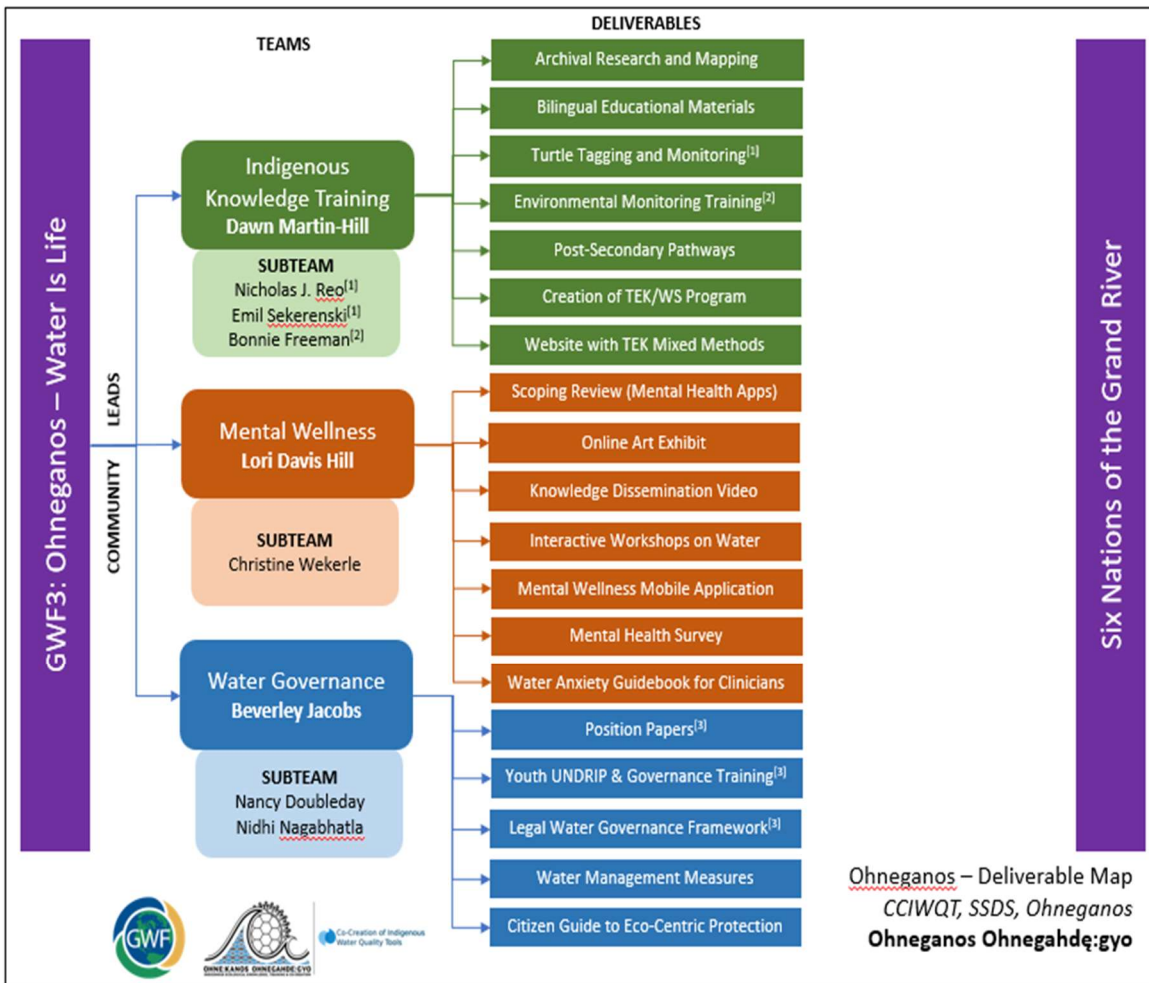


Figure 6. Ohneganos—water is life deliverables, adapted with permission from diagram created by Colin Gibson,

## 7.2 Decolonizing Research Approach:

As a part of the *Ohneganos* project funded through the Global Water Futures (GWF), this research progressed by adopting a decolonizing approach throughout by rejecting objectivity and acknowledging the researchers’ inherent biases derived from the researchers’ worldviews, training, and life experiences. It is crucial to acknowledge and understand that academic research, especially anthropological research and methodologies, have been exploitative, imperialist, and racist (Smith, 2012; McCarthy, 2016). With some rare exceptions, anthropological research contributed to the assimilation, marginalization, and extermination of Indigenous people (Kovach, 2009; Smith, 2012; Stevenson, 2014; McCarthy, 2016) and created

"repressive authenticity," as McCarthy (2016) terms it. Research in social science materially and politically benefited the researchers (Galtung, 1975). Indigenous scholars and researchers demonstrated a direct link between academic research and colonialism as research has been used as a weapon by colonial states to subjugate, control, and assimilate Indigenous people and to get access to their lands (Smith, 2012; Wilson, 2008). It justified ripping them of their identities, even exterminating them (Smith 2012, p. 27). Anthropology and anthropological research contributed to reproducing and reinforcing structural violence serving colonial agendas. It kept colonialism alive through the research, theory, and methods in the community by creating "the Other" (Uperesa, 2016; Todd, 2016).

Therefore, in the process of decolonization, Uperesa (2016) and Todd (2016) call for alternative ways of thinking, which will dislocate subject/object dualism. Galtung (1975) calls for the abolition of vertical divisions of labour so that "the researched" will not be considered as "researched" but as a part of a team. Smith (2012) proposes alternative words such as a project for research, a process for a method, and community for a field. The research for the current dissertation progressed by following the lead of Haudenosaunee women. From designing the research to data collection and analysis, the Six Nations Birthing Centre led this research as an active community partner.

### **7.3. The Six Nations Birthing Centre (SNBC) (Tsi Nón:we Ionnakerátstha) as research**

**partner:** The research progressed in partnership with the SNBC, following their lead and guidance throughout. The digital story (Appendix Q) I created is submitted as a part of the thesis that talks about the foundation of SN maternal and childcare centre, the philosophy behind it, and

the success that has been achieved in the 25 years since its establishment. In addition, there is a discussion about SNBC and their political activism to reclaim birth and sovereignty in chapter 2. I was invited by the *Ohneganos* project PI and my supervisor, Dr. Dawn Martin-Hill, to work on a collaborative project with the Six Nations of the Grand River community to assess the health impact of water insecurity in 2017. Ohneganos project complied with OCAP/TRI-Council ethics approved by SNEC ethics. I started visiting the community for project meetings and learned more about water situations in the community. I visited the SN water treatment plant in 2018. During my PhD. coursework, my interactions with the SN community were limited to Global Water Futures meetings, assisting in the GWF table at the summer Powwow, and helping in the community medicine garden. More active communication with the SNBC and the community started in the late summer of 2018 when Dr. Martin-Hill discussed water with the SNBC director Julie Wilson and they both decided to include maternal health in the *Ohneganos* project. They also decided to examine water insecurity's impact on maternal health by reviewing midwives' charts and invited me to collaborate on the project with the midwives (MW). I proposed incorporating interviews and focus group discussions (FGDs) with community members to gather firsthand empirical data about water insecurity and maternal health. The research project was discussed and approved in midwives' meetings. We initially planned to interview women (mothers/clients), men (father figures), and volunteer consultant grandparents at the SNBC. Unfortunately, we had to exclude men from the research design to adjust to the changing situation of the COVID-19 pandemic discussed below.



**7.4. Memorandum of Understanding:** We used a memorandum of understanding for this research with the SNBC (see appendix A). A memorandum of understanding (MOU) helps reinforce responsibilities and agreements and establish trust (Ball & Jnayst, 2008). It is also helpful in protecting individuals and communities from the negative impacts of research (Ball, 2014). A MOU was also essential to obtain ethics approval from the HiREB as it demonstrated the community's agreement with the research. Although we created a memorandum to set expectations and responsibilities for the research, our conversation and trust in our words were sufficient to continue the research. The oral commitments have value in the tradition and culture I come from. Similarly, Haudenosaunee knowledge transferred orally is as essential as a written document. The memorandum, however, worked as a reminder of ethical research. It was a reminder of our agreement and written consent that the SNBC can withdraw from the research at any time. It highlighted their rights. Throughout the research, our sincere commitment and good minds kept us going.

**7.5. Co-developing interview questionnaire and guidelines:** To discuss the semi-structured interview and focus group discussion (FGD) guides, Julie Wilson, the supervisor midwife at the SNBC, and I met at my office at the Department of Anthropology at McMaster University to go over each question together so we could make sure that the questions were relevant, in the proper sequence, and easy to understand for the general community. Julie also helped with word choices. In addition to the interview and FGD guides, we discussed and finalized consent forms and an advertising pamphlet (see Appendices E, F, G, H, I) for the research. Julie helped make the invitation pamphlet more communicative and meaningful to the community. A protocol for data collection from the MW charts was also co-developed (see appendix D). The preliminary

plan, as mentioned before, was to review midwives' charts at the SNBC to investigate the relationships between mothers' health and water. MW charts are handwritten notes maintained for each birthing parent following Ontario government forms for midwives, and they are confidential, so I was supposed to visit the SNBC and spend time reviewing charts at the SNBC. However, this plan of in-person interviews and FGDs was changed and adjusted due to the ongoing COVID-19 pandemic. As a result, we mainly conducted phone interviews with SNBC clients and cancelled focus group discussion (FGDs) for the safety of the community and the researchers. The SNBC midwives helped collect data from their client charts following a protocol (appendix D) developed by Julie and me.

**7.6 Impact of Covid-19 on research:** The COVID-19 pandemic affected the community and the research leading to changes in methods and interviews. A few days after we submitted our application to the Hamilton Integrated Research Ethics Board (HiREB) for ethics approval in March 2020, the province of Ontario went into complete lockdown, allowing only essential errands and limiting in-person interactions even with family members. The SN community was locked down for non-members, which changed my plan to be in the community in person to conduct interviews and review MW charts. I discuss this impact more in chapter 2, but to mention briefly, the impact of COVID-19 forced us to change our methods and strategies. We realized the difficulty and risk of conducting in-person interviews and FGDs during lockdowns. We changed all in-person interviews with the clients to phone interviews and had those interviews audio recorded. FGDs were cancelled to follow the provincial and community pandemic guidelines and to ensure safety for both participants and the researcher. Realizing the difficulties of phone interviews with a researcher that the participants did not get a chance to

know in person, Julie offered a solution by recruiting Janet Homer, SNBC maternity care worker and SN community member, to conduct all the interviews. Due to the privacy and protection of the midwives' handwritten charts, it was impossible to hand them to me outside of the SNBC territory. The midwives solved the problem by deciding to collect related data from their charts during their meetings with other midwives. I was then handed the collected data for analysis. These changes needed to be reflected in our application to the HiREB and SNREC. We underwent a significant change in the application, which resulted in a delay in obtaining ethics approval. More on our research collaboration is discussed in the next chapter (chapter 2).

This research received funding from the GWF *Ohneganos* project, the School of Graduate Studies fieldwork research fund, and the thesis-writing fund from the Anthropology Department at McMaster University. However, the bulk of my funding remained unused due to not having to travel to the SN community as much as I had initially planned and due to the significant in-kind contributions the SNBC made by recruiting their maternal care worker and midwives in data collection.

**7.7. TCPS2 training:** I received a TCPS2 training certificate before conducting this research (see appendix K). Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC), and Social Sciences and Humanities Research Council of Canada (SSHRC), together known as the Tri-Council research funding agencies, updated their Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS) in 2020 to include an entire chapter for the research that involves Indigenous and First Nations peoples commonly known as TCPS2 to ensure "respect, concern for welfare,

and justice (Stiegman & Castleden 2015, 1). It emphasizes relationship building, shared decision making and mutual capacity building (Castleden et al., 2012). TCPS2 training has been excellent as it reminded me about historical mistreatment through research, awareness about the potential misuse of power by researchers, and the importance of informed consent in every part of the research. However, it does not provide guidelines about navigating tensions between the university research ethics board and the Indigenous community's ethical guidelines (Stiegman & Castleden, 2015), a tension also felt by the larger CCIWQT project (Duignan 2021). Stiegman and Castleden (2015) point to the ultimate decision-making power of the university and call for more balance and effective ways of doing community-based research. Therefore, researchers trying to do research with good minds often face bureaucratic challenges (Ball, 2014; Ball & Janyst, 2008).

Akwesasne Task Force on the Environment, 1996, and the Royal Commission on Aboriginal Peoples, 1993, emphasize active roles by community partners at all phases of research (Ball & Janyst, 2008). In addition to the Hamilton Integrated Research Ethics Board (HiREB), this research sought ethics approval from the Six Nations Research Ethics Committee (SNREC) and obtained approval as a part of the larger *Ohneganos* research project (see Appendices L, and M).

**7.8. Ethics approval from the HiREB and SNREC:** My specific maternal health and water insecurity study had to acquire two ethics approvals: one from the HiREB and the other from the Six Nations Research Ethics Councils (SNREC). In addition to separate consent and questionnaire for each group of people (clients, midwives, and grandmothers), HiREB asked for

SN community approval for the project, which is vital for research with Indigenous communities in Canada. The preliminary approval of the larger CCIWQT project was provided to HiREB. Ethics clearance for the research was sought from the SNREC along with the MOU and TCPS2 training certificate. We had to change our application to the HiREB by adopting research strategies suitable during the COVID-19 pandemic. The research finally received HiREB clearance in August 2020 (see Appendix O).

**7.9. Materials and management of data:** Both primary and secondary data were collected for this research. A co-developed interview guide and protocol were used to collect data from interviews and MW charts. My notes written prior to the COVID-19 pandemic from visiting and observing the community and its water treatment plants and notes from my meeting with the SNBC director, midwives, and maternity care workers also helped record information. The secondary data came from peer-reviewed articles, books, grey literature, and Canadian government and Six Nations websites.

Recruitment of research participants was done via invitation brochures (see Appendix I) that were placed at the SNBC receptionist's desk. However, due to the limited access to the SNBC during the pandemic, most participants were recruited through word of mouth. Two layers of informed consent were taken for each interview: oral and written. The participant provided oral consent over the phone before the interview started with a reminder that they could withdraw their participation in part or full anytime during and after the interviews and choose not to answer any questions. After the phone interview, Janet set a time convenient for the participant to receive their \$50 gift certificate, determined by the SNBC as a small compensation

for their time. At that time, the participant signed the written consent form, which ensured continual consent. We interviewed 55 participants in total where 41 were mothers who were SNBC clients, 4 SNBC midwives, and 10 consultant grandparents affiliated with the SNBC. All interviews were stored on my password-protected personal computer, a password-protected external hard drive and in McMaster University cloud storage, MacDrive. The MacDrive was shared immediately with the SNBC by creating McMaster email IDs for Julie and Janet, ensuring Ownership, Control, Access, and Possession (OCAP).

**7.10. Study Participants:** We partnered with the SNBC to learn how limited access to no access to clean running water in the community affects maternal health. For this purpose, we recruited clients who are residents of Six Nations. Therefore, clients who were not a resident of SN were excluded. In total, 41 mothers were recruited for this research. Ten consultant grandparents and four midwives also gave us interviews, expanding our knowledge and understanding of the relationship between water and maternal health. Of the 41 mothers we interviewed, the age varied from 17 to 51 years old (see the chart below). Most mothers (34%) were 25 to 30 years old (see Figure 7). In addition, we interviewed grandmothers (n=10, age, 65-88), and midwives (n=4, age 37-65).

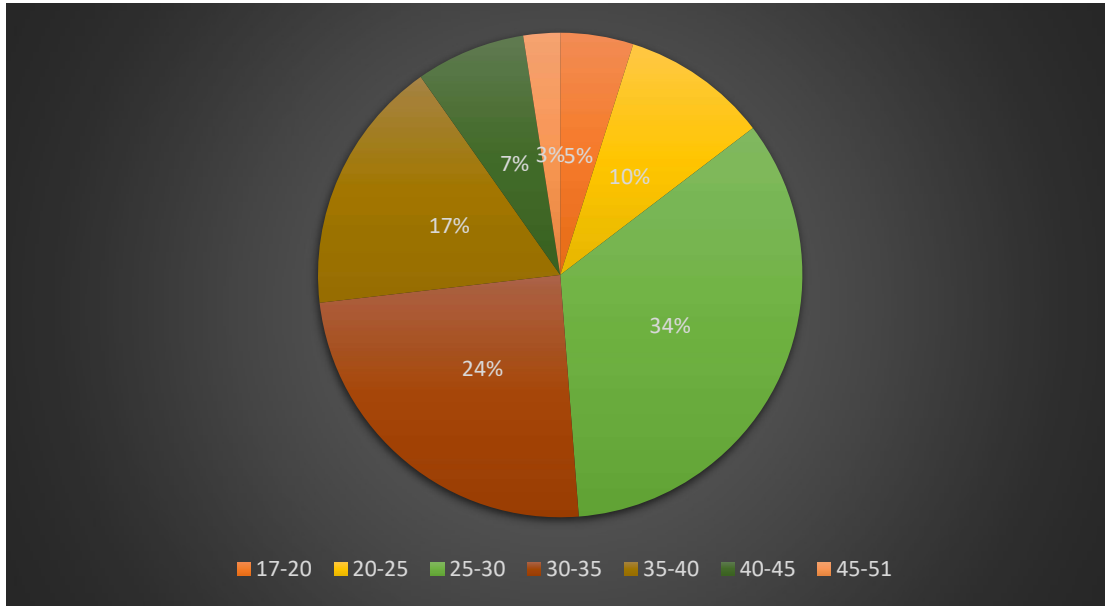


Figure-7. Age chart of participants clients.

Of the 41 mothers, there were single mothers (n=9), married (n=13), living with a common law/partner (n= 18), and among them, four were pregnant at the time of interview. The number of children they had at the time of interview varied from 1 to 6 (see Figure 8).

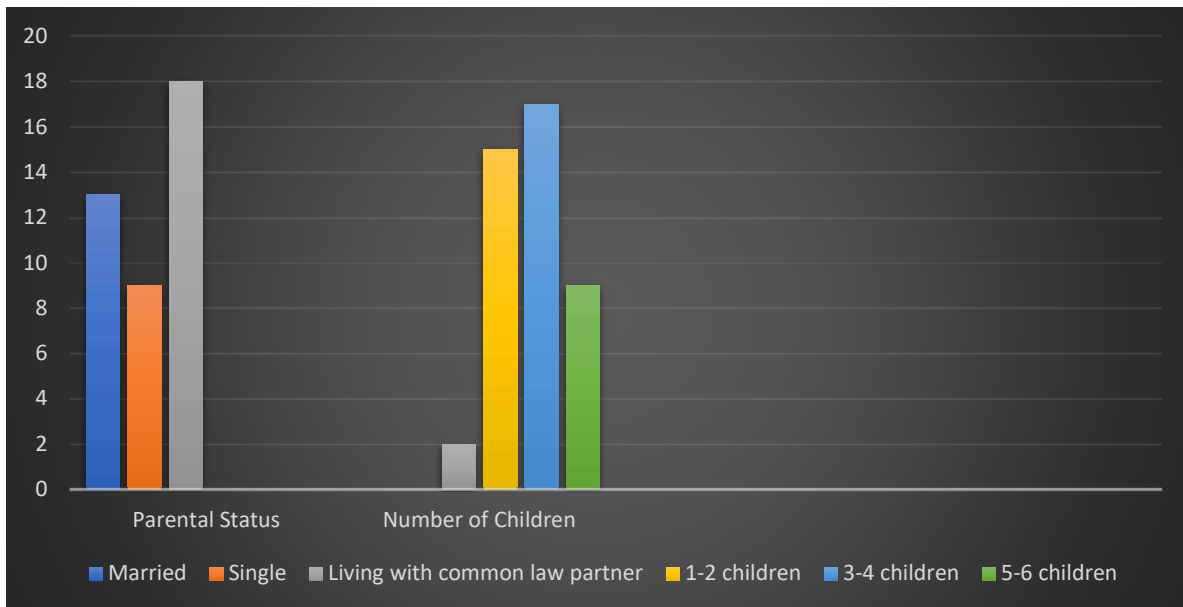


Figure-8 demographic information of participants

**7.11. Interviews and storytelling as methods of data collection:** We used semi-structured interviews and storytelling as a method of data collection. The SNBC maternity care worker, Janet Homer, conducted all interviews. Community partners are better equipped to interview as they know the proper ways to show respect and appreciation (Ball & Jaynst, 2008). As discussed in detail in chapter two, Janet was well equipped to advise on interview strategies. She was in charge of recruiting clients, finding suitable times to interview, knew when to stop, if she should stop the interview (i.e., baby crying, family members' sudden visit, client's visit, or getting emotional). Janet asked co-developed semi-structured questions following the guidelines and listened to the stories that participants shared while showing respect and gratitude in a culturally appropriate way. As an insider, Janet was aware of traumatic experiences in the community; she was able to show genuine empathy and offer social support, as was the case for Ball and Janyst's (2008) projects as well.

**7.12. Interview transcription:** All interviews were audio recorded with permission from the participants. I listened to all interviews first before I started transcribing them. I received interviews periodically from Janet, and I listened to them as they came in to get a feel for the interviews. It made me feel like I was there, but just not asking the questions myself. Janet and I met regularly to exchange recorded interviews, thoughts, feedback, and plans. I only started to transcribe data after all interviews were done. First, I input them into NVivo software (NVivo 12) to use its automated transcription feature; then, I reviewed each interview by replaying the recordings to ensure the transcription was verbatim. Although NVivo was helpful and timesaving, it missed some words that were said. Some were because the participants used Indigenous words, or because NVivo could not capture and missed the words, tones, and pauses.



I corrected those words and ensured the tones, corrected the punctuation and so forth. Although I tried to transcribe verbatim as much as possible, some passages were missed due to unclear recordings, and there was an incidence where participants were cutting off as they were talking due to a poor phone network. I took notes when participants used Indigenous words and later asked Janet about them to ensure I had used the correct word. Janet provided me with the right words with spelling and meaning in English. I would then input them into the transcription. The privacy of the participants was maintained by making all data confidential by using codes instead of names.

**7.13. Data analysis:** Both deductive and inductive data analysis have been used in this research. The deductive analysis reflects the research objective to investigate the impact of water insecurity on SN mothers' health and wellbeing. It also is helpful to sort data based on types, participants, and age groups. (Bingham & Witkowsky, 2022). I initially used deductive data analysis to categorize data using NVivo qualitative data analysis software and manually colour coded based on the words or concepts used by the participants. I sorted the data using interview groups: mothers, midwives, and grandmothers, and according to my research objectives. After the initial categorization of data, I used inductive analysis for data coding. Inductive data analysis helps to condense data, establish a link between data and research objectives and develop a theoretical framework (Thomas, 2006). Inductive analysis helped generate themes and concepts from raw data. I reread transcripts several times to identify themes, categories, patterns, concepts, topics, and frequencies. I used memos or notes for important quotes. A summary of the data analysis can be seen in Figure 9.

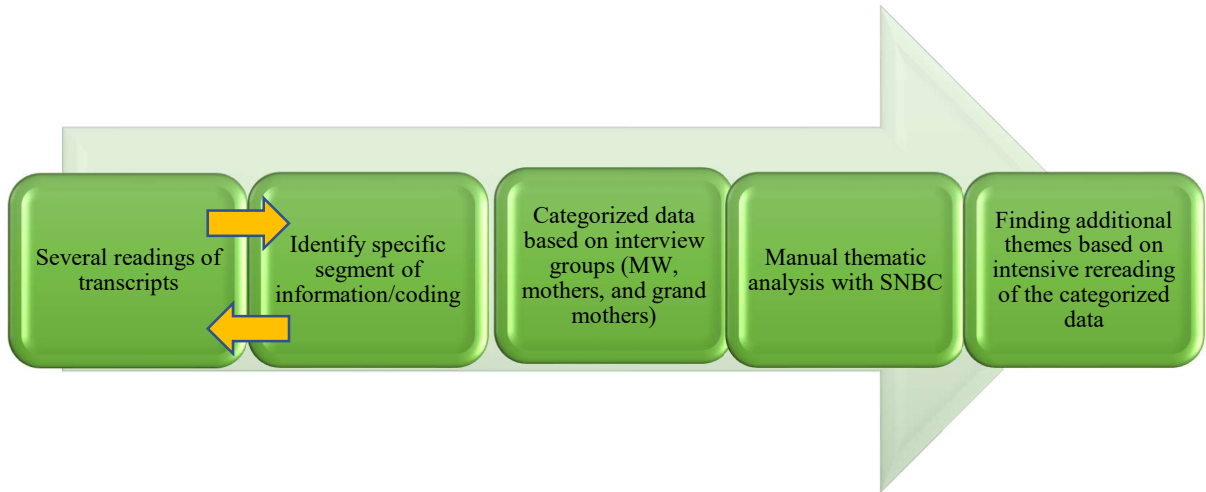


Figure 9. Steps of data analysis from semi structured interviews.

Thematic analysis has also been an essential aspect of data analysis for this research, as thematic analysis is flexible, helps identify and analyze patterns, and provides “a more detailed and nuanced account of one particular theme, or group of themes, within the data” (Braun & Clarke, 2006, p. 83). Thematic analysis was conducted with the SNBC midwives and maternity care workers. We went through the transcriptions and discussed over the phone where the SNBC decided on some of the common themes they found in the interviews and shared them for me to add with some other themes I had identified. I also kept an analytic memo to jot down my thoughts, ideas, questions, and reflections that helped create themes and analyze them (Rogers, 2018). Data coding was not unilinear but cyclic/iterative, meaning I went back and forth between the data coding and analysis. I tried to find the big picture first, as suggested by Deterding and Waters (2018), in relevance to research objectives and questions. Therefore, I coded materials under each question first, then reread them to find sub-sections/themes and points, a coding method that Deterding and Waters (2018) call “flexible coding.” Finally, I wrote down important quotes in other coding categories. Although I tried using NVivo in the beginning, I mostly did

coding manually in MS word files, utilizing multiple methods such as colour coding and categorizing. I also used comparison analysis, as mentioned by Wuitch (2009), to compare data between different interview groups.

**7.14. MW charts analysis:** The SNBC midwives and my research partners, Ashley Lickers and Stephanie George, went through their clients' charts to collect data based on the co-developed protocol. We co-developed a guideline to collect data from MW charts (see Appendix D). After data collection from the MW charts, we conversed over the phone and shared our experiences collecting data. I also met Stephanie George personally when I collected MW charts data from her. I followed up with her about any discrepancies in data or if I needed further information about a term. MW charts were manually quantified for patterns and frequencies. After collecting data from the MW charts, I made a bullet-form summary for each mother, making the main information easily visible. Chart data were categorized into several categories, such as number of mothers who experienced UTIs and experienced dehydration, stress, and anxiety. Those numbers were then input into MS Excel to find the percentage of the category reported in MW charts. See Figure 10 for chart analysis steps.

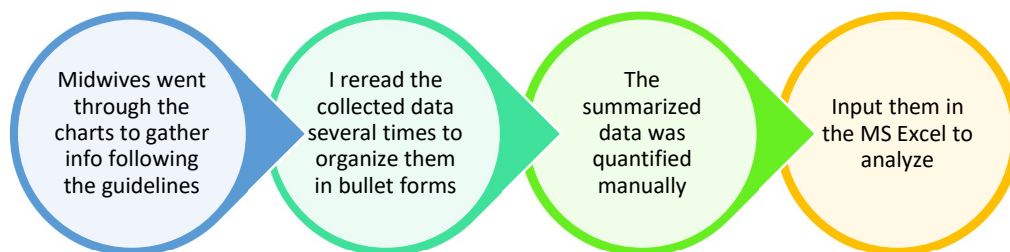


Figure 10. Steps for analysis of MW charts

**7.15. Research project impact and guidance from the participants:** While some participants believed that more actions than research are needed to solve water issues in their community, their feedback and comments on the project were mostly positive. Many participants found sharing their experiences related to water made them more grounded and helped them reconnect with water. Every time I met Janet, I asked about participants' thoughts and reactions to the research. Janet informed me how participants were participating in the research for themselves and their community and were happy to be able to talk about their experiences with water insecurity that many of them have normalized.

Our last question in the interview guide was, "is there anything we missed, or you wanted to share that we did not ask" to which often Janet added, "what would you say to the researcher say, if they were right in front of you?" This question made us more grounded in the research ethics. We received suggestions on disseminating research results to the community in lay language, avoiding academic jargon. As one participant mentioned, the research results should be presented in the community "in a very down-to earth-way." Another participant asked us to provide a copy of the research report to the SNBC, so they do not have to look for it. Participants' comments and guidance have shaped how I write this dissertation, theorize the analysis and plan to disseminate the data to the community and academic space.

**7.16. Mutual benefit:** As Ball (2008) has mentioned, research is a journey, and its benefits and specific outcomes are not determined in advance. Similarly, we cannot be sure exactly how we benefitted the community. Ball and Janyst (2008) state that research partnerships open

opportunities for learning new skills, exploring and finding a topic of interest, and networking with different organizations and people. Through the partnership, non-Indigenous people can learn about Indigenous Knowledge and worldviews (Ball & Janyst, 2008). Through this research, I learned new skills and Haudenosaunee knowledge. I also relearned and rediscovered myself, which has been my most significant benefit. Indigenous communities want researchers to focus on strengths and to move away from pathologizing and extractive research. Instead, it is more productive to focus on continuous striving and restoring Indigenous Knowledge and practices, similar to the findings of Ball and Janyst (2008) in their research. One indirect benefit for the participants, other than being compensated for their time by Walmart gift cards of \$50, was that participants expressed that they were happy to contribute to knowledge for positive changes. One participant mentioned that this research helped them to reconnect with water and has provided a way to socialize from a distance during the pandemic. Creating knowledge could be beneficial, too, if not significantly contributing to social justice (Ball, 2014).

**8. Theoretical Framework:** When SN mothers talked about water insecurity affecting their holistic health, they frequently brought up the analogy of how human bodies are made of water, unsettling the boundaries or binaries between human bodies and water. 85% of the human body is water, and the Earth has three times more water than land. SN mothers connected water, the human body and Earth inspired by their traditional knowledge shaped by their creation stories and the Great Law of Peace. The Haudenosaunee emphasize interrelationships, interdependence, and interconnectedness with the natural world. They do not compartmentalize water and the human body; instead, they understand them as complementing each other. Identity as Haudenosaunee women and mothers is interwoven and entangled with their relationship with

water, in a continual conversation, in the process of co-constructing each other, which Ingold and Palsson (2013, p. 8) termed “biosocial becomings.” Ingold and Palsson (2013) describe biosocial becomings in opposition to beings as they argue that the term human being is confined and bounded. On the other hand, biosocial becoming asserts continual co-constructions of human beings with their environments. For SN mothers, it is about becoming Haudenosaunee with water and the natural and spiritual world, not separate from them. Therefore, understanding water insecurity and its impact on Haudenosaunee mothers’ health and wellbeing requires a theoretical framework highlighting humans’ entanglements with their natural environment and other-than-human beings, as well as contextualizing them in larger political ecology and the history of assimilation, dispossession, and elimination by settler colonialism. Building on Traditional Ecological Knowledge (TEK), Critical Medical Anthropology (CMA), and environment anthropology (EA), along with other related disciplines such as geography, I use interconnections and entanglements as analytical frameworks. In doing so, I highlight two main points: 1. Humans are connected and dependent on other organisms. Human bodies are porous and affected by their interactions with their environment and relations with more than human beings. 2. Like humans, nature or the environment is not passive; it has agency and shapes and is shaped by human actions. Inspired by Berry (1988) and Hoover (2018), I offer *enchanted entanglement* to describe this porous, fluid, and entangled relationship between humans and nature, intersecting multiple identities based on class, gender, race, socio-economic conditions, and power relations. I describe this concept in more detail later in this chapter.

### **8.1. Traditional Ecological Knowledge of Health, Land, and Water:**

TEK is known as traditional ecological knowledge (Nadasdy, 1999) or Traditional Environmental Knowledge (McGregor, 2004) which is built through the relationship with the land and the environment. Despite the plurality and diversities among Indigenous knowledge or science, some common features can be identified. First, TEK emphasizes interconnected relationships that encompass ecosystems and the Earth (Berkes, 2018). One of the main characteristics of TEK framework is that nature is considered as alive, sentient, responsive, and spiritual (Berks, 2018; de la Cadena, 2015; Todd, 2017; Mangiameli, 2013). Second, TEK is adaptive, dynamic, holistic, inclusive, rooted in the land and transfers orally to future generations (McGregor, 2004). Third, Indigenous ontology is considered to be relational as the world is viewed as a “web of connections and relations (Wilson 2008, pp. 73-74)” where humans and non-humans are part of the same family (Anderson, 2010). Fourth, TEK considers the next seven generations in decision making (Colorado, 1988; Williams et al., 2020) and emphasizes living in balance, peace, and harmony with all creations, known as *Skanagoah* in Haudenosaunee (Colorado, 1988). TEK has vast meanings, and therefore Berkes (2018) proposes only a working meaning of TEK as “*a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and their environment* (Berkes, 2018, p. 8, original italicization). This relationship is not static but fluid (Berkes, 2018). I would also argue that this relationship is porous, infiltrating, affecting, and influencing each other’s health and wellbeing.

TEK understands health and illness in relation to the interconnectedness of land, identity, culture, and environment. Any disconnection and disruption to this relationship affects holistic health manifested in different illnesses and diseases. In TEK, health is holistic and encompasses physical, mental, emotional and spiritual wellbeing (Martin-Hill, 2009; Christian, 2020). As per TEK, the relationship between health and water is direct (Blackstock, 2001), as water is a living being and the lifeblood of Mother Earth (Longboat, 2015; McGregor, 2012; Bharadwaj & Bradford, 2018). Water is a spirit (Longboat, 2015; Anderson, 2010; Lawless et al., 2015) that nourishes, purifies, and keeps balance and harmony on the earth in the forms of floods and rain (Arsenault et al., 2018). Indigenous peoples maintain a reciprocal relationship with water through the Thanksgiving Address, offering tobacco and singing ceremonial songs (Anderson, 2010). Thus, Indigenous Knowledge perceives the body and environment as a connected whole (Anderson 2010, 13).

According to Haudenosaunee TEK, kinship is extended to animals and nature, including oceans (Christian, 2020). The Earth is the mother, and they learn and get sustenance from their land. Food, medicine, and shelter all come from the land. According to Haudenosaunee TEK, all creations are interconnected, and ceremonies strengthen those connections. The longhouse symbolizes connections between nations bonded with the Great Law of Peace (Hansen & Rossen 2017). In Haudenosaunee TEK, water is the first environment of humans (Cook, 2008). It is alive and not only sustains life, but itself is life (Cook, 2008). Water is a sacred being, and a spiritual force that people turn to for food, to quench thirst, to cleanse body and mind, and for spiritual strength (McGregor & Whiteker, 2001; Latchmore et al., 2018). Water in Haudenosaunee is not an object or “*something that doesn’t feel.*” Although everyone is responsible for protecting



water, Haudenosaunee women speak for the water (McGregor, 2008; 2012). Water plays a significant role in conception, birth, and after-birth processes, and women have a unique connection with water. Through breast milk, mothers sustain new life, and so does water (Cook, 2008; Anderson, 2010). Mohawk midwife Katsi Cook emphasizes the connections between women and the Earth as they nourish and sustain life. Thus, Haudenosaunee TEK rejects the binaries between water and women's bodies and health. Haudenosaunee environmental philosophy reflects their relationship with nature and the environment and accumulated knowledge transferred from generation to generation (Martin-Hill et al., 2021).

## **8.2. Political Ecology of Health and Water**

Political ecology (PE) is an interdisciplinary concept flexible enough to combine various methods and approaches (Robbins, 2020; Harper, 2004). In a broader sense, political ecology focuses on power relations, unequal socio-economic and political structures, social relations, local and global interconnectedness, and human actions and agencies to understand environmental issues and climate change (Robbins, 2020). Thus, PE emphasizes multi-level analysis connecting micro to macro and local to global (Blaike & Brokkfield, 1987; Roberts, 2020; Robins, 2022). It is believed that anthropologist Eric Wolf first coined the term “political ecology” in 1972. Later geographers like Turshen (1984) and Mayer (1996) and medical anthropologists such as Baer (1996) demonstrated the usefulness of PE in understanding health and disease. Mayer's (1996) political ecology of disease framework particularly became popular in understanding health and disease in anthropology, geography, and other related disciplines. Mayer's (1996) political ecology of disease demonstrates interconnections between social, political, and economic processes and local health and wellbeing.

Political ecology assesses health in its social, political, economic, and natural environment (King, 2010; Mansfield, 2013). Political ecology is not deterministic and refuses unidirectional analysis (Mayer, 1996). It also considers the non-human in its understanding of health. The political ecology of health understands that environments outside of bodies and the environment inside bodies are inseparable (Jackson & Neely, 2015; Nichols & Casino, 2021). Jackson and Neely (2015) argue that to merge practice and theory in PE, it is crucial to understand that knowledge is partial and biased, and health is historically and politically constructed. Building on anthropology and feminism, scholars Jackson and Neely (2015) demonstrate that humans and non-humans are always in interaction and that the human body is porous, never confined, and that socio-economic conditions and control over resources affect health and wellbeing.

Similarly, the political ecology of water (PEW) highlights power relations, unequal access, distribution, and management of water, and control of resources that negatively affect marginalized communities (Cornea et al., 2016; Drew, 2020). PEW tries to understand the ways social structures such as economic, gender, racial, political, and social categories “produce inequities in water ownership, access, and quality” (Wutich & Beresford 2019, 170). Studying water as a *hydrological* being is also inspired by PE, where water actively shapes human societies and relations, co-constructing each other (Wutich & Beresford, 2019).

The political ecology of health (PEH) helps understand that the human body, health, and environment are inseparable. Following this framework, water and SN mothers’ health and

wellbeing are inseparable. The PEH perspective helps to critically analyze the ways in which resource extraction, exclusion from decision-making processes, land encroachment, lack of political sovereignty and lack of self-determination affect Haudenosaunee health and wellbeing. The political ecology of health and water is critical—because it reveals the power dimensions, control, management, and distributions giving rise to conflict and struggles. It highlights inequality and violent political, social, and colonial structures embedded in environmental racism, disproportionately affecting marginalized and vulnerable communities (Murphy, 2017). I broadly take this political ecology approach to understand the interrelationship between water insecurity and Haudenosaunee maternal health in the settler colonial state of Canada.

### **8.3. Health in Critical Medical Anthropology (CMA) and Environmental Anthropology**

**(EA):** Recent work by medical anthropologists and environmental anthropologists demonstrates that the human body and health must be understood in relation to the environment, nature, and larger political-economic structures. As a result, there has been growing interest in understanding human health and wellbeing in connection to non-humans or more than human beings. For example, Brown and Nading (2019) reemphasize human and non-human entanglement regarding health and wellbeing, arguing that political economy affects human and non-human beings such as animals and that human health and wellbeing are affected by that of animals. However, this assertion of human and non-human entanglement is not entirely new. As mentioned above, TEK always considers the non-human beings in understanding human health and wellbeing as a part of ecosystem assessment. Similarly, as shown by Jackson and Neely (2015), feminist scholars such as Donna Haraway argue that human bodies are porous and can include anything from chemical toxins to political relations (Harvey and Haraway, 1995, cited in Jackson and Neely,

2015, p. 58). Nancy Scheper-Hughes and Margaret Lock (1987) argue that mind, body, and society get entangled when it comes to understanding health. Other studies in anthropology demonstrate how the environment and nature, such as mountains, forests, and oceans, shape humans' health and wellbeing as active agents (de la Cadena, 2015, Todd, 2017; Andrews, 2020; Bird-David, 1999; 2004). However, Indigenous people are not passive reactors to nature but aid in shaping forests. Thus, humans and more-than-humans construct each other.

CMA was created to rectify disciplinary contributions to colonialism and as a step toward decolonization (Singer, 1989). Merrill Singer (1995) lists some features of CMA:

1. CMA recognizes that anthropology served colonial agendas, and medical anthropology served biomedicine, thus contributing to further subjugations of the marginalized.
2. CMA spotlights “underlying political structures and relations” for health disparities (Singer 1995, 82).
3. It supports self-determination and provides opportunities for silenced voices (Singer, 1995).
4. CMA rejects externally determined health problems and solutions and works with communities to identify community-felt needs and solutions (Singer, 1995).
5. It emphasizes collaboration and working together with marginalized communities.

Singer (1986, p. 128) defines CMA as “understanding health issues in light of the larger political and economic forces that pattern human relationships, shape social behaviour, and condition collective experience, including forces of institutional, national, and global scale.” Unlike conventional medical anthropology, CMA understands that health is not only about environmental fitness and disease and is not merely pathogenic; health and disease depend on many resources, such as access to nutritious food, adequate housing, control of resources, economic security (Singer, 1986; Witeska-Mlynarczyk, 2015), and access to clean water.

The critical contribution of CMA is to highlight that disease and illness are not natural phenomena; instead, they are the products of a dialectical interaction of natural, political-economic, and sociocultural forces (Singer, 1988; Singer 2004, cited in Witeska-Mlynarczyk, 2015, p. 386). Disease and illness result from various socio-political structural conditions, ultimately rooted in the capitalist world system. Thus, disease and illness can result from malnutrition, social stratification, economic insecurity, alienation in the workplace, occupational risks, industrial and motor vehicle pollution, inferior housing, poor sanitation, the stress of everyday life, and environmental degradation (Baer et al. 2012, pp. 243-244). In the same vein, Paul Farmer and colleagues (2004; 2006) added the concept of “structural violence” to CMA to understand health inequalities. Structural violence demonstrates how broader historical, political, and economic structures do violence to marginalized groups. Thus, CMA highlights social inequality in health, situating it in historical and colonial contexts.

Later, along with political economy (PE), CMA emphasizes medical ecology to understand health and wellbeing, as capitalism significantly impacts nature, the environment and health. As Baer (n.d., p. 347) states, “critical medical anthropology must treat political economy and political ecology as inseparable.” Political ecology thus intersects with environmental anthropology, which is applied, emancipatory, and seeks to eradicate environmental racism by reconsidering the human-nature relationship to which Indigenous ecological knowledge and genome studies have significant influence. Lock (2015) refines the concept of embodiment by highlighting external environmental stimuli in internal biological impacts. Her concept of *local biology* exemplifies the importance of understanding health in connection to the local

environment, not separating from it. Furthermore, local biology emphasizes that social inequality is manifested in the biological body.

Environmental anthropology (EA) demonstrates that nature is intertwined with humans, which formulates the understanding of health, disease, and illness (see (Descola and Pálsson, 1996; Pálsson, 2007; Ingold, 2011; Bird-David, 2004). The human and nature dichotomy has long been problematized and challenged with the rejection of Cartesian Dualism. Recent studies demonstrate that human and environmental health is inseparable and that their connections, interactions, and interdependence is messily entangled, since they are continuously constructing each other (Pálsson, 2007; Ingold & Pálsson, 2013; Bird-David, 2004; de la Cadena, 2015; Todd, 2017; Hoover, 2017). For example, Ingold (2013) wants to call humans biosocial becoming as humans continuously construct themselves with nature. Pálsson (2007) argues that humans are also microbes, and human bodies are environments that get affected by the external environment.

Building on EA and CMA, Elizabeth Hoover (2017; 2018) developed the concept of *Environmental Reproductive Justice* inspired by Mohawk midwife Katsi Cook to describe the environmental impact on biological and cultural reproduction. In developing the concept of *environmental reproductive justice*, Hoover (2017) draws on the theory of intersectionality outlined by Collins and Bilge (2016). This holds that micro, macro and individual levels of power relations are intertwined, and so are humans and the environment. In doing so, Hoover (2018) establishes interrelations and rejects the binary of the health of human bodies and the

land, arguing that water contamination negatively affects biological and cultural reproduction among the Mohawk of Akwesasne.

Similarly, Zoe Todd (2017; 2016) challenges the binary of land and water or ocean, demonstrating that they are all connected through hydrological cycles and human actions. Therefore, life and health underwater are shaped by human policies, politics, and violent structures. Geographer Max Liboiron (2021) argues that contamination is not just about capitalism or industrialism. Instead, it is systematic in colonial settler structure and has roots in the forcible land dispossessions, assimilations, and genocide of Indigenous peoples. Finally, Michelle Murphy's (2017) concept of *Alterlife* forces us to think about human bodies and health in relation to chemical contaminants such as PCBs. Murphy (2017) argues that exposure to contamination, colonialism, and racism has already altered humans' bodies and lives. However, this *alterlife* also is open to alteration and thus "to become something else, to defend and persist, to recompose relations to water and land, to become alter-wise in the aftermath" (Murphy 2017, p. 500).

These works mentioned above demonstrate that health, nature, politics, economy, and sociocultural structures are messily entangled, and our understanding of them will remain incomplete within the binary framework. However, these interconnections and interrelatedness are, I argue, ever-changing. It is a situation of constantly becoming, and making, cocreating identity with non/more than human beings, in interactions with the physical and spiritual worlds. Hoover (2018) uses intersectionality to highlight this messiness, to reject either/or binarism. She demonstrates how aspects such as environmental justice and reproductive justice intersect.

Building on her work with Akwesasne and framing my work in interconnections, I would like to take this concept of intersectionality further and propose *enchanted entanglement*.

The Latin word *incantare* means “to chant a spell on someone,” In French, *enchanter* means to cast a magical spell, and the related word *chant* means song (Beaman 2021, 2). Enchantment has been understood as dreams, imagination, fascination, and compulsions that allow our senses to transcend structural constraints and create a world of possibilities (Beaman, 2021; Stainova, 2019). While enchantment has been used for humans, enchantment is not limited to the human world (Beaman, 2021). In this research, I understand the enchantment as a chorus of humans and more-than-human beings. This chorus is asymmetrical and not always calculable. The chorus is relational that allows us to participate in co-creation (Beaman, 2021). I argue that while human health, politics, the natural environment, culture, and knowledge intersect, these precise areas or grounds of intersections are not static; instead, they are fluid, constantly changing and constructing. Thus, this research also rejects the binary compartmentalization of water and land, human-nature health, physical and spiritual world, human and more than human, living and dead. Instead, it focuses on how they all are interconnected, only becoming in relationship with others, always in the process of co-creation and co-constructions of other beings or “becoming,” as Palsson and Ingold (2013) conceptualized.

**Chapter Outlines:** In addition to a Digital Story (Appendix Q), this thesis is organized into five chapters, of which three chapters have been submitted for publication in peer-reviewed journals, following the McMaster university “sandwich thesis” guidelines. This introductory chapter sets the research context, background, research objectives, methods, and guiding analytical



framework. A decolonizing methodological approach and theory of interconnectedness have been discussed in this chapter with a proposed concept of *enchanted entanglement* to describe porous, flexible, messy, and changing intersections between socio-political, economic, and colonial structures and the environment and spiritual world affecting health and wellbeing.

**Chapter 2** “Navigating across anthropological and Haudenosaunee knowledge: co-developing research using CBPR and *Kaswenta* (Two-Row Wampum) principles in partnership with Six Nations of the Grand River.” Submitted to *International Indigenous Policy Journal*.

This chapter dives into a more methodological discussion on how Haudenosaunee knowledge and principles can come together with anthropological knowledge, especially critical medical anthropology, to understand health and wellbeing better. In this chapter, I discuss our partnership with the SNBC and demonstrate that anthropology can still be helpful in community-based participatory research despite the colonial legacy of the discipline. Finally, I argue that knowledge systems different from those of the researchers do not need to be ignored or reduced to enable one to work across worldviews. Instead, I suggest that acknowledging and highlighting the differences will lead to innovative methods and scholarship.

**Chapter 3** “If water is not in good quality, our bodies will not be in good quality either”: Impact of Water Insecurity on Maternal Holistic Health and Wellbeing among Haudenosaunee Women at Six Nations of the Grand River, Canada, submitted to *Medical Anthropology* journal.

This chapter discusses how water insecurity impacts Haudenosaunee mothers’ health and wellbeing. Positioning water insecurity in the settler colonial context, this chapter documents the profound ways water insecurity affects SN mothers’ holistic health. In this paper, I demonstrate that Haudenosaunee understandings of water insecurity and maternal health transcend technical and narrow biomedical understandings to incorporate non-human beings. This comprehensive

understanding of water insecurity and maternal health ultimately shapes SN mothers' relationship with water affecting their holistic health.

**Chapter 4:** Assessing the Impact of Water Insecurity on Maternal Mental Health at Six Nations of the Grand River is published in *Frontiers in Water* (Sultana, A., Wilson, J., Martin-Hill, D., Davis Hill, L., & Homer, J. (2022). Assessing the Impact of Water Insecurity on Maternal Mental Health at Six Nations of the Grand River. *Frontiers in Water*. <https://www.frontiersin.org/articles/10.3389/frwa.2022.834080/abstract>). This chapter delves deeply into the mental health of SN mothers experiencing water insecurity. This chapter documents participants' recurring thoughts about the lack of clean water in their community, resulting in mental health issues such as depression and anxiety. It also highlights Haudenosaunee women's resiliency through culturally innovative adaptations to their changing environment.

**Chapter 5:** Water Insecurity is Colonialism: Discussion and Conclusion is the last chapter of the thesis, where I highlight the main arguments by situating them in settler colonial contexts following a decolonizing theoretical approach. I discuss how water insecurity in Indigenous communities and Six Nations has been subject to a systematic agenda of erasure by settler colonialism. Further, utilizing the concept of enchanted entanglement, I argue that the maternal health of Haudenosaunee mothers and water insecurity are entwined and affected by colonial policies and structures. These structures and policies were designed to eliminate the relationships that the Haudenosaunee maintain with the natural environment and the spiritual world. This chapter also discusses how SN mothers challenge, resist and adapt to colonial assimilation in culturally innovative ways with relationships to land and water guided by their traditional teachings and laws.

Chapter 2: Navigating across anthropological and Haudenosaunee knowledge: co-developing research using CBPR and *Kaswenta* (Two-Row Wampum) principles in partnership with Six Nations of the Grand River.

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**Abstract:**

As part of the *Ohneganos* research project, funded through the Global Water Futures (GWF), we document the ways we worked across Haudenosaunee and anthropological knowledge to assess the impact of water insecurity on holistic maternal health. This research was led by the Six Nation Birthing Center (SNBC), inspired by Haudenosaunee *Kaswenta* treaty principles. We utilized community-based participatory research (CBPR) and Indigenous research methods (IRMs), such as storytelling, to find common ground of dialogue and reciprocity. In doing so, this research goes beyond traditional anthropological ways of data collection and fieldwork and highlights the importance of active community direction and participation. We argue that different knowledge from the researchers does not need to be ignored or reduced to one singular perspective to work across worldviews. Instead, acknowledging and highlighting the differences will lead to innovative methods and scholarship. This paper contributes to the literature on research methods and policies and will be helpful to Indigenous communities and non-Indigenous researchers working together.

**Introduction:**

Many Indigenous scholars have emphasized the importance of collaboration with Indigenous communities for meaningful research (Smith, 2012; Kovach, 2009; McGregor, 2008). Although the popularity of collaboration is increasing in community research across disciplines,

community participation in most cases has been tokenistic. Moreover, despite Indigenous scholars and anthropologists' significant contribution to working across different worldviews (e.g. Freeman and Katwyk, 2020, de la Cadena, 2015), literature that demonstrates how to work across knowledge and epistemologies (worldviews), anthropology and Indigenous knowledge, in particular, remains scant. Drawing from our research with the Six Nations Birthing Center (SNBC), we discuss two significant aspects of our collaborative research: 1. The SNBC's active participation in the research from conception to data analysis and 2. The ways we worked across critical medical anthropology (CMA), environmental anthropology, and Haudenosaunee knowledge by creating a dialogical space with mutual respect and understanding inspired by the *Kaswenta* treaty as applied in the Ohneganos research project. Invited by the Ohneganos project PI (Author-2), the midwives at the SNBC and a non-Indigenous, non-western Ph.D. student, trained in socio-cultural and medical anthropology, worked together to co-create knowledge about the impact of water insecurity on SN mothers' holistic maternal health. In this paper, we argue that it is not necessary to understand different worldviews entirely for meaningful collaboration, but maintaining mutual respect, trust, and reciprocity with "partial connection" (de la Cadena, 2015) is sufficient to work across knowledge and worldviews. There is no need to diminish any worldviews for creating a common ground across epistemologies. We document how community-based participatory research (CBPR) and Indigenous research methods (IRMs), such as storytelling, helped find common ground while following the lead of the SNBC. Our research is innovative for several reasons: the research project was led and directed by the Haudenosaunee women; it followed IK pedagogy; it was not confined in traditional anthropological methods of data collection (lone anthropologist in the field); instead, research design, development and implementation were collectively undertaken, and both Haudenosaunee

knowledge and anthropological knowledge were utilized throughout, from designing the research to data analysis.

*Ohneganos Ohnegahde:gyo*, is an ongoing Indigenous research program funded through the Global Water Futures (GWF), designed and directed by the Six Nations community, and grounded in Haudenosaunee philosophy and teachings. Braiding both western scientific knowledge and Indigenous science for sustainable solutions to water and environmental ‘problems,’ *Ohneganos Ohnegahde:gyo*’ has progressed with ongoing consultation with Six Nations partners where academic researchers have worked with community stakeholders to investigate the impact of water insecurity on SN maternal health. Indigenous knowledge (IK) pedagogy framework helped develop the research project with the community and for the community (Author-2, 2021). As a part of the *Ohneganos* research project and a Ph.D. dissertation this research was conducted in collaboration with *Tsi Non: We Ionnakeratstha Ona:Grahsta* or the Six Nations Birthing Center (SNBC), also known as Six Nations Maternal and Child Centre to investigate the interrelationship of water insecurity and its implications for the holistic health of SN mothers living in the reserve, an under researched area identified by the SNBC. This research progressed following the lead of the SNBC at its every step, significantly, during the unprecedented COVID-19 pandemic. We kept Haudenosaunee knowledge and teachings at the center of the research. This paper details the process, not the findings, of our collaboration using CBPR through critical medical anthropology and Haudenosaunee principles drawn from *Kaswenta*. *Kaswenta* teaches not to diminish or ignore differences but to honour and celebrate them for peaceful co-existence, achieving common goals, and reaching sustainable solutions.

Along with *Kaswenta*, we utilized other principles of Haudenosaunee teachings such as the Covenant Chain and the Dish with One Spoon Treaty to create and maintain a long-lasting trustful relationship and shared responsibilities between western researchers and Haudenosaunee knowledge holders. Like the *Kaswenta* or the Two Row Wampum treaty, the Covenant Chain treaty teaches friendship and reciprocity to last for a long time (McCarthy, 2016). This teaching warns researchers against “parachute research” or “helicopter research” where researchers only come into the community to extract knowledge and then disappear, taking what they need. The Two Row Wampum and Covenant Chain teachings instead emphasize the long-term reciprocal relationship between community and researchers. It encourages working through researchers’, academics’, and communities’ diversities, establishing mutual respect and trust, and finding common ground. We discuss how we worked collaboratively across epistemologies, in partnership with *Tsi Non: We Ionnakeratstha Ona: Grastha*, meaning the place they will be born, in Mohawk, or a Birthing Place, in Cayuga.

Positionality is important in research with Indigenous communities as it rejects the notion of objectivity established in positivist research and helps build trust with the community and readers. Providing the researchers’ worldviews and socio-political context, positionality highlights biases in the research (Wilson, 2008; Holmes, 2020). Similarly, reflexivity has been a critical component in contemporary ethnographic research as it highlights the political nature of ethnography and rejects the idea of objectivity and neutrality in research (Hammersley, 2006). Jean-Paul Dumont (1991, p.5) argues that anthropologists or researchers themselves work as a research tool and are an integral part of fieldwork; therefore, any attempt to claim that

anthropology is objective is flawed. Indigenous scholars argue that in addition to challenging objectivity, the minds of researchers have to be decolonized (Kovach, 2009; Smith, 2012; Wilson, 2008).

<Author-2> and < Author-3> are Haudenosaunee women. Author-2 resides at the Six Nations reserve, is a faculty member at <University name> in the Department of Anthropology and Indigenous Studies Program and has over 35 years of work experience in the community. <Author-3> works full-time as a director at the SNBC. <Author-3> is trained in both Western and Haudenosaunee medical models and has over 20 years of experience as a Haudenosaunee midwife at the SNBC. I, the first author <Author-1> am the mother of a seven-year-old daughter. I am not an Indigenous person in Canada. I am an immigrant and a member of a visible minority in Canada, born and raised in Bangladesh. I moved to Canada for higher studies. As a member of a non-western society, I have been part of a history of being colonized as a Nation – a nation that had fought for their land and language and achieved freedom and independence. I am trained in both cultural and medical anthropology. As a non-western woman, I offer critical anthropological training and tools to co-create water insecurity and maternal health knowledge by centring Haudenosaunee knowledge and teachings in partnership with the SN community and scholars. I received cultural and academic training about Indigenous knowledge and Haudenosaunee teachings under <Author-2>'s supervision, and <Author-3> offered me her extensive training and knowledge on western and Haudenosaunee medical models in designing and guiding the research.

**SN community and a brief introduction of Haudenosaunee through teachings:** Located in proximity to Toronto, Hamilton, and Brantford, Six Nations of the Grand River is the most populous and the second-largest Indigenous reserve in Canada. People living at Six Nations are known as Haudenosaunee, meaning "the People of the Long House" or "we build the house." The Haudenosaunee consist of six nations: Onondaga, Cayuga, Mohawk, Seneca, Oneida, and Tuscarora, who formed allyship under the Great Law of Peace, ending war among those nations and establishing peace by burying their weapons under the Tree of Peace. The Dish with One Spoon treaty stopped bloodshed over shared hunting ground and taught that it is essential to take only what is needed while respecting others—the dish symbolizing the hunting ground and the spoon symbolizing the absence of weapons. The Haudenosaunee Creation Story depicts the birth of *Anowarakowa Kawennote* or Great Turtle Island (North America) and teaches being respectful and working together with non-human beings such as turtles and beaver, goose, earth, and water to continue and promote flourishing of life on Earth (Hill, 2017). Although the Indian Act and residential schools destroyed the Haudenosaunee matrilineal society and ways of life, the Haudenosaunee have shown robust resilience by maintaining their knowledge and relationship with the land. This is not to romanticize, nor to say that there is no division or conflict among members of the Six Nations of the Grand River. It is a diverse community where divisions exist, yet, despite divisions, the people have held onto core values as Haudenosaunee through traditional teachings and laws, traditions that are linked to the past but woven into the future (McCarthy, 2016).

Along with some core Haudenosaunee teachings, as mentioned above, it is also crucial for non-Indigenous researchers to understand Six Nations protocols for dealing with outsiders.



For example, expected practices can be found from the teachings of *Kaswenta* treaty or the Two Row Wampum and Covenant Chain treaty. The Two Row Wampum teaches not to belittle one another, not to subjugate or rule one another, but to stay peaceful and offer help when needed.

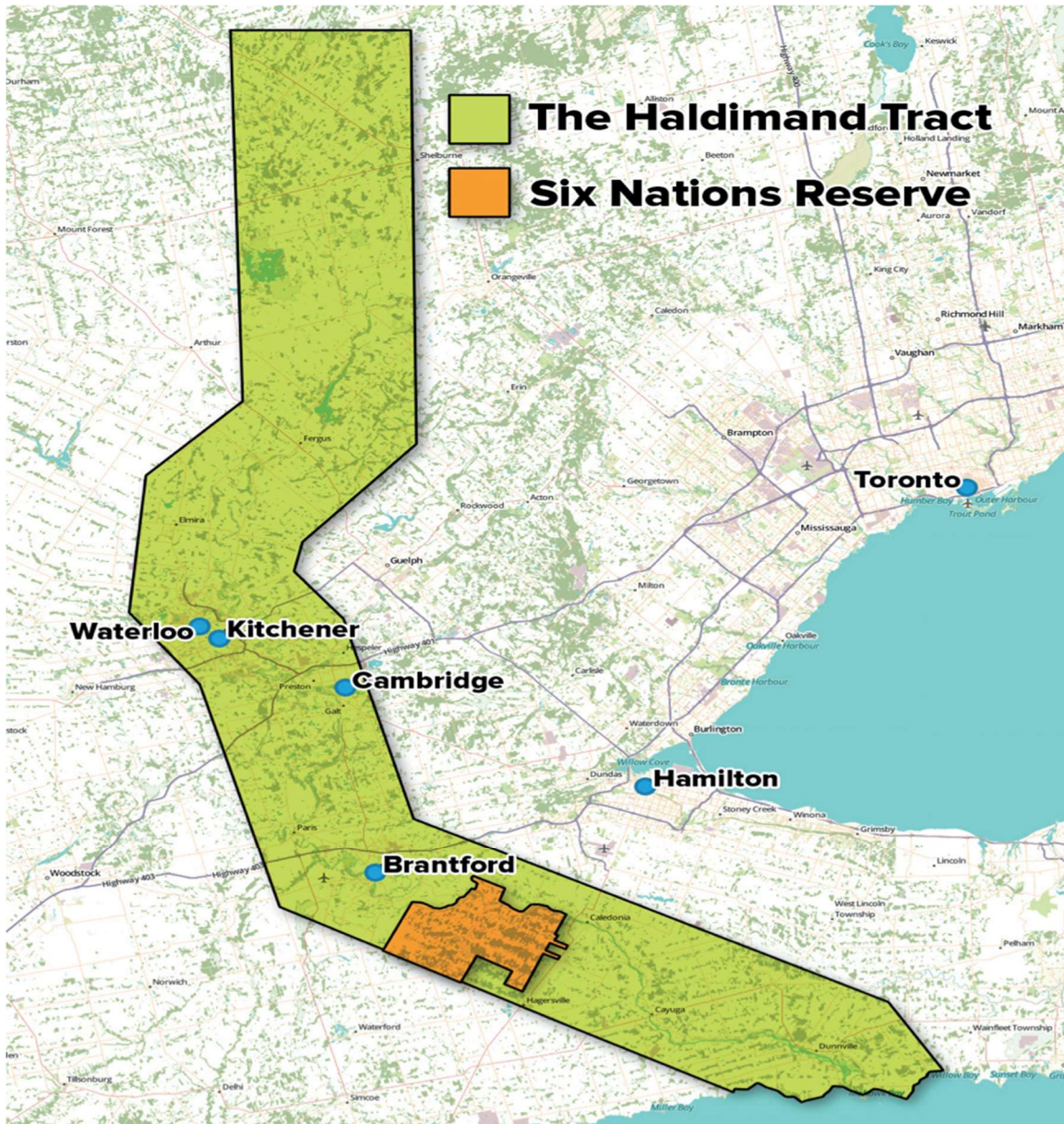


Figure-11: The Haldimand Tract and Six Nations reserve, used with permission from the Decolonial Atlas under Decolonial Media Licence 0.1.

### **Kaswenta as a guidance for collaborative research:**

*Kaswenta* or *Gaswentha* is also known as Tekani teyothata'tye *Kaswenta* (Two-Row Wampum belt) (Goodchild et al., 2021, p. 81). The *Kaswenta* was first established between Haudenosaunee and the Dutch colonizers around 1613. The *Kaswenta* symbolizes *onake* (canoe) and *honwey* (boat) in the water (Hill, 2013). The Two Row Wampum is made of two rows of purple and three rows of white wampum beads (Goodchild et al., 2020; Parmenter, 2013). The two purple rows symbolize two vessels: the European's ship and the Haudenosaunee birch bark Canoe, moving in parallel with their own customs, laws, and ways of life. The three white rows symbolize the river of life where two vessels of autonomous sovereignty travel without interfering with the internal laws of the other's vessel nor steering the vessel. The three rows of white beads symbolize "the *ne'skennen* (peace), *karihwi:iyo* (good word or way), and *ka'satsténshsera* (unified, empowered minds) (Coleman, 2019, p. 65)." The three principles of *Kaswenta*: the Kanianerenko:wa is *Sgënö'* (Peace), *Ga'hasdehsäh* (Strength through Unity) *Ga'nigoi:yoh* (Good Mind) were later extended to other Nations (Williams, Umangay, and Brant, 2020). The *Kaswenta* implies mutual respect, autonomous sovereignty, and power; it rejects controlling others and interfering with others' ways of life. However, at a time of mutual benefit, it promises to work together for meaningful and sustainable solutions and to help each other in times of necessity, like brothers. Here, it is important to note that we do not intend to reduce the value and sacredness of the *Kaswenta* treaty into simple research guidelines but rather to highlight the effectiveness of its teachings in making common ground across epistemologies.

While non-Indigenous and non-Haudenosaunee researchers should be cautious about approaching *Kaswenta* as to not reduce its sacred significance or misrepresent it, Indigenous

scholars have demonstrated that principles of *the Kaswenta* treaty could be extended to collaborative research as these principles provide respectful dialogical space or "ethical space" (Goodchild et al., 2021; Ermine, 2007). Williams et al. (2020) have shown that unequal research relationships contribute to Indigenous peoples' marginalization, dehumanization, and epistemic violence. They argue that Indigenous research sovereignty is crucial to reduce this inequality and violence in research and that the Two Row Wampum is helpful to implement equal relations in research. Williams et al. (2020) finds the Two Row model especially applicable, as it includes all creations animate and inanimate in its relational accountability. Ransom and Ettenger (2001) describe the Two Row Wampum as providing powerful guidelines to collaborate respectfully without subsuming one knowledge by another and upholding Indigenous sovereignty in research. McGregor (2008) used the Two Row Wampum principles as an example of traditional ecological knowledge and western scientific knowledge coming together to solve climate change issues sustainably. Martin-Hill et al. (in-press) highlights the pluralism in *Kaswenta*, as it preserves plural ways of being within peaceful co-existence. They argue that in an interdisciplinary project where western and Indigenous methodologies come together, *Kaswenta* helps create a strong relationship and "respect [for] diverse approaches to research (Martin-Hill et al., in-press)."

Non-Indigenous researchers trained in western academic knowledge also find the principles of *Kaswenta* helpful in their research across western and Indigenous methodologies. For example, Duignan et al. (2020) conducted their health survey with *Kaswenta* principles to work across critical medical anthropology and Haudenosaunee Knowledge. Similarly, Latulippe (2015) was inspired by the Two Row Wampum principles to work respectfully across western and Indigenous knowledge. Latulippe (2015) argues that the Two Row Wampum treaty

facilitates ethical engagement, ensures relational accountability, and respects different epistemologies (Latulippe, 2015, p.9). As utilizing Two Row Wampum principles in collaborative research is increasing, non-Haudenosaunee researchers need to be careful when working with the *Kasweta* as it is a sacred law for Haudenosaunee. In an attempt to learn from the *Kasweta*, one should not reduce this sacred Haudenosaunee law into academic research guidelines or methodology. In this paper, we aim to demonstrate how the *Kasweta* principles worked as an inspirational backdrop in collaboration with Haudenosaunee and critical medical anthropological knowledge. We take the core teachings of *Kasweta* to guide us to non-extractive, respectful, and ethical research, and collaborated peacefully with good minds.

**Working across Haudenosaunee and anthropological knowledge:** Traditional anthropological understanding of “field” and fieldwork was problematized by Gupta and Ferguson (1997). They argued that in a politically and economically connected world, the traditional understanding of entering in and out of the field or separating the field is not viable. For “...in an interconnected world, we are never really out of the field” (Gupta & Ferguson, 1997, p.35). Instead of fieldwork in the traditional sense, Gupta and Ferguson (1997) proposed a connection between different knowledges through shared purpose and alliance. They argued that the field is not a site of data collection but a site for strategic intervention (Gupta & Ferguson, 1997, p.39). Instead of the term fieldwork, they proposed “location work.” Location work is not confining someone in their identity, as Gupta and Ferguson (1997) demonstrate, but it is more like an epistemological or political agenda. It is an ongoing project connected to one’s political practice and interest in a larger project. In our case, there was no lone anthropologist collecting data in a remote field. Our research was collaborative, with active community participation. Although I never lived at Six

Nations, I was never out of it either. Through newspapers, social media, phone calls and virtual meetings, I was connected to the community. I visited the community several times, attended GWF project meetings, took part in a pow wow where we promoted our project at GWF table, and assisted with the community medicine garden in pre-pandemic time. However, everything went virtual amid the COVID-19 pandemic, right at the time that I began research. Thus, I was a virtual anthropologist in its literal meaning, a term Kath Weston (1997) used to describe an insider anthropologist or anthropologist who did not do “real” fieldwork, in the traditional anthropological sense. We tried to work across anthropology and Haudenosaunee knowledge with a shared political interest in water security and health equity. Thus, our work aligns more with location work conceptualized by Gupta and Ferguson (1997).

Many Indigenous scholars and anthropologists proposed creating a common ground of dialogue with common political interests (Smith, 2012; Kovach, 2009; Ingold, 2017; Gupta and Ferguson, 1997). There is a growing interest across disciplines to go beyond binaries or conceptual limitations and construct new mutual forms of research, knowledge, and action by collaborating with different partners (Kovach, 2009; Hastrup, 2014). The most popular way of working across epistemologies has been at the margins, borders, or boundaries, not the center. For example, sociologist Stephen Lyng (2005) developed the term “edgework” to describe emotional intensities and going out of one’s comfort zone with skill and control. Anthropologists later adopted the concept for both environmental and medical anthropology. For example, Hastrup (2014) defined *edgework* as working beyond institutional and conceptual boundaries to better understand human-nature relationships. Similarly, Moyer and Nguyen (2017) adopted edgework in medical anthropology to describe work between disciplinary, theoretical, and

epistemological boundaries. But, how to work across epistemologies? Sociologist Susan Leigh Star (1988) developed the concept of boundary objects to work across epistemologies. A boundary object, as Leigh and Griesemer (1989) elaborate, provides “interpretive flexibility,” allowing different parties to work together without the need to reach any consensus. However, the concept of boundary objects remains vague, so much so that twenty-two years after her original publication, Leigh (2010) needed to explain what should not be considered as a boundary object. In her latest article about boundary objects, she explains that boundary in her concept does not necessarily mean edges or borders. Instead, it is a shared space, and an object means something to act with. Consideration of scale and scope are also essential to understand boundary objects (Leigh, 2010). Duignan et al. (2020), although not engaging directly in the debate about defining boundary objects, claim that their co-created survey to construct health knowledge with Six Nations worked as a boundary object, as it provided guidance and facilitated dialogues between Indigenous knowledge and medical anthropology.

In our research, I was more interested in working at the edges or boundaries of epistemologies to create a dialogical space with common political interests. de la Cadena’s concept of *partial connections* and Haudenosaunee *Kaswenta* are particularly helpful in understanding and making common ground between different epistemic ontologies. de la Cadena (2015) argues that there is no need to disqualify something simply because it cannot be understood in our own epistemic-ontological terms; heterogeneity and differences can still be understood through “partial connections” (de la Cadena, 2014, p.24). All we need is to be partially connected with them where gaps in understanding are obvious and shared (de la Cadena, 2014). They emphasize making those differences and gaps in understanding visible,

enabling one to see beyond the limits, outside of one's own epistemic ontology. According to Ermine (2007), these partial connections take place in "ethical space." Ethical space is defined as a space that is created when two disparate worldviews or epistemologies engage with each other and create a framework of dialogue (Ermine, 2007). "The space offers a venue to step out of our allegiances, to detach from the cages of our mental worlds and assume a position where human-to-human dialogue can occur" (Ermine, 2007, p. 202). Longboat indicates that in Haudenosaunee worldviews, this ethical space is also a sacred space (Goodchild et al., 2021, p. 84). Taking examples from the Tow Row Wampum, he further illustrates that the three rows of white beads on the *Kaswenta* are sacred spaces that enact the principles of peace, friendship, and respect (Goodchild et al., 2021).

de la Cadena's (2015) partial connection between epistemologies resonates with the *Kaswenta* or the Two Row Wampum. Two-Row Wampum teaches that research between different epistemological groups should create a respectful dialogical space, promote equality, accept heterogeneity, and share the knowledge acquired (Hill & Coleman, 2019). *Kaswenta* or Two-Row Wampum also depicted a gap in understanding while working across epistemologies and knowledge:

*You sail your own boat and we'll paddle our own canoe Side by Side...the pail [pale] face man said to the read [red] fase [face] I don't understand the way of your canoe rules [rules]. The Six Nations chief said I don't understand the ways of your boat rules..."* (National Archive of Canada, RG 10 vol. 1862 F. 239, as cited in Hill & Coleman, 2019, p.343, original corrections, italics added).

The above excerpt highlights a noticeable gap in understanding while creating a dialogical space between Haudenosaunee and European epistemologies. It tells us that gaps will always exist, but that does not mean they need to be reduced; instead, differences should be

highlighted to work across epistemologies (de la Cadena, 2014). The Two-Row Wampum also teaches equal relationships:

*The white man then asked, “what term of relationship will we go by? I will call you my “child.” However, the Ongwehowe replied, “This is not proper, for a father can control the child. What do you think if we addressed each other as “brothers?” (Cited in Hill & Coleman, 2019, p.349, italics added).*

Thus, control and power relations were rejected, and an equal relationship was proposed for creating a common ground. A parent can control and exercise power over the child, but brothers have relatively equal power. Two-Row Wampum also rejected imposing one’s culture, beliefs, and laws on others and thus reducing them as one (Hill & Coleman, 2019, p. 351).

***Tsi Non:we Ionnakeratstha Ona: Grastha: an example of working across epistemologies:***

*Tsi Non:we Ionnakeratstha Ona:grahsta* was established on May 17, 1996, to bring birthing care back into the community of the Six Nations of the Grand River, reducing the need for Indigenous mothers to place themselves and their babies at risk in western hospitals. Since then, they have been using both Haudenosaunee and western medical models but have kept Haudenosaunee medicine at the center. SNBC is not just a regular birth center; it is a place where *they* will be born. These "they" are the future generations coming to the world to do "important jobs" as Haudenosaunee and bring hope to the community. SNBC is a place of self-determination, resistance, and accommodation. In Ontario, SNBC was the first birthing center in an Indigenous community, partially funded by the Government of Ontario, and operating under the exemption of the Midwifery Act (National Aboriginal Council of Midwives [NACM], 2016). The SNBC has four midwives trained in both Haudenosaunee and western medical models, one lactation consultant, one maternity care worker, a house mother, a clinical manager who is also an



Indigenous midwife, and a secretary/receptionist. In addition, SNBC has a very knowledgeable Traditional Medicine woman who collects medicines from the land and customizes them as per the particular needs of clients. SNBC trains new midwives and runs many programmes such as healthy baby programmes and prenatal classes. Since their establishment, more than two thousand babies have been born at the center.

Birthplaces in Indigenous communities are also a political landscape (Olson, 2003). Midwifery was outlawed in Canada in 1895 and was replaced with Western medicine, increasing the number of hospital births and demolishing traditional teachings related to pregnancy and births (Born, 2003; Perry, 2019; NAHO, 2004). Indian Act and residential schools also destroyed traditional practices and knowledge, especially those transferred orally from generation to generation. This resulted in the loss of culturally appropriate maternal and birth care and negatively impacted the health of mothers, babies, and the community (Born, 2003; Perry, 2019). Indigenous women's voices are silenced and ignored in western medical settings (Leason, 2018). SNBC gives that voice back to the women. It resists assimilations, reclaims self-determination by reclaiming births, decolonizes medicines, fights for basic human rights and health equality. SNBC is a political landscape because it reclaims sovereignty, revives, and continues the traditional teachings and medicines of the Haudenosaunee people.

Colonialism and systematic racism demolished Indigenous midwifery practices, making accessing health care difficult for Indigenous mothers. Indigenous mothers often must give birth outside of their community in a setting with language barriers, where they experience racism and discrimination and adverse birth and health outcomes. Studies report a high infant mortality rate,

twice that of non-Indigenous populations, and higher postpartum depression among Indigenous women (Stout & Harp, 2009; Balkissoon, 2018). SIDS (sudden infant death syndrome) is five to seven times higher in Indigenous communities than non-Indigenous populations (Stout & Harp, 2009; Mann, 2018; Statistics Canada, 2017). Lack of prenatal care, remote locations, lack of health funding, and insufficient Indigenous health professionals are some reasons for these adverse health outcomes (Smiley et al., 2021; Nove et al., 2021). Indigenous midwives brought births back to the communities to improve health and well-being for mothers, babies, and families, regenerate Indigenous knowledge and practices, and reclaim self determination. Studies have demonstrated significant improvement in health outcomes with Indigenous midwives in the community (Smiley et al., 2010; 2018). In addition to providing services during pregnancy, pre-, and postnatal periods, Indigenous midwives de-medicalize births, provide cultural safety, increase family and cultural bonding, play critical roles in building safe communities, restore traditional ways, and reduce medical evacuation or flying out of the community to give birth (National Aboriginal Council of Midwives [NACM], 2020).

SNBC is a perfect example of working across epistemologies as they have been successfully utilizing western medicine in Haudenosaunee medicine for the last 25 years. Some scholars who studied contemporary Indigenous midwifery practices analyzed this coexistence of two medical models as "blending" or "merging" of different medical models of birthing care (e.g., Carroll & Benoit, 2004; Perry, 2019.). However, the words "blending", and "merging" are problematic because they are reductionist and promote the idea of assimilation. At SNBC, western and Haudenosaunee medical models do not merge or blend but peacefully co-exist (see figure-12), reflecting the Haudenosaunee Two-Row Wampum, a treaty of peaceful coexistence,

with a promise of helping each other at times of need. Therefore, the western medical model is only sought at times of need, such as, for example, when mothers need to transfer to the hospital, start an IV, or emergency delivery of the placenta. Otherwise, traditional medicine and traditional practices remain at the center of their services. SNBC is distinct from the western medical model in many ways. For example, while western birthing positions are mostly semi-recumbent, they are primarily upright in the Haudenosaunee model. In addition, there is no limit to the number of support people mothers can have in the Haudenosaunee model versus very tight western restrictions on numbers of support people. The Haudenosaunee system gives power to mothers rather than expecting them to defer to doctors. Thus, a sharp difference from the western medical model is noticeable in their practices that would not be possible if there were a blending or merging of these two models. Instead, it is more like working at the edges so that two systems

can come together to enhance mothers' and babies' health. "A relationship of respect" is what is needed, according to <Author-3> when working with different epistemologies (Figure 12).

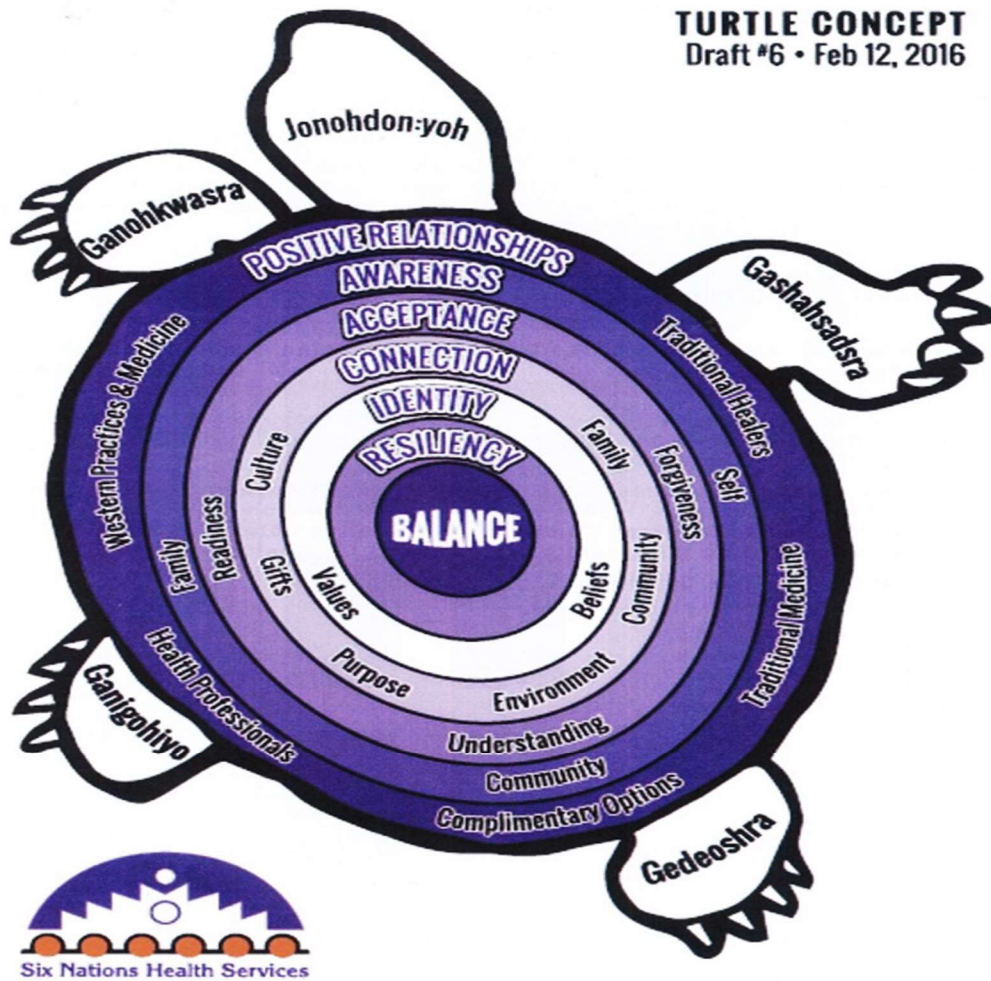


Figure-12. The Haudenosaunee Wellness Model showing Haudenosaunee and western medicines co-existing peacefully at Six Nations Health Services (SNHS) and SNBC. Used with permission from the SNBC.

## **Community-based Participatory Research (CBPR) and Indigenous Research Methods (IRMs): finding a common ground:**

Mainstream research has been used as a weapon of colonialism to exercise power and create the Other (Said, 1978; Williams et al., 2020), contributing to western disciplining of Indigenous communities through exclusion, assimilation, marginalization, and denial. With some rare exceptions, mainstream research has mainly represented Indigenous peoples as primitive, reluctant to change, lacking intellect, and thus justified ripping them from their identities, forcibly assimilating them, even exterminating them (Smith, 2012; Stevenson, 2014; McCarthy, 2016). Throughout western colonial history academic and institutional research has been top-down, decided by the researcher, with Indigenous communities having no access to data or results (Smith, 2012; Galtung, 1975). Anthropology is no exception and has a history of reproducing and reinforcing structural violence by keeping colonialism alive through research, theory, and methods (Upersea 2016; Todd, 2016; Clair, 2003; Davis, 2008; McCarthy, 2016). Despite this traumatic experience with academic research, many Indigenous scholars and anthropologists, along with those in other similar disciplines, believe creating a common dialogical space is essential for sustainable solutions and achieving common political goals such as health equity and water justice. Smith (2012) and Kovach (2009) argue that insiders' experience is vital, but assuming that is all they require for research is arrogant (Smith, 2012). Similarly, Ingold (2017), an anthropologist, argues that no one single group, specialist scientist, Indigenous group or philosophy holds the key to the future; instead, dialogues between those groups will make the future, and anthropology can expand the scope of that dialogue (Ingold, 2017:22).

Collaboration with Indigenous communities that includes Indigenous worldviews and voices has been considered a fruitful way of working across epistemologies (Smith, 2012; Kovach, 2009). Kovach (2009) thought Participatory Action Research (PAR) or Community-Based Participatory Research (CBPR) could be good models for collaboration with Indigenous communities. Some of the reasons are: PAR and CBPR deviate from positivist research paradigms, seek active community participation, and have decolonizing or anti-colonial agendas (Battiste & Henderson 2000; Castleden et al., 2012; Kovach, 2015; Dawson et al., 2017), recognize that the researcher is not a neutral instrument of the research process (Kovach, 2009, p.32), emancipatory in nature, and aim to give back to the communities (Ritchie, 2013; Ninomiya, 2016). Although participatory research or action research has proven to be beneficial to the marginalized due to community involvement in the research, the level of involvement in most cases has been tokenistic (Easby & Brown, 2016), with little to no discussion about the degree of community participation (Armstrong et al., 2011). Moreover, most research with Indigenous communities has neglected to articulate Indigenous research paradigms (Wilson, 2001).

While Indigenous research methods (IRMs) are too diverse to define (Steinhauer, 2002), it is possible to extract some central themes: Indigenous research methods put Indigenous worldviews at the center, respect the natural world, are relational in data collection, and have decolonizing objectives (Wilson, 2008; Kovach, 2009; Kurtz, 2013; Dawson et al., 2017). IRMs derive from Indigenous Knowledge that emphasises the interconnectedness and interdependency of all creations. That knowledge is shared, not individualistic, and accumulated through relations with land (Battiste & Henderson 2000; Williams et al., 2020). Knowledge is gathered from multiple sources such as "traditional teachings, empirical observations, and revelations"

(Castellano, 2000, p. 23). In addition to being anti-colonial, anti-positivist, and anti-objectivist, Indigenous research methodology is relational—that relationship goes beyond human relationships and includes all living beings and creations (Kovach, 2009; Battiste & Henderson, 2000).

On the other hand, CBPR is collaborative where community works as an active and full collaborator, and where academicians and other scientists work as co-partners and learners (Holkup et al., 2004; Pontes & Gendron, 2011). It aims to improve the lives of marginalized groups by taking actions against oppressions, addressing injustice and inequities, and focusing on community needs (Holkup et al., 2004; Pontes & Gendron, 2011). CBPR is fluid and open to the unpredictability of the research process (Armstrong et al., 2011). It is beneficial for academicians, researchers, and the community (Holkup et al., 2004; Hopkins et al., 2019). However, one problem with CBPR is that it claims to be the perfect method of researching with Indigenous communities and does not emphasize adopting Indigenous research methods when they fit (Coachran et al., 2008; Armstrong et al., 2011). Sigmond and Cristopher (2013) also point to the need for CBPR to adopt Indigenous methods and worldviews and acknowledge Indigenous sovereignty. Theoretically, since CBPR is flexible and seeks full community involvement at every research stage, Indigenous scholars find it appropriate to use CBPR in research with Indigenous communities given that other appropriate IRMs are used (Wilson, 2008; Kovach, 2009). Both CBPR and IRMs are flexible and adaptive. They advocate for active community participation, reject objectivity, challenge positivist research, and are emancipatory. As such, in this collaborative research, IRMs or Haudenosaunee knowledge and methods and CBPR create a common and respectful ground of dialogue to facilitate the co-creation of knowledge about maternal health and water insecurity. In our research, there was active

community participation, differences and biases were highlighted with clear positionality. It was adaptive and flexible enough to adapt to the unprecedented COVID-19 pandemic situations. Most importantly, the research was not top-down. Instead, it progressed following the SNBC lead.

**Building relationships of trust:** Building relationships in research with mutual respect and truthfulness is of utmost importance in IRMs. It is also important in CBPR to encourage active participation of the community involved. I entered the Six Nations Community based on the long-term relationship established by <Author-2> as a member of the Six Nations, researcher, and scholar, and her over 35 years of work in the community. Further, our research stands on the long-term trustful and respectful relationship created and maintained by SNBC with their clients since 1996.

The first time I walked into the Six Nations Birthing Center was in Fall 2018 when the project PI (<Author-2>) held a meeting to decide future directions for the Ohneganos project with consultations of the SN community partners. There I met some of the SNBC members and midwives, including the director, <Author-3>. The PI introduced me as a potential candidate to collaborate with the SNBC and review MW charts to assess the impact of water insecurity on SN mothers and children. <Author-3> and I met several times after for talking about the research, its purpose, questions, and benefits. I remember mentioning the importance of this research as part of my Ph.D. requirement as well. When it was evident that I could not be the one interviewing the participants due to COVID-19 pandemic restrictions in the province and the SN community, <Author-3> came up with the idea of someone from the community to be conducting phone



interviews for me. A few days later, she emailed me about <research assistant>, who has been working at the SNBC since its establishment and has built respectful and trustful relationships with the clients of the SNBC through her programs like Mom and Tots. We were e-introduced over email, and then we decided on a time to chat over the phone and go over the research, its plans, and how she was going to help. <research assistant> and I met in person briefly for the first time when I handed her the questionnaire, invitation brochures, and consent forms along with a notebook so she could write notes about the interviews. <research assistant> and I live in the same neighbourhood, so we often met briefly with masks still on our faces and exchanged thoughts and shared experiences. We talked about technical issues that <the research assistant> faced, such as being disconnected with participants over the phone and how to manage the situation better. <research assistant> and I also regularly met to collect interviews from the audio-recorder and to upload them onto my personal computer to make room for her subsequent interviews. After about ten interviews were collected, I listened to them and provided <research assistant> with further suggestions to include in interviews, such as asking probing questions as she felt relevant. I also met regularly with her to provide her with the Walmart gift cards for the participants. We communicated via emails, text, phone calls, and in-person meetings.

We decided to make a Digital Story (DS) about the SNBC to record practices, services, and relationships with their clients. I was invited to revisit the SNBC on May 17, 2021, on its birthday! I had opportunities to meet the house mothers, other midwives and staff while making the DS. I learned so much more about the facility on that day! <Author-3> and I chatted over the phone, communicated over email and met in person in pre-pandemic time and one time during the pandemic while making the DS. We talked about the research and its progress, and she

always asked me about my progress and what needed to be done. I was comfortable sharing my vulnerabilities with her as a student and a mother of a little daughter. “Just hang in there <Author-1>, you have got this” or “tell me what you need” or “will this be helpful for your research then I will do it, if not I will pass just for time’s sake” often were the most encouraging and supporting words I would hear. She would find time for me even when she was attending births. To my hesitation to talk to her at a birth, she would assure me saying, “oh no worries, the mother is resting now so I have few minutes to talk to you.”

*"They will talk to you 'cause you will be going through us,"* <Author-3>, encouraged me when I was worried that the clients of the Six Nations Birthing Center might not want to talk to me since they did not know me! My doubts came from talking to colleagues and reading literature that shared their experiences of difficulty getting access to participants in Indigenous communities due to previous history of exploitative and extractive research (Castleden et al., 2012)). Literature showed that one of the requirements of researching with Indigenous communities is to build a long-term, trustful relationship. Trust is an ongoing process; it is not build in a day and it takes a lifetime to uphold that trust, but we believe we have established a foundation and now need to maintain and continue that relationship of trust.

**Co-designing research led by the SNBC:** The SNBC actively participated in the research by co-designing and leading the research. Research with Indigenous communities needs to be relevant to the community. The SNBC identified the need to assess the impact of water insecurity on young SN mothers. <Author-3> and I met several times in person at the SNBC at Six Nations of the Grand River and at < University Name> and conversed over the phone to co-

design the research. It prevented research from being extractive and encouraged active community participation. While the preliminary plan was to review midwives' charts to assess water insecurity, my proposal of in-person interviews with the clients was accepted and incorporated. We then interviewed the SNBC clients, midwives, and consultant grandparents. The questionnaire for the research was also co-designed and so was the invitation brochure. Co-designing the questionnaire helped me choose words that are easy to understand for the general community and respectful. We avoided questions that might trigger trauma, and midwives' expertise and experience helped ensure that. We reorganized our questions with the midwives' suggestions to inspire the flow of conversations and asked questions about water usage and practices and their impact on holistic maternal health. Our interview guidelines included questions about stories, where participants were encouraged to share their stories about their experiences with water in the community. Midwives drew relevant data from their charts. Moreover, the supervisor midwife, <Author-3> directed the research by joining my Ph.D. committee meetings at <University name> to monitor progress and provide necessary guidance. This level of community leadership in the academic sphere is rare within western post-secondary education and represents a small step toward decolonizing academia (Smith, 2012; Zaval, 2013). Thus, the research followed a decolonizing approach and progressed with community leadership and control.

**COVID-19 and flexibility in research:** As mentioned above, adaptability and flexibility are characteristics of both IRMs and CBPR and therefore they worked well in changing situations of COVID-19 pandemic. The first case of COVID-19 was detected in Ontario in January 2020, and the province-wide lockdown was ordered as an attempt to reduce the spread and flatten the

curve. Six Nations of the Grand River also was closed for non-members. It was also the time we were waiting to obtain our final ethics clearance from the Hamilton Integrated Research Ethics Board (HiREB) and Six Nations Ethics Council (SNEC) before we started the research by interviewing the SN Birthing Center clients. Foreseeing the COVID-19 situation, an alternative was sought. Phone interviews were decided on instead of the original in-person interviews and focus group discussions (FGDs) with grandparents and midwives were cancelled, prioritizing both clients' health and safety and the research team. The SNBC offered support by recruiting their Maternity Care researcher, *Yekararò:roks* (She gathers stories), <research assistant>, to conduct phone interviews for the research. <research assistant> has been working at the Birthing Center for 25 years and has built a strong, trustful relationship with the clients. She supports mothers through her 'Mom and Tot' program, provides postnatal care, helps them make traditional medicine, does home visits whenever someone needs an extra hand to cope with new babies or multiple children or needs a short break. Therefore, when <research assistant> interviewed the participants over the phone, the established trust was there. They spoke openly and spoke their mind. "*Some of them were emotional during interviews, and I feel honoured that they showed their emotion to me*"—<research assistant> told me in one of their regular touch-base conversations.

Anthropologists conducting interviews with others is not new in the discipline, although they have been marginalized in the discipline as not "real anthropologists" (Gupta & Ferguson, 1997). For example, in 1935, Paul Radin used local insurance salespersons and real estate agents to collect data rather than being one lone anthropologist. He argued, as Gupta and Ferguson (1997) explain, that local unemployed researchers are much better qualified to interview

working-class people than university degree holders (Radin, 1935, cited in Gupta & Ferguson, 1997). Providing the example of Radin's ethnography, Gupta and Ferguson argue that believing only university-trained and degree holders are always better is problematic; rather, local intellectuals and stakeholders can be better positioned to collect certain sorts of data.

"...inexperienced and often socially awkward ...graduate students are not necessarily the best of all possible observers [or interviewers/researchers]" (Gupta and Ferguson, 1997, p.24). <the research assistant> was undoubtedly a much better fit for conducting interviews as building a relationship of trust is essential for interviews to be meaningful, especially when the pandemic demanded mostly phone interviews.

In addition to the interviews, our initial plan to collect data by reviewing midwives' charts also changed as COVID-19 continued to worsen in Canada. Instead of handing the charts over to me, midwives went through their notes and collected information related to co-developed questions about water insecurity. Despite their full-time midwifery job, they offered support and decided on the best way to collect data from their notes. Although we planned to have the midwives read aloud the data from the charts so I could transcribe them later, the midwives decided to put them in word files as the best way of recording the data. *"I do not know how I came up with this idea, but I wanted that it is easy to understand for someone outside [of the Birthing Center],"* shared a midwife as she talked about her decisions of moving from audio recording the data to charts in a word file. This action is significant as it reveals several important points: 1) The SN Birthing Center owned the research by deciding ways of data collection, and 2) the researchers-participants binary dissolved as they were very active in the research process and made decisions. I then quantified the data pulled from midwives' charts.

Looking back to the features of CBPR, active participation by all involved is reflected in the research, as everyone served as co-researchers in terms of collecting data and providing directions and guidance. In our research, typical researcher-community or researcher-participants hierarchical binary dualism was minimal. Further, to cope with the new situation of COVID-19, the research was flexible enough to incorporate new directions and changes. Flexibility and adaptiveness to unprecedented conditions are characteristics of both Haudenosaunee worldviews and CBPR. This process shows the community's strength and capacity to adjust to unprecedented situations and lead the research path.

**Storytelling as a method:** Many Indigenous scholars have emphasized the incorporation of stories in the research with Indigenous communities (Smith, 2012; Archibald, 2014, Kovach, 2015) as stories are inseparable from Indigenous or Traditional Ecological Knowledge (TEK). Stories have an important place in Haudenosaunee knowledge and philosophy. Knowledge is transferred orally through stories. Therefore, incorporating stories in research design with Indigenous communities is crucial. We incorporated storytelling as a means of data collection in semi-structured interviews. We asked for participants' stories related to water in the households and community. Kovach (2009; 2010; 2015) highlights the importance of stories, dreams, and visions in Indigenous methodologies passed orally from one generation to another. Recently, storytelling has been used as a data collection method in research with Indigenous communities across disciplines. Bringing stories into academia as a method has been a way of decolonizing methodologies, a term used by Smith (2012). Inspired by Smith, Archibald (2020) emphasizes incorporating stories as a method for Indigenous research since stories assert space in colonial settings and conventions.

Stories for Indigenous communities are acts of resistance to colonial power and frameworks for reclaiming Indigenous sovereignty (Frank, 2017, p.3). Stories are embedded in Indigenous ways of life, work as guidance, connect the past with the present, and provide directions (Archibald, 2008; Frank 2017). Indigenous stories not only include geography, land, people, and kinship; they also include spiritual realms, visions, dreams, and miracles. Further, stories are therapeutic and emancipatory (Frank, 2000; Anderson, 2019). They reduce depression and anxiety, strengthen social connections and support, strengthen a sense of community, and work as a medium of forgiveness (Frank, 2017). Archibald (2008) coined the term "story work" and described its seven principles: respect, responsibility, reverence, reciprocity, holism, interrelatedness, and synergy. She argues that stories have different categories, such as sacred stories, historical stories, and life experience stories. Sacred stories are not easily unfolded; it takes time and a different level of understanding. Listeners may not understand stories all at once; stories unfold themselves (Archibald, 2008, p.112-114). This possibility of not understanding stories resonates with de la Cadena's (2014) notion of equivocation, discussed above.

Stories for Haudenosaunee connect the past and guide the future, much like how McCarthy (2016) defined Haudenosaunee traditions. Stories are essential against silencing; they are an excellent form of resistance. They do not only work as meaning making of our surroundings; they work for changing it. Stories are not myths or beliefs—stories are identities, explanations of the world, and nature. It is essential to become accountable in retelling any story. We retell and analyze the stories of the participants by highlighting their voices, by retelling the

stories in the participants' own words. Archibald (2008) argued that stories need to be understood in relationships that encompass family, community, nations, and nature and environment. Linking this idea with the critical medical anthropology (CMA) approach (Singer, 1989), we argue that stories should also be understood with political ecology, political economy and colonial violence in mind.

**Maintaining OCAP and 4Rs:** IRMs highlights ownership, control, access, and possession (OCAP) of the research data, therefore it was crucial for us to be clear about data OCAP with the SN community and the SNBC. "Nothing about us without us" is a slogan popular for research with Indigenous and marginalized communities emphasizing the need for community involvement and access to the research. The Tri-council ethical guidelines and the Royal Commission of Aboriginal People (RCAP) state that the data's ownership, control, access, and possession (OCAP) will be by the Indigenous communities. Visiting the community and having a conversation about ownership, use and purpose of the research at the beginning is essential in research with the Indigenous community (Kovach, 2009; Simons & Christopher, 2013). We followed OCAP, where Six Nations Birthing Center and Six Nations own the research. For our research, the data ownership by SNBC was made clear to the community before the research began. We also indicated this ownership agreement in our ethics application to Hamilton Integrated Research Ethics Board (HiREB) and the Six Nations Ethics Council (SNEC). As soon as the transcriptions were done, the anonymous interview data was shared with Birthing Center through a secured <university name> storage called <nameDrive>. The < University name> email Id, known as <name ID> was also created for Birthing Center, so they have immediate full access and control over the data.



In addition, RCAP also states that respect, relevance, relationality, and reciprocity, otherwise known as 4Rs, should be maintained. Kovach (2009) warns that the idea of respect should not be assumed but should be established on mutual understanding of respect. Steinhauer (2002, p.73) elaborates that respect does not only mean saying please or thank you, but it means listening attentively and then acting accordingly by involving the community. Smith demonstrated that for Indigenous communities, respect goes beyond humans and includes the environment, nature, and land (Smith, 2012). In our research, we carefully maintained 4Rs. For instance, our research maintains respect by listening and incorporating community advice and following their lead and guidance to carry on the research mentioned in the COVID-19 response discussion. Moreover, the research has progressed by being respectful and humble, listening, and acting accordingly. We were respectful of the knowledge, time and stories shared with us. The relevance of the research was maintained by following the SNBC lead, from selecting the research topic to designing and carrying out the research. The community identified the need for the research, so the research is relevant to the Six Nations community. The community's lead was followed in adopting and designing research methods, co-analyzing themes, and co-publishing research papers. We were also responsible for maintaining all participants' anonymity, privacy, and confidentiality. As an act of reciprocity, I created a Digital Story (DS) (Appendix Q) for SNBC, highlighting their knowledge and practices related to pregnancy, childbirth, family and community care, which might be useful to spread their works beyond the SN community. We are also co-publishing articles that take our collaboration beyond data collection and analysis. Co-analyzing and co-publishing data also help reduce any potential misinterpretation of data.

### **Mutual benefit and Capacity Building:**

Indigenous communities want the researchers to focus on strength away from pathologizing research and extractive research, such as the continued survival of settler colonialism and restoring traditional knowledge and practices (Ball and Janyst, 2008). Research that is mutually beneficial and helps capacity building is welcomed by Indigenous communities. CBPR seeks to give back to the community, and the *Kaswenta* treaty principle also teaches about mutual benefits. As Ball (2008) mentioned, research is a journey, and its benefits and specific outcomes are uncertain. Creating knowledge could be beneficial, too, if not making a significant direct contribution to social justice (Ball, 2014). In our research, the participants appeared to have a positive view to contribute knowledge for positive changes related to water in their community and beyond. A small token of gratitude in the form of gift certificate was given to each participant for their time in the research. Further, as outlined by Ball and Janyst (2008), research partnership opens opportunities for learning new skills, exploring and finding the topic of interest, and networking with different organizations and people. Through the partnership, non-indigenous researchers can learn about Indigenous knowledge and worldviews and themselves (Ball & Janyst, 2008). I learned about new skills and was exposed to Haudenosaunee knowledge and philosophy through this research. Working with the SNBC, Haudenosaunee women, helped me relearn, rediscover myself, which I consider the most significant benefit. I was also benefited from the SNBC's in-kind support in the form of conducting interviews and their time guiding their research. In addition to receiving funding from the GWF as a Research Assistant (RA) and a stipend through the *Ohneganos* project, involvement in the GWF and Ohneganos project has

been beneficial for me as I learned from other multidisciplinary team members and built networks.

Along with the community, researchers' and academics' capacity building is also essential to conduct ethical research that goes beyond following ethical guidelines (Kotaska, 2019; Coachran et al., 2008). Since I am not Indigenous in Canada, I received training in Indigenous knowledge, research, and methods through my PhD coursework under the supervision of my supervisor, and received cultural orientation on Haudenosaunee worldviews by attending GWF meetings. Working closely with the SNBC helped build my capacity for collaborating on the research. Although no direct capacity was built for the Birthing Center from this research per se, the larger *Ohneganos* research project helped with different capacity building for the community, such as hiring community members as research assistants and training youth in water governance and rights, Traditional Ecological Knowledge and western science environmental monitoring.

**Researching with a “good mind”:** CBPR and *Kaswenta* principles facilitated working across anthropological and Haudenosaunee knowledge with "good minds." Having good minds has the utmost importance in the Haudenosaunee philosophy, especially when collaborating. A good mind in research would mean being clear about motives, being transparent with purposes, and having positive intent (Freeman, 2015). It also means to listen carefully with compassion and kindness and act accordingly. In our research, we clearly stated our intentions and purposes for this research which were to contribute to water justice and health equity and get a Ph.D. requirement done. The mutual benefit was understood and agreed upon by the SNBC. I was

introduced to the SNBC at the Six Nations of the Grand River in 2017. Since then, I have been learning and trying to grapple with Haudenosaunee tradition and knowledge, acknowledging that my understanding is and will remain partial since I am not a member of the Six Nations community. de la Cadena (2015) suggests understanding unfamiliar worldviews through partial connections by introducing the concept of "equivocation" and arguing that we mean different things even after using the same word. However, we need to strive to make those partial connections stronger and better with truthfulness, trust, and respect. The SNBC did not only help with the research but with the completion of my Ph.D. requirement as we learned that the *Kaswenta* principles encourage them to do so, which is helping each other in need while journeying side by side.

Not only the SNBC as researcher partner, but the participants also upheld the good mind by not only contributing to the knowledge creation but reflecting on the research with encouragement. Many participants expressed the necessity of the research that focused on mothers and water. They wanted their voice to be heard, their situations with water to be taken seriously and known to the policymakers and broader people, and to bring equity and justice to water rights to and behind their community.

They're [researchers] doing a great job by doing this kind of research, especially in Indigenous communities... I think that research can help push a lot of changes and initiatives.

Some participants thought the research would help promote basic rights such as water. As one participant stated,

This is like a basic human right that our people have been struggling with. This research is important. And I think that the results will be important to supporting that. The data

will be important, but we need to act on these things now because it's an inequity that we shouldn't have.

Another grandmother shared her thoughts about the research:

Just continue to do what they're doing, hopefully, maybe not in my generation, but maybe the other generations will benefit from that because working with the government is very slow, its very slow. That's why I say it might not happen in my generation, but hopefully it'll happen in their grandchildren, whatever they find, you know, and whatever they can do to help.

As a researcher and young scholar, as I write, I keep the SN mothers and grandmothers and children in my mind. I remember their knowledge, suggestions, and reflections. I aim to spread their words and stories with my writing while being mindful of the "good mind." Co-authoring with the community partner is essential to make sure their stories are presented in a good way. It is also crucial to dismantle “repressive authenticity” (McCarthy, 2016, p. 43) and acknowledging ownership of the community.

### **Discussion:**

Indigenous and western knowledge can come together for mutual benefit and goals without dismissing each other. Despite the colonial history of western academic research and methods, many Indigenous scholars are against the total rejection of western knowledge (e.g. Smith, 2012; Kovach, 2009, Martin-Hill, 2021). They have demonstrated the need for western knowledge and Indigenous knowledge to work together for sustainable solutions to ecological problems, including water justice. Indigenous knowledge and methods are crucial, along with community participation in decision-making with western scientific knowledge. Anthropologists also believe that collaboration is a key to better scholarship and a sustainable future (de la Cadena, 2005; Ingold, 2017). Research with Indigenous communities must include Indigenous communities as research partners and ground the work in local knowledge derived from unique relationships

with the land. CBPR and IRMs work well together, for they both are flexible, anti-colonial, and reciprocal. Both Haudenosaunee teachings and philosophy and critical medical anthropology helped us to create a common ground with mutual respect and shared responsibilities. We co-created the research design and methods by putting Haudenosaunee knowledge at the center of data collection and analysis. While the involvement of Indigenous communities in most community-based research has been minimal, our research progressed following the SNBC lead from research conception to data collection and analysis.

Haudenosaunee *Kaswenta* treaty is a living example of the peaceful co-existence of different knowledge, worldviews, and cultures. While the settler-colonial state of Canada did not uphold the treaty, many Indigenous scholars demonstrated that the *Kaswenta* treaty helps create dialogical space across knowledge and methods (McGregor, 2009 Hill & Coleman, 2019 Goodchild, 2020; Martin-Hill et al., forthcoming), as it celebrates heterogeneity, respects differences. *Kaswenta* is helpful to understand how research across epistemology is feasible without being extractive, ignoring, or silencing other knowledge. *Kaswenta* worked as an inspiration in our research to work across Haudenosaunee and medical anthropological knowledge and methods. However, non-Indigenous researchers need to be mindful and respectful of the sacred nature of *Kaswenta* so that something as valuable as the law of *Kaswenta* does not get reduced into simple research guidelines. It is important to uphold the teachings of *Kaswenta* beyond the academic integration and work in solidarity with Indigenous communities, so the real purpose of the peaceful co-existence of sovereign nations is upheld and respected.

Our collaboration with the SNBC taught me that when the community takes the lead, we get meaningful and fruitful research outcomes, and any problems that may arise can be resolved suitably. When the purpose and goal of the research align with community needs and dialogue happens with respect and trust, researchers-participants' binary and hierarchical power relations are reduced. In our research, during COVID-19, the SNBC took the lead by finding ways to proceed with the research during the COVID-19 lockdown; midwives collected relevant information from their clients' charts, and members of the midwifery team conducted interviews. As a result, our research progressed efficiently despite the global pandemic. We learned that sometimes, just stepping back and letting the community lead is an efficient way to progress the research. We also learned that community members can be better interviewers especially if the researchers did not have the opportunity to build a solid, trustful relationship with the community. Interviews, conversations, and stories are more meaningful when they are shared with someone who has built a relationship of trust. Janet Homer, the maternity Care worker at SNBC, has built a relationship of trust for over 25 years. Therefore, participants opened their hearts, shared their stories and emotions. Although there was a physical distance in the phone conversation, they connected by maintaining the "sacred space" built through trust, respect, and friendship.

Despite the COVID-19 pandemic, we were able to conduct 54 interviews in just four months. The number and the depth and quality of interviews prove that community members can be better fits for conducting interviews than academic degree holders, especially than "an awkward grad student" (Gupta & Ferguson, 1997). The SNBC involvement in every research step, including co-analyzing key themes and co-publishing data, made the research more

meaningful. It reduced the researcher's biases in the analysis and reduced risk of misinterpretation. Involving the community partner in academic settings such as formal Ph.D. committee meetings has been very effective. The community partner assessed the progress and directed the plans and goals. This enriched the whole research and Ph.D. process, and it allowed other two Ph.D. committee members, Dr. Tina Moffat and Dr. Ellen Badone to meet the community partner, learn and know the research situation, and follow their lead. It helped decolonize academic space.

**Conclusion:** Contrary to western methods where principal researchers define research questions, design research methods, select participants, document the findings, and then publish the reports, our research was co-designed and co-developed as part of the Ohneganos research project with the SNBC. Designing methods to select participants progressed following the SNBC lead. This paper discussed our ways of co-developing research by working across medical anthropology and Haudenosaunee Knowledge. It describes our partnership with Six Nations of the Grand River, where we applied CBPR and Haudenosaunee methodology in developing our research. Providing a case study of research with the SNBC, we demonstrated how we worked across epistemological boundaries and grounded our methodology in Haudenosaunee worldviews. We demonstrated that Haudenosaunee Knowledge, IRMs, and CBPR are flexible and adaptive, and they fit well together in our research. We argued that tokenistic mention of community participation and 4Rs are problematic and provided a detailed account of how we followed and maintained OCAP and 4Rs with this in mind. Our research was a collaboration with full and active participation from the community. Although full and active community participation is rewarding, we need to be mindful of the limitations that may accompany academic institutions



and funding agencies and not overburden the community with the extra workload for the research. However, all decisions should be informed and guided by the community for meaningful research with Indigenous communities.

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## Chapter 3: Water Insecurity and Maternal Health among Haudenosaunee Women in Canada

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### Abstract:

Water is central to Haudenosaunee knowledge, philosophy, and culture. The health of Haudenosaunee mothers is tied to that of water. Today, the lack of access to reliable drinking water for Six Nations is a significant health concern. Technical measurement of water advisories in Canada fails to understand the interwoven relationship that Haudenosaunee women have with water. Highlighting the voices of 55 Haudenosaunee women, we provide expanded definitions of water insecurity and maternal health to include more-than-human beings. This comprehensive understanding of water insecurity and health shapes SN mothers' experiences with water in a settler colonial state, affecting their holistic wellbeing.

Keywords: water insecurity, maternal health, Indigenous women, TEK, Canada

**Introduction:** The research documented in this paper stems from a community-led project in collaboration with Six Nations of the Grand River in southern Ontario that uses Indigenous knowledge and western science to seek sustainable solutions to water security, water sovereignty, and water governance. In partnership with the Six Nations Birthing Centre (SNBC),

an Indigenous organization, we sought to highlight the interrelationship between water and maternal health, guided by Haudenosaunee environmental and political philosophy.

Water has profound meaning in Haudenosaunee knowledge and philosophy. It is the main component of the Haudenosaunee creation story where the Sky Woman fell in the water on a turtle's back and said: *Nék ne ohné:ka í:ken*, "it's all water" (McQueen, 2019). *Ohen:ton Karihwaterhkwen* (Haudenosaunee Thanksgiving Address) thanks water and all creations, teaching the interrelatedness of all parts of the natural world. Water is in their Great Law of Peace, according to which the peacemaker travelled through the water to unite five founding Nations: Oneida, Onondaga, Mohawk, Seneca, and Cayuga. Later, Tuscarora joined the confederacy, and together they are known as the Six Nations. Water also played a vital role as a symbol of friendship, peace, and righteousness in the Wampum belt, known as *Kaswenta*. Haudenosaunee worldviews make strong connections between women and water. Women carry life in water, and that intimate link between the two is understood as a feminine bond, a reciprocal relationship of protection. In Haudenosaunee knowledge, women reflect water as they sustain life in the water in their womb. Although everyone is responsible for protecting water, Haudenosaunee women speak for the water (McGregor, 2008; Martin-Hill et al., 2022). Mohawk midwife Katsi Cook (2018) emphasizes the connections and embodiment of women and Earth as they both nourish and sustain life through interconnectedness and interdependencies,

*We know from our traditional teachings that the waters of the Earth and the waters of our bodies are the same water. The follicular fluid which bathes the ripening ovum on the ovary; the dew of the morning grass; the waters of the streams and rivers and the currents of the oceans - all these waters respond to the pull of our Grandmother Moon. She calls them to rise and fall in her rhythm. Mother's milk forms from the bloodstream of the woman. The waters of our bloodstream and the waters of the Earth are all the same water (Cook, 2018, pr-1, italicized added).*

However, this relationship between Haudenosaunee women and water has been damaged by Canadian colonial assimilationist policies such as the Indian Act and residential schools. The Indian Act demolished the leadership roles and community decision-making power of Haudenosaunee women by replacing the traditional confederacy with elected band councils (Kolahdooz et al. 2016; Martin-Hill et al., 2022). Children were forcibly put into residential schools away from mothers' and communities' care, resulting in the loss of traditional language, knowledge, and connections with the land (Cave and McKay, 2016). Although Indigenous women play significant roles in protecting water and are spokespersons for water (Anderson et al., 2013; Anderson, 2010; Baird et al., 2015; Longboat, 2015; McGregor, 2012), as a result of settler-colonialism, Indigenous women have not been included in the decision-making process about water (Cave and McKay, 2016).

While it is well established that water insecurity disproportionately affects women, primarily for their responsibilities as caregivers (Collins et al., 2019; Wutich, 2009; Ennis-McMillan, 2001; Wutich and Ragsdale, 2008; Hanrahan et al., 2014; Wutich et al., 2020), the interrelationship between water and maternal health remains understudied. Hoover's (2017) research in the Akwesasne Mohawk community in the Upstate New York documents severe negative impacts on biological and cultural reproduction due to water contamination. To our knowledge, this research is one of the first to document how water affects the holistic (physical, mental, emotional, and spiritual) health and wellbeing of Haudenosaunee mothers in Canada.



## **Background:**

There are boil water advisories in one in five Indigenous communities in Canada at any given time (Baird et al., 2015; Meehan et al., 2020). In 2016, there were long-term drinking water advisories in 105 Indigenous communities in Canada (Cecco, 2021). The federal government failed to uphold its promise to eliminate all long-term water advisories by March 2022. As of December 1, 2022, there were still 30 long-term water advisories in 26 Indigenous communities (Indigenous Service Canada, 2022). An inspection by the province of Ontario in 2017 reported that water treatment plants in the Indigenous communities were not disinfecting water to the provincial standard, even though they were regarded as low risk by the federal government assessment (Isai, 2021). These discrepancies and continuous failures create frustration and mistrust among Indigenous peoples. Chambers and Burnett (2017) report that 35.8% of Indigenous peoples do not believe their home water supply is safe. The prevalence of conditions such as obesity, diabetes, and mental illness are high in Indigenous communities, and they are often linked to malnutrition, poor living condition, and environmental and water contamination (Gracy and King, 2009).

Research on water insecurity has demonstrated direct links between persistent water insecurity in Indigenous communities and colonialism (Simpson et al., 2009; Cave and McKay, 2016; White et al., 2012; Arsenault et al., 2018). White et al. (2012) argue that the first displacement of Indigenous people onto reserved lands and the subjugation of Indigenous knowledge contributed to the present suffering of Indigenous peoples. Further, the complex bureaucratic structures of water governance contribute to persistent water insecurity in Indigenous communities (Arsenault et al. 2018; Collins et al. 2017). For example, provincial

governments are responsible for ensuring water quality off-reserve, whereas ensuring clean water on-reserve is the federal government's responsibility (White et al., 2012; Arsenault et al., 2018; Bradford et al., 2016). Despite millions of dollars allotted by the government to maintain safe drinking water, including the 4.6 billion dollars announced by the Prime Minister of Canada in 2016, safe drinking water in Indigenous communities is yet to be achieved. The problems lie in the federal government's continuing colonial paternalistic attitude, the exclusion of Indigenous leaders from the decision-making process, development extraction and land encroachment, and the ignorance of Indigenous knowledge related to water and land (White et al., 2012. McGregor 2012; Arsenault et al., 2018; Arsenault, 2021; Latchmore et al., 2018).

**Study Site and Methods:** This research was co-designed with the partnership of the Six Nations of the Grand River, demographically the largest First Nations reserve in Canada, a home close to 13,000 people. Located along the Bank of the Grand River in Southern Ontario, SN is the residence of all Six Nations (Oneida, Onondaga, Mohawk, Seneca, Cayuga, and Tuscarora). Currently, SN has less than 5% of their original land compensated through the Haldimand, treaty in 1784 (Six Nations of the Grand River, 2022). Although just half an hour away from major cities such as Brantford and Hamilton, SN does not have clean running water for about 90% of its households (Six Nations Public Works, 2019). Most households use cisterns or wells, trucks in their water, and buy bottled water to drink (Bradford et al., 2016). While SN people struggle for clean drinking water, Canadian water policy permitted companies like Nestle to extract 3.5 million litres of water per day from SN territory without consultation with the community (Martin-Hill et al., 2022; Patel, 2014). The source water for this community comes from the Grand River, which is contaminated with various chemicals from industrial development,

farming, and landfill runoff. A water treatment plant was established in 2014 but is poorly managed, insufficient to meet community needs, and expensive and unaffordable for many (Dyck et al. 2015). SN has experienced several boil water advisories, and testing has detected *E. coli* in the tap water of some households (Pecoski, 2013; Dupont et al., 2014; Baird et al., 2015; Duignan et al., 2022).

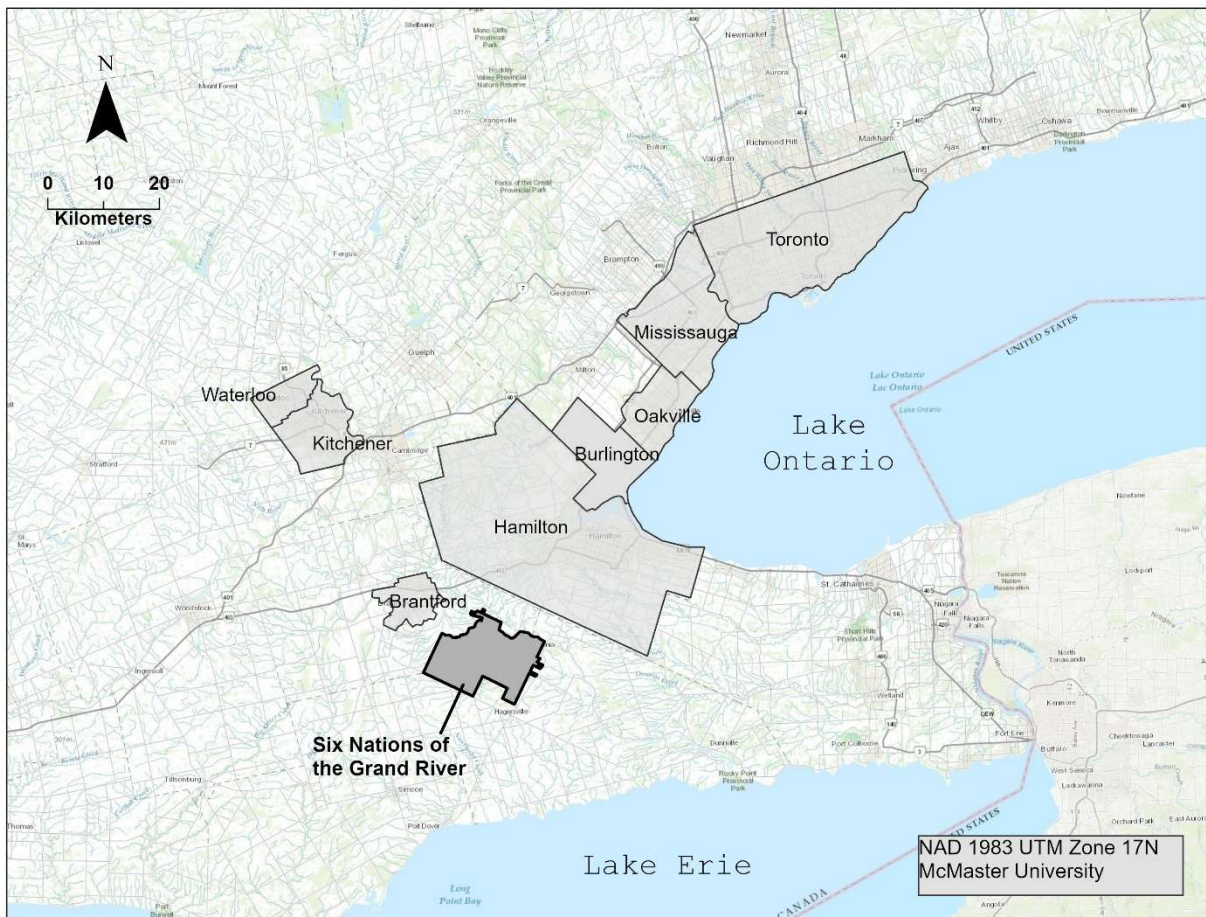


Figure-13: Six Nations of the Grand River Reserve. Map created by GWF-1 Project team. Used with permission.

This research is a part of Ohneganos—Indigenous Ecological Knowledge, Training, and Co-Creation of Mixed-Method Tools funded by the Global Water Futures (GWF) and approved by the Hamilton Integrated Research Ethics Board (HiREB) and the Six Nations Council Research Ethics Committee (SNCREC). For Ohneganos, where community knowledge and

science are mutually exchanged, decolonization and reciprocity have been essential aspects. We were inspired by *Kaswenta* or Two-Row Wampum principles and applied Community Based Participatory Research (CBPR). The Two-Row Wampum treaty was established between the Haudenosaunee and the Europeans (Dutch), promoting equality and acceptance of heterogeneity (Hill and Coleman, 2019; Goodchild et al., 2021). The Two-Row Wampum principles helped create a dialogical space across the worldviews of Haudenosaunee community and non-Indigenous researchers. Ohneganos partnered with the Six Nations Birthing Center (SNBC) as humans' first environment is in water inside mothers' wombs (Cook, 2008; 2018). This research was co-developed with the SNBC and followed their lead and guidance through unprecedented COVID-19 pandemic conditions.

Guided by the SNBC, we conducted 55 semi-structured in-depth interviews with SN mothers (n=41), grandmothers (n=10) and midwives of the SNBC (n=4) to learn about their experiences with water insecurity and maternal health and gathered water and maternal health-related data from midwives' charts (MW charts) of those 41 mothers. All 54 interviews were transcribed using NVivo software. The transcriptions were cross-checked for mistakes and to document the tone of the participants. Data were coded in two ways: using the NVivo software and colour coding on MS Word. All coded data were then categorized under major themes, physical, mental, and spiritual impacts. Thematic and comparative analyses were done with the SNBC. Data from midwife charts were manually quantified for frequencies and then input into MS Excel for further analysis.

## **Analytical Framework:**

Our analysis is framed in Traditional Ecological Knowledge (TEK), critical medical anthropology (CMA), and environmental anthropology to understand the interrelationships between water and health. In TEK, health is holistic and encompasses physical, mental, emotional, and spiritual wellbeing (Martin-Hill 2009; Nadasdy 1999). Similarly, CMA emphasizes broader historical and political-economic structure and local knowledge and practices to understand health holistically (Singer, 1995; Baer et al., 2012). Research in environmental anthropology demonstrates that human health is interwoven with ecological or environmental health (Bird-David 2004; Andrews 2020).

CMA emphasizes that disease and illness are the products of a dialectical interaction of natural, political–economic, and sociocultural forces (Singer, 1988; Singer, 2004, cited in Witeska-Mlynarczyk, 2015:386). Paul Farmer and colleagues (2004; 2006) added the concept of "structural violence" to CMA to understand health inequalities. Structural violence demonstrates how broader historical, political, and economic structures do violence to marginalized groups. Thus, CMA highlights social inequality in health, situating it in historical and colonial contexts. Environmental anthropology explains that nature is intertwined with humans, forming an understanding of health, disease, and illness (Pálsson 1996; Pálsson 2007; Ingold 2011; Bird-David 2004). Human and environmental health is inseparable, and their connections, interactions, and interdependence are messily entangled since they continuously construct each other (Pálsson 2007, 2013; Ingold 2013; Bird-David 2004; de la Cadena 2015; Todd 2017). For example, Brown and Nading (2019) reemphasize human and non-human entanglement regarding health and wellbeing, arguing that political economy affects human and non-human beings such

as animals and that human health and wellbeing are affected by that of animals. Nancy Scheper-Hughes and Margaret Lock (1987) argue that mind, body, and society are interconnected when it comes to understanding health. Other studies in anthropology demonstrate how the environment and nature, such as mountains, forests, and oceans, shape humans' health and wellbeing as active actors (de la Cadena 2015; Todd 2017; Andrews 2020; Bird- David 1999, 2004).

Research in anthropology has demonstrated that water has cultural, political, and economic significance (Wutich and Beresford 2019; Walker 2017; Eichelberger 2014). Water is a biosocial entity or a *hydrological* being that shapes human societies and relations, with water and humans co-constructing each other (Wutich and Beresford 2019; Stevenson 2018). Water demands "flexibility and negotiability in social relations" (Mosse, 2008:944). It resists the western idea of private property as it crosses human-made land boundaries and requires communities and societies with different knowledge and worldviews to work together as they share the water (Mosse 2008; Stevenson 2018; Todd 2017). Water shapes and reshapes geographies, thus challenging dualistic thinking about water and land or water and society (Linton and Budds 2013; Neimanis 2017).

Similarly, Indigenous scholars have emphasized the spiritual significance of water (Todd, 2017; McGregor, 2012). Water nourishes, purifies, and keeps balance and harmony on the Earth in the form of floods and rain (Arsenault et al. 2018). Water is associated with overall physical, mental, and spiritual health (Anderson, 2010). In Haudenosaunee TEK, water is the first environment (Cook 2018), medicine, and a living spiritual force (Latchmore et al. 2018). Water is a sacred being that people turn to for food, to quench thirst, to cleanse body and mind, and for spiritual

strength (McGregor and Whiteker 2001). Water, to Haudenosaunee mothers, is not an object or "*something that doesn't feel.*"

Indigenous knowledges perceive the body and environment as a connected whole (Anderson, 2010). Research has demonstrated that the divisions between water and land or water and humans are narrow and serve the colonial agenda of divide and rule (McGregor 2012; Todd 2017; Liboiron 2021). Although like Haudenosaunee women, water has been a target of exploitation by colonialist and capitalist policies and agendas, water is not a passive recipient of human actions and politics but an active agent that shapes social relations, geographies, politics, and challenge western binarism (Mosse 2008; Linton and Budds 2014; Murphy 2017; Todd 2017; Neimanis 2017). Our analysis also rejects the binary compartmentalization of water and land, human-nature health, physical and spiritual worlds, human and more than human, living and dead. Instead, we focus on how all these domains are interconnected, only becoming in relationship with others, always in the process of co-creation and co-construction of other beings.

### **Defining Maternal Health and Water Insecurity**

SN mothers' understanding of maternal health goes beyond biomedical definitions. World Health Organization [WHO] (2022) defines maternal health as "women's health during pregnancy, childbirth, and the postpartum period," with a positive experience for both women and babies. However, to SN mothers, maternal health was not limited to those short periods or only to biological mothers. The perception of maternal health encompassed mother figures or "female role models in a child's life" (grandmothers, aunts, and clan mothers) and Mother Earth. Furthermore, it was not confined to a mother's health as an individual; instead, maternal

wellbeing was entangled with the health and wellbeing of their children, grandchildren, family, community, society, nations, and Mother Earth (Figure 14). For example, a grandmother linked maternal wellbeing to Mother Earth:

I just think of the Earth and all of her waterways. She has a family, like our environment, to nurture and nourish. The Earth has a relationship with water. When the water comes to the shores of the land, the land opens up all the veins and arteries, and it absorbs that. Water has a relationship that can flow through that mother's veins and nurture the rest of her body to keep her healthy...Everything needs to have that water... if there is no water, there is no life! Mothers need to have that in order to produce food. A Mother Earth for her children, which includes the trees, the medicine, the berries, animals—everything, you know! And mother needs to have that water in order for her mental health because the water flows through her body every day, and every artery and every membrane in her body needs to have water in order to produce life. Just relating to our Mother Earth and the human element, as long as Mother Earth is well, humans will be well.

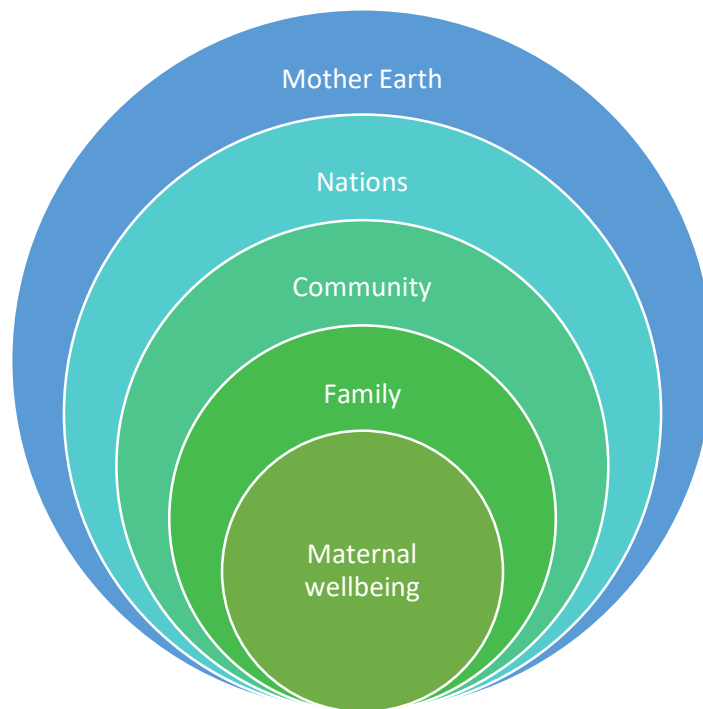


Figure 14: SN mothers understanding of Maternal health.



Similar to the research conducted by Leason (2018) in the Okanagan Valley of British Columbia, the SN mothers also linked maternal health with basic needs, which Leason categorized under “proximal determinants” (2018, 56). Leason (2018) argues that multi-layers of social determinants of health, including colonization, shape Indigenous maternal health. SN mothers stated that accessing food, nutrition, water, health care, support systems, and housing is essential to maternal health. In addition, for some mothers, maternal wellbeing meant having a state of good mind; living in a safe, violence-free environment; and being healthy enough to take care of their babies.

Several definitions of water insecurity can be found in the literature, which are based on water access (Wutich, 2009; Stevenson et al., 2012; Ennis-McMillan, 2001; Bulled, 2016), availability and affordability (Hanrahan et al., 2014). Others have incorporated all three of these variables (Jepson et al., 2017; Weis et al., 2020). However, SN mothers understood water insecurity as equality and equal access to clean, safe water for all creations: humans and more-than-humans. While participants worried about the lack of clean running water for daily use and raising families, their worries extended to plants, turtles, fish, and all other creations. They were also concerned with the health of the water itself. Norman et al. (2011, 54) defines water security as "sustainable access on a watershed basis, to adequate quantities of water of acceptable water quality, to ensure human and ecosystem health." We define water insecurity as inaccessibility to and unavailability of clean and safe water that jeopardizes the wellbeing of humans and more-than-humans that depend on the water and interrupt the balance and relational connections in the ecosystem.

### **Household Water Insecurity at SN:**

Our research documents severe water insecurity in the SN community. Only 15% of the participants reported having access to water. However, understanding of access to water varied among participants. Most understood accessing water as "being able to turn to the tap to drink;" others included have to buy water from stores and getting water delivered. Accessing water during the COVID-19 pandemic was especially a struggle for SN mothers as there was a purchase limit on store water and a backlog on water truck delivery. As one mother mentioned:

In COVID, I know the water companies were kind of backed up sometimes. So, we had to really limit our bath and our water intake at home because we're off the well, and we have like fifteen hundred gallons well... we had to really watch our water intake.

While most participants expressed distrust and dissatisfaction with their water quality and avoided drinking it, a few reported drinking tap water at times of absolute necessity. Participants described tap water as discoloured, hard, and smelling like sulphur and chlorine. "*It's always been this way since I was little,*" said a mother. Some noted that the water situation worsened due to increasing farming, chemical waste, extraction of resources, and the development of capitalist industries in the surrounding region. Growing up on the SN reserve, many have normalized not having clean running water in their households. "*Growing up without it, I never thought what life would be like with clean drinking water,*" a mother stated. Another mother also pointed to normalizing water scarcity:

I definitely think [water affects us] in ways that we probably don't, we aren't able to see. Because we're used to living this way of growing up on the reserve and living on the reserve for most of our entire life. We don't realize that we have inequity in terms of our access to water because that becomes normalized for us. And I think that it impacts our children and our pregnancies in ways that we don't see.

Running out of water was a significant concern among SN mothers. One mother noted:

Running out of water becomes something that we're all in a community familiar with it. There are a lot of times when you run out of water... it's kind of like a crisis situation. Regularly our homes will run out of water. And, you know, you have to figure out how you're going to flush toilets, how you're going to bath kids. It just becomes difficult, especially when you have a lot of little ones.

Some participants indicated unaffordability with trucking in water or purchasing bottled water and the costs of transportation, gas, and babysitters to access water. Many participants expressed frustrations with long-standing water issues in their community due to contaminated source water, limited access, and unaffordability to waterlines from the water treatment plant. Connecting to the waterline costs around CAD 10,000 (Duric, 2021) and many waiting for years for the waterline to come to their neighbourhood (see Figure 15). An SNBC midwife expressed this challenge,

They're trying to expand the waterlines, but they're only getting to the main places, like the schools. So, anybody in the outlying areas...it doesn't even touch them yet. And it could be many years before it's ever addressed!

Similarly, a mother stated,

They did run waterlines to a lot of parts of the reserve, which I thought was amazing. I did see the long-term plans for water lines being run through the whole reserve. But I was told like even in my location, we likely won't see that waterline in my area till for like another 20-plus years, which is really discouraging.

One mother expressed concerns about the cost,

Certainly, it does not sound like [getting on the waterline] is going to happen any time soon. And never mind making it affordable for me. To hook up to it doesn't sound like that's within my reach either!

A midwife was concerned that many of her clients would not be able to afford access to the waterline:

The hardest part is that as the water lines are being spread out, it's still a cost for people to be able to access those waterlines, even if they're going to run right by their house. There's still a significant cost. And I guarantee you [that] 95% of people are not going to be able to afford to hook up to the waterlines as soon as they run by their houses.

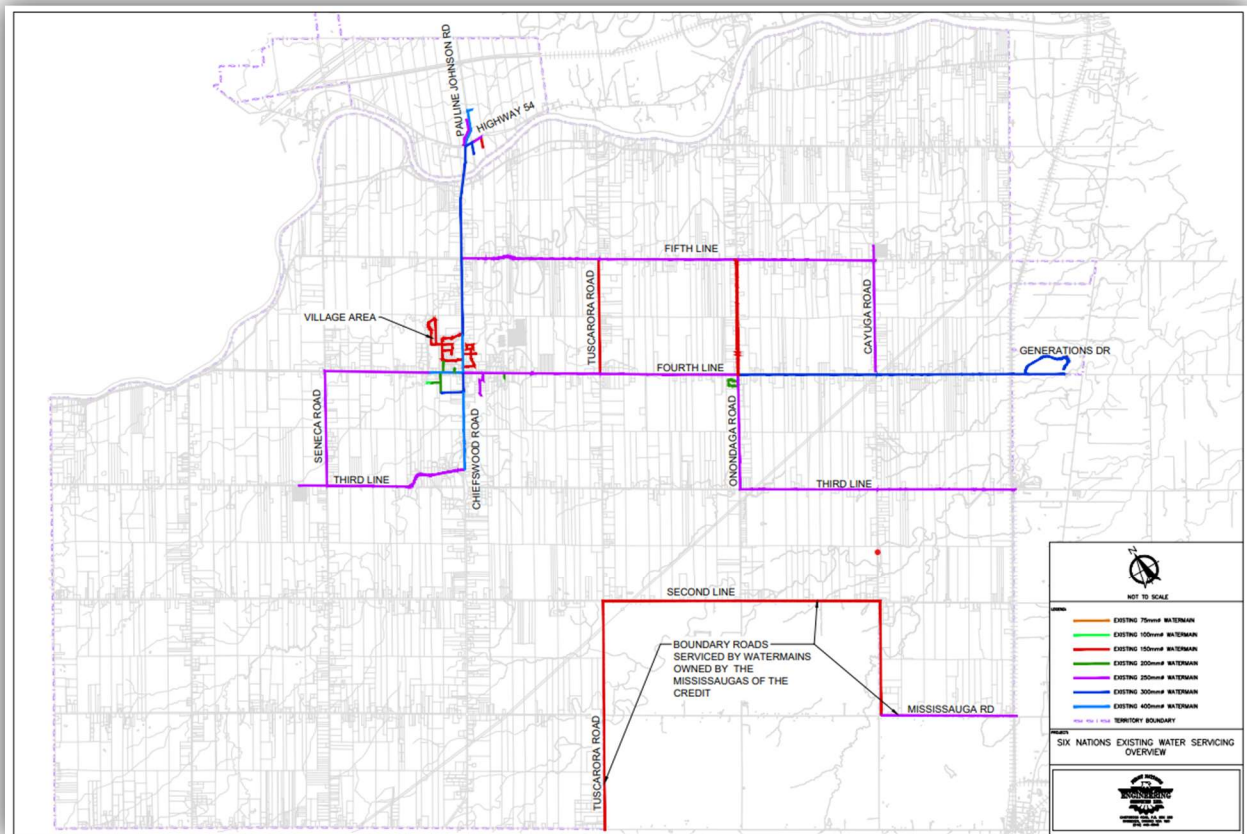


Figure 15: SN reserve—highlighted lines showing water treatment plants' service areas, as of February 2022. The map was collected and used with permission from the SN Public Works.

Frustration towards the federal government's lack of will to end water issues and ensure maternal health in their and other Indigenous communities was evident. For example, more than 88% of participants thought that the government of Canada is not doing enough to solve water

issues in their community, and 66% of participants thought there are not enough sustainable initiatives taken to ensure maternal health in their community.

### **The Impact of Water Insecurity on SN Mothers' Holistic Health**

#### **The impact of water insecurity on the physical health of SN mothers:**

SN mothers reported that poor water quality affected the functionality of maternal bodies. "Our bodies are made of so much percent of water. And if it's not that good quality, then our bodies aren't really of good quality either to be carrying a baby and, you know, building all those babies' important functions," stated a mother. Another participant believed that drinking tap water which is "hard" makes people tired, sluggish, and nauseous. Both interviews and midwives' charts reported skin issues and eczema in mothers and children. Participants stated that there is a direct link between water and their skin problems. Abdominal pain was also reported concerning water. MW chart analysis demonstrates other maternal health conditions such as Urinary Tract Infections (UTIs) (31.7%), Gestational Diabetes Mellitus (GDM) (19.0%), anemia (9.8%), and vaginosis infections (9.8%) (Figure-16).

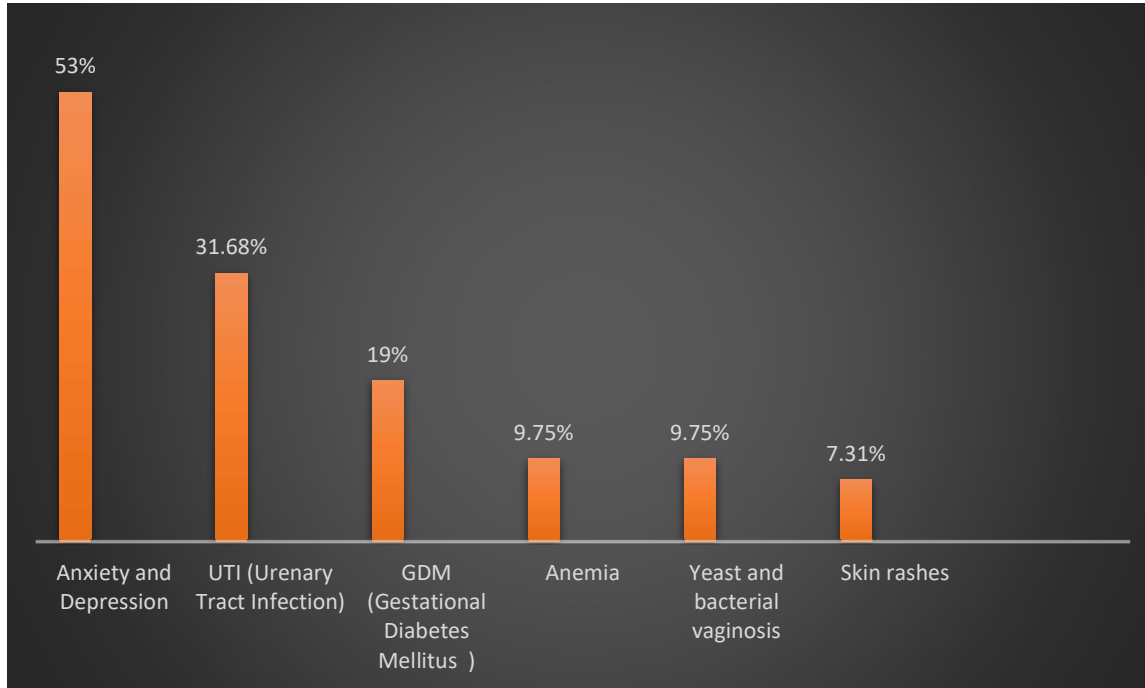


Figure-16 Documented Pregnancy Health Conditions Found in Midwife Client Charts (n=41)

Lack of water affects personal hygiene practices, contributing to UTIs and yeast and bacteria vaginosis. One mother explained:

Sometimes like the fact that some women don't have water at all, and they're not able to clean properly, clean themselves, clean their children, and clean the home, which increases the risk of viruses and illnesses spreading.

The COVID-19 pandemic created additional challenges in maintaining personal hygiene. For example, a mother recounted going ten days without a shower as there was a long waitlist for water delivery:

[In] the early stages of the corona time, we had run out of water, but everybody must have been running out of water because we had to go ten days without getting a refill. So I went ten days without showering, and I just gave my kids birdbaths. My husband did the same. It made me feel dirty.

Although GDM and anemia are commonly linked to food security, our study demonstrates that they are also linked to water insecurity, as poor water quality impacts food choices and

feeding practices. A recent study in Pakistan also demonstrates the same and argues that food security and water insecurity are syndemics that influence food choices and feeding practices, impacting health negatively (Ahmed et al., 2021). Many mothers in our study reported drinking high amounts of sugary drinks as water substitutes. As one young mother stated,

When I first had her[daughter], we had numerous trips to the store because I'd have to get bottled water, clean water, to make the bottles in the morning. And we drink water throughout the day. And [if] there's no water, then, of course, we have to substitute with juice, which is not ideal.

Many mothers prioritized their water intake last, often leading to severe adverse health impacts such as dehydration. A mother noted,

There are days that I would think I didn't get enough water. And then I thought, well, I'm going to go get a drink and then we're out of bottled water! And so then I would just skip it and have to wait until the next day.

Some mothers linked dehydration with low breast milk production and other mental and spiritual health impacts. As one mother noted:

If moms [are] not hydrated enough, lots of things during pregnancy can affect, you know, lots of swelling and dehydration. Mom [is] not going to feel well. And then postnatal, when she has a baby, if she is breastfeeding, trying to make enough milk, again if she's not able to be hydrated enough, she's going to struggle with milk supply. Or if a mom is like me and has to formula feed, worrying that the formula that she's going to be giving her baby is going to make her baby sick or not feeling well because the water isn't great like that's going to affect her mentally and emotionally and spiritually in the sense that she might not feel like she can provide for her baby.

Some mothers thought dehydration during pregnancy could lead to miscarriage. As one mother who used to be a midwife stated,

The amount of health issues is just like the list just goes on and on and on. Like even dehydration that can cause early labour, early labour can cause preterm delivery and preterm delivery, you know if it's too soon, the baby could not survive. So, in so many ways, it can cause death for the baby. And an illness or death for the mom too.

### **Emotional and mental health impacts:**

SN mothers reported negative mental and emotional health impacts caused by severe water insecurity in the community. Stress and anxiety were reported the most (Sultana et al., 2022).

MW chart analysis also shows higher stress and anxiety in mothers (53%) (Figure 16). SN mothers worried about running out of water and being forced to drink unsafe water, which was aggravated during pregnancy and pre and postnatal care. A mother identified increased worries during pregnancy:

If you're pregnant, you're very cautious of what you put into your body and the effects on the baby. So, I would be worried. We're preparing meals with unsanitary water that could affect the mother and the baby and the other children as well.

As noted, most mothers reported being stressed about accessing and affording water. A mother stated:

Just the kind of stress of worrying like if you're going to run out of water, if the water truck will get here before you run out the water and then [the] cost like, we have to get water delivered probably twice a month, and that's like at least one hundred- and sixty-dollars water a month. But we can't even drink it. It's just like cooking or showering or bathing or whatever. We obviously have to buy drinking water.

Naguib (2007) argues that being unable to maintain personal hygiene due to lack of water affects women's dignity. Similarly, SN mothers reported that water insecurity is associated with lower self-esteem. One participant said,

I could see how that could just bring a person down when you can't just shower; you can't just easily put a pot of water on for your children to make a quick thing and noodles or grab a glass of water when your kids are thirsty. It would be draining to constantly have so much extra work on top of an already hard day when you come home to be dealing with a lack of water and not being in the bath and things like that.



Thinking about the future generations who may not have clean water made the participants sad. Mothers reported that they felt depressed by knowing the water was "sick." As one mother stated,

Depressing the idea of knowing that the water that we were surrounded by is sick; I don't know how else to word it, but it's sick, and it's full of contaminants, and it's not well.

**The impact of water insecurity on spiritual health:** "It [water] not only affects our physical bodies; it's affecting our mental and spiritual being as well," stated a mother highlighting the invasive effects of water insecurity on maternal health and wellbeing. Grandmothers most frequently raised the spiritual component (Figure 17); however, participants' understandings of the spiritual relationship with water varied. Some understood it as having a ceremonial role, recognizing water's medicinal, healing, and rejuvenating powers. For some, it was about giving thanks and being respectful or being drawn to water to feel calm, refreshed, and relaxed. For others, it was just a part of being Haudenosaunee or *Onkwehon:we*.

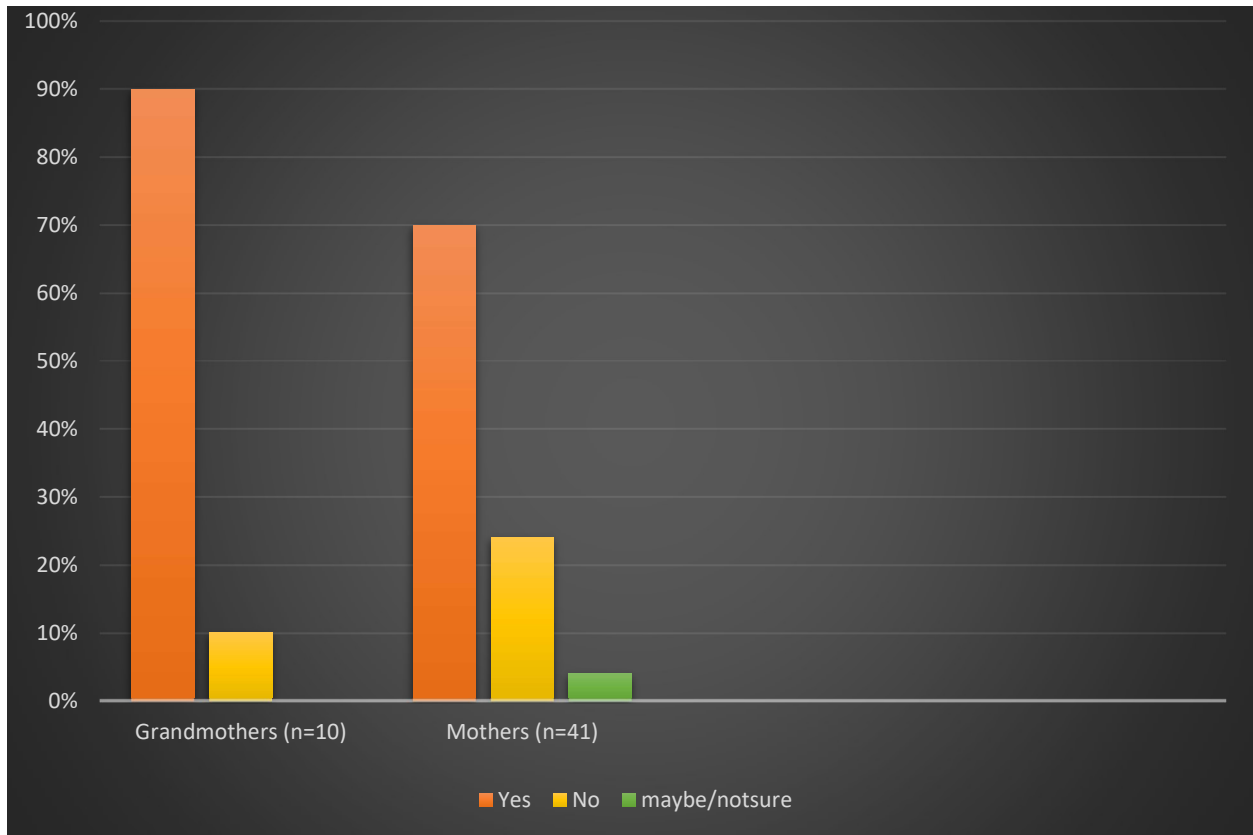


Figure 17: Views on the spiritual relationship with water by mothers (n=41) and grandmothers (n=10).

30 % of grandmothers (n=3) reported talking to water and water talking back to them. One grandmother shared her story:

When I lost my granddaughter, I went to the water to ask for their help to bring that awareness about the importance of water and the importance of family. And the water talked back to me and told me that they were still doing their job, as it was appointed to them. They said it's human beings who have forgotten the importance of water. And I was like I was overwhelmed with that because there was another lady with me. And I asked her if she heard them, and she said, 'no, I didn't hear anything.' So, I have been doing prayers along the waterway from up in where the Grand River begins.

Another grandmother confirmed the sentiency of water,

I believe in that water. That it's alive, and I talk to it. You know, I thank you for being there, and after I take a drink, I say Nia:weh and stuff. I'm just right into it, like with the spiritual part of it. Because it's alive and, you know, it does things for what you want it to

do. And I ask when I get the cramp at night. I will say, come on now, get those cramps away from me, you know, stuff like that. I'll have a couple of drinks, and next, your cramps are gone, you know. You have to have a relationship.

Some mothers and grandmothers did not necessarily see their relationships with water as being spiritual. For example, being drawn to water was not spiritual for one mother but was about mental health and wellbeing. She stated,

I grew up going down to the river anytime I was mad or sad, and some people call it praying or meditating. But I just go to the river and let it wash that away. Wash the anger away. Wash that sad away. I don't see it as a spiritual thing; I see it as mental wellbeing. That's what I do to get myself right with everything that's going on.

Similarly, another mother stated respecting water but not feeling spiritual connections with it:

I don't know about ceremonial or spiritual, but definitely I respect it. I know it's critical to your whole health, your whole life. You need it a good supply of good drinking water in order to be as healthy as you can be. So definitely, there's that respect. Therefore it.

Some mothers and grandmothers thought this unique relationship with water is what makes an *Onkwehon:we* or Haudenosaunee woman. As a mother described,

I feel connected to it [water]. I don't know if you say spiritually, but as a part of who I am as an *Onkwehon:we* woman. I don't think of it as spiritual as you say. The connection that just is part of who I am! And I feel like within sorrow or even in grief or whatever it is, I deal with those heavy emotions, I find myself in the water; it uplifts me. I know that's what it does. And sometimes I don't even know I was there because I didn't even know I was going there until I got there. My body and my soul, or something within me, tells me I need to be by that water. And I feel like that is just something, that, because the water flows through our body, and I feel like that's something we need to be by. So, I guess I would say that's just part of who I am, as *Onkwehon:we* women.

Similarly, a grandmother found the question of how water insecurity impacted her spiritual relationship with water an odd question. She uttered,

When you are Haudenosaunee, when you are thankful for all the things you've got, you have to be thankful for them, whatever level you got. I mean, we can always want more, always, but we still always have to be thankful for what we have. We should have water, definitely for health and everything, but, you know, we also have to accept and try to figure out and solve the issues of no water.

Because of this special relationship with water, water insecurity affected some mothers spiritually as well. Participants thought contaminated traditional medicines, interrupted ceremonies, and disrupted connections and traditional activities such as fishing, swimming, and kayaking affected their spiritual wellbeing. Some participants shared how water insecurity creates difficulties for their ceremonies in preparing ceremonial food and preventing people from participating in ceremonies, as one midwife mentions:

I've even known that people [do] not want to even go to ceremonies because they were sitting so close proximity to the person next to them. I've heard, you know, unfortunately, sometimes people get harassed or bullied or teased because of that, which is really big.

On the other hand, some mothers and grandparents mentioned that limited access to water does not affect their spiritual relationship with water, as they are thankful even, or especially when there is not enough. One mother noted,

I feel saddened. I feel like it really affects me, and I feel like I have to ground myself to the Earth more when I don't have it. So, I mean, it makes me sad, but it makes me more rooted and connected at the same time. It's because I want to give my thanks. I want to show my appreciation. I want to put my feet in the dirt more, and I want to be in the garden more.

### **Coping with Limited Water:**

One of the ways for SN mothers to cope with water insecurity is by storing water. "We just got to figure it out day by day. like any chance I get, we try and go and get our water." Participants reported that having a support system from relatives and family is an essential coping mechanism along with day-to-day planning. Community support is also vital. For example, SN Elected Band Council provided water to the community during the COVID-19 pandemic, which many mothers found helpful. Other practices such as "constantly boiling water" and taking a "birdbath," piling up laundry, not running the dishwasher, holding on to the bath and dishes and "not flushing the toilet every time you go pee" were coping strategies for many. Some mothers reported harvesting rainwater to meet daily needs. A mother stated using public facilities more than usual as a coping strategy with water insecurity in her household:

[if] I would have to go out to different programs, I would use the bathroom facilities a little bit more than people think is acceptable. Because once I went home, I wouldn't have access to being able to clean because I myself have eczema and the water [in the household] irritates it.

Similarly, another mother shared her coping strategies with little water at times of financial difficulties:

There were times or there was water insecurity when I didn't have enough to actually pay for the water delivery. So, at those times, I'd have to make means of trying to get what I can from what I had in my pocket. Instead of a big one-thousand-gallon cistern, I'd have to go to the store and get maybe like five litres of water for like five bucks. Or, I would kind of go ask family members either to loan me money just to get by, or I would have to just work extra shifts in order to make do. Even with the water insecurity of not filling the cistern and the children didn't have enough water to bath, then we would kind of go to family members' houses and just kind of ask them for their support and just use their shower for the time being until we can get water delivered.

In addition, going to the water, either to the local Grand River or visiting nearby lakes with beaches to heal, calm or receive guidance, have been significant ways for SN mothers and grandmothers to cope with water insecurity.

**Discussion:** Our research expands the definition of water insecurity and maternal health from SN mothers' perspectives. Water insecurity was not limited to households but to all creations that rely on water. Similarly, maternal health is not individualistic; instead, it is collective, including community, society, the environment, and Mother Earth. However, similar to the research that has called for a localized water insecurity scale built on local or traditional knowledge (Young et al., 2021), we argue that water insecurity is not universal and must be contextualized. Traditional knowledge of water and maternal health is essential to unpack water insecurity and its impact on women's health.

This research demonstrates the negative physical and mental health impacts of water insecurity that SN mothers experience in the settler colonial state of Canada. Skin issues or eczema were reported the most. UTIs and diabetes due to water insecurity were also reported in our study. Compromised personal hygiene and dehydration contribute to UTIs and low breast-milk production. Mothers linked dependency on sugary drinks to gestational diabetes, anemia, and nausea. Limited access to water impaired personal hygiene, impacting self-dignity and social life. A wide array of research worldwide reports that women are the most mentally and emotionally affected by constant water insecurity (Bulled, 2016; Ennis-McMillan, 2001; Tallman, 2019; Wutch and Beresford, 2019). Our research reports the same as stress and anxiety over water insecurity were most frequently reported in the midwife charts and interviews. In addition to physical and mental health impacts, we document that water insecurity impacts

mothers' spiritual health by disrupting ceremonies, connections with water, and raising children in traditional Haudenosaunee ways.

Several other profound impacts of water insecurity on SN mothers are documented: 1. Growing frustration and distrust of community water quality; 2. Being forced to dehydrate or substitute water with drinks high in sugar, and 3. Concerns about normalizing water insecurity in the community.

The lack of accessibility and affordability of water causes water insecurity in the SN community. The quality of water, which is often discoloured or odorous, makes mothers distrust their tap water. Previous and recent research in Six Nations also confirmed this distrust toward drinking tap water (Baird et al., 2015; Dupont et al., 2014; Duignan et al., 2022). This distrust challenges the narrative of safe water (Cairns, 2021) as the participants' understanding of safe and clean water differs from the governmental understanding, which is confined to not having drinking water advisories. Instead, the water's colour, smell, and taste cue the SN mothers to decide whether the water is safe to drink. Further, poor infrastructure in the community, lack of regular testing of wells and cisterns, previous history of *E.coli* contamination, lack of funding and broken promises from the Canadian settler government all contribute to the growing frustrations and distrust toward water quality.

We found that two options are readily available for SN mothers at times of water scarcity — drinking sugary drinks or dehydrating. Participants reported either going without water and thus dehydrating themselves or resorting to juice or soda pop as a substitute, contributing to obesity and diabetes. Similarly, Ilyniak (2014) argues that mercury poisoning in the English-Wabigoon River forced residents of Grassy Narrows to change their dietary habits from fish to store-bought food, which contributed to diseases like type 2 diabetes and cancer (Ilyniak, 2014).

For many SN mothers the reality is that all consumed food and beverages including water must be brought in and rationed to last until the next trip to the town. It is not uncommon for clients to report that they drink 1 to 2 L of Pepsi daily. Many pregnant women living in Indigenous communities do not have water to prepare food, cook, or even clean up after cooking. As a result, families often consume non-nutritional pre-prepared food. Processed junk food and fast food contribute to anemia because they lack adequate iron and other essential nutrients.

Growing up in a community that has always relied on purchasing bottled water to drink, many participants have normalized water insecurity. Grandmothers were the most likely to remember times with safe water from springs or wells, when they could drink water without being worried. On the other hand, the younger mothers had always had unsafe drinking water, so they were the ones who normalized the situations the most.

While the profound negative health impact of water insecurity on SN mothers' holistic health is evident, our research demonstrates that the impact of water insecurity is not unilinear. Water insecurity strengthens resiliency in Haudenosaunee women as they cope and rejuvenate their relations with water and land by going by the water and seeking guidance, reassurance, and seeking for mental and emotional support and collecting traditional medicines and food. Water insecurity strengthens community and familial connections as SN mothers use support networks to cope with water. Further water insecurity leads Haudenosaunee mothers to reclaim their stewardship towards water and land and resist western binaries of land and water. Water insecurity provides, as Yazzy and Baldy (2018) argue, culturally innovative strategies to resist contamination, exploitation, and domination over water and reclaim Indigenous sovereignty and self-determination and thus plays important roles in Indigenous political movements. For Haudenosaunee mothers at Six Nations, water insecurity is a way to reconnect with traditional



teachings, shaping identities as *Onkwehon:we*, reclaim sovereignty and restate reconnections and reciprocal relations with the motherland.

**Conclusion:** Water insecurity in Indigenous communities in Canada cannot be separated from settler colonialism as it was created with the displacement of Indigenous peoples to confined reserve lands with poor infrastructure. Indigenous knowledge was ignored, and connections to the land and water with Indigenous peoples were systematically disrupted. The binaries between land and water were created for resource extraction and land encroachment. In our research with SN, we demonstrate that Indigenous knowledge about water and land is ignored in the settler colonial state of Canada. The Haudenosaunee do not separate land from water and humans from more-than-humans, as they are all seen as a connected whole. Therefore, SN mothers included more-than-human beings to describe water insecurity and maternal health. We have argued in this paper that without considering these expanded meanings, the fight against water insecurity will remain incomplete. While water insecurity manifests the oxymoron colonial structures that continuously work to erase the relations between Indigenous people and their lands, it also demonstrates the resiliency of Haudenosaunee women as they rejuvenate their relationship with land and water and claim their leadership as spokesperson of water.

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## Chapter 4: Assessing the Impact of Water Insecurity on Maternal Mental Health at Six Nations of the Grand River

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### Abstract:

The Haudenosaunee or Six Nations (SN) is a matrilineal society sustained through reciprocal relationships with nature and all creation. Haudenosaunee hold a special relationship and responsibility with water, as it is the first environment of humans. Colonialism attacked Haudenosaunee land, women, children, and traditional ways of life. The Haudenosaunee were displaced from their land and were forced to migrate to a reserve. Colonial and capitalist agendas contaminated water leaving the Six Nations, Canada's most populated reserve, without clean running water and making SN women and children more vulnerable to water insecurity. The Ohneganos, an SN community project, is intersectional, and the intersectionality of health, culture and water identified maternal health as understudied in water insecurity research. Research on Indigenous mental health mainly focused on suicide and substance abuse and ignored the root causes of violent colonial structures and policies such as the Indian Act and residential schools. Our research suggests that gender, migration and water for Indigenous communities must be contextualized with larger violent colonial structures such as environmental racism and epistemic violence. Ohneganos research examines impacts of water insecurity on maternal health and co-developed design and implementation with Six Nations Birthing Center (SNBC). The SNBC's traditional Haudenosaunee health care practices shaped the research, revealing the critical importance of community-led research's efficacy. Haudenosaunee and anthropological research methods are employed to assess the impact of water insecurity on maternal mental health. The co-designed semi-structured interviews highlight the voices of 54 participants consisting of mothers (n = 41), grandparents (n = 10), and midwives (n = 3) of SN. Most participants expressed that the lack of clean water had profound impacts on mental health and had recurring thoughts about the lack of clean water in the SN community. Mental health issues, including depression and anxiety, were reported due to a lack of running water. Despite experiencing water insecurity, Haudenosaunee women demonstrate resiliency through culturally innovative adaptations to their changing environment.

Keywords: water insecurity, maternal health, mental health, indigenous women, structural violence, colonial violence, resiliency, Six Nations of the Grand River

## INTRODUCTION

Two-thirds of the world's population faces water scarcity, and more than two billion people live without adequate clean drinking water (WHO, 2017; Young and Miller, 2018; Tallman, 2019). There are well demonstrated adverse effects of water insecurity on human wellbeing, such as diarrheal diseases, dehydration, emotional stress, and physical violence (Wutich, 2009; Hanrahan et al., 2014; Bulled, 2016). Water insecurity is defined as a condition when unreliable, unsafe, and inadequate water jeopardies wellbeing (Weis et al., 2020, p. 65). Water insecurity is particularly a problem for Indigenous peoples. In Canada, the reservoir of the world's largest freshwater bodies, Indigenous communities have been experiencing water insecurity for decades. There are several long-term advisories where an entire generation grew up without access to clean water (Human Rights Watch, 2016). The Canadian government failed yet again to solve water issues in First Nations communities by March 2021, a promise and plan they made in 2015. There was a total of 160 long-term drinking water advisories on public water systems in First Nations communities, and by the fall of 2020, 60 (37.5%) remained in effect in 41 First Nations communities (Reports of the Auditor General of Canada, 2021). As of December 2021, there were still 42 long-term drinking water advisories on public water systems in 30 First Nations communities (Indigenous Service Canada, 2021). Reports of the Auditor General of Canada to the Parliament (Reports of the Auditor General of Canada, 2021) demonstrated that the Indigenous Service Canada failed to provide necessary support to ensure safe drinking water in Indigenous communities. Six Nations (SN) of the Grand River community, the most populous reserve in Canada, do not have access to clean running water for decades. The Grand River is the

water source for the SN community, which gets contaminated by commercial agriculture and landfill runoff along with capitalist development projects and industries. Although the federal government issues no long-term water advisory, SN experiences several boil water advisories (Duignan et al., in press). Most residents of the reserve depend on wells and cisterns that are old and contaminated. Many do not trust the water due to previous contamination and depend on purchasing water. Recent research at SN also reported E. coli and high levels of mercury in the water (Dupont et al., 2014; Baird et al., 2015; Duignan et al., in press).

Research has confirmed that women are most vulnerable to water insecurity (Fleifel et al., 2019; Pouramin et al., 2020; Dickin et al., 2021; Duignan et al., in press). For example, Duignan et al. (in press) demonstrated that Six Nations women faced health and social challenges more than men due to water insecurity. The Postpartum Period is particularly challenging for most women, and it becomes more challenging when there is a lack of clean running water to meet the necessities for mothers and their families. It is one more obstacle that many Six Nations mothers must constantly face. Besides essential hydration, water is critical to keep themselves, their families, and their homes clean. Bringing enough water home to accomplish this task is difficult for many SN families, especially single mothers with limited transportation. Many SN mothers live with a constant fear that child protective services may become involved, with the challenge of keeping children and homes clean adding to the threat. This alone causes immense worry and stress for SN mothers who do their best with limited access to water. SN mothers who bottle-feed require clean drinkable water to prepare powdered or liquid-based formulas as the ready-made formula is much more expensive. Water is essential for feeding their babies. As a result, SN mothers not only worry about running out of formula, but they also worry about running out of water to make the formula.

Water has critical spiritual roles during pregnancy and birth. Six Nations Birthing Center (SNBC) clients often use traditional medicines during postpartum. Clean-out medicines for mothers and babies and a traditional sitz bath are routinely used to aid postpartum healing and recovery. The medicines are boiled in large pots and require large amounts of clean drinking water. For clients with limited access to water, the Indigenous Midwives make the medicines at the center then bring them to the client's home. It is a cumbersome yet critical task for midwives who are already limited by time. A warm cedar bath relieves the mind and comforts the body when a client is emotionally distraught. Keeping a "good mind" during pregnancy is important due to a fundamental traditional belief that the unborn baby can sense and feel everything the mother is experiencing. Therefore, it is critical to clear mothers' minds of negative thoughts, fears, and grief. Many laboring women prefer to labor and even give birth in a warm relaxing bath. Water reduces pain by causing a deep level of relaxation during the birth process. It also reduces perineal tearing due to the improved elasticity of the skin. For women with a history of sexual abuse, this dramatically improves their overall birth experience. The pain and tearing from birth can often trigger past sexual trauma. A traumatic birth experience can cause women to relive past sexual abuse. Reducing those triggers and creating a positive birth experience through use of water can be very therapeutic and healing for women (see NIMMIWG, 2019; Martin-Hill et al., in press a,b). It can even mark the start of their recovery as they reclaim their sexuality and power.

Six Nations' displacement from their land and being confined on a reserve with poor infrastructure and contaminated water sources put them under a severe health threat.

Environmentally, reserves were chosen in remote or infrastructurally poor areas. Polluting

industries were built beside reserve lands, dumping toxic chemicals in the water (McGregor and Whitaker, 2001; White et al., 2012; Hoover, 2017; Waldron, 2018; Martin- Hill, 2021a), and thus threatening both water, animals and destroying Haudenosaunee food sources. Recent studies with Six Nations demonstrated that climate change is a health threat for people at Six Nations reserve (Deen et al., 2021). Water scarcity and contamination are one of the major factors of migration and forced displacement around the world (Parker et al., 2016; Miletto et al., 2017; Nagabhatla et al., 2020). Colonial policies such as Indian Act and residential schools worked to systematically displace Six Nations from their land and their traditional ways of life. Colonial and capitalist agendas not only contaminated water but undermined women’s decision- making authority in their society and diminished their leadership responsibilities impacting their wellbeing. The Haudenosaunee people believe that there is a link between the violence against water and against Indigenous women (NIMMIWG, 2019; Martin-Hill et al., in press a,b). Arsenault (2021) argues that there is a direct link between water insecurity and Missing and Murdered Indigenous Women and Girls (MMIWG). Therefore, it is crucial to understand the impact of water insecurity on Haudenosaunee mothers through “the larger framework of cultural genocide, environmental ecocide, and racialized injustice (Martin-Hill et al., in press a,b).” Keeping that framework in mind, we adopted the concept of “Structural violence” and looked into the colonial history and assimilationist policies to understand the impact of water insecurity on Haudenosaunee mothers’ mental health.

## Six Nations of the Grand River

Located along the banks of the Grand River, Six Nations has 27,660 band members, 12,892 of whom live on the reserve (Six Nations, 2021; Six Nations of the Grand River Development

Corporation, 2021) Six. Six Nations includes all Haudenosaunee Nations, also known as Iroquois (Six Nations, 2021). Originally there were five nations: Mohawk, Onondaga, Seneca, and Oneida; later, Tuscarora joined the Confederacy in 1722 (Barbeau, 1917; Hill, 2017). When the Europeans first encountered the Haudenosaunee, they occupied most of the Great Lakes to Carolina (Barbeau, 1917). Most New York State, Northern Ohio, Pennsylvania, Southern Ontario, and Quebec were part of Haudenosaunee traditional lands (MacDougall, 2005, p. 2-3).

Haudenosaunee means the “people of the Longhouse,” or “the people who build a house” (MacDougall, 2005, p. 2-3, Gonyea, 2014; Hill, 2017). Mohawk or Kanien’kehaka means “People of the Flint,” they are also known as Keepers of the Eastern Doors, “Oneida or Onayotekaono means” People of the Standing Stone, “Onondaga or Onundagaono, means” People of the Hills, “also means” Keepers of the Central Fire “Cayuga or Guyohkohnayoh means” People of the Great Swamp, “Seneca or Onondowahgah means” People of the Great Hill, “also known as” Keepers of the Western Door, “Tuscarora Skaruhreh means” The Shirt wearing people “(Ransom and Ettenger, 2001; Haudenosaunee Guide for Educators, 2009; Hill, 2017). Six Nations upholds their original teachings such as the Creation Story, the Kayaneren’kowa or the Great Law of Peace, the Niyorihwai:ke or Four ceremonies, and Ohenton Kariihwatehkwen or Thanksgiving Address (Hill, 2017). The creation story emphasizes connections between physical and spiritual worlds. Similarly, the Thanksgiving Address and ceremonies highlight the interdependence with all creations. The Great Law of Peace teaches Peace, Power, and Righteousness, emphasizing the importance of Ganikwi:yo or good minds in creating and maintaining Peace (Mann, 1997; Ransom and Ettenger, 2001; Hill, 2017). Like other Indigenous Peoples, Haudenosaunee believe that human wellbeing is achieved by maintaining a balanced

and respectful relationship with all beings, including water (Anderson, 2010; McGregor, 2012). They connect the physical world, the Sky world, animals, and plants and maintain a non-hierarchical and sacred relationship with nature.

Haudenosaunee traditionally is a matrilineal society where women, especially clan mothers, are leaders in the society and make decisions about various issues, including war and adoption (Wagner, 2001; Martin-Hill, 2009). They select leaders and chiefs—a right and responsibility established through the Great Law of Peace (Martin-Hill, 2021b; Martin-Hill et al., in press a,b). Female lineage provided the foundation of the political, economic, and social structure of Haudenosaunee (Wagner, 2001). Children are valued and cherished and grow up under the collaborative care of clan mothers. In addition, Haudenosaunee women maintain a special relationship with water—a relationship started with the Sky woman falling into the water on turtles back, creating the Turtle Island (North America) (King, 2007; Hill, 2017). The Sky woman enabled life to flourish by spreading the mud on the turtle’s back brought to her by beavers and muskrat from the bottom of the sea. The Earth is mother to Haudenosaunee as it sustains and generates life, and water is considered the “blood line” of the Earth (Cook, 2008). Water, land, and women carry special responsibilities toward upbringing and sustaining future generations. Haudenosaunee women protect and maintain a relationship with the land to protect their family and community. Thus, a profound relationship between women, land, and water is established. “From the bodies of women flows the generations’ relationship both to society and the natural world. In this way, our ancestors said the Earth is our mother. In this way, we, as women, are Earth,” stated Katsi Cook to highlight the inseparable relationships between



Haudenosaunee women and Earth (Cook, 2008, cited in Goodman, 2018; Martin-Hill et al., in press a,b). Colonial policies and structures attacked all three: women, water, and land.

The Haudenosaunee made several treaties with the Europeans. The Kaswentha or the Two-row wampum and the Covenant Chain are notable. These treaties emphasized long-lasting friendship, separate sovereignty, and respecting each other without interference in each others' laws and ways of life (Ransom and Ettenger, 2001; Hill and Coleman, 2019). In the American Revolution, British colonizers broke the treaties and surrendered Haudenosaunee land in the Treaty of Paris without consulting them (McCarthy, 2016; Hill, 2017). As compensation General Frederick Haldimand offered six miles each side along the Grand River, which was 950,000 square kilometers (Six Nations Land Resources, 2008; McCarthy, 2016). Before the Haldimand Proclamation 1784, Six Nations' land right to the Grand River was also acknowledged in many treaties between Haudenosaunee and the Crown, such as the Albany treaty or Beaver Hunting Ground Treaty in 1701 (Hill, 2009; McCarthy, 2016). However, by the early 1800s, settler colonizers disposed of over 600,000 acres of Haudenosaunee land (Hill, 2009:485). Within only 63 years, the settler colonizers grabbed most of their lands and currently, only 4.8 percent of their land is remaining as Six Nations reserve (McCarthy, 2016) (see Figure 18).

Continuous displacement of the Haudenosaunee people from their land is still ongoing covertly and overtly. Contamination of water, confining the Haudenosaunee in a land with poor infrastructure and faulty water governance is all example of the structural violence of Haudenosaunee displacement. The 1492 Land Back Lane protest is a recent example of continuous land encroachment by settler colonizers, where without consulting with the Six

Nations, 132 acres of Six Nations land in Caledonia was given to a housing development, the Douglas Creek Estates, to establish housing units which were hugely protested by Six Nations in 2006 and again in 2020 (McCarthy, 2016; Barrea, 2020).

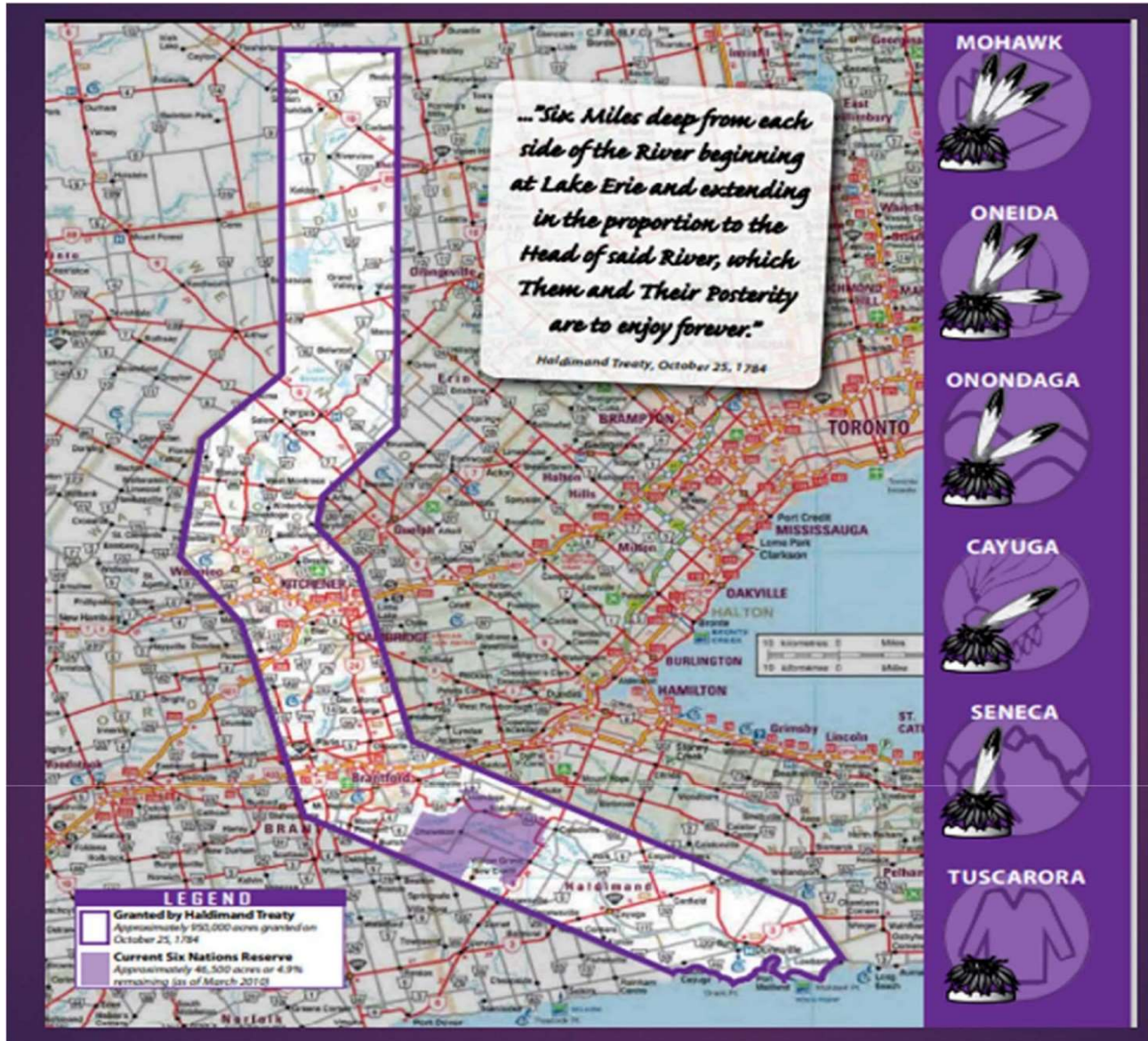


Figure-18: Six Nations of the Grand River and the Haldimand Tract

## METHODS

This research is a part of Ohneganos - Indigenous Ecological Knowledge, Training, and Co-Creation of Mixed-Method Tools funded through the Global Water Futures (GWF).

Ethics approval was obtained from the Hamilton Integrated Research Ethics Board (HiREB) and the Six Nations Council Research Ethics Committee (SNCREC). Ohneganos research project adopted and applied Haudenosaunee traditional ecological knowledge and western science to co-create water quality tools and mixed methods tools designed with the Six Nations community (Martin-Hill et al., in press a,b). Ohneganos project emphasized “gender-nature” linkages where Haudenosaunee women played leadership roles from project conception to dissemination. Ohneganos’ overarching goal has been to decolonize and co-develop innovative research methods. Reciprocity has been an important aspect, so both the community knowledge and science are mutually exchanged.

Ohneganos promoted partnership with the Six Nations Birthing Center as humans’ first environment is in water inside mothers’ wombs (Cook, 2008; Goodman, 2018). In this research, we assess maternal health in relation to water, adopting Kaswenta or Two-Row Wampum principles in Community Based Participatory Research (CBPR). The Tow-Row Wampum treaty was established between the Haudenosaunee and the Europeans (Dutch). The Two-Row Wampum allows for creating a dialogical space across epistemologies by promoting equality and accepting heterogeneity (Hill and Coleman, 2019; Goodchild et al., 2021). The Six Nations Birthing Center (SNBC) led the research from the very conception and guided the research through unprecedented COVID-19 pandemic situations by administering phone interviews and midwife chart analysis. We utilized co-created semi-structured interview guidelines with

Haudenosaunee story-telling methods. We listened to experiences and stories related to water from 41 mothers (age 19 to 51) who are clients of the SNBC, 3 midwives (age 34 to 65) trained in both Haudenosaunee and western medical models who work at the SNBC, and 10 grandparents (age 61 to 88) who volunteer as consultants at the SNBC to guide mothers through their traditional teachings and activities. Although, with the help of the midwives, we gathered quantitative data from all 41 clients to further assess the impact of water insecurity on mothers' health, only qualitative data related to mental health and water from 54 participants are utilized in this article.

All interviews were conducted, and tape recorded by SNBC maternity care worker, Janet Homer, who has established a relationship of trust with SNBC clients. The questions related to water quality, water uses, relationship between maternal health and water were asked. The First author transcribed all recorded interviews using qualitative data analyzing software NVivo. The first author then replayed and listened to the recorded interviews several times to rectify any mistakes that the software could not correct and ensure the participants' tone was honored in the transcriptions. The data were analyzed both manually and utilizing NVivo. All data were shared with the community partners for cross-validation. The community partner and the first author went back and forth to manually code major themes from the interviews. The interview data was also inputted in the NVivo to identify concepts and patterns and build analytical models. All related data were categorized under main themes identified with community partner such as the mental impact of water, emotional impact, and water quality in the SN community. The first author then reread the categorized data under each theme to validate and manually code the

frequency for further analysis. We utilized critical medical anthropology and Indigenous scholarships to analyze our data.

## Analytical Framework

Indigenous communities in Canada have large numbers of boil water advisories, have been experiencing a lack of clean drinking water in their communities for decades, and experience poor health with double the mental health issues of non- Indigenous people (Kirmayer et al., 2000; Khan, 2008; Nelson and Wilson, 2017). To understand why, we must understand violent structures of ongoing colonialism in Canada. The concept of structural violence was developed by sociologist Galtung (1969) and adapted in anthropology by physician and medical anthropologist, Farmer (1996, 2004). Farmer (2004) argued that violence built-into social, political, and economic structures is the root cause underlying the fact that the poor and marginalized are always the victims of avoidable illness and death and suffer the most. Anthropology as a discipline also served colonial agendas and contributed to the structural violence for Indigenous and non-western peoples (Clair, 2003; McCarthy, 2008). Indigenous scholars also argue that understanding maternal health issues would be incomplete without understanding colonial structural violence and colonial assimilationist policies (Mann, 2018; Martin-Hill et al., in press a,b).

Although we adopt the concept of structural violence, we move away from Farmer's deterministic conception as it implies universalism and fails to show how marginalized people participate, resist, and make meaning in the face of violent structures (Bourgois and Scheper-

Hughes, 2004; Hannig, 2017). Farmer (2004) did not want to recognize Indigenous and marginalized people's resistance in shaping social structures as he considered them fruitless. However, research shows that people at the margin shape and impact the center; therefore, considering marginalized people's resistance and resilience is vital to understand the interplay between center and periphery (Das and Poole, 2004). Humans are not passive recipients of violence; humans are both resilient and fragile, and therefore a balanced study of both human vulnerability and resiliency is crucial (Scheper-Hughes, 2008).

Although many scholars from different disciplines have adapted the concept of resilience to understand the strengths in opposition to vulnerabilities, it is a prevalent and contested concept. Understanding resilience as bouncing back to the previous condition has been criticized, and instead, many proposed to see resilience as a process that encourages thriving through adversity (Kirmayer et al., 2009; Ungar, 2012; Barrios, 2014; Hansen, 2016). Researchers have argued that resilience is not just an individual capacity but can be found in family, culture and community (Stout and Kipling, 2003; Fleming and Ledogar, 2008; Kirmayer et al., 2009). In health research, resilience has been an important concept to look beyond metanarratives such as post-traumatic stress disorder (PTSD). For example, Scheper-Hughes (2008) demonstrates that people insist on their right to live even in a most challenging time. She demonstrated that people adopt different resilience strategies to cope with adversaries, such as humor. She calls them "everyday resilience" (Scheper-Hughes, 2008, p. 52). However, others have been more critical in using the concept of resilience. For example, Chandler (2014) argues that resilience is a form of neoliberal governmentality that enables and extends bio-political rules. Similarly, Barrios (2014) argues that the concept of resilience depoliticizes highly politicized things. Resilience theory's

depoliticized nature erases the historical process that produces disaster and vulnerability (Barrios, 2014). As such, Barrios (2014) recommends that resilience must be polyvocal. It should also emphasize local knowledge and should not be a subject of neoliberal ideology.

Despite ongoing colonialism and continuous marginalization, Indigenous communities in Canada thrived and did well (Kirmayer et al., 2009; Noronha et al., 2021). Indigenous resilience is land-based and rooted in traditional philosophies and cultures. Indigenous peoples focused on resiliency in youth for centuries and cherished them in various ways (Stout and Kipling, 2003). Community involvement in child-rearing, respect for age, wisdom and tradition, nature, generosity, cooperation, and patience are essential in nurturing resilience (Stout and Kipling, 2003, p. 23). The Haudenosaunee have upheld their traditions and teachings despite the ongoing colonial pressure of acculturation and assimilation (Shimony, 1994; Noronha et al., 2021). Kirmayer et al. (2009) demonstrated that availability and accessibility of several protective factors such as family, community, language, cultural identity, improved infrastructure with local control are crucial for Indigenous resiliency. According to Luthar et al. (2000), resilience factors can function in a number of ways: they can maintain a child's functioning under stress, protecting them as stress increases. A protective factor may also interact with stressors to create growth in a child exposed to adversity. The protective factors help maintain normative levels of competence in children exposed to multiple risks. Positive relationships with adults, mentors, and stable school environments also work as strong resilience factors (Lipman et al., 2002; Stout and Kipling, 2003). However, like Kirmayer et al. (2009) we also argue that impact of structural violence is crucial in understanding Indigenous resilience. In this paper, we focus on both

structural violence and resilience to have a balanced analysis of the impact of water insecurity on maternal mental health.

## RESULTS AND ANALYSIS

### Impact of Water Insecurity on Haudenosaunee Mothers' Mental Health

In this section we draw from our ethnographic data (54 semi- structured interviews) to highlight the complex ways water insecurity affects Six Nations mothers' mental and emotional health. In our research, participants understood mental health not as an absence of illness but in relation to fundamental human rights such as water, food, shelter, access to land and water, access to traditional medicines, and raising kids with Haudenosaunee teachings. Further, mental health was understood with the ability of fulfilling their roles in raising kids as mothers and grandmothers, which resonates with Anderson (2011) findings. Anderson (2011) argued that health in Indigenous communities means carrying on responsibilities in various life stages.

*Onkwehon:we* (the original people) are at more risk than others because of their traditional relationship with water and living under ongoing colonization. Participants find that not having access to water affects their mental and emotional health more than others.

Everybody should have a right to have clean water. So, knowing that just because you're a Native and you live on the reserve, and it's not [affects mental health].

Participants mentioned that as *Onkwehon:we*, water insecurity put them at additional risks. To understand this statement, we need to understand *Onkwehon:we* people in the context of settler colonialism where residential school experiences, child welfare, missing and murdered



Indigenous women, and land back struggles all take a mental toll on Indigenous people in general and *Onkwehon:we* /Haudenosaunee people in particular. Not giving access to water to Six Nations means further exercising continuous settler-colonial power and continuing dominations, discrimination, inequality, and demolishing traditional relationships with water and land. It could be read as a contemporary way of “killing an Indian in a child” by disrupting their traditional ways of living, creating barriers to be traditionally connected with water and ceremonies, and denying basic human rights—they all add to stress. As one participant explained:

Mental health is a really big thing because a lot of people struggle with it within our community.” “[As] Onkwehon:we people, we already are at such high risk for mental health. And why not just add another thing to not clean water, you know? Water is a big gift given to us, and we don’t have access [to it]. And I think it really affects your mind because you need water. . . and people take that for granted. [So] it truly affects your mental health because it’s like, what can I really do? It is just the way it is and this makes me sad.

Further, participants find that living in different water realities than their neighboring cities distinctively affects their mental health. Six Nations do not have access to clean drinking water on the reserve as their neighboring cities have. A water treatment plant was established in 2014, but only 12% of households are attached to the waterline (Public Works Report, 2019, cited in Martin-Hill et al., in press a,b). As a result, most people need to buy water for drinking and other daily uses. They believe tap water puts them at risk of various diseases such as skin rashes and even cancer. The Human Right Watch (2016) study that included Six Nations with other Indigenous communities in Ontario found cancer-causing Trihalomethanes and *E. coli* in their water.

Moreover, the struggle for ensuring access to clean water, which should be “basic human rights,” has been ongoing for decades in Six Nations so much so that many participants did not know if the water situation will be solved in their lifetimes or if their children and grandchildren will have access to clean water, water that city dwellers seem to take “for granted.” Water seems abundant in nearby cities where “you can turn on your tap for drinking water.” This reality of the cities came as a “cultural shock” to one client and felt “strange” by other clients. One participant stated that not having access to clean water affects both mothers’ and babies’ health in general and that people can be depressed, angry and even spiteful living in different realities with neighboring cities where residents do not have to stress out about the water. Participants pointed out that raising kids without water affect mothers’ mental health:

I think the poor quality of water would affect your mental health by just feeling frustrated that you’re not able to have running water the same as other communities. . . [it] makes your life harder and causes more stress trying to raise your family without having running water. It would just constantly weigh on you mentally and cause more physical work for you at the end of each day.

In a similar vein, a participant describes how not having running water adds extra stress to their already stressful life:

It’s whole different stress you know! Everybody has their daily stressors say, did I make enough supper for tonight or you know! But I think that having that additional stressor water. . . [which] is so essential to living can take a toll on your mental health for sure, to have an extra load that other people don’t have to think about.

It affects mental health and builds ‘mom guilt,’ leading to postpartum depression, stated a participant. A study in Nepal demonstrated a link between water insecurity and postnatal depression, arguing that worries, anxiety, and stress over clean water led to postpartum depression (Aihara et al., 2016). Although no link between water insecurity and postpartum

depression among Indigenous women was investigated yet, research demonstrated that postpartum depression (PPD) and antenatal depression are higher in Indigenous women than non- Indigenous women in Canada (Bowen et al., 2008; Daoud et al., 2019).

However, despite the long struggle for clean water, one client thought Six Nations are in a better position and “one of the more fortunate one” than other Indigenous reserves in Canada struggling for clean drinking water.

I’ve seen pictures on Facebook of that one reserve where they had no access to water and when they did turn the water on, and it was just brown. It just made me so sad. And I just feel like if I had water like that, I would feel depressed. I would feel very upset that not only is this what I’m drinking, but this is the water that I have to give to my children.

In addition, participants believe that contamination and water insecurity affect them more due to their special relationship with water. Haudenosaunee people hold a special relationship with water from their creation story to pregnancy and childbirth and ceremonies. There is a sacred relationship between women and water. Therefore, not having access to clean water affects them much deeper than others. Other studies that focused on women and water insecurity found that women are more susceptible to water insecurity since they value water more (Baird et al., 2015). In a similar vein, Deonandan and Bell (2019) argued that since Indigenous women play crucial roles and responsibilities, environmental contamination affects them the most. Recent research with the SN community demonstrates that women are more concerned and anxious about water access and quality than men and that Six Nations women felt anger, frustrations and worries for not having access to clean drinking water (Duignan et al., in press; Martin-Hill et al., in press a,b). Some participants find water used for amusement in nearby cities, such as splash

pads, is both wasteful and disrespectful to water. On the contrary, water in Haudenosaunee worldviews is given utmost respect through their Thanksgiving address and ceremonies and treated as medicine. And contaminated water, paradoxically, means both not being able to use it as medicine and being sick ingesting it. Further, food preparations in ceremonies become stressful due to lack of clean running water:

One of the big things in every ceremony like do we have water? do we have water to make corn mush, to make the soup, the strawberry juice? Those are, I guess I will say, the staple dishes of ceremony that you have to prepare on when it's your responsibility to prepare ceremony. And, you know, our Longhouse doesn't have running water. Like we have to carry jugs of water to our cookhouse every ceremony to make sure that they are there. Like that cost can build if you do not already have jugs. People were constantly donating money just for water... And not just any water, but the water that's for cooking, for drinking for the people so that ceremony can happen.

Not having clean running water adds to the physical, financial, spiritual, and mental burden.

What follows is a detailed discussion of how water insecurity affects SN mothers' mental health and their survival strategies or coping mechanisms with water insecurity.

### Stress and Anxiety

Research that focused on the mental health of Indigenous and non-western women found stress, anxiety, and depression are most prevalent among women (Wutich and Ragsdale, 2008; Stevenson et al., 2016; Collins et al., 2019; Duignan et al., in press). Collins et al. (2019) reported severe stress related to water insecurity among pregnant and postpartum women in Kenya. Similarly, in our research, stress and anxiety were reported the most as the mental health impact of water insecurity. Not having clean water to drink, cook, and bathe negatively affects mental health, stated most participants.

The thought of how I am gonna get the water. . . can be stressful... And we ran out [of water] one time, and it was really stressful just not to be able to really do anything, no bath or dishes. This causes stress and anxiety.

Another participant explained that not having clean water makes her “motherlike stressed,” she stated,

It is stressful not to have clean water or to run out of water. If we are trying to raise a family and we don't have those basic things that we need, then it becomes stressful, and it can cause anxiety.

A grandmother echoed the same, stating,

Just not even having good drinking water when your kids are little, and not being able to give them good drinking water, then it's going to affect you mentally because you can't give it to your kids.

To the participants, this inaccessibility of clean water adds extra problems to Six Nations people on the reserve, especially mothers, which could be easily avoided. It could be read as structural violence that puts people in harm's way and causes avoidable disease, illness, and death (Farmer, 2004).

Water-related anxiety and stress were even higher when the province went to complete lock-down in March 2020, causing bottled water supply to be limited in the stores. While the toilet paper shortage for larger communities was highlighted in local and national newspapers, Indigenous communities like Six Nations were worried about water supplies. It also affirms different realities for Six Nations and its neighboring cities during the pandemic. The rhetoric of political parties, “we are all in this together,” remains shallow as it failed to capture different situations for Six Nations and other Indigenous peoples without clean water. Advice to

frequently wash hands with soap and water comes as a joke for people without access to clean water. Six Nations mothers had to use more water to be as hygienic as possible during the pandemic. Not only do they have to make more trips to stores and spend extra money to get drinking water during the pandemic, but they also worry if there would be enough water to buy since water cases were sold within the limit. Participants who truck in their water often wait for days for the truck to come due to pandemics. These realities forced many participants to limit bathing and limit the amount and frequency of drinking water. A mother said when bottled water was on limit, she was anxious thinking,

Is there going to be enough water [to buy] when we go to the store? We can get only one case today, but you know we'll have to make it last. So, then everybody is limiting themselves.

Realities were not the same in the pandemic living in the same country despite politicians saying, “we all are in the same boat” Indigenous people’s boat was different since they were still struggling to get a hold of water supplies. In addition to not socializing with extended family and community, participants reported that not having enough water was an essential thing that mothers and families in Six Nations had to worry about during COVID-19 pandemic.

#### “Who Knows What’s in There”: Broken Trust Affects Mental Health

Not having enough water forces people to limit their water intake, eventually causing them to be dehydrated and drained. Using tap water to cook and drink can make people “nauseous, sluggish, or irritable because of the chemicals that are put into the water or in their wells,” said one participant. A grandparent was concerned that not having clean water affects traditional

upbringing, which holds a close relationship with water, as poor quality and contaminated water make them anxious and worried.

I can't look after my grandchildren the way I know I'm supposed to with our medicine. I can't take them to more water areas and be sure of their safety because who knows what's in there, right?

“Who knows what's in there” is expressed by several other participants. In this research, we learned that many could not fully trust the water they have even if they are connected to water line coming from the water treatment plant because they find the water “hard,” “smells strange,” or smells like chlorine or sulfur, and sometimes has an “odd color.” Also, participants reported that the source water, the Grand River, has “all the garbage” in it, and “all the chemicals are used to make the water look good” make them suspicious about the water quality. According to a grandmother, the nutrients in the water get destroyed by dumping garbage in the water and treating water to make it drinkable. She worried:

It [water] doesn't have the nutrients that are actually in the water because water has nutrients in it, so with all the garbage that's in the water, like how can you know, how can that be healthy for anybody to drink?

Another grandmother thought the same way and believed that something in the water causes short-term memory loss. That contaminated water or not having enough clean drinking water can cause short-term memory loss also supported by the Harvard School of Public Health (2021).

Who knows what's in there, what is hidden in the water? I think a lot of times that's what causes short term memory loss... we don't have the best water here anymore like we used to, so things like that get a hold of their brain, and we don't know what it's doing to it, said the grandmother.

Participants reported that not having access to clean water can affect clear thinking, as not having clean water to drink makes people dependent on “sugary” drinks, which cause diseases like diabetes, but it also affects clear thinking.

If you’re consuming so much sugar and not having enough water, I think that affects your mind, not just your [physical] body [but] your whole body, like your mind, body, and spirit, said a participant.

Another client echoed the same,

You’re probably not going to be able to think properly if your body is struggling to regulate itself, and that’s what water does. It regulates your body, regulates your hormones. [If] you’re not intaking a good quality of water, your mind is going to struggle. It’s going to struggle to think clearly.

Similarly, according to another participant:

Water that has something in it that shouldn’t be, or you get too much of something that your body doesn’t need with contaminations, then it can affect your mental abilities even just to think clearly.

To other clients, contaminated water poisons bodies and thus affects clear thinking. For some participants, contaminated water and water without proper nutrients can block clear thinking and interrupt connections with self and others:

[If] we’re drinking [contaminated] water, we’re not going to see one hundred percent. We’re not going to be happy one hundred percent; we’re not going to be able to think clearly one hundred percent. We’re not going to be connected the way we should with our body because our bodies are being poisoned, really.

A grandmother shared the same and thinks not drinking enough water makes people forgetful. She shared her husband’s experience who does not like to drink enough water,

I don’t know why he won’t drink water. He will, once in a while. It seems like he doesn’t remember things, or he gets forgetful, and I think it’s because of that. I told him you gotta lubricate everything, you know, that way things start working in your body.



**Financial Barriers and Affected Self-Confidence:** Participants reported that added financial burden to access clean water affects mental health. They buy water to drink and fill in their cisterns and wells for other daily uses. As a result, they have to save and spend extra money on water which should be “available to all.” This avoidable financial burden that Six Nations are forced to pay affects their mental health. However, this extra cost for water is not affordable for many. As one participant client asked,

What about those who are on welfare that doesn't have jobs or on disability and can't work? Where are they going to find the money? Because they're just barely getting by as it is, but now they need to go buy water on the side. How are they going to get the money for that? And who's going to help them if they can't get it? So that's very tampering.

For Six Nations people, getting clean water is going the extra mile, both literally and financially. Traveling the distance to buy bottled water, arranging transport, and paying for gas add to the financial burden and ultimately affect mental health. To a client: “having to go extra mile to get clean water, you know, can be pretty tiring on you.”

Along with the financial burden, not having a support system to help access water causes anxiety. As one participant client shared her moments of anxiety:

We have access to water in terms of drinking and cooking, but we have to truck our water to our house. You know, sometimes there's financial, sometimes it's an emotional barrier. My dad trucks our water and dumps it into our well, but he goes moose hunting like he's about to go moose hunting for 2 weeks. And you know if I run out of water while he's gone, that automatically I have to pay 80 dollars for somebody to conceal my well for me. And so there's always like you're constantly trying to make sure that you have enough for what you need it for you, and that can become a burden for me when I have a toddler, and I can't just go and truck water for myself using my dad's truck, right? So those kinds of things like for me is. . . mental and financial barriers when it comes to access to clean water.

Further, not having access to clean water often impacts hygiene practices and affects confidence in public places, including Longhouses and schools. Participants mentioned how having a bath or doing laundry is not an option for many. According to a client,

a lot of people can't even save the money to do laundry, so showering sometimes is just beyond that person." In addition, many people depend on other family members' houses for a shower, "it's the whole point of insecurity for a lot of people.

A midwife of the Birthing Center confirmed the same for some of their clients' situations:

They might be struggling with even being able to have clean clothes, with being able to take a shower or to wash up, even washing their hands. They come in [at the Birthing Center]. They'll wash their hands really good because they don't even have water at home to do that

She helps client mothers by offering them to take a shower so that mothers feel better:

On occasion, I've even let people take a shower [at SNBC], especially if they're at a birth. . . ' Why don't you take a shower before you leave,' you know, like that kind of thing as well. And it makes a big difference for them. And they smile a lot bigger, and they feel a little bit more relaxed." She concludes, "It's just a simple, basic thing, but it's something that's being robbed of our people.

## The Emotional Impact of Water Insecurity

In total, 78% (n = 32) clients and 100 % grandparents (n = 10) think that water insecurity can affect emotional health along with mental health. They indeed think mental and emotional health goes "hand in hand." However, more than 4% (n = 2) of clients did not think water could affect emotional health, and 17% (n = 7) of clients were unsure about the connection between water and emotional health. Clients who thought water affected emotional health reported themselves and their children being sad, upset, depressed, worried, and anxious. Emotional and mental

health are connected and entangled. As one client said: “the emotional and mental health go hand in hand if one is off, the other one is going to be affected by it as well.”

Not having access to something as essential as water that should be considered human rights and available to everyone causes anxiety. Not just being able to provide water to their children affects mothers’ emotional health. They get upset and worried about raising kids without clean running water.

Just feeling like you can’t provide something that is so common in other houses to your family. Just feeling like you can’t provide for your children what they deserve and what is completely normal for everybody else [causes anxiety], shared a mother.

Similarly, another mother shared,

I would be sad, and I would feel really guilty and angry as well [that] I couldn’t provide these what I consider to be basic needs, so emotionally it would cause a big strain.

Many participants truck in their water, and if the water truck does not come as scheduled, that could force them to limit their water uses and causes anxiety:

if we are running low and the truck can’t come for few days, it can be hard. It’s like we have to really limit how much we are using. You know, it’s hard to go to work. . . [if] you didn’t get to have a good shower. It causes anxiety.

One client reported waiting as many as ten days before the water got trucked in. She could not shower for these ten days affecting her physical hygiene and mental health. Some participants who had clean running water from the water treatment plant worried about their other family members, relatives, and community who do not have access to clean running water and are forced to use the water they cannot trust. For example, a participant with running water shared her worries about her mother using well water that she thinks could be contaminated:

“this really shouldn’t be a worry to have access to clean water, not when everybody else around

us enjoys it abundantly.” Another participant explained that emotional wellbeing gets severely affected by “just having to go through this, you know, when I couldn’t afford water. Like, we had to go without [water], and that was very emotionally stressful.”

To some participants, water is a source of emotional wellness, and if they do not get access to that water, their mental wellbeing gets negatively affected. When water is contaminated, polluted, scarce, limited and not trustworthy, it affects Haudenosaunee’s traditional connections with water and affects emotional health. The connection with self and others and land and water gets disturbed. “If we’re not feeling hundred percent, then we are not able to connect with our bodies a hundred percent, there is no way we will connect with people around us a hundred percent,” described a participant. A grandmother was worried about all the chemicals that are put in the water because “it changes the molecules in our bodies, you know, so you’re more emotional; you get depressed,” she continues, “because they’re not the natural order of the earth; they’re affecting everything about us, our mental or emotional, our physical and our spiritual.”

Not only mothers, but the poor quality of water and not having enough clean water affects children’s emotions. For example, a mother shared how being able to wash his face in the morning with fresh water makes a significant difference in her son’s emotions:

Simple bowl of water to wash your face in the morning really refreshes you! My boy has a lot of mental health issues. He suffers from depression, and he has these other issues going on with him, but if you don’t use that water daily on his face, his body, he’s in the emotional ride. I can see how the water can refresh him. He feels pretty good.

Another client thinks there is a relationship between a teenage girl who is angry and does not have running water. A grandmother shared that looking at the contaminated water at the Grand River not only makes her upset that she could not raise her grandchildren in the

environment she wants to, but the water in the Grand River makes her granddaughter sad for the fish and turtles.

“I feel bad for my grandchildren,” the grandmother said, “’cause they are growing up in a time where my granddaughter looked at the river [and] we have brown water. [I said] I never wanna eat anything from there. And then she was saying ‘if it’s not good for us, then what about those turtles?’ so she thought about the turtles and the fish in there, she was sad!” she continues, “her childhood experience should be happy, right?” Not being able to raise grandchildren in the environment that she grew up with the connection to the environment that is healthy worries this grandmother.

That’s how I grew up, as I was always taught to be connected to the environment. So that’s what I try to provide, and then the environment is dying! So, you know, the emotional base, a positive base that she should have, isn’t there!

## Coping Mechanisms With Water Insecurity

Despite the negative impact of water insecurity on mental health, Haudenosaunee women demonstrate resiliency and adopt various culturally innovative coping strategies in times of very limited to no access to clean water and to sustain good mental health. These strategies include rejuvenating their relationship with water, having family and communal support, and planning better. Research that focused on coping mechanisms in times of water insecurity also demonstrated that planning ahead of time, water sharing with neighbors and relatives, and having a strong family and community support have been effective coping mechanisms (Hanrahan et al., 2014; Brews et al., 2019).

While not having clean water made SN mothers stressed, depressed, and anxious, water is the place for many to go to relieve those stresses and anxieties and to heal. Going to the water to revive mental health has been significant for many participants.

I grew up going down to the river. Anytime I was mad or sad. . . I would go to the river and let it wash that away. Wash the angry away. Wash that sad away.

Many participants found water calming and helpful with mental health. As one participant shared how water helps them feel better and feel connected:

I know a lot of people find going even to the ocean or to the Grand River is very calming. Like my husband, I can kind of understand why he loves to fish all the time because he says it's so peaceful and it is. And we're all together, and water is healing because if we're having a bad day, usually he says, oh, let's just go down to the river and we'll take the girls, and we'll have some fun and I think if that wasn't accessible, I would just feel like I'm almost trapped like you have no outlet to let things go. . . sitting near of the Grand River would just be so calming where if you needed that moment to reconnect yourself and to get in touch with your feelings, that would be the place to do it.

In addition, participants find that having a support system within the family, community, and society ensures good mental health.

The stress of, like, just the way that we live our lives now and the hassle that affects our mental wellbeing. . . but it's so important to have community and a support system in times of stress, said one participant.

Participants mentioned extended family support to cope with limited or no access to water. For example, being able to use the kitchen or shower or laundry with other family members or having someone to buy water for the families who cannot or do not have transportation were mentioned as coping mechanisms. Constant planning about water and water uses help them cope with limited water.

Well, you're constantly planning and trying to figure out that anxiety, your brain is just always in overdrive, trying to make sure that you have it [water] or that if you do not have it [water] which way that I can use it, stated one mother.

Limiting bath and laundry, stocking up on water, giving kids the priority of water are some of the strategies mentioned by SN mothers. One client said she must even plan her garden based on its need for water, "I have to consider how I can water the garden, how big of a garden, what kind of plant can I plant!" Another client said she even plans her stops and water uses on the road or going for a walk, "if I start to have a drink, where am I going to get more (laughter)," she adds, "you learn asking if you take a shower or save up money."

A grandparent said collecting maple water is a way of planning too,

that's why they talk about these maple trees. . . when you tap those trees that supposed to be our water. That's one of the pure water sources, and that's why they always said that you collect that when it's that time of the year and because you don't know what's going to happen to the rest of our waters.

Different programmes were mentioned as supporting mothers to ensure good maternal and mental health. Many expressed their satisfaction with the services provided by the Six Nations Birthing Center, especially when it comes to mental health, as their services are extended beyond births. Programs such as Mom and Tots and Childminding were mentioned to be helpful to care for mental health. Being able to be learning crafts with other moms while their children are being taken care of by the Birthing Center staff is considered necessary. "Just sit down and do something with other women... is critical or central to my mental health. Sometimes it is enough for you to know that you are not alone in terms of caring for your wellbeing and that of your child," said one client participant. Some mentioned "mommy fitness" classes at Stoneridge daycare, which offers childcare when mothers can work out and feel physically and mentally sound. Some found programmes that teach participants to prepare and cook food for babies

helpful for their mental health. The Six Nations Elected Council free water delivery during the pandemic proved to be a stress reducer for many participants who accessed it.

## DISCUSSION

Ethnographic data on water insecurity and maternal mental health revealed three major points: (1), maternal mental health is holistic which is understood in relation to family, community, land, and water. (2) maternal mental health and water insecurity were contextualized in ongoing violent colonial structures; and (3) despite ongoing colonialism and severe water insecurity, Haudenosaunee mothers demonstrated resiliency by adopting various cultural strategies inspired by their traditional teachings. Water insecurity profoundly affected SN mothers' mental health because of their holistic understanding of mental health and their traditional relationship with water. Ethnographic data reveals that, unlike western concepts, mental health was not understood as the mere absence of illness; instead, it was entangled with the health of family, community, environment, and water. Good mental health is defined by the absence of illness in the western concept, which is compartmentalized, individualistic, and inadequate to understand Indigenous mental health issues (Cardona et al., 2021). Conventional western knowledge reduced Indigenous mental health as 'problems' and often categorized Indigenous people as helpless, vulnerable, and passive (Kelm, 1998; Scheper-Hughes, 2008, p. 52; Simpson, 2008).

In the name of managing mental health “problems” such as stress, depression, and PTSD, the conventional western methods perpetuated racism and discrimination and contributed to violent colonial structures (Kelm, 1998; Kirmayer et al., 2007; Stevenson, 2014). Academics



played vital roles in constructing Indigenous people as pathologic, disordered, alcoholic, and vulnerable (Kelm, 1998; Waldram, 2004; Waldram et al., 2006). Recent research by critical medical anthropologists and Indigenous scholars has questioned the individualistic and universalistic understanding of mental health and demonstrated that mental health has various meanings in different cultures. These works have highlighted the importance of contextualizing illness and health in broader social, historical, economic, political, and colonial structures (Singer, 1989; Farmer, 1996, 2004; Farmer et al., 2006; Lavallee and Pool, 2009). In Indigenous societies, mental health is a part of holistic health and is interconnected with the natural environment and all creation (Martin-Hill, 2009; Howell et al., 2016; Freeman, 2019). For Haudenosaunee, mental health is embedded in their notion of Ganikwi: yo or good mind established in the Great Law of Peace. A good mind is achieved through living in peace, balance, and harmony with all creation (Noronha et al., 2021). Noronha et al. (2021) adapted the Haudenosaunee wellness model collected from the *Kawenni:io/Gaweni:yo* private school to demonstrate that for Haudenosaunee, both good mental health and resilience depend on a good mind, family, community, environment, and spirituality. Further, they demonstrated that mental health issues such as stress, anxiety, and depression are not universal, nor are their healings; instead, they vary in different cultures (Kleinman and Good, 1986; Kelm, 1998; Adelson, 2005). For example, spirit possession that could be understood in various medical terms such as schizophrenia or epilepsy is not pathology rather valued in many cultures (Fadiman, 1997; Seligman, 2005). Similarly, depression in Mohawk is *Wake'nikonhrèn:ton*, meaning “a mind spread out in the ground” describing a situation of mind and body disembodiment (Elloitt, 2019). It does not pathologize but expresses a particular situation in individuals.

Studies reported higher psychological distress in people living on-reserve (FNIGC, 2012). This is due to personal and interpersonal trauma (family violence, sexual exploitation), compounded by community trauma (intergenerational trauma), and the challenges of environmental stewardship responsibilities. For example, suicide rates increase with heightened anxiety concerning the impacts of climate change (Burke et al., 2018). Indigenous women, in particular, are at increased risk of mental health issues such as depression and anxiety (Oawis et al., 2020). Our research reveals that stress and anxiety are linked to water insecurity, as water insecurity causes financial burden, affects self-hygiene and self-esteem, and negatively impacts raising family and children. Western solutions have failed to meet the needs of Indigenous populations: the majority (72.3%) of FN youth do not utilize mental health services, with no differences between genders (FNIGC, 2012). The western individualistic healing approach that seeks to treat individuals outside of their family, community, and society has proven ineffective to Indigenous people (Kirmayer et al., 2000; Freeman, 2019). Research demonstrated that mental health for Indigenous people is better ensured within the context of community and family support and when seen holistically (Kirmayer et al., 2000; Martin-Hill, 2009). However, the holistic meaning may not be mutually understood. Our research shows that the sense of holism goes beyond physical, mental, emotional, and spiritual domains. In addition to ongoing colonialism, we, therefore, argue that mental health must be understood in connection to land, water, and the environment, as natural disasters, including water contamination, are symptoms of colonialism, western development policies, and structural violence (Barrios, 2014). Our participants described their water as “sick” and “unwell,” which made them sad and frustrated about themselves and about all the animals that live in and depend on the water. Research in non-western and Indigenous societies also demonstrated that people believe they are related to nature

or the ocean and that their personal illness is just a reflection of what is happening in their environment, land, and water (Andrews, 2020). Both sufferings and healing for these participants then get interweaved with the suffering and healing of the water.

Mental health and water insecurity and their relationship were understood in the broader historical and colonial context, racist policies, and violent and unequal social structure. Water insecurity was understood as violence of basic human rights. SN mothers linked their mental health with land degradation, water contamination, loss of traditional knowledge and medicines, and traditional upbringing of children caused by colonial assimilationist policies such as the Indian Act and residential schools. Indigenous identity and their unique relationship as protector and spokesperson of water affected Haudenosaunee women and their health. Haudenosaunee women's voices were silenced throughout the colonial era through multiple agencies. Anderson (2011) demonstrates the significant role that colonial subjugation played in the loss of status and power experienced by Indigenous women, which in turn crippled or fragmented societal and family structures, including those affecting Indigenous women and their authority and responsibilities.

The imposition of the Indian Act over the last 120 years, for example, is viewed by many First Nations women as immensely destructive to the family unit. Forcing patriarchal policies on extended families eroded Haudenosaunee women's authority and reproductive autonomy. Colonial assimilationist policies threatened the existence of Haudenosaunee by outlawing their ceremonies and criminalizing their traditional economic practices. Further, the Indian Act's discriminatory policies utilized science to codify Indigenous inferiority. It justified horrendous

policies to sterilize women, remove children from homes, and ban customs and culture. Once the Indigenous attachment to lands was subverted, the next phase in securing the European occupation of Indigenous lands was sterilizing Indigenous women (Stote, 2015). Treatment of Indigenous women in the form of forced/coerced sterilization was also recognized by the United Nations as torture, as an act of genocide and a violation of human rights, medical ethics and reproductive rights (Stote, 2015; Collier, 2017; Patel, 2017). Stote (2015) argues coerced sterilization must be considered in relation to the larger goals of Indian policy — to gain access to Indigenous lands. Epistemic violence is deeply rooted in justifying horrendous actions toward Indigenous people, women, and, we would argue, their natural world (Stote, 2015).

The inability to raise children with traditional medicines and in connection to land and water was also linked to colonial policies such as residential schools. Indigenous children were forcibly put into residential schools where they were not allowed to speak their language or practice their traditions (Partridge, 2010; Wilk et al., 2017; Cowan, 2020). “Killing the Indian in a child” was the motto, but the recent finding of more than 1300 unmarked graves in just four of the 150 residential schools proves that children were killed in those residential schools. More than 4500 children’s bodies were found, and the number is rising (Hopper, 2021; Voce et al., 2021). Stealing children from their mothers, families, and community is still going on in the name of child welfare. Indigenous children aged 0 to 4 are overrepresented in foster care (Danison et al., 2013). Studies demonstrated that women often refuse health care for themselves in fear of losing their children to foster care (Danison et al., 2013). With no clean running water, women and children’s health gets severely impacted, especially mothers and grandmothers who

want to fulfill their responsibilities by raising the children with traditional medicines or just providing the basic rights to their children.

However, despite water insecurity in their community, SN women are resilient and use various culturally appropriate ways to cope with water insecurity, such as reconnecting with water. Both Indigenous and medical anthropological research demonstrated that people are innovative, exercise their right to live and adopt various culturally appropriate resilience strategies (Stout and Kipling, 2003; Scheper-Hughes, 2008). The Haudenosaunee have a unique way of dealing with sorrow, sadness, or depression, which Hiawatha, one of the founders of the Great Law of Peace, taught when he used ceremony, beads and wampum to deal with his tremendous sadness and depression over losing his daughter (Haudenosaunee Guide for Educators, 2009). Hiawatha's way is still used in the Longhouse as a condolence ceremony to overcome the grief and continue living with hope and clear thinking. Sustaining reciprocal relationships with the natural spiritual world through kinship systems renewed through cycles of the ceremony is foundational to Indigenous communities' resiliency, including the Haudenosaunee. *Ohen:ton Karihwaterkwén* is an ancient practice of giving thanks through recital; speaking to the plants, animals, water, and the wind is a reminder of gratitude. Haudenosaunee values and worldview survived throughout the colonial era. To demonstrate the brilliance of Haudenosaunee female leaders, Louise McDonald re-introduced 'rites of passage' to restore knowledge, values, beliefs and families. The *Tehtsitewa:kenrotka:we* "Together we pull it from the earth again" *Ohero:kon* Rites of Passage core premise is revealing multiple layers of being as corn is revealed after husking. *Ohero:kon*, "under the husk," is an educational, instructional and ritualized ceremonial process drawn from the Haudenosaunee Skyworld story

known as the “Earthgrasper.” Restoring the roles of uncle and auntie mentorship has had significant impacts in healing families often torn apart through residential schools or child welfare removal of children from home. A significant outcome overall is building leadership skills, interpersonal relationships, and restoring the rightful position of women through training the boys in supporting and respecting women and peers. The mentorship of ‘Uncles and Aunties’ nurturing ‘nieces and nephews’ with land-based skills is an asset to the community, particularly maternal health and parenting. Our research demonstrates that in addition to family and community support, water itself is a source of healing. Water has been significant to reconnect with traditional teachings, rejuvenate, and guide future directions.

## CONCLUSION

Most research on Indigenous mental health focused on suicide and substance use despite highlighting social determinants such as poverty, the Indian Act, colonialism, and residential school trauma (Nelson and Wilson, 2017). Focusing on symptoms, not the root cause, did little on critically questioning the violent structure; instead, it further brought Indigenous people under medical gaze. The intersectionality of culture, history, colonialism, and mental health remained a less developed area (Waldram, 2004), and women are not fairly represented in the research about Indigenous mental health (Adelson, 2005). Our research co-creates knowledge about the impact of water insecurity by contextualizing it in larger violent colonial and assimilationist policies and structures. Research on water insecurity is relatively new compared with research on food insecurity, especially with the development of the water insecurity scale in recent years (Bulled, 2016). Water insecurity research has been significant in demonstrating its devastating impact on people living with limited to no access to clean drinking water. Results highlighted women to be

affected more than men as they have more responsibilities toward collecting and providing water for their families (Collins et al., 2019). Studies that focus on mental health has been limited but has nonetheless made a significant contribution to highlighting that water insecurity affects women beyond the physical level and causes emotional stress, depression, and violence (Arsenault, 2021). Our research demonstrates that Haudenosaunee women understand mental health to extend beyond the absence of illness and is viewed in relation to the larger natural environment and all creation, including water. Therefore, the condition of water such as polluted and contaminated Grand River made them sad and depressed. Not being able to use water as medicine or collect medicinal plants by the water and thinking about other animals that depend on water affected their mental health. Haudenosaunee women connects themselves with mother earth and water in emphasizing the importance of water for their overall wellbeing. In Haudenosaunee's understanding of health, mental health, nature, and water get intertwined. This understanding of mental health recommends a different kind of healing—a healing that interweaves with the healing of nature. The participants trace this sickness of water and illness in the family and community to ongoing colonialism. As such, water insecurity in SN and its impact cannot be understood in isolation from the ongoing colonialism, racism, and discrimination against Indigenous people in Canada. Participants emphasized that trust needs to be restored, and the government of Canada needs to be sincere about solving water problems to restore sound mental health for Six Nations mothers and children. Water security will eventually restore the health of whole community. Stress and anxiety over accessing clean water, along with memory loss, and loss of clear thinking was reported by Haudenosaunee women. Not having enough water to drink and for daily uses, not being able to provide clean water to kids, not raising children and grandchildren traditionally, experiencing disrupted traditional relations with

water, and living under settler colonialism all affected SN mothers mental and emotional health. Despite severe water insecurity Haudenosaunee women remains resilient by maintaining the connections with land and water and having social, familial, and community support. They all help Haudenosaunee foster good mental health.

#### DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

#### ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Hamilton Integrated Research Ethics Board (HIREB) and Six Nations Council Research Ethics Committee (SNCREC). The patients/participants provided their written informed consent to participate in this study.

#### AUTHOR CONTRIBUTIONS

AS: conception, methodology, analysis, original draft writing, structuring, and reviewing and editing. JW: conception, methodology, and writing and reviewing. DM-H: conception, supervision, and writing and reviewing. LD-H: reviewing and editing. JH: interviews. All authors contributed to revision, read, and approved the submitted version.

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## Chapter -5: Water Insecurity Is Colonialism: Discussion and Conclusion

### Introduction:

In partnership with the SNBC, this co-created research was designed to investigate how limited to no water access affects Haudenosaunee mothers' health and wellbeing. The goal was to look beyond the visible and physical impacts of water insecurity at SN by contextualizing them in the settler colonial structures of Canada. Incorporating anthropological and Haudenosaunee theory and methods, this research documents the profound ways water insecurity affects SN mothers in their roles in the family and community, as spokespersons for water and land, and as leaders and *Onkwehon:we* in a settler colonial state. In doing so, braiding TEK, CMA, and EA, we have tried to understand the meanings and significance of water and maternal health. Indigenous knowledge is essential to understand the local meaning of water and its impact on holistic health. In this concluding chapter, I review the study's key findings, followed by a discussion highlighting the link between water insecurity and settler colonialism.

This research highlighted three significant concepts and their interrelations: traditional knowledge of water, water insecurity, and maternal health. It demonstrates that the western understanding of water and water insecurity is too narrow as is the biomedical understanding of maternal health. In Indigenous Knowledge, water is not an object or resource; water is a hydro-social being that has rights and is sentient. Water is an ancestor, teacher, member of the kin group, and active agent (McGregor, 2001; Latchmore et al., 2018). Water can listen, resist, express, direct, and shape human actions and societies (Mosse, 2008; Linton & Budds, 2014; Murphy, 2017; Todd, 2017). For the Haudenosaunee women, the importance of water lies in its daily necessity, as a life sustainer, as medicine, source of wellbeing, as part of creation and as a

powerful being. Water was understood as a cleaner, purifier, and refresher for humans and the earth. Its importance lies in ceremonies and *Ohen:ton Karihwaterhkwen* (Thanksgiving address) that should be continued. Haudenosaunee mothers understood water through its power of healing as well as the power to destroy.

As discussed in chapter 1, 2, 3, and 4, Haudenosaunee worldview makes strong connections between women and water as a life sustainer. Haudenosaunee women and water share feminine bonds and reciprocal relationships as carriers of life (Cooke, 2008). According to Haudenosaunee knowledge, land and water are not separable; land, water, and humans are connected through interwoven and reciprocal relations. The western idea of water as a resource violates the rights of water and disrupts the interconnections. The subjugation of Indigenous knowledge of water and Indigenous ways of learning is directly linked to colonialism and water insecurity in Indigenous communities (White et al., 2012). Dividing water and land, or as Todd (2017) argues, "othering" water from humans, further exploits water and serves colonial agendas. The ignorance of Indigenous knowledge about water makes it possible to access and contaminate water and the lives that depend on it (Todd, 2017; Liboiron, 2021).

This research demonstrates that water insecurity in the SN community affects SN mothers' physical, mental, emotional, and spiritual health. Limited access to clean running water jeopardizes SN mothers' health and wellbeing by creating financial burdens and requiring the strenuous physical labour of carrying water. Water insecurity creates anxieties, worries, and stressors in SN mothers who need to manage daily water needs and usages and live with recurring thoughts of running out of water. These worries about running out of water forced

mothers to put their family and children first and become dehydrated themselves. Mothers are often forced to consume drinks high in sugar for affordability and easy access. This forced dehydration has other consequences for mothers' and children's health. For example, dehydration leads to poor breast milk production and is linked to urinary tract infections (UTIs).

As demonstrated in chapter 3, diseases like diabetes, eczema, nausea, tiredness, abdominal pain, GDM, anemia, and vaginosis infections are linked to water insecurity. For mothers, stress, worries, sadness, and depression were related to poor water quality and lack of access to clean water for their family, children, community, other animals, and all creations that depend on water and the health of the water itself. There are spiritual impacts as well. Disrupted ceremonies, difficulties in acquiring traditional food and medicines, harvesting, and loss of traditional ways of upbringing children are linked to land encroachment, resource extractions, commercial farming, capitalist industrial development and water contamination. Water insecurity robs the life of children and mothers by disrupting their connections with the land and water. Lack of funding for reserve infrastructure results in most families' unaffordability to connect with the waterline. For example, most mothers reported that they cannot afford to have a connection with the main water line linked to the water treatment plant on the reserve, and the ones who can afford it are still waiting for the water line to come close to their households. This lack of affordability and long waiting create frustrations among SN mothers. Lack of access to clean water clearly manifests structural inequality and human rights violence toward Indigenous peoples in Canada.



While technical water advisories in Canada define water insecurity, SN mothers' understanding of water insecurity transcend narrow biomedical and technical frameworks. SN mothers' understanding of water insecurity goes beyond human access to water and includes animals, birds, trees, and everything that depends on water. Moreover, SN mothers connect their health and wellbeing with that of water. Similarly, SN mothers' understanding of maternal health challenges narrow biomedical definitions that confine maternal health only to biological mothers and to a short period of pregnancy, birth, and postpartum. Instead, maternal health is understood to extend to connections to the health and wellbeing of families, communities, nations, mother figures and Mother Earth.

These expanded definitions of water insecurity and maternal health and interconnections with the land and water challenge the western concept of the individual body as a bounded object. Human beings are relational and porous (Harvey & Haraway, 1995; Jasarevic, 2017) but are in a continuous process of becoming (Ingold & Pálsson, 2013). Individual bodies are connected to society, nature and the environment, and the physical world is in connection to the spiritual world (Hoover, 2017; Bird-David, 2004; de la Cadena, 2014). As Shawn Wilson (2009) argues, "There is no distinction between relationships that are made with other people and those that are made with our environment" (p. 87, Cited in Yazzy & Baldy, 2018:1). Tim Ingold (2011; 2013) argues that a human being is not a single entity as it constantly changes, evolves, and develops in relation to others. As such, the boundaries between humans and nature are blurred (Descola & Pálsson, 1996). Bird-David (2006) demonstrated that human beings are joint beings and not separable from the forest, nature or ancestors. Similarly, de la Cadena (2014) demonstrates that nature or mountains, or as she calls "earth beings," are part of social bodies

and actively participate in political movements. Hoover (2017) "loosely adapts" Nancy Scheper-Hughes and Margaret Lock's (1987) heavily cited concept of "the three bodies" in her research. She argues that clear distinctions among these three bodies for the Haudenosaunee are not possible; Haudenosaunee see animals, the natural world, and the community as connected to individual and social bodies. The natural environment, more-than-humans, and the spiritual world, shape the ways of life and the health and wellbeing of the Six Nations.

In this research, humans, water, nature, the environment, and the physical and spiritual worlds are understood as interwoven, porous, overlapping, and messily entangled—always co-constructing each other. I use the concept of *enchanted entanglement* to understand these relationships, rejecting the binaries between humans and more-than-humans, and between physical and spiritual worlds. These relationships are co-constructed through the intersectionality of race, gender, economic and socio-political status, power relations, environment, and spiritual engagement. They are not fixed or bounded and can adapt to changing relations. These interwoven and entangled relationships are also enchanted as they co-construct each other, joining the chorus of co-creations (Beaman, 2021; Stainova, 2019). Therefore, they are not passive recipients or victims of domination, power and control. However, this chorus is asymmetrical, not always predictable or calculable, but essential to existence, strengthening each other's resilience and agencies.

Water plays a significant role in Indigenous political movements. These movements have formulated culturally innovative strategies to resist contamination, exploitation, and domination over water and reclaim Indigenous sovereignty and self-determination (Yazzy & Baldy, 2018).

Indigenous political movements about water challenge binaries set by colonial structures such as land vs water and seek to establish rights of water. These movements establish that water has rights just as all creations, human and more-than-human, have rights to water. Water provides the foundation of theory built in relation to land (Baldy, 2017; Yazzy & Baldy, 2018). For Haudenosaunee mothers at Six Nations, water is a way to reconnect with traditional teachings, shaping identities as *Onkwehon:we*. Water is a way for Haudenosaunee mothers to reclaim sovereignty and restate reconnections and reciprocal relations with the motherland. As shown in the previous chapters, Haudenosaunee women have been working to reconnect with the land. The SNBC, for example, have successfully brought back birthing and Indigenous midwifery practices and knowledge in their community and thus reclaimed their sovereignty. Clan mother Louise McDonald successfully worked to reconnect Haudenosaunee youth with Mother Earth through ceremonies called *Ohero:kon* and teachings about the connections of women's bodies with Mother Earth (Hoover, 2017; Martin-Hill et al., 2022).

## Chapter Summary

Besides the introduction and conclusion, this thesis includes a digital story (DS) about the SNBC (Appendix Q) and three original research chapters discussing collaboration with the SNBC and an analysis of the impact of water insecurity on SN mothers. In this research, I take a decolonial or anti-colonial approach, from research design to data analysis which is reflected throughout all chapters. Chapter two, titled Navigating across anthropological and Haudenosaunee knowledge: co-developing research using CBPR and *Kaswenta* (Two-Row Wampum) principles in partnership with Six Nations of the Grand River, acknowledges the harm done by academic research that contributed to colonialism by claiming authority over Indigenous knowledge, and

conducting extractive research that ignored Indigenous knowledge, methods, and worldviews.

Chapter 3, Water Insecurity and Maternal Health among Haudenosaunee Women in Canada, provides data from the research and demonstrates that water insecurity profoundly impacts SN mothers' holistic (physical, mental, emotional, and spiritual) health due to their unique relationships with the land and living under violent settler colonial structures and policies such as the Indian Act and Residential Schools. Finally, chapter 4, Assessing the Impact of Water Insecurity on Maternal Mental Health at Six Nations of The Grand River, does the same but focuses more deeply on the mental health of the mothers who lived all or most of their lives on the reserve. Below is a more detailed summary of chapters 2, 3, and 4.

Chapter 2 is engaged with methodological discussions bridging anthropological and Haudenosaunee knowledge and worldviews. Inspired by Haudenosaunee *Kaswenta* treaty principles and philosophy, we have argued that anthropological knowledge with CBPR and Indigenous research methods and paradigms can come together to create a dialogical space of mutual respect. It questions the traditional anthropological idea of field and fieldwork and adapts “location work” to describe the importance of becoming political allies and being involved in projects with common political agendas and interests. In this chapter, I have argued that Indigenous knowledge does not need to be ignored or reduced to the researchers but can be understood through “partial connection.” Likewise, we do not need to ignore or dismiss the differences between the worldviews of the researchers and Indigenous communities; instead, highlighting those difference is essential for creating new knowledge and scholarship. This chapter provides an example of our research that created that dialogical space with the SNBC and SN community through mutual respect.

Chapter 3 highlights data from 54 in-depth interviews with mothers (n=41), grandmothers (n=10), midwives (n=3) and midwives' charts of those 41 mothers. Data reveals water insecurity in the households and SN community as mothers constantly worry about running out of water, have difficulties accessing clean drinking water, and suffer financial burdens for buying bottled water or trucking in water for cisterns and wells. Only 15% of the participants reported having access to water. Despite having a water treatment plant, most households are not connected to the waterline from the water treatment plant. There are two reasons for that: the waterline is yet to reach most households, and the cost is too high to afford. This situation creates worries and frustrations among mothers who believe the Canadian government is not doing enough to solve water issues in their community. For example, more than 88% of participants thought that the government of Canada is not doing enough to solve water issues in their community, and 66% of participants thought there are not enough sustainable initiatives taken to ensure maternal health in their community.

In-depth interviews revealed that persistent water insecurity made many mothers normalize the situation as they grew up without running water. There was a spiritual health impact of water insecurity as well, such as disrupting connections with water, losing traditional medicines and food, and interrupted ceremonies.

MW charts analysis from 41 mothers reports negative health impacts of water insecurity. For example, MW chart analysis also shows higher stress and anxiety in mothers (53%). Other maternal health conditions documented in midwives' charts were Urinary Tract Infections (UTIs) (31.6%), yeast and vaginosis infections (9.75%), Gestational Diabetes Mellitus (GDM) (19%) and anemia (9.75%).

Moreover, SN mothers maintain that water insecurity persists in their community because they are Indigenous or *Onkwehón:we* in a settler colonial state. They believe water insecurity results from settler colonialism that did not uphold the treaties and promises, held paternalistic attitudes, and deliberately put Six Nations on a reserve with poor infrastructure.

Chapter 4 focuses exclusively on mothers' mental and emotional health. 78% (n=32) of clients of SNBC and 100 % of grandparents (n=10) think water access can affect emotional and mental health. SN mothers understood mental health not as the absence of illness but in relation to fundamental human rights. 90% (n=37) of clients stated that poor quality of water or having limited or no access to water negatively affects mental health. Depression, anxiety, being upset, a sense of worthlessness, impaired clear thinking, and mood swings were all reported as mental health effects due to poor water quality. They indeed think mental and emotional health goes "hand in hand." Only 4% (n=2) of clients did not think water could affect emotional health. 17% (n=7) of clients were unsure about the connection between water and emotional health. Clients who thought water affected emotional health reported themselves and their children being sad, upset, depressed, worried, and anxious. Water insecurity affects mothers' self-confidence. The situations were worse during the pandemic when there was a backlog on trucking in water and a limit on purchasing bottled water. As a result, mothers had to compromise water use.

However, the impact of water insecurity was not linear, meaning there was not only a negative impact of water insecurity; instead, SN mothers have been culturally innovative to make the best out of poor water quality in their households and community. For example, Haudenosaunee cultural tradition is to seek water to help them reduce anxiety, worries, pain, and

grief. Therefore, through going to spend time close to the Grand River, SN mothers reported using water to reduce stress, worries, and anxieties. Situations of water insecurity have also been utilized to strengthen familial and community ties. For instance, people help extended families with wells and cisterns, purchase water for friends and family who cannot go to the store due to lack of transportation and other physical limitations, and the elected band council provided water for the community during the COVID-19 pandemic. SN mothers also reported the creative strategic planning they do to counteract limited access to water, such as stocking up on water and planning stops on a trip where water is available.

SN mothers believe that water insecurity results from violations of fundamental human rights. Participants linked their experiences with water insecurity on the reserve to the policies and structures of settler colonialism. Participants believed water insecurity in their households and community affects mothers' holistic health and well-being and disrupts raising children, which creates depression and anxieties in mothers as they highlight structural violence and inequality rooted in the settler colonial state of Canada.

### Water Insecurity is Colonialism:

Like many other scholars (e.g. Dyck, 2017; McGregor, 2012; White et al., 2012; Simpson et al., 2009; Cave & McKay, 2016), some SN mothers link the present situation of water insecurity in their family and community with the settler colonial state of Canada and its broken treaties and promises. SN mothers emphasized that one must understand colonialism to understand why their community faces water insecurity and how it affects the mothers' and their families' health and wellbeing. One SN mother maintained that the water quality in the community and water

situations in the households all have to do with the colonization of their land. To that mother:

*"Water quality is a symptom of a huge problem; the huge problem is colonialism."*

To understand how water insecurity in Indigenous communities in Canada is colonialism, we need to question how water insecurity is systematically created and sustained. Who gets benefits from this persistent water insecurity, and in what ways? What is the political economy of persistent water insecurity in Indigenous communities in Canada and at the Six Nations of the Grand River in particular?

Before addressing how water insecurity is directly linked to colonialism, we must shed light on what colonialism means. While colonialism is generally understood as the domination or exploitation of one group by another (Castleden et al. 2017), it holds vast meanings! It is hard to find a universal definition of colonialism as its implementation and impact is localized. As such, settler colonialism differs in Australia, North America, and Palestine (Wolfe, 2006). Colonialism is spread in many dimensions and layers of social relations, including scientific research and theories, even in those with good intentions (Liboiron, 2021; Spivak, 1988; McCarthy, 2014; Said, 1993; Wolfe, 2006).

Colonialism is an ongoing process (Pels, 1997; Stewart et al., 2022) or a structure (Wolfe, 2006). It is not an event of the past. Edward Said (1993, p. 9) defined colonialism as "the implanting of settlements on the distant territory." To Said (1993), colonialism is not only about accumulation but also about ideological formation. This ideology justifies the domination and exploitation of one group by another. Further, colonialism uses the resources of Indigenous



people to benefit colonial structures (Assante, 2006). Colonialism is non-separable from genocide. It "violently disrupted relational ways, criminalizing cultural practices, restricting freedom of movement, forcing relocation, removing children from families, dismantling relational worldviews, and marginalizing Indigenous lives" (Greenwood & Lindsay, 2019, p. 82). Colonialism destroys to replace (Said, 1993). It replaces Indigenous knowledge, thoughts, practices, and epistemologies with western binarism and eurocentrism (Greenwood & Lindsay, 2019).

Canada is a settler colonial state. The primary motive of settler colonialism is to access Indigenous territory or land (Wolfe, 2006; Liboiron, 2021). Colonialism operates through the "logic of elimination" (Wolfe, 2006, p. 387). This elimination does not only involve frontier genocide, but the logic of elimination is built into the structure that furthers the settler colonial interests of accessing Indigenous land (Wolfe, 2006; Palmater, 2014). Residential schools, imposition of patrilineality on matrilineal societies, western education, and western knowledge of private property are some examples of how the logic of elimination operates in colonial settler countries. This elimination occurs on multiple scales, such as interbreeding, child abduction, and religious conversion (Hill, 2017; Wolfe, 2006, p. 388). Settler colonialism around the world accessed Indigenous land through the narrative of *terra nullius*—which is the perception that Indigenous land was unused or empty (Liboiron, 2021; Wolfe, 2006). It also operates through power imbalances and racist narratives that depict Indigenous peoples as "savages" who are less than human and need to be civilized.

Assimilation has been an essential aspect of settler colonialism. Assimilation is a more effective way of elimination than killing, leading to cultural genocide, acknowledged by the Truth and Reconciliation Commission of Canada [TRC] in 2015. Cultural genocide is genocide (Wolfe, 2006; Truth and Reconciliation Commission of Canada [TRC], 2015), as it has the same repercussions as biological genocide (Wolfe, 2006; Liboiron, 2021). Culture and biology are inseparable when it comes to Indigenous child abduction, missing and murder of Indigenous women, or forced sterilization of Indigenous women (Stote, 2015). Hoover (2018), in her research with Akwesasne, demonstrated that cultural genocide is directly linked to biological or reproductive genocide.

While colonialism has many disguises, such as imperialism, neo colonialism, post-colonialism, external colonialism, and settler colonialism, they all have one common goal: accessing Indigenous land (Said, 1993; Wolfe, 2006; Simpson, 2014; Liboiron, 2021). As Said describes, "to think about distant places, to colonize them, to populate or depopulate them; all of this occurs on, about or because of land" (Said, 1993, cited in Liboiron, 2021, p. 9). Land to Indigenous peoples has various meanings, which are quite different from the western idea of land as a resource. The land is not something that can be owned, bought, sold, or exploited for profit. Land is not a commodity. Land in Traditional Ecological Knowledge (TEK) relates to physical and spiritual worlds (Martin-Hill, 2009). Indigenous knowledge does not differentiate between land and water (Todd, 2017). Liboiron (2021) argues that the division of land and water serves the colonial divide-and-rule agenda. The land sustains life, creates identity, nurtures intellectuality, and teaches resiliency (Wolfe, 2006; Kimmerer, 2020; Simpson, 2014). Language, traditional practices, Indigenous knowledge, medicines, and healing are all derived

from the connection to the land (Dei et al., 2000). However, the land is not homogenous; some parts are considered sacred and more spiritual than others (Indigenous Corporate Training INC [ICTI] 2022). Since land and Indigenous identity are inseparable, accessing Indigenous land means accessing Indigenous bodies and their relations. Indigenous people's health and wellbeing depend on their sovereignty, management and maintaining a traditional relationship with the land (Schultz et al., 2018; Simpson, 2014). Without this relationship with the land, health and wellbeing are affected, and the interconnections are compromised.

The research presented in this dissertation suggests that water insecurity is an enactment of colonialism that seeks to access Indigenous land by destroying the Indigenous relationships with land and water. Our research demonstrates that contaminated water at SN affected traditional medicines and food sources and led them to be replaced with western food and medicines. Contamination of the Grand River and stealing water from the SN community by capitalist industries created water insecurity in the community. Water insecurity creates anxiety and destroys traditional food sources and replaces them with western food low in nutrients causing various health issues such as diabetes, anemia, and stress. Not having access to clean running water affects SN mothers' water intake and food choices. It forces mothers to dehydrate or to drink less expensive and readily available sugary drinks compromising their health and wellbeing. Water insecurity is a genocidal structure of elimination as well as forceful assimilation, which is systematically built.

Water insecurity works as a barrier to sustain connection with the land and keeps Indigenous people detached from their relations with land and traditional ways of being. Water

contamination, along with degradation of environment and pollution have changed Indigenous people's traditional relationship with water. For example, they cannot drink from natural water sources (Anderson, 2010) or draw drinking water from natural springs and are forced to rely on bottled water (Lavallee, 2006). SN mothers mentioned not being able to collect traditional medicines or grow traditional food because of limited access to water and thus not being able to raise children and grandchildren in Haudenosaunee traditional ways. Losing traditional food sources means losing the language to describe them (Hoover, 2017). Similarly, contamination limits access to water, disrupts ceremonies, and prevents raising children and grandchildren in culturally appropriate ways with traditional teachings. These are all examples of cultural genocide. One mother in our research stated, "*Haudenosaunee people have always been river people*,"—so taking that river away by making it contaminated and polluted means taking the ways of being Haudenosaunee. Despite living by the river, this disconnection with the river affects *Onkwehon:we* ways of living. The systematic erasure of relationships with the river and other local water sources is tantamount to cultural genocide. Further, diseases and illnesses that results in death by drinking contaminated water is genocide!

This disrupted relationship is manifest in a distrust of water. SN mothers who have access to running water cannot trust that their water is safe enough for their children. In addition, many SN mothers grew up and raised their children in a household or community where water was not trusted due to the previous history of contamination, with bacteria such as *E. coli*. As mentioned by one midwife, this distrust is rooted in years of mistreatment and broken promises by representatives of settler colonial Canada. Therefore, SN mothers and midwives believe

restoring trust between nations and honouring treaties are more important than lifting technical water advisories.

Measuring water insecurity through technical water advisories is narrow and inherently colonial as it ignores Indigenous knowledge and rejects the rights of water and the rights of more-than-human beings to water. To SN mothers, as this research demonstrates, water insecurity is not limited to technical definitions encoded in water advisories but extended to include more than human beings. In addition to not having enough water to meet daily needs and usages, water insecurity is also about not being able to maintain traditional relationships with water, the wellbeing of more-than-humans that rely on water, and the wellbeing of the water itself. Liboiron (2021), in their book *Pollution is Colonialism*, argues that pollution theory assumes some level of contamination of water, human bodies, and other beings is acceptable to the extent that no biologically detectable harm can be recognized. This theory gives settler colonial society power to contaminate Indigenous land and bodies. Furthermore, it legitimates accessing Indigenous water to dump chemical waste and land to use for landfill sites. Similarly, the theory that assumes a particular amount of water contamination is acceptable and relies on measuring water insecurity by technical definitions of various types set out in water advisories ignores Indigenous knowledge and is part of the colonial endeavour.

Water insecurity perpetuates colonial settler access to Indigenous land and water. As shown in the previous chapters, chemical dumping by capitalist industries, landfill runoff, and other wastewater dumping occur in the Grand River. This access to the Grand River was taken without the permission of Indigenous people. Corporations that are part of the capitalist economy

not only contaminated water but bottled drinking water for profit by stealing water from Indigenous land. Both Nestlé and Blue Triton have extracted billions of litres of water from SN territory. These actions constitute invasion, exploitation, violence, appropriation, and thus colonialism.

Water insecurity creates fertile situations for child abduction in the name of child welfare. As shown in this thesis, not having enough clean water compromises mothers' personal hygiene and creates an immense challenge for them to keep their households clean, opening up the possibility for child protective services' involvement. Barker and colleagues (2014) have shown that Indigenous children are overrepresented in government care; fifty percent of Indigenous children in Canada are in government care. Inadequate funding, improper housing, and inadequate food and water contribute to the high proportion of Indigenous children in government care. The Ontario Human Rights commission report (2017) says that child abduction in the name of welfare is rooted in structural inequalities, which are a direct result of colonialism. Child welfare was created more to regulate than to provide service. The Sixties Scoop is an example of how Indigenous children were forcibly put up for adoption and adopted mostly by non-Indigenous families. It worked towards forcible assimilation and integration of Indigenous people into mainstream society. The 2021 census in Canada reports that despite being only 5% of all population, 53.8 % Indigenous children are in foster care (Hobson, 2022). Recently Bill C-92, An Act Respecting First Nations, Inuit and Métis Children, Youth, and Families, was passed in 2020 to ensure Indigenous communities' right to provide culturally appropriate support and service for children and families. However, this Bill comes with limitations, such as inadequate funding.

Rupturing Indigenous access to land, and relationships with the land has also involved a colonial paternalistic attitude that does not include Indigenous leaders, especially women, in water policy and planning, and proceeds to pass legislation or implement policies in Indigenous land without consulting Indigenous leaders (Cave & McKay, 2016). Indigenous women and water are targeted, ignored, and exploited by settler colonial policies and structures that took away women's leadership roles and stewardship. Colonial policies jeopardized this relationship between women and water. This relationship is not considered in water policy and governance in Canada, reflecting Canada's patriarchal attitude, an attitude that assumes Indigenous people need guidance to solve their problems. These policies and structures ensure colonial access to Indigenous land (Wolfe, 2006).

Our co-created research demonstrates that water insecurity is a condition that emerged from unequal and violent socio-economic and political structures that jeopardize the health and wellbeing of humans and more-than-humans by violating their rights and ignoring interrelationships among them. Thus, this thesis demonstrates that persistent water insecurity at SN is linked to colonial negligence with respect to Indigenous knowledge, women's stewardship, and Indigenous self-determination. Water insecurity persists because it avoids proper dialogue with Indigenous communities, rejects Indigenous sovereignty, ignores treaties, and encroaches on their land. As SN mothers stated, the trust between nations needs to be restored, and the rights to water for all creations need to be acknowledged to end water insecurity. Indigenous knowledge must be incorporated in assessing the wellbeing of water and land. The definition of water insecurity and maternal health must expand beyond technical and biomedical measurements to include Indigenous Knowledge. Denouncing colonialism by acknowledging

Indigenous sovereignty and self determination is vital to ending water insecurity at Six Nations of the Grand River.

### Contributions:

This research has methodological, theoretical, analytical, and applied significance. It bridges Indigenous and anthropological knowledge. In doing so, not only did this research put Haudenosaunee worldviews at the center but challenged the traditional anthropological ideas of the field and fieldwork. It provides an example of a co-created and community-led project that progressed with mutual respect and reciprocity inspired by *Kaswentha* treaty principles. It includes Indigenous and anthropological methods with CBPR and follows the community's guidance. This research is innovative for several reasons:

- The research project was led and directed by the Haudenosaunee women.
- It followed IK pedagogy, such as adhering to the Two-Row Wampum principles.
- It was not confined to traditional anthropological methods of data collection (lone anthropologist in the field), the research design, development and implementation were collective.
- Haudenosaunee and anthropological knowledge, from designing the research to data analysis, were utilized throughout.

The example of our research has the potential to inform policymakers involved in research with Indigenous communities. Although our study focused only on one Indigenous community in North America, the evidence from our research will be helpful for Indigenous and non-Indigenous researchers and Indigenous communities working together in any part of the world.



Our research also contributes to the literature on water insecurity by providing SN mothers with understanding and documenting their experiences with poor water quality. The detailed and nuanced impact of water insecurity presented here enhances our knowledge about the devastating impact of water insecurity, importantly, this research helps broaden understanding of water insecurity and maternal health. It highlights the importance of learning the local and Indigenous meanings and significance of water and maternal health. As evidenced in chapter 4, our research also provides a detailed account of the impact of water insecurity on the mental health of SN mothers such as stress, anxiety, and short-term memory loss. Indigenous mental health is still understudied in the global North. Overall, this research adds to knowledge on the topics of water insecurity and maternal health.

In addition to expanding water insecurity and maternal health definitions, this research contributes to theory by incorporating TEK, Critical Medical Anthropology (CMA), Environmental Anthropology (EA), and political ecology of health. The introduction of the concept of *enchanted entanglement* will help us understand the porous, fluid, interwoven, messy relationship between humans and more-than-human beings, including water. Framing water insecurity at Six Nations in the context of settler colonialism helps us understand water insecurity as historically rooted in violent social, economic, and political structures.

#### Future directions:

Our preliminary research proposal included Haudenosaunee men as research participants. However, due to essential changes made to address the COVID-19 pandemic, we could not investigate the impact of water insecurity on SN men and their understanding and experiences.

Nevertheless, our research revealed that men play a significant role in filling wells and cisterns for their families and extended family. Therefore, knowledge about men's experience will provide a complete understanding of water insecurity in the SN community. In addition, involving SN youth will also be effective and will enrich our knowledge.

For future directions, research on the relationship between water insecurity and reproductive health needs to be conducted to understand the impact of water insecurity on health and wellbeing holistically. For example, we need to investigate whether there are any relationships between miscarriage and/or difficulty conceiving and poor water quality in the community and the contaminated Grand River. Postpartum depression also emerged as a crucial issue in the interviews that a few SN mothers linked to water insecurity. Further, domestic and state violence against Indigenous/Haudenosaunee women should be investigated as a correlation of water insecurity. Finally, more studies need to be done to see how water insecurity may be weaponized to apprehend Indigenous children. For all this necessary future research, Indigenous knowledge and worldviews should be at the centre, contextualized in colonialism, while adopting other methods such as those provided by anthropology, as needed.

I will be co-publishing more articles with the SNBC midwives and look forward to any future collaborations highlighting the health and well-being of SN mothers and their families.

## Conclusion:

As discussed in this chapter and the previous chapters, three approaches, TEK, CMA, and EA, were weaved to understand and analyze the interrelationship between water insecurity and maternal health in partnership with the SNBC at the Six Nations of the Grand River. Despite the global pandemic and uncertainty with conducting community-based research, we were able to interview 55 participants in total following the guidance of the SNBC. The SNBC took the steering wheel of the research and directed the way to carry on the research by coming up with innovative ideas such as assigning a maternity care worker who is also a member of Six Nations to conduct interviews and involving midwives in collecting data from the MW charts. The number, depth, and quality of interviews prove that community members can be better suited for conducting interviews than academic degree holders (Gupta & Ferguson, 1997). The SNBC's involvement in every research step, including co-analyzing key themes, made the research more meaningful, and it significantly reduced, if not dissolved, the researchers-participants binaries. By actively collaborating on and making necessary decisions about the research, SNBC owned the research, and that is what makes this research innovative.

The teachings of the *Kaswenta* treaty principles guided us to create a dialogical space of mutual respect to collaborate on the research. As evidenced in chapters 3 and 4, and this chapter, water insecurity is linked to colonialism and has negative impacts on mothers' holistic health, putting mothers at higher risk for conditions such as dehydration, UTIs, stress and anxiety. However, despite the negative health impacts, SN mothers use culturally innovative strategies that help sustain their relations with water, such as seeking help from water to deal with life and health stressors. In this dissertation, I have demonstrated that humans and more-than-humans,

such as water, are not separable; instead, they co-construct and shape each other. Therefore, theories that force binaries between land and water or humans and more-than humans fail to understand these interconnections and, perhaps, unintentionally serve the colonial agenda of the divide and rule to access Indigenous land and bodies. It is crucial to understand local and Indigenous meanings and the significance of water and the relations between humans and nature, physical and spiritual worlds, to gain a holistic knowledge about the water and maternal bodies and health. As many SN mothers mentioned, “our bodies are made of water”—the depth of this quote shaped the analysis of the thesis.

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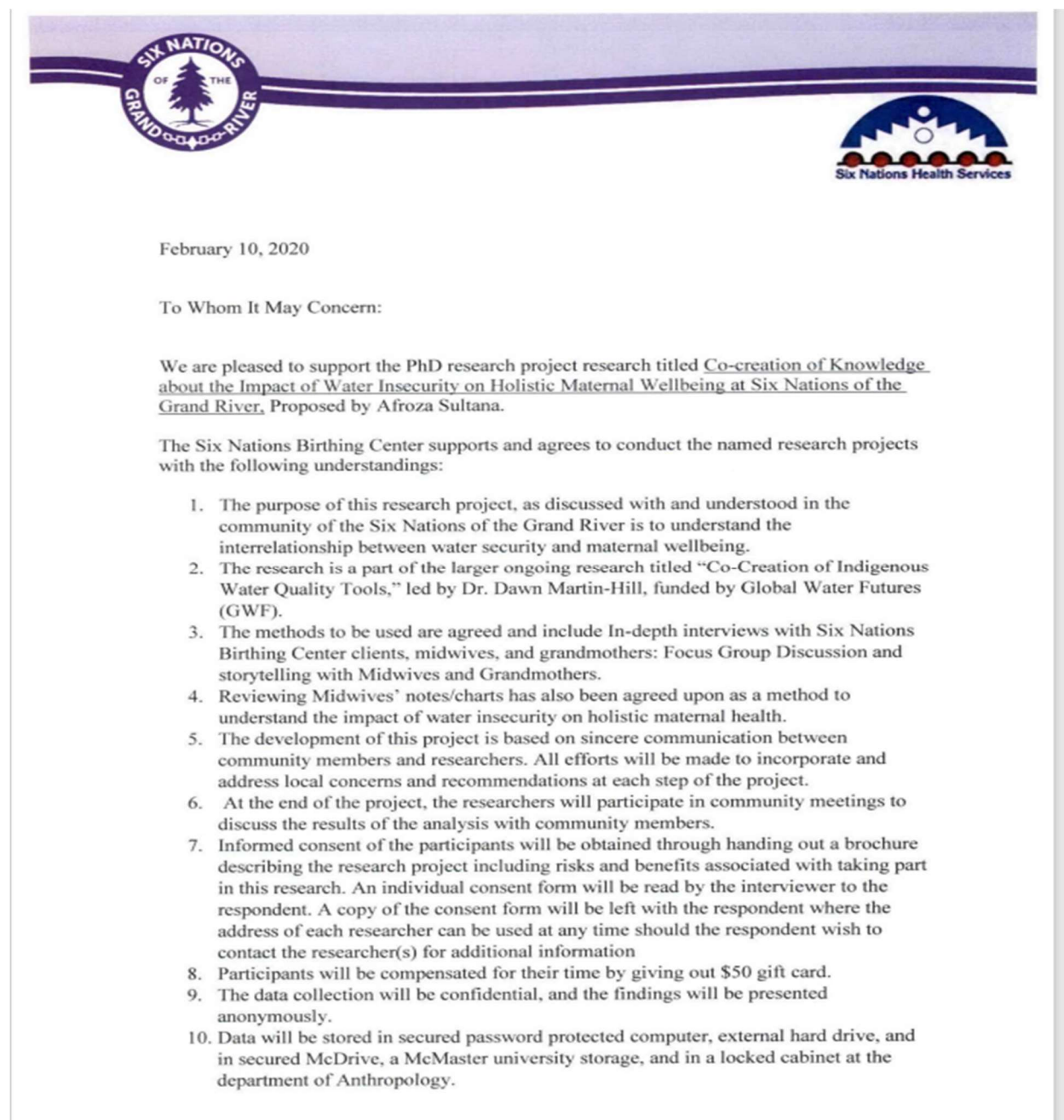
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## Appendices

### Appendix-A: Memorandum of Understanding (MOU)



11. OCAP (Ownership, Control, Access, and Possession) of the research data will be by the Six Nations community.

12. 4Rs (Respect, Relevance, Rationality, and Reciprocity) will be maintained with the community during and after the research.

**Commitments**

The community's commitment to the researchers is to recommend capable and reliable community members to collaborate or to be employed in this project. • Keep informed about the progress of the project and help in leading the project toward meaningful results.

The researchers' main commitment to the community is to inform the community about the progress of the project in a clear, specific, and timely manner. • Act as a resource to the community on water insecurity and maternal wellbeing related issues.

The researchers agree to interrupt the research project in the following circumstances: If community leaders decide to withdraw their participation. • If the researchers believe that the project will no-longer benefit the community.

**In Health:**

**Dated:**



**Julie Wilson, BHSc in Midwifery  
Supervisor of Six Nations  
Maternal and Child Centre**



## Appendix-B: Semi-Structured In-depth Interview Guideline

### **Semi-Structured in-depth interview / FGD Guide with Clients/Grand Parents**

Afroza Sultana co-developed with Julie Wilson

Hello. My name is Afroza Sultana. Thank you for agreeing to this interview. Just to remind you, I am looking to understand the interrelationship between water security and holistic maternal well being. The research is funded by Indigenous Water Quality Tools, supported by both SNEC, HCC and community health lead SNHS. I am working with the health assessment team and Julie Wilson, the supervisor midwife at the Six nations Birthing Center, is my research partner.

The length of the interview will be one hour to maximum one and a half hour long. However, you can choose to stop the interview at anytime, and/or choose not to answer the questions. You can ask for further clarification if any question is not clear to you. You can also choose to withdraw partial or all your information by contacting me via email to [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca) and/or my cell number [REDACTED]. I will be tape recording our conversation. I will transcribe our recorded conversation. If you wish to read what you said afterwards, I am happy to give you a copy. Please let me know after the interview is over or by email or phone call and I will make it available for you.

I will follow a question guide so I can be on track asking questions related to the research topic: water and maternal wellbeing; however, I will be asking probing questions that may come into my mind related to your discussion.

**Risks:** there are minimal risks associated with the study. For example, you may remember painful memories and get upset during the interviews. If that occurs, we can stop the conversation immediately or change our discussion according to your preference. You are in control during this whole interview and we will follow your lead.

**Benefits:** There are no immediate or individual benefits for participating in this research. However, the findings of the study will be helpful for the Six Nations community and the policy makers. It will help improve maternal wellbeing. It will also help develop policies that seek to incorporate cultural traditions to provide culturally safe maternal services and lead toward sustainable water security. Thus, it will contribute towards the efforts at reducing the disparities between Indigenous and non-Indigenous maternal wellbeing. This may help reduce the disparity between people. This will help improve the health, wellbeing, and environment and living situation for your children and for the generations yet to come.

**Privacy and Confidentiality:** the data will be kept confidential and findings will be presented anonymously, which means your identity will not be mentioned while presenting data, so your privacy and confidentiality is maintained. Lastly, community leads will approve any release of our data to the public.

**Contact information:** Please feel free to contact me if you have any questions or concerns: Afroza Sultana. email: [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca); cell phone: 904-417-9212. Feel free to call or text.

**Compensation:** In appreciation of your time and help with this study, you will receive a \$50 gift card in our small gesture of our gratitude to saying thank you! You can withdraw any and all part of your conversation and you can keep the gift card.

**Sample Question/Guideline for Mothers/ Clients/Grand Parents:**

1. Do you have access to clean drinking water? How is the water like (quality) in your community?
2. How does water affect your wellness? And that of your child?
3. How do you feed your baby? How does not having enough or poor quality of water affect feeding your babies (breastfeed/ formula)?
4. (If bottle feeding) Do you worry about the quality of the water when making formula? (If breast feeding) Do you worry about not having enough drinking water for yourself?
5. What does maternal wellbeing mean to you?
6. What are some central services that are essential to ensure maternal wellbeing in your community?
7. How do you think poor quality of water affect maternal wellbeing? Please provide me examples you can use from personal experience.
8. How do you manage daily tasks during times of water insecurity/inaccessibility?
9. Other than water what are other things that may affect maternal wellbeing for you and your community?
10. Would you consider yourself to have a strong relationship with water, as in ceremonial or spiritual? If so, can you please share?
11. How does water not having access to clean water affect spiritual relationship with water?

12. Do you think there is a connection between the health of the water in your community and the health and wellbeing of your body? Please explain.
13. How can the health of the water affect the health of your babies?
14. How does poor quality of water insecurity affect people's mental health?
15. Are there ways water insecurity affect your emotional well-being or mental health? if you wish to describe?
16. In what ways would you hope your children sustain a relationship with water?
17. What recommendations would you make to improve water situations in your community?
18. What your recommendations would you like to see are implemented, and how that are going to change maternal wellbeing?
19. Do you think the government of Canada doing enough to resolve the water issues in your community?
20. Do you think the government of Canada doing enough for ensuring maternal wellbeing in your community?
21. Has the access to clean water situation improved over time or has gotten worse?
22. Why is water important to you?
23. Have we forgot something? Or did you want to tell me something else that I need to know?



## Appendix-C: Interview Guide with Midwives

### **Semi-Structured in-depth interview / FGD Guide with Midwives**

Afroza Sultana co-developed with Julie Wilson

Hello. My name is Afroza Sultana. Thank you for agreeing to this interview. Just to remind you, I am looking to understand the interrelationship between water security and holistic maternal well being. The research is funded by Indigenous Water Quality Tools, supported by both SNEC, HCC and community health lead SNHS. I am working with the health assessment team and Julie Wilson, the supervisor midwife at the Six nations Birthing Center, is my research partner.

The length of the interview will be one hour to maximum one and a half hour long. However, you can choose to stop the interview at anytime, and/or choose not to answer the questions. You can ask for further clarification if any question is not clear to you. You can also choose to withdraw partial or all your information by contacting me via email to [sultaa2@mcmaster.ca](mailto:sultaa2@mcmaster.ca) and/or my cell number [REDACTED]. I will be tape recording our conversation. I will transcribe our recorded conversation. If you wish to read what you said afterwards, I am happy to give you a copy. Please let me know after the interview is over or by email or phone call and I will make it available for you.

I will follow a question guide so I can be on track asking questions related to the research topic: water and maternal wellbeing; however, I will be asking probing questions that may come into my mind related to your discussion.

**Risks:** there are minimal risks associated with the study. For example, you may remember painful memories and get upset during the interviews. If that occurs, we can stop the conversation immediately or change our discussion according to your preference. You are in control during this whole interview and we will follow your lead.

**Benefits:** There are no immediate or individual benefits for participating in this research. However, the findings of the study will be helpful for the Six Nations community and the policy makers. It will help improve maternal wellbeing. It will also help develop policies that seek to incorporate cultural traditions to provide culturally safe maternal services and lead toward sustainable water security. Thus, it will contribute towards the efforts at reducing the disparities between Indigenous and non-Indigenous maternal wellbeing. This may help reduce the disparity between people. This will help improve the health, wellbeing, and environment and living situation for your children and for the generations yet to come.

**Privacy and Confidentiality:** the data will be kept confidential and findings will be presented anonymously, which means your identity will not be mentioned while presenting data, so your privacy and confidentiality is maintained. Lastly, community leads will approve any release of our data to the public.

**Compensation:** A \$50 gift card will be given to you to compensate your time.

**Questions/Guideline for Midwives:**

1. What is the water situation at Birthing Center?
2. Please describe the water situations of your clients.
3. How do you help your clients with those issues?
4. How important is water for your clients' wellbeing?
5. How important is water security for maternal wellbeing?
6. Please share some stories from your experience related to water and maternal wellbeing?
7. How does water insecurity affect you clients' physical and mental well being?
8. How does the water insecurity affect your clients' spiritual wellbeing?
9. How do your services at the Birthing Center promote Indigenous practices?
10. How do you combine Western medicine with Indigenous practices?
11. Tell me about some of the services at the birthing center that are affected by water insecurity in the community.
12. What are some essential uses of water in providing maternal and pregnancy related services in the birthing center?
13. How does water insecurity affect labour and delivery care?
14. How does water insecurity affect prenatal and post natal care?
15. Do you provide any assistance with water to the clients? Please describe.
16. What recommendation would you make to improve the water situations?
17. What are some major obstacles would you find in implanting your recommendation?
18. Do you think the government of Canada doing enough to resolve the water issues in your community?
19. Do you think the government of Canada doing enough to ensure maternal wellbeing in your community?
20. Has the water situation improved over time or has it gotten worse?
21. Is there anything important I missed to ask that you would like to share?

## Appendix D: Guidelines for collecting data from MW charts

### **Information to pull from midwives' chart**

1. Mental health issues
2. Domestic violence or significant relationship issues
3. Urinary Tract Infections especially past and present history
4. Preterm deliveries
5. Fetal anomalies
6. GBS positive swab at 36 weeks
7. Breastfeeding issues such as mastitis
8. C-section incisions infections
9. Uterine infections
10. Perineal infections or poor healing
11. Maternal diet and water intake during pregnancy and postpartum
12. Involvement with child protective services
13. Did she use Traditional Medicines during pregnancy, birth and/or the postpartum period
14. Skin infections/eczema/hives in moms and newborns
15. For clients who had home births – did they labour/birth in water
16. Breastfeeding vs bottle feeding clients? If bottle feeding, ready made, powder or concentrated liquid?
17. Newborn eye infections even if mild
18. Number of children/pregnancies
19. Access to clean drinking water
20. What support did mothers get from family/extended family/community during pregnancy

Appendix-E: Written Consent Form for In-depth Interview (clients/mothers)



McMaster  
University



**“Co-creation of Knowledge about the Impact of Water Insecurity in Maternal Wellbeing in Six Nations of the Grand River.”**

Principal Investigator: Dr. Dawn Martin-Hill  
Mohawk, Six Nations of the Grand River,  
Associate professor, Department of  
Anthropology, McMaster University  
Email: [dawnm@mcmaster.ca](mailto:dawnm@mcmaster.ca)  
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Student Researcher: Afroza Sultana  
PhD candidate, Department of Anthropology  
McMaster University  
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Cellphone: [REDACTED]

**Funding and Support:** This research is funded by the GWF, the department of anthropology, McMaster University, and School of Graduate Studies (SGS fund), McMaster University.

**Team:** I am working with the health assessment team of the “Indigenous Water Quality Tools” along with Julie Wilson, the supervisor midwife at the Six nations Birthing Center, and supported by both SNEC, HCC and community health lead SNHS.

**Purpose of the Study:** As a part of the larger Global Water Future (GWF) project in the Six Nations titled “Co-creation of Indigenous Water Quality Tools,” led by Dr. Dawn Martin-Hill, I am looking to understand how lack of access to clean water affect maternal and reproductive health. How lack of access to clean water may affect physical, mental, emotional, and spiritual health. This research will also serve as my PhD. thesis, which is vital for me to complete my PhD. Degree.

To remind you there are two interlinked aspects in this study: 1. with the midwives’ assistance we will go through your charts for the recent pregnancy and/or any other deliveries that you have delivered through the Six Nations Birthing Center. In your chart we will be looking for any effect that water may have on your recent or previous pregnancy. And 2. One on One in-depth interview.

**Procedures Involved in the Research:** with your permission and with midwives’ assistance we will go through your charts to find and correlation of access to clean water and maternal and reproductive health. If you wish to see findings from your chart you let me (Afroza Sultana) know and they will be available for you. The study also involves one-on-one interview with you.

Interview will be conducted by a member from your own community or by Afroza Sultana. The length of the interview will be one hour to maximum one and a half hour long. However, you can choose to stop the interview at anytime, and/or choose not to answer the questions. You will be asked questions like: Do you have access to clean drinking water? How is the water like (quality) in your community? How does not having enough or poor quality of water affect feeding your babies (breastfeed/ formula)? I will follow a question guide so I can be on track asking questions related to the research topic: water and maternal wellbeing; however, I will be asking probing questions that may come into my mind related to your discussion.

You can ask for further clarification if any question is not clear to you. You can also choose to withdraw partial or all your information by contacting me via email to [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca) and/or my cell number [REDACTED]. I will be tape recording our conversation. I will transcribe our recorded conversation. If you wish to read what you said afterwards, I am happy to give you a copy. Please let me know after the interview is over or by email or phone call and I will make it available for you.

**Privacy:** The data will be kept confidential and findings will be presented anonymously, which means your identity will not be mentioned while presenting data, so your privacy and confidentiality is maintained. Lastly, community leads will approve any release of our data to the public.

**Risks:** There are minimal risks associated with the study. For example, you may remember painful memories and get upset during the interviews. If that occurs, we can stop the conversation immediately or change our discussion according to your preference. Since the interview will be in the Birthing Center, we can seek for midwives' assistance if you wish. You are in control during this whole interview and we will follow your lead.

**Benefits:** There are no immediate, direct, or individual benefits for participating in this research. However, the findings of the study will be helpful for the Six Nations community and the policy makers to better understand water situation and its interrelationship with maternal health. Thus, it will help improve maternal wellbeing. It will also help develop policies that seek to incorporate cultural traditions to provide culturally safe maternal services and lead toward sustainable water security. Thus, it will contribute towards the efforts at reducing the disparities between Indigenous and non-Indigenous maternal wellbeing. This may help reduce the disparity between people. This will help improve the health, wellbeing, and environment and living situation for your children and for the generations yet to come.

**Compensation:** In appreciation of your time and help with this study, you will receive a \$50 gift card in our small gesture of gratitude to saying thank you! You can withdraw any or all part of your conversation and you can keep the gift card.

**Participation and Withdrawal:** Your participation in this study is completely voluntary. It is your choice to be part of the study or not. If you decide to be part of the study, you can decide to stop (withdraw), at any time, even after signing the consent form or part-way through the study. If you decide to withdraw, there will be no consequences to you. You have the option of removing your data from the study OR information provided up to the point where you withdraw will be

kept unless you request that it be removed. If you do not want to answer some of the questions you do not have to, but you can still be in the study. Please note that your decision of participating or not to participating in this research will have NO effect on your care at or relationship with, the Six Nations Birthing Center!

**Availability of the Study Result:** I am hoping to get this study done by approximately December 2021. The anonymous findings of the study will be presented in your community and you will be invited to come. If you wish to get a personal copy instead or like both participate and get a personal copy, please let me know and they will be provided to you!

**Question about the study and Contact information:** If you have questions or need more information about the study itself, please contact me at: Afroza Sultana, email: [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca); cell phone: 905-525-9212. Feel free to call or text. You can also call my supervisor and Principal investigator of this study: Dr. Dawn Martin-Hill, email: [dawnm@mcmaster.ca](mailto:dawnm@mcmaster.ca), phone: 905-525-9140 ext. 24424; or you can also contact supervisor midwife at the Six Nations Birthing center and partner of this research, Julie Wilson, email: [juliewilson@sixnations.ca](mailto:juliewilson@sixnations.ca). Phone: 519-445-4922.

**Participant:**

I have read the preceding information thoroughly. I have had an opportunity to ask questions and all of my questions have been answered to my satisfaction. I understand that if I agree to participate in this study, I may withdraw from the study at any time. I will be given a signed copy of this form. I agree to participate in the study.

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Name	Signature	Date
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**Parson Obtaining Consent:**

I have discussed this study in detail with the participants. I believe the participant understands what is involve with this study.

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Name, Role in study	Signature	Date
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## Appendix -F: Written Consent Form for Grandparents and Midwives



### “Co-creation of Knowledge about the Impact of Water Insecurity in Maternal Wellbeing in Six Nations of the Grand River.”

#### Participant Information and Consent Form for Midwives and Grandparents of the Six Nations Birthing Center

Principal Investigator: Dr. Dawn Martin-Hill  
Mohawk, Six Nations of the Grand River,  
Associate professor, Department of  
Anthropology, McMaster University  
Email: [dawnm@mcmaster.ca](mailto:dawnm@mcmaster.ca)  
Phone: 905-525-9140 ext. 24424

Student Researcher: Afroza Sultana  
PhD candidate, Department of Anthropology  
McMaster University  
Email: [sultaa2@mcmaster.ca](mailto:sultaa2@mcmaster.ca)  
Cellphone: [REDACTED]

**Funding and Support:** This research is funded by the GWF, the department of anthropology, McMaster University, and School of Graduate Studies (SGS fund), McMaster University.

**Team:** I am working with the health assessment team of the “Indigenous Water Quality Tools” along with Julie Wilson, the supervisor midwife at the Six nations Birthing Center, and supported by both SNEC, HCC and community health lead SNHS.

**Purpose of the Study:** As a part of the larger Global Water Future (GWF) project in the Six Nations titled “Co-creation of Indigenous Water Quality Tools,” led by Dr. Dawn Martin-Hill, I am looking to understand how lack of access to clean water affect maternal and reproductive health. How lack of access to clean water may affect physical, mental, emotional, and spiritual health. This research will also serve as my PhD. thesis, which is vital for me to complete my PhD. Degree.

**Procedures Involved in the Research:** The study involves one-on-one interview with you. Interview will be conducted by Janet Homer, a maternity care worker at the Birthing Center or by Afroza Sultana, a PhD. student. Due to Covid-19 pandemic and to ensure your and the researcher’s safety, interview will take place by phone. However, in-person interviews at the Six Nations Birthing Center is possible, if you prefer so. In case of in-person interview at the Six

Nations Birthing Center, we will follow all safety measures related to Covid-19 including maintaining safe social distance. The length of the interview will be one hour to maximum one and a half hour long. However, you can choose to stop the interview at anytime, and/or choose not to answer the questions. You will be asked questions like: do you have access to clean water? How is water like (quality) in your community? How important do you think clean water is to ensure maternal wellbeing? What recommendation would you make to improve the water situations?

I will follow a question guide so I can be on track asking questions related to the research topic: water and maternal wellbeing; however, I will be asking probing questions that may come into my mind related to your discussion.

You can ask for further clarification if any question is not clear to you. You can also choose to withdraw partial or all your information by contacting me via email to [sultaa2@mcmaster.ca](mailto:sultaa2@mcmaster.ca) and/or my cell number [REDACTED] I (Janet Homer) will be tape recording our conversation. Afroza Sultana will transcribe our recorded conversation. If you wish to read what you said afterwards, I am happy to give you a copy. Please let me (Janet Homer) or Afroza Sultana know after the interview is over or by email or phone call and We will make it available for you.

**Privacy:** The data will be kept confidential and findings will be presented anonymously, which means your identity will not be mentioned while presenting data, so your privacy and confidentiality is maintained. Lastly, community leads will approve any release of our data to the public.

**Risks:** There are minimal risks associated with the study. For example, you may remember painful memories and get upset during the interviews. If that occurs, we can stop the conversation immediately or change our discussion according to your preference. Since the interview will be in the Birthing Center, we can seek for midwives' assistance if you wish. You are in control during this whole interview and we will follow your lead.

**Benefits:** There are no immediate, direct, or individual benefits for participating in this research. However, the findings of the study will be helpful for the Six Nations community and the policy makers to better understand water situation and its interrelationship with maternal health. Thus, it will help improve maternal wellbeing. It will also help develop policies that seek to incorporate cultural traditions to provide culturally safe maternal services and lead toward sustainable water security. Thus, it will contribute towards the efforts at reducing the disparities between Indigenous and non-Indigenous maternal wellbeing. This may help reduce the disparity between people. This will help improve the health, wellbeing, and environment and living situation for your children and for the generations yet to come.

**Compensation:** In appreciation of your time and help with this study, you will receive a \$50 gift card in our small gesture of gratitude to saying thank you! You can withdraw any or all part of your conversation and you can keep the gift card.

**Participation and Withdrawal:** Your participation in this study is completely voluntary. It is your choice to be part of the study or not. If you decide to be part of the study, you can decide to



stop (withdraw), at any time, even after signing the consent form or part-way through the study. If you decide to withdraw, there will be no consequences to you. You have the option of removing your data from the study OR information provided up to the point where you withdraw will be kept unless you request that it be removed. If you do not want to answer some of the questions you do not have to, but you can still be in the study. Please note that your decision of participating or not to participating in this research will have NO effect on your employment at or relationship with, the Six Nations Birthing Center!

**Availability of the Study Result:** I am hoping to get this study done by approximately December 2021. The anonymous findings of the study will be presented in your community and you will be invited to come. If you wish to get a personal copy instead or like both participate and get a personal copy, please let me know and they will be provided to you!

**Question about the study and Contact information:** If you have questions or need more information about the study itself, please contact Afroza Sultana. email: [sultaa2@mcmaster.ca](mailto:sultaa2@mcmaster.ca); cell phone: 905-525-9212. Feel free to call or text. Janet Homer, [jhomer@sixnations.ca](mailto:jhomer@sixnations.ca), You can also call Afroza Sultana’s supervisor and Principal investigator of this study: Dr. Dawn Martin-Hill, email: [dawnm@mcmaster.ca](mailto:dawnm@mcmaster.ca). phone: 905-525-9140 ext. 24424; or you can also contact supervisor midwife at the Six Nations Birthing center and partner of this research, Julie Wilson, email: [juliewilson@sixnations.ca](mailto:juliewilson@sixnations.ca). Phone: 519-445-4922.

**Participant:**

I have read the preceding information thoroughly. I have had an opportunity to ask questions and all of my questions have been answered to my satisfaction. I understand that if I agree to participate in this study, I may withdraw from the study at any time. I will be given a signed copy of this form. I agree to participate in the study.

---

Name	Signature	Date
------	-----------	------

**Parson Obtaining Consent:**

I have discussed this study in detail with the participants. I believe the participant understands what is involve with this study.

---

Name, Role in study	Signature	Date
---------------------	-----------	------

## Appendix-G Oral Consent for the SNBC Clients/SN Mothers



### *Co-creation of Knowledge about the Impact of Water Insecurity on Holistic Maternal Wellbeing at Six Nation of the Grand River*

**Researcher: Afroza Sultana, PhD Candidate McMaster University**

#### **Oral Consent Script for Clients**

##### **Introduction:**

Hello. I am Janet Homer/ Afroza Sultana. I am conducting interviews about interrelationship between water and maternal wellbeing. I'm conducting this as part of a larger ongoing Global Water Futures (GWF) research in the community led by Dawn Martin Hill that will also be used as a PhD thesis for Afroza Sultana at McMaster University's department of Anthropology in Hamilton, Ontario. This study has been reviewed and cleared Hamilton Integrated Research Ethic Board (HiREB) and supported by SNEC, HCC, SNHS

**Team:** I am working with the health assessment team of the “Indigenous Water Quality Tools” along with Julie Wilson, the supervisor midwife at the Six nations Birthing Center, and supported by both SNEC, HCC and community health lead SNHS.

I located/found your name and email/phone number at the Six nations Birthing Center searching for present and past clients with and without any challenges with water.

**Procedures Involved in the Research:** With your permission and with midwives' assistance we will go through your charts to explore if there is any correlation between access to clean water and maternal and reproductive health. We will look into your charts to see, for example, your water intake, breastfeeding issues, domestic violence, and any skin irritations. If wish to see a complete list of information that will seek in your charts, please let us know. Also, If you wish to see findings

from your chart or the information that we have pulled out from your chart, you let me (Janet Homer) or Afroza Sultana know and they will be available for you! To avoid any misconception, your midwives will pull those information for Afroza Sultana and audio record them by reading them out loud in a confidential room at the Six Nations Birthing Center. Your name or identity will not be recorded in the recorder. Your identity will be kept confidential in a separate document locked in a cabinet at the Six nations Birthing Center.

The study also involves one-on-one interview with you. Due to Covid-19, the interview will be conducted by Janet Homer or by Afroza Sultana over the phone. In-person interview at Six Nations birthing center may be possible if you prefer and all safety measures related to covid-19 will take place in the case of in-person interview. The length of the interview will be one hour to maximum one and a half hour long. However, you can choose to stop the interview at any time, and/or choose not to answer the questions. You will be asked questions like: Do you have access to clean drinking water? How is the water like (quality) in your community? How does not having enough or poor quality of water affect feeding your babies (breastfeed/ formula)? I will follow a question guide so I can be on track asking questions related to the research topic: water and maternal wellbeing; however, I will be asking probing questions that may come into my mind related to your discussion.

You can ask for further clarification if any question is not clear to you. You can also choose to withdraw partial or all your information by contacting Afroza Sultana via email to [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca) and/or phone or text to Afroza's cell number [REDACTED]. I (Janet Homer) will be tape recording our conversation. Afroza will transcribe your recorded conversation. If you wish to read what you said afterwards, I am happy to give you a copy. Please let me know after the interview is over or by email or phone call and I will make it available for you.

**Risks:** There are minimal risks associated with the study. For example, you may remember painful memories and get upset, feel discomfort or anxious during the interviews. If that occurs, we can stop the conversation immediately or change our discussion according to your preference. We can provide you further assistance at the Birthing center if situations demand.

You do not need to answer questions that you do not want to answer or that make you feel uncomfortable. You are in control during this whole interview and we will follow your lead.

**Benefits:** There are no immediate, direct, or individual benefits for participating in this research. However, the findings of the study will be helpful for the Six Nations community and the policy makers to better understand water situation and its interrelationship with maternal health. Thus, it will help improve maternal wellbeing. It will also help develop policies that seek to incorporate cultural traditions to provide culturally safe maternal services and lead toward sustainable water security. Thus, it will contribute towards the efforts at reducing the disparities between Indigenous and non-Indigenous maternal wellbeing. This may help reduce the disparity between people. This will help improve the health, wellbeing, and environment and living situation for your children and for the generations yet to come.

**Compensation:** In appreciation of your time and help with this study, you will receive a \$50 gift card in our small gesture of gratitude to saying thank you! You can withdraw any or all part of your conversation and you can keep the gift card.

**Participation and Withdrawal:** Your participation in this study is completely voluntary. It is your choice to be part of the study or not. If you decide to be part of the study, you can decide to stop (withdraw), at any time, even after signing the consent form or part-way through the study. If you decide to withdraw, there will be no consequences to you. You have the option of removing your data from the study OR information provided up to the point where you withdraw will be kept unless you request that it be removed. If you do not want to answer some of the questions you do not have to, but you can still be in the study. Please note that your decision of participating or not to participating in this research will have NO effect on your care/employment at or relationship with, the Six Nations Birthing Center!

**Consent questions:**

- Do you have any questions or would like any additional details? [*Answer questions.*]
- Do you agree to participate in this study knowing that you can withdraw at any point with no consequences to you?  
[If yes, begin the interview.]  
[If no, thank the participant for his/her time.]

## Appendix-H : Oral Consent for Grandparents



### ***Co-creation of Knowledge about the Impact of Water Insecurity on Holistic Maternal Wellbeing at Six Nation of the Grand River***

**Researcher: Afroza Sultana, PhD Candidate McMaster University**

(This study has been reviewed by the Hamilton Integrated Research Ethics Board (HIREB). The HIREB is responsible for ensuring that participants are informed of the risks associated with the research, and that participants are free to decide if participation is right for them. If you have any questions about your rights as a research participant please call the Office of the Chair, Hamilton Integrated Research Ethics Board at 905.521.2100 x 42013.)

### **Oral Consent Script for Grandparents**

#### **Introduction:**

Hello. I am Janet Homer/ Afroza Sultana. I am conducting interviews about interrelationship between water and maternal wellbeing. I'm conducting this as part of a larger ongoing Global Water Futures (GWF) research in the community led by Dawn Martin Hill that will also be used as a PhD thesis for Afroza Sultana at McMaster University's department of Anthropology in Hamilton, Ontario. This study has been reviewed and cleared Hamilton Integrated Research Ethic Board (HiREB) and supported by SNEC, HCC, SNHS

**Team:** I am working with the health assessment team of the "Indigenous Water Quality Tools" along with Julie Wilson, the supervisor midwife at the Six nations Birthing Center, and supported by both SNEC, HCC and community health lead SNHS.

I located/found your name and email/phone number at the Six nations Birthing Center searching for grandparents that volunteer at the Six nations Birthing Center.

**Procedures Involved in the Research:** The study involves one-on-one interview with you. Due to Covid-19, the interview will be conducted by Janet Homer or by Afroza Sultana over the phone. In-person interview at Six Nations birthing center may be possible if you prefer and all safety measures related to covid-19 will take place in the case of in-person interview. The length of the interview will be one hour to maximum one and a half hour long. However, you can choose to stop the interview at any time, and/or choose not to answer the questions. You will be asked questions like: Do you have access to clean drinking water? How is the water like (quality) in your community? How important do you think water is to ensure maternal wellbeing? I will follow a question guide so I can be on track asking questions related to the research topic: water and maternal wellbeing; however, I will be asking probing questions that may come into my mind related to your discussion.

You can ask for further clarification if any question is not clear to you. You can also choose to withdraw partial or all your information by contacting Afroza Sultana via email to [sultaa2@mcmaster.ca](mailto:sultaa2@mcmaster.ca) and/or phone or text to Afroza's cell number [REDACTED] I (Janet Homer) will be tape recording our conversation. Afroza will transcribe your recorded conversation. If you wish to read what you said afterwards, I am happy to give you a copy. Please let me know after the interview is over or by email or phone call and I will make it available for you.

**Risks:** There are minimal risks associated with the study. For example, you may remember painful memories and get upset, feel discomfort or anxious during the interviews. If that occurs, we can stop the conversation immediately or change our discussion according to your preference. We can provide you further assistance at the Birthing center if situations demand.

You do not need to answer questions that you do not want to answer or that make you feel uncomfortable. You are in control during this whole interview and we will follow your lead.

**Benefits:** There are no immediate, direct, or individual benefits for participating in this research. However, the findings of the study will be helpful for the Six Nations community and the policy makers to better understand water situation and its interrelationship with maternal health. Thus, it will help improve maternal wellbeing. It will also help develop policies that seek to incorporate cultural traditions to provide culturally safe maternal services and lead toward sustainable water security. Thus, it will contribute towards the efforts at reducing the disparities between Indigenous and non-Indigenous maternal wellbeing. This may help reduce the disparity between people. This will help improve the health, wellbeing, and environment and living situation for your children and for the generations yet to come.

**Compensation:** In appreciation of your time and help with this study, you will receive a \$50 gift card in our small gesture of gratitude to saying thank you! You can withdraw any or all part of your conversation and you can keep the gift card.

**Participation and Withdrawal:** Your participation in this study is completely voluntary. It is your choice to be part of the study or not. If you decide to be part of the study, you can decide to stop (withdraw), at any time, even after signing the consent form or part-way through the study. If you decide to withdraw, there will be no consequences to you. You have the option of removing your data from the study OR information provided up to the point where you withdraw will be kept unless you request that it be removed. If you do not want to answer some of the questions you do not have to, but you can still be in the study. Please note that your decision of participating or not to participating in this research will have NO effect on your care/employment at or relationship with, the Six Nations Birthing Center!

**Consent questions:**

- Do you have any questions or would like any additional details? [*Answer questions.*]
- Do you agree to participate in this study knowing that you can withdraw at any point with no consequences to you?  
[If yes, begin the interview.]  
[If no, thank the participant for his/her time.]

Name of the participant :

Date:

**Parson Obtaining Consent:**

I have discussed this study in detail with the participants. I believe the participant understands what is involve with this study.

---

Name, Role in study

Signature

Date

## Appendix-I: Invitation Brochure



You are invited to participate in research Titled: **“Co-creation of Knowledge about the Impact of Water Insecurity in Maternal Wellbeing in Six Nations of the Grand River.”**

### **About the researcher:**

Name: Afroza Sultana, a Ph.D. student at the Department of Anthropology, McMaster University.

Supervisor: Dr. Dawn Martin-Hill, department of anthropology and Indigenous Studies Program, McMaster University

Community Lead: Julie Wilson, Six Nations Birthing Center.

Midwives: Laurie Jacobs, Sharon Smoke, Phyllis Hill, and Melodie Smith.

Contact information of the researcher: [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca); cellphone: 905-417-9212

**Purpose of the Study:** As a part of the ongoing Global Water Futures research in the Six Nations community led by Dr. Dawn Martin-Hill, this research will help us to identify how water insecurity affect maternal wellbeing.

**Objectives of the Research:** We are hoping to understand the water situation in the community and how it affects women personally, and how we could improve the present water situations for the community and for the generations to come. We also want to understand the connection between water and spirituality. **Through this research I aim to understand** the ways water insecurity in Six Nations community affects holistic maternal wellbeing, **and how** water insecurity affects the Six Nations' reclamation of traditional practices related to maternal wellbeing. I also want to examine the importance of water security in providing physically and culturally safe and appropriate maternal services to the Six Nations women.

**Risks:** There are minimal risks associated with the study. For example, you may remember painful memories and get upset during the interviews. If that occurs, we can stop the conversation immediately or change our discussion according to your preference. You are in control during this whole interview and we will follow your lead.

**Benefits:** There are no immediate or individual benefits for participating in this research. However, the findings of the study will be helpful for the Six Nations community and the policy makers. It will help improve maternal wellbeing. It will also help develop policies that seek to incorporate cultural traditions to provide culturally safe maternal services and lead toward



sustainable water security. Thus, it will contribute towards the efforts at reducing the disparities between Indigenous and non-Indigenous maternal wellbeing. This may help reduce the disparity between people. This will help improve the health, wellbeing, and environment and living situation for your children and for the generations yet to come.

**Compensation:** In appreciation of your time and help with this study, you will receive \$50 gift card in our small gesture of our gratitude to saying thank you! You can withdraw any and all part of your conversation and you can keep the gift card.

**Confidentiality:** All information collected will be confidential. The findings will be presented anonymously, which means only data will be presented but your name will not be mentioned to keep your privacy.

**Contact information:** Please feel free to contact me if you have any questions or concerns: Afroza Sultana. email: [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca); cell phone: 905-417-9212. Feel free to call or text.

**Consent:** The research has two parts: 1. with the midwives' assistance we will go through your charts for the recent pregnancy and any other deliveries that you have delivered through the Six Nations Birthing Center. In your chart we will be looking for any affect that water insecurity has on your recent or previous pregnancy.

We will also contact you for a one on one interviews for a 1 hour to 1:30 hour at the Six Nations Birthing Center. In the one on one interview you will be asked questions related to water and maternal wellbeing. If you wish to participate in the research and permit us to contact you, please provide your name and preferred contact information below or by contacting the researcher directly; please either text or call to Afroza Sultana at 905-417-9212 or email me to [sulaa2@mcmaster.ca](mailto:sulaa2@mcmaster.ca). if I do not answer the phone right way please leave a message. You can also contact in person or call to the Six Nations Birthing Center at 905-  
!

Please note that this participation or your decision to not to participate in this research will have no effect on your care at, or relationship with, the Six Nations Birthing Center!

If you wish to participate in the research

I have read and understood the purpose of the research and associated risks and benefits and wish to be connected for further participation in the research!

Name (please Print):

Signature:

Preferred ways to contact:

Date:

## Appendix-J: Oath of Confidentiality

### **Oath of Confidentiality**

#### Oath of Confidentiality for Research Assistant/community navigator

I understand that as a research assistant or community navigator for a study being conducted by Dawn Martin-Hill, the Principal Investigator and Afroza Sultana, the student researcher, of the Department of Anthropology at McMaster University confidential information will be made known to me.

I agree to keep all information collected during this study confidential and will not reveal by speaking, communicating or transmitting this information in written, photographic, sound, electronic (disks, tapes, transcripts, email) or in any other way to anyone outside the research team.

I will tell the researchers as soon as I discover that I know any participant either as a family member, friend, or acquaintance or in any other way; so that the researcher can take the appropriate steps to manage or minimize any conflicts of interest that might occur because of any dual roles I may have.

Name: \_\_\_\_\_ Signature: \_\_\_\_\_  
(Please Print)

Date: \_\_\_\_\_

Witness Name: \_\_\_\_\_ Witness Signature: \_\_\_\_\_  
(Please Print)

Appendix K: TCPS 2: CORE Certificate



## Appendix-L: HCC Approval of Larger Ohneganos Research Project



### Six Nations "Iroquois" Confederacy GRAND RIVER COUNTRY

August 15, 2019

Ohswegen, Ontario

Letter of Support: Ohneganos – Indigenous Ecological Knowledge, Training and Co-creation of Mixed Method Tools.

Attn: Research Ethics Council

Nyaweh Sgeno (greetings),

On behalf of the Haudenosaunee Confederacy Leadership, we send greetings and hope all is well as you receive our words of support for the *Ohneganos- Indigenous Ecological Knowledge, Training and Co-creation of Mixed Method Tools*, research project, Global Water Futures Research Fund. We have provided verbal support for the Co-creation of Indigenous Water Quality Tools and understand the two GWF projects are responding to the needs of Six Nations community in water quality and health.

Six Nations is experiencing a number of water issues caused by climate change, resulting in severe environmental, social, and health concerns. All six Haudenosaunee languages are endangered, and with Ohneganos project's aim to create science language material/resources and tools in multiple mediums in Mohawk, Cayuga and English, we see a great opportunity for intergenerational learning from elders, knowledge keepers and youth/students.

Based on the significance of the work already done by Dr. Dawn Martin-Hill (lead) and her team with respect to raising awareness on the poor quality of water in Six Nations and the consequent environmental, social and health concerns, we look forward to working together to complete the visions of this project. A living bilingual archive conclusive of Haudenosaunee linguistic mapping has never been done before, that with a virtual reality exhibit of the Grand River will help to awaken community as to how far we have come and where we must go to create real lasting change. We appreciate the value this would bring to our community and those coming generations who will inherit our choices of today.

We hope to continue to work with Dawn, through the Haudenosaunee Environmental Health Task Force, McMaster University and the local schools to offer support and help to ease the minds of the our youth regarding this growing climate crisis.

Importantly, we encourage our community of SN to support this project and participate in all aspects especially health surveys and water testing to ensure the safety of their families.

---

2634 Sixth Line, Ohswegen, ON NOA 1M0  
Email: [1749resource@gmail.com](mailto:1749resource@gmail.com) Phone: 905.765.1749

If any further material is required or other information is needed, please do not hesitate to contact us. We look forward to your approval of this next stage in this project.

In Peace and Friendship,



Hohahes, Leroy Hill  
Council Secretary,  
Haudenosaunee Confederacy Council  
Six Nations' Grand River Territory

Appendix-M: Six Nations Band Council Approval of Larger project



File #: RE18-001[C]

Dr. Dawn MARTIN-HILL  
RR#2, PO Box 472  
Ohsweken, ON  
N0A 1M0

DUPLICATE   
E-MAILED JAN 19 2018

January 4, 2018

To Whom it may concern;

I am writing to you on behalf of the Six Nations Research Ethics Committee to confirm the status of your application. Please be advised that your application to the Six Nations Research Ethics Committee, regarding your project entitled "Co-creation of Indigenous Water Quality Tools", was received by the Six Nations Research Ethics Committee prior to its regular meeting of November 21, 2017. The application was reviewed by the committee and, after deliberation, was recommended to Six Nations Elected Council for approval by the Research Ethics Committee, as follows:

***EC#02-11/21/2017:** "Moved by Andrew Joseph, Seconded by Lee-ann Blackbird that the Six Nations Research Ethics Committee recommends to Six Nations Elected Council to approve Dawn Martin Hill 'Co-Creation of Indigenous Water Quality Tools' preliminary Ethics application on contingent, conditional approval that will allow the researcher to start a community consultation process. Methodologies, additional consents, data collection questionnaires and recruitment materials shall be submitted to the Six Nations Research Ethics Committee for further approval once the consultation process has produced substantive actionable plans."*

**ALL IN FAVOUR**

**CARRIED**

Subsequent to this recommendation, an Executive Summary and Briefing Note for your preliminary research proposal were submitted to Six Nations Elected Council for their information and decision on the matter. Six Nations Elected Council passed the following SNCRs approving the project preliminarily.

***ICGC#714-12/12/2017:** Moved by Melba Thomas, and Seconded by Mark Hill that the Six Nations Elected Council approve Dawn Martin Hill, "Co-Creation of Indigenous Water Quality Tools" Ethics application on contingent conditional approval that will allow the researcher to start community consultation process. Additional consents, data collection questionnaires and recruitment materials shall be submitted to the Six Nations Research Ethics Committee for further approval once the consultation process has produced substantive actionable plans.*

**ALL IN FAVOUR**

**CARRIED**

ICGC#716-12/12/2017: Moved by Melba Thomas and Seconded by Mark Hill that the Six Nations Elected Council WAIVE SECOND READING on resolutions **714&715-12/12/2017.**

**ALL IN FAVOUR**

**CARRIED**

It is my pleasure to inform you that the preliminary phase of your research project, community consultation and engagement, has been approved and may commence immediately (after all necessary approvals have been acquired). I have attached a copy of the, "Conducting Research at Six Nations" policy for your reference. It would also be prudent to remember that, because this is only a preliminary approval, it is the Committee's expectation that a further Application to Conduct Research will be submitted for Committee approval once this initial process has been completed.

Should you have any questions or concerns regarding the above, or during the conduct of your approved consultations, please do not hesitate to contact the Research Ethics Administrative Coordinator at the contact information provided below.

Good luck with your research endeavours within our community.

Regards,



**Andrew Wm Joseph**

- Junior Policy Analyst

- Research Ethics Administrative Coordinator

Phone: 5194452205 x3229

Email: [ajoseph@sixnations.ca](mailto:ajoseph@sixnations.ca)

Fax: 519-445-4208

Appendix-N: Study Key

Study Title: **“Co-creation of Knowledge about the Impact of Water Insecurity in Maternal Wellbeing in Six Nations of the Grand River.”**

**Study Key**

No.	Study ID#	Full Name	Sex	Age	Affiliation to Six Nations (SN)	Email	Phone Number	Number of Children	Years of Residence at Six Nations (SN)	Parental Status (single parent or living with a partner)?	Access to Clean Drinking Water in the Household? (Yes/No)
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											
11.											
12.											
13.											
14.											
15.											
16.											
17.											
18.											
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## Appendix-O: Ethics Approval From the HiREB



Aug-24-2020

**Project Number:** 9440

**Project Title:** Co-creation of Knowledge about the Impact of Water Insecurity on Holistic Maternal Wellbeing at Six Nations of the Grand River

**Principal Investigator:** Dr. Dawn Martin-Hill

This will acknowledge receipt of your letters dated June 10, 2020; July 24, 2020 and August 14, 2020 which enclosed revised copies of the Information Consent Forms, Invitation Brochure, Email/Telephone Script, Interview Guides, Protocol and the Application Form along with a response to the additional queries of the Board for the above-named study. These issues were raised by the Hamilton Integrated Research Ethics Board at their meeting held on April 1, 2020. Based on this additional information, we wish to advise your study had been given **final approval** from the full HiREB.

The following documents have been approved on both ethical and scientific grounds:

Document Name	Document Date	Document Version
Method unpacking	May-04-2020	1
Unpacking recruitment_sultana_afroza	May-04-2020	1
Sample of questions that will be sought from the clients	May-06-2020	1
appendix1_outh of confidentiality	May-30-2020	1
Study Key_sultana_afroza	Jul-20-2020	1
clearcopy_in-depthinterviewguide_with_midwives_sultana_afroza	Mar-07-2020	2
in-depthinterviews_withgrandparents_sultana_afroza	Jul-20-2020	1
informationtopull_midwives/charts_sultana_afroza	Jul-10-2020	1
clearcopy_brochure invitation_afroza_sultana_tracked	May-10-2020	3
clearcopy_email or telephone communication	Jun-10-2020	2
clearcopy_oralconsent_clients_afroza_sultana	Jun-23-2020	3
clearcopy_oralconsent_grandparents_sultana_afroza	Jul-21-2020	2
clearcopy_oralconsentform_midwives_afroza_sultana	Jul-21-2020	2
clearcopy_writtcnconsen_form_for midwives_sultana_afroza	Jul-21-2020	2
clearcopy_Writtcnconsent_grandparents_sultana_afroza	Jul-21-2020	2
clearcopy_writtcnconsent_with clients_sultana_afroza	May-29-2020	4
clearcopy_revised_protocol_sultana_afroza	Jun-12-2020	3
clearcopy_indepth interviewguide_withclients_sultana_afroza	Mar-08-2020	3

The following documents have been acknowledged:

Document Name	Document Date	Document Version
DMH teps2_core_certificate	Jan-21-2018	pdf
teps2_core_certificate-Afroza Sultana	Apr-18-2020	1
Six Nations ethics approval 2018	Mar-14-2018	1
HCC_approval	Aug-15-2019	1
Six_Nations_Ethics_Committee_Preliminary Approval_4JAN18	Jan-04-2018	1
julir-Wilson_letter_of_support	Feb-10-2020	word document
Sultana_afroza_budget	Feb-14-2020	word document

In light of the current COVID-19 pandemic, while this study has been reviewed by HiREB and given final approval status, the actual conduct of the

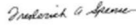
research needs to be performed in accordance with institutional restrictions with respect to Coronavirus (which means new subjects cannot be actively enrolled and most research staff will be limited with respect to access to other data sources for the time being).

**Please Note:** All consent forms and recruitment materials used in this study must be copies of the above referenced documents.

We are pleased to issue final approval for the above-named study for a period of 12 months from the date of the HIREB meeting on April 1, 2020. Continuation beyond that date will require further review and renewal of HIREB approval. Any changes or revisions to the original submission must be submitted on a HIREB amendment form for review and approval by the Hamilton Integrated Research Ethics Board.

**PLEASE QUOTE THE ABOVE REFERENCED PROJECT NUMBER ON ALL FUTURE CORRESPONDENCE**

Sincerely,



Dr. Frederick A. Spencer, MD  
Chair, Hamilton Integrated Research Ethics Board

The Hamilton Integrated Research Ethics Board (HIREB) represents the institutions of Hamilton Health Sciences, St. Joseph's Healthcare Hamilton, Research St. Joseph's-Hamilton, and the Faculty of Health Sciences at McMaster University and operates in compliance with and is constituted in accordance with the requirements of The Tri-Council Policy Statement on Ethical Conduct of Research Involving Humans, The International Conference on Harmonization of Good Clinical Practices, Part C Division 5 of the Food and Drug Regulations of Health Canada, and the provisions of the Ontario Personal Health Information Protection Act 2004 and its applicable Regulations. For studies conducted at St. Joseph's Healthcare Hamilton, HIREB complies with the Health Ethics Guide of the Catholic Alliance of Canada

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## Appendix -P: Study Completion Letter From the HiREB



Hamilton Integrated Research Ethics Board

### Study Completion Acknowledgement

Mar-23-2022

HiREB Project #: 9440

Project Submission Title: Co-creation of Knowledge about the Impact of Water Insecurity on Holistic Maternal Wellbeing at Six Nations of the Grand River

Local Principal Investigator: Dr. Dawn Martin-Hill

Your Study Completion Report has been reviewed and accepted by the Hamilton Integrated Research Ethics Board Executive.

A handwritten signature in black ink, which appears to read "Frederick A. Spencer".

Dr. Frederick A. Spencer, MD  
Chair, Hamilton Integrated Research Ethics Board

The Hamilton Integrated Research Ethics Board (HiREB) represents the institutions of Hamilton Health Sciences, St. Joseph's Healthcare Hamilton, Research St. Joseph's-Hamilton, and the Faculty of Health Sciences at McMaster University and operates in compliance with and is constituted in accordance with the requirements of: The Tri-Council Policy Statement on Ethical Conduct of Research Involving Humans; The International Conference on Harmonization of Good Clinical Practices; Part C Division 5 of the Food and Drug Regulations of Health Canada, and the provisions of the Ontario Personal Health Information Protection Act 2004 and its applicable Regulations; For studies conducted at St. Joseph's Healthcare Hamilton, HiREB complies with the Health Ethics Guide of the Catholic Alliance of Canada

## **Appendix Q: The Digital Story**

As a reciprocity, I have created a Digital Story (DS) (appendix Q) highlighting the goals and services provided by the SNBC for the SN community, which could be used on their official website to help spread the information to the larger SN community and beyond! It is submitted with this thesis. Below is a link to the DS:

[https://drive.google.com/file/d/1ko16IxonrllR4caze1UZK5Mth\\_UrQBSb/view?usp=sharing](https://drive.google.com/file/d/1ko16IxonrllR4caze1UZK5Mth_UrQBSb/view?usp=sharing)