Histories, Bodies, Stories, Hungers: The Colonial Origins of Diabetes as a Health Disparity among Indigenous Peoples in Canada

by

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Abstract

Indigenous people in Canada suffer disproportionately from health disparities, such as obesity and type 2 diabetes, and I have explored these health disparities among Indigenous peoples through the lens of embodiment. Framed within the Developmental Origins of Health and Disease (DOHaD) model, and applying a biocultural ethnographic approach combining colonial histories, published epidemiological and anthropometric data, and thematic analysis of Tlicho pregnancy and birth stories, I investigated the impact of the injustices of patriarchal colonialism on Indigenous maternal bodies. I have revealed that diabetes as a health disparity among Indigenous peoples reflects the maternal embodiment of colonial injustices and reproductive oppressions. These embodied colonial oppressions are manifest in compromised reproductive biologies and, subsequent intergenerational maternal health disparities, which underlie the explosion of high prevalence of diabetes among Indigenous peoples in Canada. However, a sole focus on measurable health disparities medicalizes the colonial reproductive oppressions and inequities Indigenous women have experienced and as health inequities underlie health disparities, the issue is one of social justice. As reproductive justice was an inherent feature in Indigenous communities reflecting local worldviews and ways of knowing, by applying a reproductive justice lens to Indigenous maternal wellbeing not only may Indigenous maternal bodies begin to heal and end the intergenerational transmission of compromised reproductive biologies, but women's knowledge and the traditions, ceremonies, and rituals around pregnancy and birth may be reclaimed allowing for a process of maternal self-determination and decolonization of overall maternal wellbeing.

Preface

This thesis is an original work by Leslie Dawson. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board (Study ID MS2_Pro00033105 “Pregnancy Stories Across the Generations”) on October 17th, 2012. This research was approved by the Tlicho Government’s Chiefs Executive Council on June 26, 2012 and I received my scientific research licence (No. 15302), issued by the Aurora Research Institute (Aurora College, Inuvik, Northwest Territories), on August 1st, 2013.

Dedication

This thesis is dedicated to the memory of my mother,

Denise (Monson) Dawson (1936-2007).

I miss your laughter.

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I would like to thank my supervisor, Dr. Helen Vallianatos, and my PhD Supervisory committee members, Dr. Nancy Gibson and Dr. Noreen Willows, for their endless support, guidance, and incredible feedback on my doctoral research. I’ve learned so much and would not have been able to produce this work without them. I would also like to thank members of my defense committee, Dr. Sandra Garvie-Lok and Dr. Naomi Adeson (my external reader), for taking the time to provide feedback, and undoubtedly, strengthen my doctoral work. Thank you as well to Dr. Kathleen Lowery for chairing my defense.

I am also grateful to the Tlicho Government for its support of my research and fieldwork as well as providing me with a Tlicho translator. I would like to thank the members of the Community Action Research Team (CART) for helping me connect with members of the communities of Behchoko and Whati, and thank you to Anita and Theresa for opening your homes to me! I would also like to thank the Healing Wind Advisory Committee (HWAC) for their guidance and validation of my thematic analysis of the pregnancy and birth stories. And, of course, thank you to the women of the Tlicho region who shared their pregnancy and birth stories with me.

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Chapter 1

Introduction:

Addressing Charlie Snowshoe's Question

In July 2009, I attended the *14th International Congress on Circumpolar Health* in Yellowknife, NWT. Given my research interests in the impact of social inequality on nutritional health, I attended the session on *Indigenous Peoples Foods Systems for Health* (Centre for Indigenous Nutrition and Environment, McGill University). Following a presentation revealing a trend for improved anthropometric measures (i.e., healthy body mass indices) with a return to a traditional Gwich'in diet, Elder Charlie Snowshoe asked a question of the audience when typical academic conference structure would see presenters taking questions. The question he asked was straightforward: "What really causes diabetes"? Noting that his generation has diabetes despite the fact they were raised on the land with traditional foods and lots of physical activity, his words were contrary to the model presented encouraging traditional foods for nutritional health. What really causes diabetes? I address Charlie Snowshoe's question through an investigation of the origins of diabetes as developmental, and, more importantly, as reflecting colonial histories of social and political economic marginalization where diabetes among Indigenous peoples reflects the intergenerational embodiment of colonization. In my PhD research, I explore the relationship between colonization, maternal health, and diabetes among Indigenous peoples in Canada. Viewing diabetes as developmental in origin, I investigate the embodiment of the lived experiences of colonization through a biocultural ethnographic approach involving colonial histories, published anthropometric and epidemiological data, and thematic narrative analysis of pregnancy and birth stories from Tlicho women of different generations to reveal how social and political economic factors impact maternal and prenatal health within cultural contexts specific in time and space.

Diabetes among Indigenous Peoples in Canada

The health of Indigenous peoples is worse than that of non-Indigenous Canadians for almost every health measure (Health Canada, 2003), and there is considerable evidence that many health problems experienced by Indigenous peoples are related to poor nutritional health: anemia, dental caries, obesity, heart disease and type II diabetes (from here on referred to as diabetes) (Kuhnlein *et al.* 2001). In a discussion of the health impact of inequity on Indigenous peoples in Canada, Adelson (2005) explains that although diabetes was once unknown to Indigenous populations over the last 25 years this chronic disease has grown to become a major health concern for Indigenous peoples.The prevalence of diabetes among Indigenous peoples is three to five times the Canadian national average (Dyck et al., 2010; Harris et al., 2011), with prevalence highest among women and those living on reserve, although the prevalence rates vary across Indigenous populations. The Public Health Agency of Canada (2011) reported a diabetes prevalence rate of 17.2% among on-reserve First Nations people, 10.3% off-reserve First Nations peoples, and 7.3% among Métis. The prevalence increases rapidly with age and is observed increasingly among children and adolescents (Dyck et al., 2010; Jacklin et al., 2017; Young et al., 2000). As Adelson (2005) states, given these statistics, diabetes should be a significant health funding and research priority for Indigenous leadership in Canada. However, as Willows (2005) notes, although many issues seem to be related to a poor diet, data on Indigenous populations are limited in scope with a narrow geographic and subject focus, including only a few Indigenous communities, a concern echoed by Young (2003) in his survey of the literature on Indigenous health. Furthermore, information is primarily epidemiologic (i.e., quantitative) and there is limited discussion of the determinants that contribute to health status. Richmond and Ross (2009) discuss criticisms of a population health approach; namely, the framework's inability to consider the theoretical contexts within which the determinants of health and social inequalities are produced and structured (Labonte *et al.,* 2005; Coburn *et al*., 2003) and relate these shortcomings to a "fixation with positivist methods, including large-scale survey analysis and categorical approaches" (Richmond and Ross, 2009, p. 405; Labonte and Robertson, 1996). As Richmond and Ross (2009, p. 410) sum up,

> "Perhaps most significantly, in the context of reducing health inequality in Indigenous context, health policies, health programmes and future health research on the determinants of health in these populations cannot advance without blatant recognition of the complex historical, political and social context that has shaped current patterns of health and social inequality and allowed them to grow to such appalling proportions."

I address these concerns through a biocultural theoretical perspective, and in particular I apply the biocultural synthesis, to investigate the embodiment of colonization as the basis for the unequal burden of diabetes among Indigenous peoples in Canada. As Levins and Lewontin (1998, p. xv) note, "Anthropology, properly construed, is not separable into the physical and the social. Anthropology is at the nexus of the biological and the social, a biocultural synthesis spanning an enormous range of comparative, historical, and dynamic material". Naomi Adelson (2005) has investigated the *embodiment* of inequity of Indigenous peoples in Canada as revealed in health disparities, which are seen as directly or indirectly associated with social, economic, cultural, and political inequities, and therefore, as Adelson (2005, p. S45) states, in the analyses of such disparities, “it is important to navigate the interstices between the person and the wider social and historical contexts as it is to pay attention to the individual effects of inequity”. By contextualizing published epidemiological and anthropometric data within colonial histories, further illuminated by the lived experiences of Indigenous women as revealed in pregnancy and birth stories, I explore the colonial origins of diabetes as a health disparity among Indigenous peoples in Canada.

Intersecting the Biological and the Social: A Biocultural Perspective

A biocultural approach reflects a holistic perspective to understand how biology, culture, and the environment interact to shape particular phenomena. The inherent holistic framework allows for the exploration of a wide range of research topics across time and the application of a variety of perspectives employing different measures (e.g., childhood growth and development, or reproductive success). For instance, paleoanthropologists have applied an evolutionary perspective within a biocultural framework to investigate how and why brain size and complexity increased through evolutionary history; namely, the interaction of behavior (tool manufacture) and biology (brain size and complexity) through evolutionary time (Wynn, 2002). An alternative application of the evolutionary perspective can be seen in Profet’s (1992) proposal that morning sickness evolved as an adaptation to plant toxins during the Plio-Pleistocene epochs (~5 mya – 10,000ya): Women who vomited plant substances that could harm the developing fetus had greater reproductive success. Biocultural studies can also apply an ecological perspective on human adaptation: For example, investigations into why some populations have retained the ability to digest lactose in adulthood have lead to a connection between a high degree of lactose tolerance among populations of European or west African ancestry reflecting a history of dairying (Simoons, 1978).

Not all biocultural anthropologists, however, apply evolutionist or adaptationist approaches: “Rather than explaining how a particular trait is adaptive (and selected for by natural selection), biocultural anthropologists frequently find that it is *human plasticity* [or the body’s physiological ability to adapt to environmental stressors] that has evolved through natural selection, allowing for changes in a particular trait across space and time in relation to particular stressors” (Sievert, 2006, p. 20). For instance, changes in age at menarche in response to changes in nutritional excess or deficits (Bogin, 1999), or social or psychological factors associated with stress and disease outcomes such as depression or hypertension (e.g., Dressler, 1996). Within this approach various environmental stressors (e.g., nutritional or psychological) shape human biology through plasticity resulting in a physical or measurable outcome (e.g., alterations in growth and development, or in disease prevalence).

The integration of social and political-economic perspectives into human biology, and the plasticity of physiological responses to changing environments, is yet another application of the biocultural approach. In what Goodman and Leatherman (1998, p. 5) term the “biocultural synthesis”, reflecting a need to bridge the chasm between biology and culture, a key interest lies in how sociocultural and political economic processes affect human biologies and in turn how compromised biologies further threaten social fabric; rather than a focus on genetic adaptation, biology and culture are seen as “dialectically intertwined”. A particular focus is on the biological consequences of poverty, inequity, and inequality (i.e., a biology of poverty), and by integrating perspectives from social and political-economic anthropology with ecological and adaptationist perspectives from biological anthropology, the impact on human biology by factors such as the control, production, and distribution of material resources, ideology and power can be investigated (Leatherman and Goodman, 1997). Following Goodman and Leatherman's (1998) lead, I investigate the impact of colonization and its related oppressions on maternal health of Indigenous peoples through a biocultural assessment of growth and development, ultimately culminating in the high prevalence of obesity and diabetes among Indigenous peoples in Canada. My approach not only considers biological and cultural influences on health, but more importantly, the *interaction* of socio-cultural, historic, and biological factors in the creation of health status. Inherent in this biocultural approach is a political economic perspective on health which reflects a holistic integration of politics, economics, history, and society. Thus, the biocultural synthesis, with an inherent focus on political economy, allows an intersection of social history and the body to explore health disparities such as obesity and diabetes among marginalized groups, such as Indigenous Canadians.

To investigate the impact of social, political economic, and colonial historic forces on Indigenous bodies, I apply the *Developmental Origins of Health and Disease* (DOHaD) framework. As will be elaborated on in subsequent chapters, the DOHaD model posits that factors impacting the maternal environment (e.g., undernutrition) can alter fetal development (i.e., fetal programming) and result in the onset of chronic diseases (e.g., obesity and diabetes) later in life. As Gluckman and Hanson (2010) explain, the *Developmental Origins of Health and Disease* (DOHaD) model developed out of Barker and colleagues' concept of "fetal origins of adult disease" (FOAD) which focused on "fetal programming" based in the relationship of birth size and subsequent risk of cardiovascular disease and type II diabetes. Although FOAD concept was initially received with criticism with some arguing for a genetic basis of disease and others for a reassessment of epidemiological interpretations, as Gluckman and Hanson (2010, p. 1) note;

> "With the wisdom of hindsight, we can see that some of the reluctance to accept the FOAD concept arose precisely from the problems FOAD addressed: namely that the underlying causes of the common chronic diseases of adulthood (heart disease, diabetes, stroke) could not be explained purely in terms of genetic inheritance or life style factors, such as diet or exercise. That instead, gene-environment interactions would hold the clues."

As the concept of FOAD expanded, the term "fetal origins of adult disease" was replaced with "Developmental Origins of Health and Disease" (DOHaD). Although a key focus is still on environmental factors (e.g., maternal nutrition or maternal body composition) impacting fetal development, the timing has been broadened to include events prior to conception as well as after birth thus initiating new measures focusing on maternal and child health. As Gluckman and Hanson (2010, p. 2) sum up, the concept of "FOAD has therefore been replaced with DOHaD and an international society was formed in 2003 to promote this new endeavor". Although the underlying mechanisms of programming within the DOHaD model are yet to be fully understood, they may include epigenetic change, changes in the growth and function of tissues and organs relative to body size, changes in vascularity and in vascular endothelial cell function due to a poor intrauterine environment, and permanent changes in homeostatic regulatory function (Gluckman and Hanson, 2010). Furthermore, it is now understood that programmed effects may be transmitted intergenerationally (Drake and Lui, 2011).

Due to the influence of the DOHaD model in human health, clinical practice increasingly focuses on maternal health prior to and during pregnancy as well as postnatally (i.e., early childhood health) (Gluckman and Hanson 2010). However, as Hoke and McDade (2015, p. 190) note, although "research on DOHaD has lead to increased attention to and intervention during developmental periods…the effectiveness of the interventions may be limited to a lack of contextual depth…it is rarely situated within social, cultural, or political economic context of the population examined". To investigate the contexts within which colonial histories have produced the developmental origins of health disparities (as evidenced in epidemiological and anthropometric data) among Indigenous peoples in Canada, I employ what Wiley (2004, p. 21) refers to as *biocultural ethnography*, a "new anthropological genre that details the larger social, cultural, and ecological context of human biology". As Roberts (2015) further explains, by combining biological and ethnographic data more complex accounts of the links between health and life circumstances may be revealed rather than situating mechanisms of health and disease solely within individual bodies. Simply put, the "maternal environment", as central to the DOHaD model, is not soley a physiological process impacted by environmental events but rather is a pregnant woman. Further, environmental events impacting the "maternal environment" can be better described as the lived experiences of a pregnant woman. Through a biocultural ethnographic approach, I explore the intersection of histories of colonization and Indigenous maternal bodies and apply oral history in the form of narrative analysis of pregnancy stories to reveal the lived experiences of colonization and illuminate the social, political economic, and historic factors impacting Indigenous maternal health.

Oral Histories, Pregnancy Stories and the Lived Experiences of Colonization: Methodology

Although colonial histories provide insight into key dates and events, such as the introduction of the fur trade in a given region, the impact of infectious diseases on a particular community, or the creation of the residential school system, oral history methods are considered congruent with an Indigenous framework for understanding including the "importance of oral tradition and respecting indigenous ways of knowing" (Whitty-Rogers et al., 2006, p. 36). An emphasis on lived experience is central to Indigenous ways of knowing, and through storytelling, information is shared and passed on to subsequent generations (First Nations Centre, 2005). One approach used in oral history is thematic analysis of narratives. Narrative analysis takes the story as told by participants as the object of investigation (Riessman, 1993) rather than qualitative methods focusing on question-and-answer exchanges (e.g., surveys or questionnaires) that aim to fill out quantifiable data. As Riessman (1993) explains, although the precise definition of personal narrative is a subject of debate, talk is typically organized around consequential events: Respondents tell stories of particular experiences in their lives and often where there has been a breach between ideal and real, self and society. For example, Ginsburg (1989) distinguishes between the story and the plot in narrative: The *story* is the expected arrangement of a woman's life according to Western narrative and social conventions (e.g., one is born, grows up like other children, marries, becomes a mother, etc.), whereas the *plot* emerges form the "unexpected twists in the narrative that draw attention to differences from the conventional story" (Ginsburg, 1989, p. 142) (e.g., one is different from other children, pregnancy occurs before marriage, etc.). By analyzing how women construct plots out of stories in terms of their pregnancy experiences, "turning points that signal a break between ideal and real, the cultural script and the counternarrative" (Reissman, 1993, p. 30) can be located; such "turning points" can be identified and compared as emergent themes.

Thematic analyses of interviews with Indigenous peoples with diabetes have been undertaken, although the aim has often been to identify barriers to compliance (e.g., Bird et al, 2008) or the identification of individual risk factors over the life course (e.g., Kmetic et al., 2008); however, some studies have addressed Indigenous explanations for diabetes which often links the disease to environmental and/or social changes (Garro, 1995, 1996). Within a developmental origins of diabetes framework, thematic narrative analysis can reach beyond issues of "barriers to compliance" and biomedical models focusing on individual lifestyle and diet that tend to consider women as "at risk for" or have, as a result, developed diabetes. How women frame their pregnancy and birth experiences within the context of their lives can reveal the broader social and political economic influences on women's lives and wellbeing.

Oral history methods can be employed to elicit the lived experience of pregnancy and birth, in the form of thematic analysis of pregnancy and birth stories, to reveal factors influencing the health and wellbeing of pregnant women as well as maternal and prenatal nutritional health. By considering diabetes as developmental in origin, and as reflecting an intergenerational transmission of maternal and fetal programmed effects, thematic analysis of the pregnancy and birth narratives of different generations of Indigenous women can reveal differences in the lived experiences of pregnancy and birth over time in that each generation would reflect different socio-historic locations impacted by various social and political economic events and processes (e.g., the impact of the residential school system, and/or the impact of the medicalization of childbirth) (e.g., Lie, 2000; Lui, 2006).

To explore the maternal embodiment of histories of colonization, pregnancy and birth stories were collected from different generations of Tlicho women. The Tlicho (formerly known as Dogrib) are a Dene people living in the Northwest Territories (NWT). As noted above, prevalence rates of diabetes within various Indigenous communities vary regionally and the Tlicho have been described by a diabetes educator as being “last in the diabetes race” in regards to having the lowest prevalence of diabetes among Indigenous communities in Canada (Kevin White, personal communication, 2011). Although the prevalence of diabetes among the Tlicho is low (3.1%, Behchoko Health Centre, chart review, 2011, similar to prevalence of diabetes among non-Indigenous Canadians), the same pattern of a higher prevalence among women seen in other Indigenous communities is also evident among the Tlicho. Furthermore, there are no cases of diabetes among community Elders suggesting recent history is playing a role and indeed colonization of the Tlicho is considered to be fairly recent. Although missionaries arrived in the late 19th century and a trading post was established at Fort Rae, the transition from life on the land to permanent settlements occurred mainly in the 1960s and 1970s. As colonization of the Tlicho in the Northwest Territories is relatively recent, the profound changes to the lives of the Tlicho women can be heard in the pregnancy and birth stories across the generations.

As part of my community-based research training, and a way to meet key members of the Tlicho communities and build rapport, I was part of the pilot project “Tlicho Healthy Eating and Diabetes Prevention” pilot (2011-2012) funded by Canadian Institutes of Health Research

(MAB-114627). Through this pilot project I met and worked with members of the Tlicho Government, the Tlicho Community Action Research Team (CART), and members of the Tlicho Healing Wind Advisory Committee (HWAC).

As part of my biocultural ethnographic approach, I collected and thematically analyzed pregnancy and birth stories from different generations of Tlicho women. Pregnancy and birth stories were collected from ten Tlicho women in their 60s through 90s, in the Tlicho communities of Behchoko and Whati, over the summers of 2013 and 2014. The women met with me in their homes and most shared their stories in Tlicho with the aid of an interpreter provided by the Tlicho Government. Interviews with the Tlicho women lasted 20 minutes to over two hours and involved the women sharing a variety of pregnancy and birth stories, as well as childhood memories and Tlicho legends. I coded the interviews to identify themes around pregnancy and birth, as well as the lived experiences of colonization, to reveal the broader colonial impacts on women's knowledge around pregnancy and the traditions, rituals, and ceremonies of birth. Members of the Tlicho Healing Wind Advisory Committee (HWAC), including Tlicho Elders, validated my thematic analysis of the pregnancy and birth stories.

This research was approved by the Tlicho Government's Chiefs Executive Council on June 26, 2012 and by the Research Ethics Board at the University of Alberta (Study ID MS2_Pro00033105 "Pregnancy Stories Across the Generations") October 17th, 2012. I received my scientific research licence (No. 15302), issued by the Aurora Research Institute (Aurora College, Inuvik, Northwest Territories), on August 1st, 2013. I have a data sharing agreement with the Tlicho Government which entails receipt of copies of the transcripts and audio recordings of the interviews of the Elders.

To sum up, I apply the biocultural synthesis in the investigation of the high prevalence of obesity and diabetes among Indigenous peoples in Canada through a biocultural ethnographic approach involving colonial histories, published anthropometric and epidemiological data, and pregnancy and birth stories from Tlicho women of different generations. I reveal that Indigenous bodies are not ahistoric but rather the contemporary high prevalence of obesity and diabetes among Indigenous peoples are a result of an intergenerational transmission of colonial histories of marginalization and starvation and ongoing settler colonialism. As noted above, diabetes among Indigenous peoples reveals unique characteristics; namely, a prevalence of diabetes three to five times the Canadian average, higher prevalence among Indigenous women in contrast to higher prevalence among men for non-Indigenous Canadians, an earlier age of onset and an increase in prevalence among children and adolescents, and the highest prevalence rates are located on reserves. As will be discussed in the following chapters, these characteristics have led to constructions of diabetes among Indigenous peoples as differences in the Indigenous body and an inevitability of developing diabetes (e.g., a thrifty genotype) rather than the colonial socio-historic contexts in which Indigenous bodies have been confined. The following chapters will focus on these unique characteristics of diabetes among Indigenous peoples in Canada and it will be revealed that history is not in the past, the body remembers.

Biomedical informed constructions about Indigenous bodies and diabetes among Indigenous peoples will be explored in Chapter 2, *Biomedical Stories, Diabetic Bodies: Indigeneity as Risk*.

Biomedical approaches to obesity and diabetes are reviewed to reveal the individualized and reductionist foci of biomedicine and how a biocultural perspective, focusing on the intersection of the biological and the social, reveals the broader social, political economic and historical factors impacting health and the body. Following Nancy Scheper-Hughes and Margaret Lock's (1987) lead, the construction of the Indigenous body as "Paleolithic" or "primitive", as "thrifty", or as "coca-colonized" to explain higher prevalence of diabetes is seen to reflect the ills of the social body being treated as diseases of the individual body and informs a view of Indigeneity as risk. Using Richard Lewontin's distinction of "cause" and social agents, obesity and diabetes will be contextualized to reveal the relationship of poverty to health disparities among Indigenous peoples in Canada. Paraphrasing Brian Stevenson (2012), human rights lawyer and equal justice advocate, and setting the tone for the dissertation, it is argued that the opposite of poverty is not wealth, the opposite of poverty is justice.

In Chapter 3, *Local Histories, Unequal Bodies: Applying Local Biologies to the Global Nutrition Transition*, I focus on the intersection of history and place in the creation of local biologies to explore the higher prevalence of diabetes among Indigenous peoples globally. I challenge key arguments and underlying assumptions constructing the global nutrition transition and, through a biocultural approach, I argue that it is not a uniform global nutrition transition among non-compliant individual bodies reflecting a universal biology but rather a case of local histories intersecting with unequal social bodies creating local biologies manifest as health disparities such as obesity and diabetes. Through a developmental lens, and an associated focus on local biologies, I argue that shifting prevalence rates of diabetes reflect histories of inequity being inscribed within unequal bodies, and that it is the intersection of shared patriarchal colonial histories and Indigenous maternal bodies that underlie the high prevalence of diabetes among Indigenous peoples globally.

The high prevalence of diabetes among Indigenous peoples in Canada is investigated in Chapter 4, *Stories of Starvation, Biologies of Hunger: Colonial Histories as Determinants of Health*. By challenging key erroneous assumptions about Indigenous traditional ways of being and the persistent view of their "precarious existence", the structural violence imposed by colonization and the Indian Act, and the resultant starvations, inform the beginnings of the developmental origins of diabetes among Indigenous peoples in Canada and the intersection of colonial histories and Indigenous bodies is revealed. By applying current physiological and endocrinological findings to an intergenerational developmental perspective on obesity and diabetes, I propose a contemporary "chemistry of starvations past" to situate diabetes among Indigenous peoples, and among Indigenous women and youth in particular, as a disease of colonization.

The geographic variation in the prevalence rates of diabetes across Indigenous populations in Canada is explored in Chapter 5, *Starved Bodies, Programmed Generations: The Intergenerational Embodiment of Colonization*, and by situating epidemiologic and anthropometric measures over generations, the intergenerational transmission of colonial histories of starvation through the creation of compromised reproductive biologies is revealed. Variation in diabetes prevalence in different Indigenous communities in Canada is linked to variation in the timing of contact, colonization, and the onset of starvation, and by using a genealogical framework, the intergenerational transmission of programmed effects from mothers to children reveals the basis of the "sudden explosion" of diabetes among Indigenous peoples in

Canada with the potential number of generations impacted correlating with a given region's prevalence of diabetes.

Chapter 6, *Birth Places, Embodied Spaces: Tlicho Pregnancy Stories Across the Generations,* is grounded in Tlicho women's narratives, particularly of Tlicho Elders and a traditional midwife, as their stories reveal changes in the lived experiences of pregnancy and birth as reflecting different socio-historic locations within histories of colonization; from birth on the land with community and midwives, to the beginnings of settlement and birth in the mission hospital with nuns in Rae, to lone evacuation to Yellowknife for medicalized birth in a biomedical hospital. By considering changing Tlicho birth places as embodied spaces, the social transformations in time and space brought about by the processes of missionization and medicalization are explored and reveal how colonial histories of controlling birth experiences became inscribed on Tlicho maternal bodies.

The challenges to biomedical attempts to address the Indigenous maternal health disparities (outlined in chapter 5) through biomedical knowledge transfer are highlighted in Chapter 7, *Hearing Stories, Healing Bodies: Seeing Indigenous Maternal Wellbeing Through Two Eyes*. As biomedical knowledge is a form of Eurocentric knowledge, based in a Eurocentric worldview and associated cultural values, its application to health disparities impacting Indigenous peoples reflects a colonial discourse and conflicts with Indigenous ways of knowing and worldviews. By extension, these conflicting worldviews and associated cultural values underlie different constructions of biomedical health as somatic and holistic Indigenous relational perspectives on wellbeing. Applying a Two-Eyed Seeing perspective to Indigenous maternal wellbeing, incorporating both biomedical knowledge and Indigenous ways of knowing and structured in Indigenous methodologies and a life course approach to identify and address local maternal wellbeing issues and concerns, would end the reproduction of colonial relationships and allow for a process of decolonization of Indigenous maternal wellbeing.

To conclude, I apply a social justice lens to Indigenous maternal wellbeing in the final chapter, *Decolonizing Indigenous Maternal Bodies Through Reproductive Justice*, by highlighting key points made in each chapter that reveal how colonization has been inscribed on and within Indigenous maternal bodies within a framework highlighting reconciliation, based in the Truth and Reconciliation Commission's Calls to Action and the United Nation's Declaration on the Rights of Indigenous Peoples and, a focus on reproductive justice. Few, if any, have applied a reproductive justice lens to the developmental origins of health and disease and by considering pregnancy as the locus of colonization in the developmental origins of obesity and diabetes among Indigenous peoples in Canada, and elsewhere, a holistic and relational view of Indigenous maternal wellbeing and healing is presented and situated as part of the broader movement for self-determination with a focus on Indigenous women's knowledge and maternal self-determination as reproductive justice to decolonize Indigenous maternal bodies.

Chapter 2

Biomedical Stories, Impoverished Bodies:

Indigeneity as Risk

Indigenous peoples in Canada and elsewhere suffer disproportionately from health disparities, such as obesity and diabetes, and a variety of causes of these disparities have been proposed. Indigenous health, however, has historically been viewed through a colonial lens inscribing meanings on Indigenous bodies as primitive or Paleolithic, as thrifty, as coca-colonized[1], or as simply non-compliant. With the biomedical focus on the individual body, and on health as somatic state, these inscribed meanings promote a view that it is something about the Indigenous body itself that is responsible for the higher prevalence of diabetes and informs a view of Indigeneity as risk. Biomedical approaches typically do not make social, political economic, and historic influences on health explicit, thus transformations of the social realm into the biological world is equivocal (one recent exception is the growth of epigenetics). Through the lens of embodiment, I explore the intersection of the biological and social using the higher prevalence of diabetes among Indigenous peoples in Canada as a case study. I argue that the injustices of colonization have been embodied in individual and social bodies and are made visible as health disparities.

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[1] *Coca-colonization* refers to the spread of unhealthy processed American foods around the world resulting in a negative nutrition transition linked to type 2 diabetes.

The Individual Compliant Body

The biomedical approach to nutritional health, and overall health, focuses on the individual, and more importantly, on individual compliance with dietary and lifestyle recommendations to ensure bodily health. The social factors that may constrain or shape individual behaviours are not typically considered, although there is a growing body of work on the social determinants of health (e.g., Adelson, 2005, Vallianatos et al., 2006; Willows et al., 2012). Traditional biomedical discourse regards diabetes as a "disease of affluence" that is prevalent in societies with greater access to calories coupled with less physical activity. If the individual does not comply with biomedical recommendations (e.g., healthy eating) then the individual is considered at risk for poor health, including diabetes, and is blamed for acquiring the 'lifestyle' disease as well as any treatment failures. The focus then shifts to target the individual through interventions to deal with potential "risk factors" and individual non-compliance (or barriers to compliance) (Chaufan and Weitz, 2009). Indeed, as evidenced on the Diabetes Canada website (2017) in regards to diabetes management, "Remember, you are the most important member of your healthcare team".

The biomedical approach further focuses on normal versus abnormal physiological functioning (pathophysiology), and on a part of, or process within, the body (i.e., the body as machine metaphor). Diabetes, for example, is seen as a disease of excessive urination and marked by insulin resistance. Bodily health is then seen as measurable (or quantifiable) and such measures can then be compared in cross-sectional and longitudinal studies, a view that informs most epidemiological approaches (e.g., incidence and prevalence of disease, morbidity vs. mortality, comparable demographic categories). Thus, the individual body can be measured in terms of body mass index (BMI) or glucose tolerance levels to determine bodily, and therefore, overall health. This view further translates to nutritional health: If an individual consumes a "balanced" diet of adequate levels of essential nutrients, and body measures (e.g., BMI) are within appropriate ranges, the diet is deemed adequate and the nutritional status of the individual is presumed to be good. Poor nutritional health, on the other hand, is seen as reflecting individual non-compliance with dietary recommendations, and/or poor lifestyle choices, and is inscribed on the physical body (e.g., obesity).

Thus, the biomedical focus is on the individual rather than the social, and on individual compliance rather than the complex relationships of social, political economic, and historic factors. This focus, coupled with measurable, quantifiable epidemiological categories, sets parameters which limit understanding of broader factors influencing health and disease. Factors that are not part of a research design and may influence study variables (e.g., alcohol consumption), or that are not easily measured, are seen as "confounding" as they confound or impact data analyses and may skew results. Although biomedicine grounds itself in science and its associated presumed objectivity, cultural constructions about the body in biomedical perspective are informed by Eurocentric values and historical influences such as Cartesian dualism where mind and body are considered separately. The body, however, "is simultaneously a physical and symbolic artifact, naturally and culturally produced, [and] anchored in a particular historical moment" (Scheper-Hughes and Lock, 1987, p. 6). By considering various socio-cultural constructions of the body, or of the bodies of particular groups of people, the connections of health to broader social, political economic, and historic conditions may be revealed.

Multiple Bodies

Within biomedical context, the body is the sole locus of disease thereby constructing health as a somatic state (Wiley and Allen, 2017). Scheper-Hughes and Lock (1987), however, provide a medical anthropological framework that considers the body beyond its physical and physiological boundaries. Three perspectives from which the body may be viewed inform this framework and provide separate yet overlapping units of analysis; the individual body, the social body, and the body politic. Although the *individual body* is seen biomedically as the locus of health, it is considered more than physical and may be described as "the lived experience of body-self" (or how the lived self is experienced) and is seen as existing apart from other individual bodies (Scheper-Hughes and Lock, 1987, p. 7). The *social body*, in turn, is "the seam between the physical body and the social world of the individual" (Wiley and Allen, 2017, p. 23) and sees the body as symbolic and representative of nature, society, and culture (Scheper-Hughes and Lock, 1987, p. 19) as well as how the individual body reflects the ideologies of culture. In Euro-American societies, for example, the "body-as-machine" metaphor, informed by industrialization, describes somatic or psychological states in mechanistic terms such as "wound up" or "worn out" and further informs "fixing" a broken part or process within the body, such as a hip or knee replacement or pace-makers, and in part informs biomedicine's focus on pathophysiology. The *body politic* involves the regulation, surveillance, and control of individual and collective bodies, and the "stability of the body politic rests on its ability to regulate populations (social body) and to discipline individual bodies" (Scheper-Hughes and Lock, 1987, p. 8). For instance, in North America the politically correct body is the lean, strong, and physically 'fit' form through which the core values of autonomy, toughness, competiveness, youth, and self-control are manifest (Pollitt, 1982; Scheper-Hughes and Lock, 1987). This view of the body sees health as an achieved rather than an ascribed status (i.e., the biomedical view of health as somatic and under the control of the individual) and each individual is expected to "work hard" at being strong, fit, and healthy (i.e., individual compliance with dietary and lifestyle recommendations) reflecting the values of an industrialized capitalist society. Conversely, ill health is attributed to the individual's failure to live right, eat well, be active, or basically, be compliant (Scheper-Hughes and Lock, 1987, p. 25).

As biomedicine does not typically make explicit the links between health and social phenomena, by considering health in relation to the three bodies, the connection of individual health to larger social, political economic, and historic conditions may be revealed. *Medicalization*, or the process by which human conditions and problems become defined as diseases and in need of medical study, diagnosis, prevention, and treatment, is a useful concept for understanding how various social phenomena are subsumed within biomedical discussions including treatment decisions. Depression, for example, is medicalized when it is seen solely as a biological disease and treated with pharmaceuticals rather than a lack of satisfaction with life social networks (Wiley and Allen, 2017, p. 23). While there is no doubt that pharmaceuticals may be necessary and useful, ignoring the effects of the illness on an individual's social networks, including their families and communities, can result in gaps in well-being. Similarly, the natural process of birth has been medicalized (as will be elaborated on in chapter 6) and framed within risk discourse seeing the hospital as the "safest place" to give birth. As Scheper-Hughes and Lock (1987, p. 10) explain, "medicalization inevitably entails a missed identification between the individual body and the social bodies, and a tendency to transform the social into the biological".

Further, cultural constructions about the body may sustain particular views of society as well as social relations and "relations between the body and the body politic leads to the consideration of the regulation and control of not only of individuals but of populations" (Scheper-Hughes and Lock 1987, p. 27). A graphic example can be found in the treatment of Indigenous children and their bodies within Canada's residential school system. Expressed in humanitarian terms, the bodies of Indigenous children in the residential schools became the site of control, regulation, and ultimately forced assimilation to end the "Indian problem". As Bednasek and Godlewska (2009) discuss, during the late 19th – early 20th century, scientific and moral intervention into people's lives was seen as necessary to save the country's moral character and protect the Euro-American "race" from degeneration. Conflating concerns for social purity, biological/hereditary sciences, and environmental sciences gave rise to eugenic- or euthenic-like thinking under the umbrella term of *betterment* and betterment discourse shaped the policies of Indian Affairs. For example, the Davin report "paid keen attention to the application of betterment sciences in the [residential] schools…" (Bednasek and Godlewska, 2009, p. 449). Euro-American core values construct the ideal body (i.e., lean, fit, etc.) as reflecting autonomy, toughness, competiveness, youth and self-control. Similarly, the bodies of Indigenous children were situated in spaces reflecting Euro-American core values:

> "Having captured and displaced the body from familiar places of family, home, and culture, betterment strategy in residential schools targeted [Indigenous] children's embodied expressions of culture. In the name of 'cleanliness', sameness, regularity and order', physical appearance and personal identity were denied as staff bathed children, cut their hair, dressed them in Euro-American uniforms and gave them English names" (Kelm, 1996; Churchill, 2004; Bednasek and Godlewska, 2009, p. 449).

Through the body politic, the residential schools "disciplined and trained [Indigenous children's] bodies by using space, punishment, surveillance, and Euro-American ideologies of morality" (Bednasek and Godlewska, 2009, p. 451) in attempts to "kill the Indian in the child" and end the "Indian problem". Thus, Indigenous children's bodies became sites of forced assimilation and cultural genocide, and as Mosby (2013) has brought to light, sites of experimentation.

Therefore, bodies are more than individual physical or physiological entities. Bodies are inscribed with social meanings and politically regulated, surveilled, and controlled. Although diabetes among Indigenous peoples is a relatively new phenomenon becoming a health concern only in the last few decades, attempts to determine the cause of higher prevalence among Indigenous peoples as compared to non-Indigenous has led to a variety of meanings being inscribed on Indigenous bodies. Within the biomedical as well as scientific literature, high prevalence of diabetes among select communities (e.g., the Pima of Arizona) became representative of all Indigenous populations and informed a genetic view of susceptibility. Neel's (1962) "thrifty gene hypothesis", for instance, sees diabetes as resulting from the Indigenous body as "primitive" (due to a hunting and gathering subsistence strategy) and not capable of handling a "Western diet" (i.e., agriculture). As will be elaborated upon in chapter 4, two assumptions underlie Neel's argument: first, foraging societies are more likely to experience regular and severe food shortages than sedentary agricultural societies, and second, societies experiencing a "feast or famine" environment (e.g., foragers) would see thrifty-gene bearers more likely to survive starvation (i.e., there is selective pressure for the thrifty gene in the feast or famine environment). The Indigenous body, therefore, is seen as programmed for a hunter-gatherer lifestyle – a prehistoric or Paleolithic body clashing with a modern diet - a view that has informed other biomedical constructions such as the “New World syndrome” based on metabolic syndrome being more prevalent among Indigenous peoples (i.e., genetic susceptibility) and indirectly in research agendas today, such as the Centre for Indigenous Food and Environment at McGill promoting a return to a “traditional diet” for bodily health (i.e., the “modern” diet isn’t working for these humans). Similarly, the higher prevalence of diabetes among Indigenous peoples globally, as will be discussed in chapter 3, are due to a nutrition transition called coca-colonization (e.g. Zimmet, 2000), or the globalization and adoption of Euro-American diet and lifestyle.

Such a view of genetic susceptibility further creates a subsequent view of “race” or ethnicity as a risk factor. Indeed, one of the key risk factors identified on the Diabetes Canada website (2017) is being of [Indigenous], Hispanic, Asian, South Asian, or African descent, therefore, essentially not “White” or of European descent. In other words, by virtue of descent, one is defined as “high risk”. Within this perspective, health is not only seen as somatic but also as White. By assuming Indigeneity is the underlying cause of diabetes among Indigenous peoples in Canada, the social, political economic, and historical forces acting on Indigenous bodies are rendered invisible. As humans and their bodies are both biological and social, one can investigate health disparities such as diabetes through the concept of *embodiment*, the process by which people “literally incorporate biologically, the social and material world in which we live” (Krieger, 2001, p. 672). Through the concept of embodiment the political economy of health is highlighted and the intersection of the biological and the social can be further explored.

The Impoverished Body

As noted above, biomedical perspectives do not make the link of health to larger social phenomena explicit, in part due to an emphasis on the physical body and health as a somatic state as well as the reductive focus on pathophysiology. Further, there is a tendency in medical science to search for cause and effect relationships. As Lewontin (1991) discusses, an ideological prejudice of modern biology sees a focus on *the* cause of an effect, where causes separated and studied independently, and typically at the individual level (e.g., an individual gene or a defective organ), and this view of causes is most evident in theories of health and disease. Elaborating on the limits of focusing on a cause, Lewontin (1991) distinguishes between "causes" and "social agents". Using tuberculosis as an example, Lewontin explains that although medical science would list the cause of tuberculosis as the tubercle bacillus, the tubercle bacillus is not the *cause* of tuberculosis but rather it is the *agent* of social causes. Noting that the continuous decline in death rates from tuberculosis and other infectious disease rates in the late 19th-early 20th century with no obvious cause (e.g., not a consequence of modern sanitation as these diseases are respiratory rather than water-borne), Lewontin (1991, p. 45) contends that the decline in death from infectious diseases was a consequence of the general improvement in nutrition, related to an increase in the real wage as well as other protections for workers. A tubercle bacillus is not a cause but an agent:

> "They are the agents of social causes, of social formations that determine the nature of our productive and consumptive lives, and in the end it is only through changes in these social forces that we can get to the root problems of health. The transfer of causal power from social relations to inanimate agents that then seem to have a power and life of their own is one of the major mystifications of science and its ideologies" (Lewontin, 1991, p. 46).

Focusing on a particular pathogen as the cause, such as the tubercle bacillus, ignores the socio-political contexts, and associated social causes, in which a given disease thrives. Tuberculosis, for example, is considered today to be a disease of poverty. Indeed, most ill health stems from impoverished conditions, yet the biomedical gaze maintains a focus on individual compliance and pathophysiology, or as Wiley and Allen (2013, p. 23) state, "the ills of the social body come to be treated as diseases of the individual body". Thus, the suffering of the social body becomes embodied within the individual bodies and is manifest as health disparities.

In a discussion of the "invisibility of poverty" in diabetes research, Chaufan and Weitz (2009) note that "affluence" (i.e., greater access to calories coupled with less physical activity) leads to diabetes and drives the current global diabetes epidemic, as individuals move less and eat more, often nutrient-poor foods. Poverty, with its limiting access to healthy foods and lifestyle, as well as questionable access to healthcare, is seen as a "problem of the poor" (Chaufan and Weitz, 2009, p. 80). Explanations of high prevalence of diabetes among the poor focus on individual choices and solutions focus on educational interventions rather than addressing the contexts of poverty (Nicolucci et al., 1998, p. 1439).

Social class is often connected with ethnocultural affiliation and complex intersections of class and ethnicity must also be considered when examining the social contexts of health. Increasing prevalence rates of diabetes in the United States disproportionately impact ethnic minorities and the poor two to six times as compared to white Americans, yet diabetes literature identifies "minority culture" as *causing* diabetes (Chaufan and Weitz, 2009). Hence, ethnicity, or Indigeneity, is a "risk factor." However, prevalence of diabetes is increasing disproportionately among all poor irrespective of ethnicity (e.g., poor “White” Appalachians), and as Chaufan and Weitz (2009) note, there is a paucity of research on poor whites. This gap in the literature inadvertently reinforces the idea that something about “whiteness protects poor whites” while something about minorities located in their bodies causes diabetes. White bodies seem to be the measure of health and overall biomedical normalcy with other bodies racialized (see chapter 3). The body politic affects not just contemporary individual bodies but also past social bodies; in other words contemporary Indigenous peoples embody past and ongoing colonization.

Embodying Injustice

As McNeish and Eversole (2005, p. 2) describe, there is a “cost” to being Indigenous. It is internationally recognized that Indigenous peoples are nearly always disadvantaged relative to non-Indigenous people with a lower material standard of living and a higher risk of disease and early death. Minority populations in their own lands, such as Indigenous peoples in Canada and other Indigenous peoples worldwide, are suffering from a lack of political power, economic subjugation, and social and cultural stigmatization (Dyck, 1985). A study by MacDonald and Wilson (2013) found 40% of Indigenous children in Canada live in poverty, as compared to 15% for non-Indigenous children, and are two and a half times more likely to live in poverty than non-Indigenous children. Rates of poverty vary among different Indigenous groups with First Nations children have the highest rate at 50% whereas Metis, Inuit, and non-Status children experience a poverty rate of 27%. Regionally, the situation is worst in Manitoba and Saskatchewan where two out of three First Nations children live in poverty.

Today it is widely held that one cannot consider only the economic dimension of poverty. Poverty has social, political, and cultural dimensions. A range of human rights are undermined by poverty including economic rights (e.g., the right to work and have an adequate income), social rights (e.g., access to health care and education), political rights (e.g., freedom of thought, expression, and association), and cultural rights (e.g., the right to maintain one's cultural identity and be involved in a community's cultural life) (Sané, 2001; UNESCO, 2015). Poverty, therefore, may be defined as a pronounced deprivation in well-being (World Bank, 2000) as it can impact the overall quality of life, rather than just a lack of income.

In Canada, attempts to measure quality of life have been, like poverty, focused on economic measures. As discussed on the Canadian Index of Wellbeing website (2016), before the creation of the Canadian Index of Wellbeing, the national instrument for tracking and reporting on overall quality of life was Gross Domestic Product (GDP). As a calculation of the value of all goods and services produced in a country in one year the GDP was never intended to be a measure of social progress or quality of life yet over time it was frequently used as a surrogate for wellbeing. Today the Canadian Index of Wellbeing has adopted the following as its working definition of wellbeing: "The presence of the highest possible quality of life in its full breadth of expression focused on but not necessarily exclusive to: good living standards, robust health, a sustainable environment, vital communities, an educated populace, balanced time use, high levels of democratic participation, and access to and participation in leisure and culture" (Canadian Index of Wellbeing, 2016). Although Canada is ranked as the sixth most developed country in the world, according to the United Nations' Human Development Index, if First Nations were measured using the same data the ranking would drop to 63rd (Globe and Mail, 2015).

Overall, Indigenous people lag behind practically every measure of wellbeing including family income, educational attainment, crowding and homelessness, poor water quality, infant mortality, health, and suicide, and Indigenous communities face multiple crises. According to the Globe and Mail (2015), six out ten on youth on reserve do not complete high school compared to one out of ten for non-Indigenous Canadians. More than half of reserves need a new school and 70% of the existing schools are in need of repair. The median income for First Nations is $19,000 compared to $33,000 for non-Indigenous Canadians with 50% of First Nations children living in poverty. The life expectancy for First Nations men is sixty-nine years, nine years less than for non-Indigenous Canadian men, and for First Nations women life expectancy is seventy-seven years, five years less as compared to non-Indigenous women in Canada. Poor maternal health in Indigenous communities reveals disparities in infant mortality rates. The infant mortality rate for First Nations is twice the rate for the rest of Canada, and the rate for the Inuit jumps to four times the rate (Favaro and St. Philip, 2014). The suicide rate for First Nations youth is five to six times higher than the rest of Canada (Globe and Mail, 2015). A 2011 report by the Ontario deputy chief coroner linked 16 youth suicides in the remote First Nation community of Pikungikum in northern Ontario to the appalling levels of poverty, deprivation, and the lack of basic necessities leading to despair (Toronto Star, 2011).

Therefore, the relationship between diabetes and poverty discussed above needs to be considered within this broader definition of well-being (or ill-being in the case of Indigenous peoples). It is necessary to move beyond the objective, biological view of health as somatic and measurable by biomedical indices, to situate the body within a social context and incorporate subjective views of quality of life. A “thrifty gene” perspective ignores the impoverished conditions Indigenous peoples have faced and continue to face under ongoing settler colonialism. Utilization of the thrifty gene concept geneticized health disparities, reducing complex social worlds to racialized and medicalized bodies (i.e., the ills of the social body become diseases of the individual body). As noted previously, Lewontin’s (1991) distinction between causes and social agents, focusing on a particular cause, such as a thrifty gene, ignores the socio-political contexts, and associated social and political economic forces, in which a given disease thrives. Or as Optis and colleagues (2012:17) note in their discussion of the health issues associated with housing conditions on First Nations reserves, “mold grows out of political and economic environments, not just poor choices of materials in a given environment” echoing 19th century physician Rudolf Virchow’s famous assertion: “All diseases have two causes – one pathological and the other political” (McGibbon, 2012, p. 19).

Through the lens of embodiment, poverty can be reimagined as ill-being that is embodied within Indigenous communities and manifest as health disparities. Health disparities, such as high prevalence of obesity and diabetes among Indigenous peoples in Canada, ought to be seen as reflecting social, economic, cultural, and political inequities (e.g., a lack of basic necessities) created by the historical injustices of colonization as well as contemporary experiences of settler colonialism. And, as will be elaborated upon in subsequent chapters, the intersection of impoverishment and the body can be understood with the Developmental Origins of Health and Disease (DOHaD) model. This model can provide a means for explaining how social experiences manifest in the body. Deeper exploration of the DOHaD model will follow, particularly in chapter 5.

As noted, poverty is seen to undermine human rights as it is more than just an economic experience but also has social, political, and cultural dimensions. To paraphrase Brian Stevenson, human rights lawyer and equal justice advocate, the opposite of poverty is not wealth, the opposite of poverty is justice (Stevenson, 2012). *Social justice*, or the promotion of a just society by challenging injustice and valuing diversity, is seen to exist when all people have a right to equitable treatment, support of their human rights, and a fair allocation of community resources. Social justice strives for fair (re)distribution of resources, opportunities, and responsibilities, challenges the roots of oppression and injustice, empowers all people to exercise self-determination and realize their full potential, and builds social solidarity and community capacity for collaborative action. Through colonization, and ongoing structural violence and associated oppressions, Indigenous peoples in Canada suffer from *social injustice*, or the unjust or unfair action or treatment evident in experiences of violence and discrimination, high rates of unemployment, health disparities and homelessness, and poverty and deplorable living conditions. These injustices are due to an unfair distribution of resources and opportunities, oppressions, and a lack of self-determination.

Braveman and colleagues (2011, p. S151) apply a social justice lens to health disparities and note that health disparities are systemically linked to social disadvantage or the unfavourable social, economic or political conditions that "groups of people systemically experience based on their relative position in social hierarchies". Social disadvantage is reflected in the impoverished living conditions and ill-being Indigenous peoples in Canada face. Braveman and colleagues (2011) further note that beyond policies around medical care social policies to promote wellbeing are needed to reduce health disparities. As health inequities underlie health disparities they reflect injustice and, therefore, the issue is social justice. There is a need to put "health disparities within the broader context of ethics and human rights…it is time to be explicit that the heart of a commitment to addressing health disparities is a commitment to achieving a more just society" (Braveman et al., 2011, p. S153-S154). McGibbon (2012) reiterates Braveman and colleagues' (2011) call for health justice and sees it as a moral responsibility:

> "It is crucial that we reframe health inequities perspectives within the scope of moral responsibility. The central role of addressing public policy-related and ideological origins of ill health must be coupled with a moral compass that directs us to integrate social justice in all aspects of health talk. When families live in chronic poverty, we are morally bound to identify oppressive public policies that sustain their poverty" (McGibbon, 2012, p. 19).

Echoing Lewontin's distinction of causes and social agents discussed above, McGibbon (2012, p. 16) takes Braveman's and colleagues (2011) argument further noting that there is resistance and a reluctance to identify the "causes of the causes" of differential health outcomes and argues that there is a need to reframe health inequities within the context of oppression to make the links between social structures and health explicit. Exploring the role of oppression in health disparities involves "ideas about domination, power and discrimination that are interconnected, and there are many different and synergistic kinds of oppression" including sexism, racism, heterosexism, ableism, ageism, and classism as well as the "intersections of these oppressions and the way their powerful synergy impacts health and wellbeing" (McGibbon, 2102, p. 27) (Note: The impact of the intersection of patriarchy and colonialism on the status and wellbeing of Indigenous women will be discussed in chapter 3). Unlike the biomedical emphasis on the body, there is a need to emphasize the social determinants of health to focus the gaze on the historical, political, social, and economic antecedents of ill health (McGibbon, 2012). As McGibbon states;

> "Although biomedical dominance remains a key driver of the medicalization of oppression, broader forces such as capitalism, globalization, imperialism, neocolonialism, and neoliberalism, [including colonization and settler colonialism] must be integrated into our analysis if we are to challenge oppressive practices that cause ill health" (McGibbon, 2012, p. 19).

Cultural constructions about the body may sustain particular views of society as well as social relations and "relations between the body and the body politic leads to the consideration of the regulation and control of not only of individuals but of populations" (Scheper-Hughes and Lock 1987, p. 27). Through colonization Indigenous peoples in Canada have been marginalized and excluded from social, economic, and political opportunities. Marginalization, or the overt or covert trends within societies whereby those people are perceived as lacking desirable traits are attributed undesirable traits (e.g., "backward", "Indianness", or "uncivilized") or deviating from the dominant group norms (e.g., Euro-American values), sees groups excluded by wider society and ostracized as undesirable as the Other. Through this process, marginalized peoples who lack self-sufficiency become increasingly dependent on the state (e.g., charity, welfare, or other government funding), and the denied opportunities deprive people of self-esteem and pride leading to a variety of health and social issues. The effects of marginalization are evident in the impoverished living conditions and the numerous measures of ill-being within Indigenous communities in Canada. A key focus today to address the marginalization of Indigenous Canadians is *decolonization*, which involves removal of the destructive effects of colonization to attain political and economic independence and allow a process of self-determination. Views that it is something about the Indigenous body are not fully incorrect. It is not the Indigenous body per se that is responsible for the higher prevalence of diabetes among Indigenous peoples in Canada. It is the meanings inscribed on colonized Indigenous bodies historically and currently, through oppressions such as settler colonialism and marginalization, that have led to higher prevalence of diabetes among Indigenous peoples in Canada.

As biomedicine focuses on the individual physical body as the locus of disease, constructing health as a somatic state, the link of health to social and political economic phenomena is not made explicit. Consequently, higher prevalence of diabetes among Indigenous peoples is understood to be due to something inherent in the Indigenous body, promoting a view of Indigeneity as risk. I have considered the body as both a biological and social entity, and I explored the intersection of the biological and the social through the concept of embodiment, where past and ongoing injustices of settler colonialism are marked on the bodies of Indigenous peoples. Rather than viewing health disparities as reflecting a collection of individual diseases and Indigeneity as a risk factor, there is a need to recognize colonization as oppression and to make the ills of the social body explicit. There is a moral need to address the Truth and Reconciliation Commission's Calls to Action to decolonize and remove the destructive effects of colonization and to allow a process of Indigenous self-determination and healing. As McGibbon (2012, p. 21) concludes, "Aim at the causes of the causes of inequities in the social determinants of health in a call for action to put oppression explicitly on the public policy and health and social research agendas in Canada".

Chapter 3

Local Histories, Unequal Bodies: Applying Local Biologies to the Global Nutrition Transition

The prevalence of obesity and diabetes are rising drastically across the globe with the highest prevalence among Indigenous peoples. The global nutrition transition has been used to explain increasing prevalence of obesity and diabetes among various populations across the globe. It is due to shifts in dietary and physical activity patterns, namely the adoption of a western diet and lifestyle (i.e., coca-colonization), and its effects are reflected in nutritional outcomes such as changes in body composition (Popkin, 2006). This is exemplified by the Pima, where a high prevalence of diabetes is prominent. The Pima became representative of the Indigenous body clashing with a western diet. However, the prevalence of diabetes is not exploding among people of European descent despite the fact they invented the western diet and lifestyle that underlies the global nutrition transition. While some have argued for an evolutionary perspective and an underlying thrifty genotype (e.g., Diamond, 2003) to explain the differential prevalence of diabetes across populations, I apply a biocultural approach and argue that diabetes is a case study of local histories intersecting with unequal social bodies, in turn creating local biologies that manifest as health disparities. In my application of a biocultural approach, I use a developmental biology lens to understand how bodies can reflect social environments and result in unique local biologies. Using diabetes as a case study, I argue that shifting prevalences of diabetes reflect histories of inequity being inscribed upon and within unequal bodies, and that it is the intersection of patriarchal colonial histories and Indigenous maternal bodies that underlie the high prevalence of diabetes among Indigenous peoples.

Although the prevalence of diabetes is rising globally, a variety of researchers have noted a lower prevalence among people of European origin and have applied a genetic, evolutionary, or thrifty genotype perspective to explain this. Diamond (2003), for example, expanded discussion of the "thrifty gene" argument and European food history to consider why, in the face of increasing global prevalence of diabetes, there is no increasing prevalence or "explosion" among people of European ancestry. In contrast, Dayaratne (2010) argued for a genetic basis of diabetes based on climatic conditions noting people who have been adapted to a harsh winter environment for generations (e.g., Europeans and Inuit) demonstrate some resistance to developing diabetes as compared to groups of tropical origin. Franks and colleagues (2013), on the other hand, explore gene-environment interactions to explain the lower prevalence among people of European origin and the higher prevalence among "non-White" populations, such as the Pima and Naurans. Basing their discussion in the view that diabetes occurs preferentially in genetically predisposed populations, the authors argue that pre-existing susceptibility genes are triggered by shifts in the environment (i.e., environmental change such as a nutrition transition) (For a review of evidence for and against the thrifty gene hypothesis as well as additional hypotheses for the evolutionary origins of obesity and diabetes see Genné-Bacon, 2014).

A shift in environment and the subsequent mismatch between genetics and the new environment, and its relationship to diabetes, has been explored by researchers through an evolutionary lens incorporating historical changes. Diamond (2003), for instance, explored the role of food history in Europe's lower prevalence of diabetes; namely, government interventions to address the periodic widespread and prolonged famines (e.g., agricultural diversification, redistribution of surplus grains to famine areas) that used to wrack Europe. These state interventions are considered to have changed the food environment making it more stable (less "feast or famine"), therefore, those with thrifty genes experienced diabetes in this new environment and were eventually eliminated by natural selection; hence, the lower prevalence among people of European ancestry. Diamond's underlying argument is that starvation ("famine") leads to natural selection of thrifty genes, and therefore, in a more food secure environment (no "feast or famine") these thrifty genes become maladaptive, noting as evidence, diabetes prevalence is five to ten times higher in obese patients and that diabetic symptoms decline or disappear under starvation conditions (in this argument, obesity reflects "feast"). Diamond further notes as evidence differences in diabetes prevalence among immigrants. The prevalence of diabetes in European immigrants of British and German ancestry to the US and Australia is higher (7%-8%) as compared to British and German people still living in Europe (~2%) under similar lifestyles, and interprets this as consistent with historians' findings with socially stratified emigration: Those who emigrated may have been the starvation prone poor who, in Diamond's argument, still carried the thrifty genotype.

More recently, Kirchengast (2017) applied an evolutionary anthropological perspective and argues that rather than a thrifty genotype, obesity and diabetes are the result of a dramatic mismatch between the environment of our evolutionary adaptiveness (i.e., hunting and gathering in the Paleolithic) and our current westernized patterns of diet and lifestyle. In early modern Europe, obesity and diabetes were nearly exclusively a problem among the affluent and not an epidemic phenomenon, however, as Kirchengast (2017, p. 37) explains, by the end of the 18th century "major technological developments foreshadowed economic, social, and cultural changes accompanying the Industrial revolution" altering living circumstances. With the state interventions discussed above by Diamond (2003), starvation and famine decreased and, with the altered living circumstances, the prevalence of overweight, obesity and associated metabolic diseases such as diabetes increased. In short, the historic changes to living circumstances mismatched with our Paleolithic bodies. Industrialization and urbanization, first leading to an increase in diabetes and obesity in Europe, was then exported through globalization as evident in the increasing prevalence of obesity and diabetes globally (i.e., the global nutrition transition as altered living circumstances).

Although both Diamond (2003) and Kirchengast (2017) do bring up pertinent points regarding the current global epidemic of diabetes, such as the role of changing food histories and the impact of broader processes such as industrialization and urbanization, what limits many genetic hypotheses is the gene versus environment dichotomy. Human adaptation is not solely genetic as adaptability can also include short term physiological alterations, and developmental modifications (including possible epigenetic alterations).

Genetic adaptation operates through natural selection and is dependent on a particular environment for a genotype may be beneficial in one environment and maladaptive in another. A landmark study in human genetic adaptation is Livingstone's (1958) approach linking the high prevalence of the sickle cell allele in sub-Saharan Africa with changing subsistence strategies, environmental change, and endemic malaria. In what has been termed the "heterozygote advantage", individuals who are heterozygous for sickle cell anemia have a genetic advantage in a malaria endemic environment as compared to those who are homozygous. However, in a non-malarial environment, the sickle cell allele has no selective advantage and results in poor health.

Short term adaptation, or acclimatization, is based in *plasticity* or the physiological flexibility of the human body to adapt to short term environmental pressures (e.g., sweating, shivering or tanning). Plasticity, however, can also be *developmental*. Environmental pressures acting on the physiologically flexible body as it grows and develops can be seen as adaptive to that environment and results in more permanent changes. Anthropological studies investigating adaptation to high altitudes (e.g., Beall, 2000) have shown that as a child grows up in a high altitude environment their body adapts to oxygen deprivation due to environmental differences in barometric pressure via developmental plasticity, resulting in, for example, larger lung capacity and increased chest size. As will be discussed below, the concept of developmental plasticity is central to the Developmental Origins of Health and Disease (DOHaD) model where factors impacting maternal health can alter fetal development leading to greater risks of chronic diseases later in life for the offspring.

The environment has often been considered in its physical aspects (e.g. altitude, temperature) when examining human adaptation. However environmental influences can also be social, political, and/or economic, and the body can adapt via developmental plasticity to these environmental pressures as well. Developmental plasticity, therefore, challenges the genes versus environment dichotomy; physiological development, although set within genetic parameters, may be altered by physical and/or social environmental influences (e.g., poverty and/or malnutrition). Anthropological studies addressing nutritional health have revealed that there are clear differences in growth measures (e.g., height-for-age) that emerge under different living conditions (e.g., Baker, Panter-Brick and Todd, 1996). Findings from recent studies in anthropology have provided greater insight into the interrelationships between social, economic and political influences on nutritional health and growth. These include the work of Duyar and Özener (2005) who investigated the effects of child labor on physical growth and nutritional status, Foster *et al*. (2005) who found nutritional status most strongly associated with the number of village teachers (suggesting access to education an important component of nutritional health), and Hadley (2005) who proposed that differences in nutritional status between two ethnic groups was not associated with household food security and wealth, but instead reflected differences in infant feeding practices. As discussed in chapter 2, biomedical approaches do not make these social and political economic contexts explicit. Poor nutritional health from a biomedical lens is grounded in the body and often the result of poor individual choices.

Universal Bodies, Local Biologies

The *nutrition transition* has been used to explain increasing prevalence of obesity and diabetes among various populations or regions across the globe. Shifts in dietary and physical activity patterns are reflected in body composition alterations that in turn affect nutritional health outcomes of individuals and populations (Popkin, 2006). Although social factors are at times considered (e.g., shifts in occupation structure, rapid introduction to modern mass media, and other aspects of globalization) the key focus is still on the individual and the behavioural choices they make. The individual body is seen as universal, hence “the” nutrition transition. The individuals in this transition who are “abnormal” (i.e. obese, diabetic) become a collective of non-compliant bodies. Populations of non-compliant problem bodies in turn become labeled as "at risk" and are disproportionately located in poorer areas, including "developing" countries and Indigenous reserves/reservations in North America. Uniform labels blanket within-group diversity and homogenize individuals into categories that are frequently racialized or otherwise othered. Although questions are asked regarding what is informing behavioral changes in dietary and lifestyle choices (i.e., barriers to compliance), a gap still exists on understanding why different people make particular choices in unique contexts. Diabetes prevalence differs between rural and urban settings within nation-states, and more markedly, between high and low socioeconomic strata. However, as discussed in chapter 2, the relationship between poverty and diabetes has for the most part been ignored in the biomedical literature.

A biocultural perspective can help address these shortcomings in that biocultural approaches "explicitly recognize the dynamic interactions between humans as biological beings and the social, cultural, and physical environments they inhabit" (Ulijaszek, 2007, p. 21). Current emphasis in biocultural approaches lies in understanding human physical plastic responses to social structure and process, including ways in which political decisions, globalization, and poverty are associated with growth and development, fertility, morbidity and mortality, and life span (Ulijaszek, 2007). Bogin and Loucky (1997), for instance, found that Guatemalan Mayan children who had immigrated to the United States were taller and heavier than Mayan children living in Guatemala, illustrating how immigration from an environment of poverty and poor health to one with better access to food and health care results in changes in body composition. Such studies reflect what Margaret Lock (1993, 2001) termed *local biologies*: Biology and culture exist in a continuous interactive relationship subject to variation on both sides so that culture and biology shape each other. Consequently, there is no "universal biology". Simply put, the socio-cultural environment, including political, economic, and social factors, as well as cultural understandings, perceptions, and practices, play into how biological and physiological functioning develops, and to varying degrees, how it is perceived. Within this view of local biologies, the standard model of genetics versus the environment is of little use. Rather than a binary opposition of forces on human biology, a biocultural model emphasizes the dynamic interaction of various socio-cultural, biological, and physical influences.

A biocultural perspective further calls for a consideration of local realities in global contexts. As Goodman and Leatherman (1998, p. 4) explain, "The infinite intersections of global economies and local ecologies, and world of history and local history, have made it equally critical to understand the local, and the global within the local." Therefore, if the concept of local biologies is applied to the global nutrition transition a very different picture emerges. Instead of a global uniform transition occurring simultaneously among non-compliant individual universal bodies in defined regions (e.g., developing countries), global social and political economic forces can be seen as playing out locally and intersecting with local histories thereby creating local biologies. For example, Diamond's (2003) discussion of higher rates of diabetes among early to mid-20th century British and German immigrants in the US and Australia compared with British and Germans still living in Europe reflects a history of inequality and migration. The British and German migrants of this time period were poorer, hence had lower nutritional status than their counterparts who did not migrate. This exemplifies how history, inequality, and migration combine to create local biologies, which in turn may manifest as health disparities among immigrants.

To further elucidate how genes, “minority culture”, and history intersect, Jasienska (2009) applied a historical perspective to investigate health disparities among African Americans. The impacts of slavery continue to be evident via rates of low birth weight, hypertension, cardiovascular disease and diabetes. Slaves had poor nutritional health due to inadequate dietary intake accompanied by high energetic costs of physical labor. Reproductive biology was compromised through developmental plasticity within the fetus, consequently poor nutritional health is transmittable over generations. The Developmental Origins of Health and Disease (DOHaD) model indicates how factors impacting maternal health can program the fetus via developmental plasticity. For example, if the mother’s nutritional health is poor, the fetus is programmed for that low nutrient environment (i.e., malnutrition among the African-American slaves) and if the environment changes post-birth, the fetal programming can lead to poor health, even decades later. Although some have argued for a genetic basis for low birth weight among African Americans (Collins and Butler, 1997), Jasienska (2009) notes that women born in the African countries where transatlantic slaves were brought from and who subsequently grew up in the United States (i.e., same environment as African Americans) have higher average birth weights than African American women. Thus, through a developmental lens, it is local history rather than genetic ancestry underlying disparities in birth weight among African American women. Applying this developmental origins view to “the” global nutrition transition challenges a basic assumption of non-compliant universal bodies in an affluent setting and proposes a global mosaic of geographies of inequality and biologies of inequity through the intersection of local histories and unequal bodies (Table 1).

The Nutrition Transition	Local Biologies
Global	Local
Uniform phenomenon: “the” nutrition transition	Specific
Focus on the present	Consideration of history
Focus on the individual complying with dietary and lifestyle recommendations	Focus on the social, political economic, and historical factors impacting individual and social bodies
Nutritional status as reflecting dietary and lifestyle choices	Nutritional status reflects the broader social and political economic contexts (e.g., poverty, inequity)
Non-compliance reflected in pathophysiology; obesity increases risk of diabetes	Developmental origins of disease; obesity as programmed in the womb
Diabetes as a result and as reflecting poor dietary and lifestyle choices	Diabetes as developmental and as reflecting poor nutritional health over generations
Obesogenic environments (e.g., access to Western foods and lifestyle)	The womb creates the obesogenic environment via fetal programming

Table 1: Nutrition transition versus local biologies. A comparison of perspective employed in the nutrition transition versus a local biologies approach in regards to the global epidemic of obesity and diabetes.

Different Histories, Different Bodies

In line with genetics informing biomedical views of risk, history is typically viewed as “family history” reflecting potential genetic susceptibility marked by evidence of disease in older family members. By considering diabetes as developmental in origin, and as reflecting the literal embodiment of inequity, history becomes not only familial but an actual determinant of health. Although the high rates of diabetes among the Pima, as discussed above, have been used as representative of the Indigenous body clashing with a western diet, differences in the rates of diabetes among the Pima in the United States versus the Pima in Mexico provides insight into the intersection of history and place in the creation of local biologies. As Schultz and colleagues (2006, p. 1869) discuss, the Pima in Arizona have one of the world's highest prevalence and incidence of diabetes and high rates of "extremely obese" whereas the Pima in Mexico have one fifth the prevalence of diabetes and less obesity. Based on genetic data, both Pima groups are considered closely related and the differences in diabetes rates between the two groups is considered due to differences in lifestyles and environments. However, each Pima group has a different history. The Pima in Arizona traditionally practiced subsistence agriculture with irrigation canals. With the 19th century settler colonial expansion in the United States, as well as the creation of the reservation in 1859, the water supply to the Pima's irrigated farming was disrupted and by the end of the 19th century "all of the Pima farms had dried up due to Anglo violations of the Pima's 'prior to occupation' rights to the Gila River water flow" (Smith-Morris, 2004, p. 36). Although these events are seen to lead to a transition to wage labour (Smith-Morris, 2004) and to store foods (Schultz et al., 2006) what is not considered is the very likelihood of hunger and starvation during this time. Such a history of hunger was not experienced by the Pima in Mexico, who have maintained their traditional subsistence economy of farming on Rancherias.

A similar story is evident with the Naurans of the Pacific, another group with high rates of diabetes seen as reflecting a thrifty genotype and the adoption of a western diet (e.g., Diamond, 2003; Franks et al., 2013). However, the Naurans, like the Pima in Arizona, also have a history of hunger, although it may not be the history often cited. As Diamond (2003, p. 600) describes, the traditional lifestyle of the Naurans was based in agriculture and fishing and "involved frequent episodes of starvation because of droughts and the island's poor soil". He further notes that early European visitors to Nauru described Naurans as “plump” and that they “admired big, fat people and put girls on a diet to fatten them up and so make them more attractive”. With the arrival of mining companies in the 1920s, Naurans received royalties and sugar consumption spiked. During World War II, Nauru was occupied by the Japanese military forces and Naurans were faced with forced labour and reduced food rations (half pound of pumpkin per day). Eventually most Naurans were deported to Truk where half of the population died of starvation. Diamond (2003, p. 600) notes that when the survivors returned to Nauru they resumed eating store bought foods and “today they are the most obese and have the highest blood pressure of all people in the Pacific”. Before World War II, there were only a handful of cases of diabetes among the Naurans with the first case in 1925 and the second in 1934; however, after 1954 the prevalence rose steeply (Diamond, 2003). Since the early 1990s, the prevalence of diabetes among the Naurans has begun to fall, and from Diamond’s (2003, p. 600) evolutionary perspective this decrease is “not because of mitigation of environmental risk factors (obesity and the sedentary lifestyle are as common as ever), but presumably because those who are genetically most susceptible have died”. Diamond (2003, p. 600) further states, “If this interpretation is correct, then Nauru provides the most rapid instance known to me of natural selection in a human population — an occurrence of detectable population-wide selection within less than 40 years”. A key aspect of Diamond’s argument, as well as other evolutionary approaches to obesity and diabetes (e.g., Genné-Bacon, 2014), is that Naurans developed the thrifty genotype due to a history of “frequent episodes of starvation” due to their traditional subsistence strategy and local environmental constraints. Campbell’s (2015) work, on the other hand, challenges this.

Noting that the peoples of Pacific Islands are often cited as vulnerable, Campbell (2015, p. 1313) emphasizes how "food security was a corner stone of many traditional Pacific Island societies" through specific food practices and inter-island exchange in many parts of Oceania. Specific food practices, such as surplus food production (and associated food storage and preservation) and "famine foods", or "food plants (or animals) that were not normally consumed unless there was some kind of failure among the normally harvested crops" (Campbell, 2015, p. 1317), addressed times of food deficit. However, it was intra- and inter-community cooperation that was key to traditional food security. As Campbell (2015, p. 1317) describes, a key element of such cooperation was the maintenance of food surpluses, not only as a means of offsetting potential food shortages, but also for sustaining political, social, and kinship linkages with a range of exchange partners in the region.

> "Surpluses enabled the ceremonial feasting associated with such exchanges and also underpinned the exchange of different food and other products among exploiting economic differences among communities… [and these] interdependent networks of kin, political allies and economic partners could be called upon by participants finding themselves in times of hardship facing food stress…" (Campbell, 2015, p. 1317-1318).

However, these traditional food security measures would decline with the intrusion of European explorers, traders, missionaries, and colonialists into Oceania.

Questioning the assumption of frequent starvations among the Naurans due to a precarious subsistence strategy, a different picture of diabetes causation emerges. Through a developmental origins lens, it is the history of starvation that accompanied Japanese occupation that resulted in the steep rise in the rate of diabetes after World War II, not solely the increased sugar intake and the adoption of store foods in the 1920s. Indeed, in both examples, the Pima of Arizona and the

Naurans, assessing the intersection of local histories of hunger on bodies reveals these societies were not (just) coca-colonized but were colonized, which lead to a disruption of traditional foodways and associated food security practices.

Differing prevalence of diabetes among different ethnic groups or "races" has often been considered to reflect a race-based or genetic predisposition, something in the racialized body. In the United States, for instance, African Americans have some of the highest rates of diabetes. However, at the turn of the 20th century African Americans were not considered to be susceptible to the disease; as stated by Pancoast (1898, p. 41) "Diabetes is a rare disease in the colored race". In contrast, the highest rates of diabetes were seen among European immigrants, Jewish immigrants from eastern Europe and among Irish immigrants in particular, in contrast to contemporary lower rates of diabetes among people of European descent (Diamond, 2003). Of course, at that time different European ethnic and religious groups were not seen as white but rather as different races, and indeed, their bodies were racialized.

As Thomas (1904, p. 358) states, "There is no race which is so subject to diabetes as the Jews", and attempts to explain the higher rates of diabetes among Jews varied in the early 20th century and in part foreshadow contemporary discussions of diabetes causation. Joslin (1924, p. 727), for example, focused on individual compliance stating, "The Jew, in my opinion, is not prone to diabetes because he is a Jew, but rather because he is fat", whereas Wilson (1912, p. 663) claimed "some hereditary defect" that made [Jews] prone to develop diabetes. Saundby (1897, cited in Tuchmann, 2011, p. 25), conversely, argued that "modern life is in itself a cause of diabetes" and that Jews, "well-to-do Jews" in particular, developed diabetes not because they were Jewish but rather because they lived in the city and ate too much, exercised too little, and strained the nervous system. This is a view that Morrison (1916, p. 57) supported noting diabetes was "more commonly found in large cities among individuals and races who are constantly under physical and nervous tension…more earnest struggle for existence". He applied his connection of nervousness and diabetes to higher rates of diabetes, and interestingly promotes a developmental origins of disease perspective, as being "particularly more prevalent among Jews, not because of ethnic peculiarities, but because of a severe environment during many centuries has developed a nervous type easily thrown out of balance".

However, this view of a relationship between strain on the nervous system and a more earnest struggle for existence was not extended to explain the little or lack of recorded diabetes among African Americans during the late 19th - early 20th century. As Lemann (1911, p.466) stated, "The negro certainly possesses no predisposition such as that of the Jews so well known, nor on the other hand, can he be known to enjoy any immunity. His carefree life of hard manual labor, with a minimum of physical strain, might lead us to think an immunity probable". A life of "great nervous tension" was lived by the "well-to-do overfed" (Lemann 1911:466) and as diabetes was a "disease of the well to do" African Americans "belong so overwhelmingly to the poorer classes" (Lemann 1911, p.462). Although type 1 and type 2 diabetes are not distinguished in the medical literature until the mid-20th century, the relationship of obesity and diabetes was evident in the early twentieth century as Lemann (1911, p. 465) notes in a case study of a 40 year old Black woman who he diagnosed as having "a mild form of diabetes, the usual diabetes of the obese" and attributes her obesity to a fondness "for the good things in life". Diabetes among African Americans during the early 20th century reinforced the view of race based differences in health. In a comparison of diabetes among the "colored race" and the "white race", Bowcock (1928, p. 994-995) noted that an "explanation for the extremely high comparative incidence of the disease among colored females [as opposed to the higher rate among white males] may be possibly found under the discussion of obesity". He also notes an earlier age of onset in that "diabetes appears about ten years earlier in the negro than the white race" further racializing the disease within the African American body and ignoring the violence and oppressions brought about by a history of slavery followed by segregation and the Jim Crow laws (i.e. the body politic regulating and controlling social bodies). In the summary of his study on "Diabetes Mellitus in the Negro Race", Bowcock (1928:999) concludes, that the "disease is usually mild and the greatest handicap to adequate control is poor cooperation, due to poverty and lack of intelligence".

Such interpretations of racialized social bodies and their specific characteristics of diabetes often reflect societal view and anxieties of the day as was seen with diabetes among the "Irish race" and the societal tensions regarding immigration in the early 20th century. O'Malley (1918, p. 623, 628) argued "the Irish in America have by far the poorest resistance to diseases in general of all the immigrants from Europe…in diabetes the Irish are in second place". In an author's note at the end of his article O'Malley (1918, p. 632) compares the death rate of Irish in America to the death rate in Ireland and states:

> "I merely wish to inform the Irish in Ireland, in friendly spirit, that their death rate at home is normal, but in America is horrible; that they should remain at home, where they ought to be, and try to save Ireland with mind and hand – and not mouth alone…Keep the young men at home."

However, the cause of immigration, for both Jewish and Irish immigrants, was not factored in to the high prevalence of diabetes. As one scholar noted, “the vast majority of Jews in the United States in the early 20th century were poor immigrants from Eastern Europe, yet the ‘Jew’ most often portrayed in the diabetes literature was the affluent Jewish urbanite” (Howe, 1976, cited in Tuchmann 2011, p. 26) reflecting the broader view of diabetes as a disease of affluence. The fact that Jewish immigrants were escaping antisemitism fueled by white supremacist views, and the ghettoization and violent pogroms of the mid-19th to early 20th centuries in Europe, was not considered. Indeed, a concurrent view of Jews at the time, informed by white supremacy and nationalism, was of a conspiracy theory of Jewish world economic domination (Levy, 2005), a view that very well may have encouraged the stereotype of the “affluent Jewish urbanite” in discussions of diabetes. The majority of Irish immigrants in the mid 19th century were escaping the Great Famine and mass immigration continued throughout the late 19th and early 20th centuries due to religious discrimination by Britain and the “troubles” in Ireland. Both Jewish and Irish immigrants were not seen as white during the 19th – early 20th century, illustrating how whiteness is a shifting identity. Through the lens of local histories, the embodiment of the lived experiences of anti-Semitism, famine, and conflict became stories inscribed within the bodies of these migrant groups and manifest as health disparities. Although Diamond (2003) used differences in diabetes rates among immigrants as evidence of socially stratified emigration of the starvation prone poor who still carried the thrifty genotype, through a developmental lens, and over a historical timeframe, it is the embodiment of histories of inequity being inscribed within unequal bodies. Famines may end but inequities may persist over generations resulting in different hungers and different bodies. Health disparities among different ethnic groups, however, shift over time, as local unequal histories are created, and today it is Indigenous peoples who experience the highest burden of diabetes globally.

Patriarchal Colonial Histories and Indigenous Maternal Bodies

Indigenous peoples have the highest contemporary rates of diabetes globally, and when seen through the lens of a nutrition transition, these rates are explained by the adoption of a western diet and lifestyle. In turn, public health programs focus on a return to a healthier traditional diet. However, through a developmental origins lens, the connection of colonial histories with Indigenous individual and social bodies reveals how local biologies were created. To contextualize my arguments linking developmental origins with intergenerational embodied experiences, I provide an overview of how colonialism impacted gender relations, women's roles as mothers, and gendered bodies.

Despite the vast cultural diversity among Indigenous societies across the world, colonial understandings of such diversity framed how Indigenous peoples were viewed. Within this 19th century perspective on the evolution of societies and cultures, all societies were seen to evolve from primitive to civilized through various innovations (e.g., the domestication of plants and animals; the development of writing) marking their place within the three main ethnical periods (i.e., savagery, barbarism, and civilization) (Morgan, 1877). Embraced by British anthropologist E. B. Taylor and American anthropologist Lewis Henry Morgan, early evolutionists saw Western culture as the pinnacle of social evolution while Indigenous peoples represented earlier stages of cultural evolution. The body of Saartje Bartmann, the so called "Hottentot Venus", for example, was seen to represent "primitive sexuality" due to distinctive physical features (e.g., large breasts and buttocks) prevalent in her population. As an Indigenous woman, she was seen as a curiosity and she was taken from her Khoikhoi homeland in southern Africa to Europe during the early 19th century to be put on display. Such views of Other as primitive or savage assisted the global colonial project. Desire for land and resources lead to disastrous colonial histories for Indigenous peoples. As Maybury-Lewis (2002) describes, Indigenous peoples are at greatest risk for genocide and ethnocide, and this was most certainly the case during European colonization of the world. Truganini, the so-called "last Tasmanian", and the genocidal Black Wars in Tasmania, are a testament to the loss of life under colonial rule and the violence of European settlers seeking land. Ethnocide, or the destruction of a peoples' way of life, was commonplace and often framed within the narrative of the White man's burden where Indigenous peoples needed to be bettered or civilized, whether they wanted to be or not. Attempts at "civilizing the savage", as well as accounts of "Noble savages", shaped the narrative that justified a "sign or starve" approach to the acquisition of Indigenous lands and the removal of Indigenous children from their families and communities, in Canada and elsewhere. Although colonization is often considered within economic and political terms, and indeed, the destruction of traditional economies and political institutions impacted all areas of an integrated culture (exemplified with the disruption of traditional foodways), social relations within a given society are shaped by gender ideologies and gender relations, and, therefore, the lived experiences of colonization would be different for Indigenous men and women.

European colonization had a tremendous impact on gender roles and gender relations in Indigenous societies. As Nancy Bonvillain (2007) explains, Indigenous peoples in Canada became enmeshed in trade with the Europeans (i.e., the fur trade) leading to fundamental transformations of local economic systems that lead to a shift in the equality between men and women typical of most Indigenous societies.

> "European traders preferred to deal with native men and thus ignored and subverted the economic contributions of [Indigenous] women. The productive value and control over economic decisions traditionally exerted by Haida and Tlingit women was diminished. Among cultures of the Plains, men's control over buffalo hunting increased in importance as trade relations with Europeans and Americans became the focus of Plains economies. At the same time, women became subsidiary workers under the direction and management of their fathers and husbands. As this process deepened women's autonomy was restricted and the social status devalued." (Bonvillain 2007:362).

Gender egalitarianism was prevalent in many traditional North American Indigenous societies. In these contexts, Indigenous women were not dependent on men but rather their role was seen as in balance with men. In pre-colonial settings, Indigenous women typically had power, respect, and recognition within their families and communities (Jaimes Guerrero, 2003). As Anderson (2011) explains, motherhood, as an affirmation of women's power to bring forth life, defined her central role in traditional Indigenous societies and accorded Indigenous women tremendous status in the family, community, and nation. This power belonged to all Indigenous women, whether or not they biologically produced children, and as Indigenous societies highly valued their children, both biological and non-biological mothers were honoured for their work. However, through colonization, the imposition of the Euro-American family structure stripped Indigenous women of their positions in the family and their powerful role as mothers [and] "…'European family values' were a keystone in the conquest strategy" (Anderson, 2011, p. 115). With colonialism came "Euro-centric notions of the inferiority of other non-white, non-western 'races', and of all women in general, versus the presumed superiority of the Anglicized, Euro-American male" (Jaimes Guerrero, 2003, p. 65). Under a patriarchal family structure embracing male authority, female fidelity, and the elimination of the right to divorce (Leacock, 1980, p. 28) Indigenous women needed to learn how to obey, a focus of the assimilationist policies of the missionaries and the residential schools (Anderson, 2011), whereas in pre-colonial settings Indigenous kinship saw Indigenous governance granting women with respect and authority (Jaimes Guerrero, 2003).

Thus, patriarchy was an inherent aspect of colonialism creating different lived experiences of colonization for Indigenous women as compared to Indigenous men. Indigenous writers have embraced the combination of patriarchy and colonialism (i.e., patriarchal colonialism) as a way of situating Indigenous women's experiences (Baldry and Cunneen, 2014, p. 282-283) as the "lives of Indigenous women are framed by the 'omnipresence of patriarchal white sovereignty' (Moreton-Robinson and Walter, 2009, p. 99)". As Baldry and Cunneen (2014) discuss, "the linking of the concepts of colonialism and patriarchy has been an important part of the development of Indigenous women's understanding of feminism. [The authors] recognize the importance of [Indigenous women's] perspectives on patriarchy (see Grande 2003; Jaimes Guerrero 2003; Moreton-Robinson 2000; Smith 1999) as for "Indigenous scholars, colonialism is the ultimate source of oppression…and an analysis of colonialism is 'a central tenet of Indigenous feminism' (Smith 1999:152)".

Exploring colonial gendered violence, Smith (2011) discusses the impact of patriarchal colonialism on the status of Indigenous women and the associated meanings inscribed on Indigenous bodies. Noting that Indigenous peoples were not entitled to bodily integrity, Smith

(2011, p. 253) describes the views of Indigenous bodies as "dirty' and "rapable" - "the dirtiest lot of humans on earth" – and when "the bodies of [Indigenous] people are designated as inherently sinful and dirty, it becomes a sin just to be [Indigenous]". As Smith (2011) further explains, European societies were thoroughly misogynistic whereas prior to colonization Indigenous societies were, for the most part, not male dominated and less authoritarian. An editorial from 1899, years before Euro-American women gained the vote and personhood under the law, highlights the central role of Iroquois women within their society.

> "They had one custom the white men are not ready, even yet, to accept. The women of the Iroquois had a public and influential position. They had a council of their own…which had the initiative in the discussion; subjects presented by them being settled in the councils of the chiefs and elders; in this latter council the women had an orator of their own (often of their own sex) to present and speak for them. There are sometimes female chiefs…the wife owned all the property…The family was hers; descent was counted through the mother" (Lopez, n.d. cited in Smith, 2011, p. 256).

The demonization of Indigenous women "can be seen as a strategy of white men to maintain control over white women" (Smith, 2011, p. 256), as exemplified in "captivity narratives", alleged first person narratives of white women who had been abducted by "savages" and forced to undergo untold "savagery", but actually written by white men to fit their agenda. The colonizers realized that to subjugate Indigenous nations they must subjugate Indigenous women, and that Indigenous people needed "to learn the value of hierarchy, the role of physical abuse in maintaining that hierarchy, and the importance of women remaining submissive to their men" (Smith, 2011, p. 256).

> "Thus, in order to colonize a people whose society was not hierarchical, colonizers must first naturalize hierarchy through instituting patriarchy. Patriarchal gender violence is the process by which colonizers inscribe hierarchy or domination on the bodies of the

> colonized. Ironically, while enslaving women's bodies, colonizers argued that they were actually somehow freeing Native women from the 'oppression' they supposedly faced in Native nations…Apparently, Native women can only be free while under the domination of white men, and both Native and white women have to be protected from Indian men, rather than from white men" (Allen, 1986a cited in Smith, 2011, p. 256-257)

Women's bodies became the site of colonialism. These patriarchal colonial histories underlie contemporary global nutrition transition. Connecting the nutrition transition to maternal health, Nolan and colleagues (2011, p.176) stress that "Improvements in maternal public health programs in pre-transition and post transition populations and provisions of education to relevant groups about the risks of rapidly adopting western lifestyles could be considered" to address the increasing global rates of diabetes. However, as will be elaborated on in chapter 6, with the loss of status for Indigenous women under patriarchal colonialism also came a loss of traditional Indigenous women's knowledge around pregnancy and birth with the suppression of Indigenous ways of knowing supplanted with Eurocentric values of science and technology and the imposition of biomedical male authority over midwifery through the processes of missionization and medicalization. The rituals of pregnancy and birth shifted from family and community with the removal of female power and became a biomedical physiological event monitored within a hospital setting. As noted above, maternal health is central to the Developmental Origins of Health and Disease (DOHaD) model, however, "maternal health" is more than a measurement of the physiological relationship between a maternal body and a fetus, it reflects the lived experiences of a pregnant woman. Given the impact of colonial histories on the status of Indigenous women, the intersection of these colonial histories and Indigenous maternal bodies in the creation of local biologies needs to be explored. As will be discussed in chapters 4 and 5, these colonial histories in Canada have been inscribed within Indigenous maternal bodies and transmitted across the generations via compromised reproductive biologies.

As discussed above, *the* nutrition transition has been used to explain increasing prevalence of obesity and diabetes among various populations or regions across the globe and is considered due to shifts in dietary and physical activity patterns (i.e., coca-colonization or the adoption of a Western diet and lifestyle) reflected in nutritional outcomes such as changes in body composition (Popkin, 2006). However, diabetes prevalence among Europeans and Euro-Americans are not rising despite being the creators of the western diet. Through an evolutionary perspective, some have proposed a thrifty genotype argument to explain the lack of diabetes among people of European descent. However, through a biocultural approach and a developmental origins lens, diabetes may be seen not as a disease of affluence impacting a universal biology but rather one of inequity and inequality with different histories resulting in different bodies. Rather than a global nutrition transition, high prevalence of diabetes among different ethnic groups may be seen as a global mosaic of geographies of inequality and biologies of inequity through the intersection of local histories and unequal bodies. By considering the intersection of history and the body in the creation of local biologies, and by reviewing shifting rates of diabetes among different ethnic groups over time, the high rates of diabetes among Indigenous peoples globally may be reimagined as the maternal embodiment of the lived experiences of colonization. As colonization brought with it European misogyny and patriarchy, Indigenous women were impacted differently than Indigenous men leading to a loss of status for Indigenous women as well as the loss of women’s traditional knowledge around pregnancy and birth. As maternal health is the focus of the DOHaD model, the declining status and lived experiences of

Indigenous women would be inscribed within the bodies of their children and grandchildren, and as will be discussed in chapter 5, these inscribed patriarchal colonial histories can be transmitted over generations through compromised reproductive biologies revealing Indigenous bodies remember.

Chapter 4

Stories of Starvation, Biologies of Hunger:
Colonial Histories as Determinants of Health[2]

The prevalence of diabetes among Indigenous peoples in Canada is three to five times the national average, with an earlier age of onset and a higher prevalence among women, adolescents, and children as compared to non-Indigenous Canadians (Public Health Agency of Canada, 2011). The higher prevalence and characteristics have led some researchers to believe Indigenous bodies are genetically predisposed, or at risk for diabetes, especially with the adoption of a "western diet and lifestyle". Neel's (1962) influential "thrifty gene" argument proposed that in an environment of cyclical feast-famine, the existence of metabolically "thrifty genes" would be selected for, because these genes would permit more efficient food utilization, fat deposition and rapid weight gain at times of food abundance, in turn making the thrifty gene-bearer better able to survive a subsequent famine. Conflating biological evolution with cultural evolution, Neel noted that with exposure to "civilization", "primitive" hunters and gatherers and their "primitive" bodies, clashed with a "civilized" diet (i.e., agriculture).[3] Although proponents of the genetic susceptibility model today do not tend to describe hunting and gathering peoples as "primitive", their bodies continue to be seen as "genetically predisposed" due to a history of starvation (e.g., Bellasari, 2008; Prentice, 2005; Diamond, 2003). Neel's (1962) view of

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[2] I intend to submit this chapter for publication in Social Science and Medicine.

[3] Neel's (1962) use of "primitive" and "civilized" reflect the ongoing use of the terminology derived from early evolutionist (or unilineal cultural evolutionist) views of social and cultural evolution discussed in chapter 3. Within an early evolutionist framework, foraging societies were deemed to be "primitive" and situated within the ethnical period of savagery whereas societies with the innovation of agriculture, among others, were elevated to the ethnical period of civilization (Morgan, 1877).

"exposure to civilization" as the determining environmental factor has simply been replaced by affluence and "unlimited access" to calorie dense foods. But is the high prevalence of diabetes among Indigenous peoples in Canada the result of what they are eating or what they are no longer consuming?

Stories of Starvation

The underlying assumption of Neel's (1962) hypothesis, which arguably continues to be propagated in scientific, clinical and medical literature, is that Indigenous peoples routinely faced episodes of starvation due to their hunting and gathering way of life. This assumption, however, is not supported in the anthropological literature (Benyshek and Watson, 2006; Dunn, 1968) and reflects erroneous views about Indigenous peoples and their ways of being. Three key flaws are inherent in discussions of Indigenous peoples and their traditional ways of living, and the role of a changing diet on current disease outcomes: First, the assumption that all Indigenous peoples in Canada (First Nations, Inuit, and Metis) traditionally practiced precarious, if not desperate, nomadic hunting; second, Indigenous peoples eked out an existence in a harsh environment (e.g., assuming the Arctic is a barren wasteland); and finally, that *all* Indigenous peoples faced the constant threat of starvation. These erroneous assumptions can be challenged by reviewing the diversity and ways of knowing and being of Indigenous peoples in Canada.

All Indigenous people are nomadic hunters. There is a great deal of cultural diversity among Indigenous peoples in Canada not only reflecting adaptive strategies to local environments but also in the understandings and meanings evident within local Indigenous ways of knowing leading to great variety in "the" traditional diet. The Iroquois for instance practiced shifting cultivation symbolically noted in the “Three Sisters” (beans, maize and squash), the Plains Cree subsisted on buffalo, and the Tsimshian exploited a variety of marine resources. The traditional Interior Salish pit cooking method to process balsamroot provides not only an example that not all Indigenous peoples were nomadic hunters but also that some included carbohydrates in their diets. Balsamroot is a former food staple that contains the complex carbohydrate inulin. During pit cooking Inulin is hydrolyzed and this process converts complex carbohydrates into simple ones, resulting in an increase of 250% in the energy provided by simple sugars (Peacock, 2008). The effectiveness of traditional pit cooking is one example that highlights the successfulness of local adaptive subsistence strategies.

First Nations of the northwest coast lived in more settled villages with denser more stratified societies and practiced hunting, gathering, fishing, and preserving within an annual cycle considered “seasonal and seamless” (Kelm, 1998, p. 20); whereas the Inuit were more nomadic applying different seasonal hunting and fishing strategies in smaller more egalitarian groups. Different environments afforded different challenges and opportunities that played into distinctions in how cultural adaptations to specific environments occurred and to what foods would be seasonally harvested. Furthermore, there is diversity within culture areas as well as within cultural groups. The Inuit, for example, are not one homogenous Arctic culture but rather represent diverse cultures, languages and peoples each producing local adaptive strategies to the diversity in the Arctic. The homogenized view of the Inuit is stereotypically characterized by igloos and the seal hunt due in part to southern animal rights groups’ outrage and the associated media (e.g., Washington Post, 1977). The Ennadai Lake Inuit, however, were inland caribou hunters:

> "…most of the Ennadai Inuit indicated never having hunted, seen, or eaten seal. When shown a picture that included a seal, for example Pallikal said, 'They are after that thing on the ice,' while Nootaraloo said, 'What is it (indicating seal on ice floe). It has got a tail like a fish and little legs… Owlijoot and Nootaraloo said, 'We don't know anything about living by the sea'." (Tester and Kulchyski, 1994, p. 237 citing Rudnicki's Report: Field trip to Eskimo Point, n.d.)

Although Indigenous societies are diverse they do share key characteristics such as food collection rather than intensive food production (i.e., agriculture) and a spiritual connection to the land. Through thousands of years of cultural adaption and innovation, Indigenous peoples have developed sophisticated ways of interacting with their environments based on local Indigenous ways of knowing.

Eking out an existence in a harsh or barren environment. The view that existence was precarious for the most part within harsh, barren, or destitute lands is also unfounded, reflecting a view that lands considered not suitable for agriculture were "barren": Agriculture in this perspective is seen as "modern", or as Neel (1962) noted, an element of "civilization". This view still underlies current development discourse, which sees agricultural development as key to ending world hunger (e.g., de Janvry, 2010). However, paleopathological data has revealed regardless of region, health status decreased with the adoption of an agricultural way of life. As Cohen and Armalegos (1984) discuss in their edited volume, paleopathological evidence in support of a demise in health status with the adoption of agriculture includes bones lesions, dental health, and stature. Foraging populations, on average, were taller, had fewer dental health issues (caries and hypoplasia), and less bone lesions (Harris lines, periostitis, and osteomyelitis) reflecting growth disruptions and infection in comparison to the subsequent agricultural populations in the same region. “Pre-agricultural” peoples (i.e., Paleolithic bodies) were simply healthier consequently, and, as Marshal Sahlins (1968, 1972) argued, reflect the “original affluent society”.

Over millennia Indigenous peoples have developed sophisticated adaptive strategies within their local environments as reflected in local Indigenous ways of knowing and traditional ecological knowledges. Environmental stewardship among the James Bay Cree of northern Quebec, for example, sees an experienced hunter deciding how and if the hunt in a given territory will take place so as to not disturb the natural balance; a system reflecting an environmental ethic of respect and responsibility to the environment (Feit, 2000). In the Arctic, the Inuit adapted not only to their environment in terms of hunting but have embedded views of the hunt within a broader worldview seeing sharing and reciprocity as key themes within Inuit cultures. Reflecting a solid understanding of their environment and its resources and seasonality – local knowledges that biologists and other scientists are now using within collaborative projects to address issues such as climate change and wildlife management – is only part of the Inuit view of the land. The land, through place names or *toponyms*, becomes a collective memoryscape (Nuttal, 1992) and connects people to the land in a familiar way. As Murielle Nagy (2006) writes “this intimate link to the land and its temporal connotations was expressed beautifully by Mark Emerak: ‘I should send (that story) somewhere to the land where I first got my memory’ (Aulavik-76B:1, in Nagy, 1999b)”. One does not simply exist or survive on the land, the land is part of being Inuit. And, as will be discussed below, eking out an existence for the Inuit, and for other Indigenous peoples in Canada, will occur, but in a very different time and place.

And finally, *the constant threat of starvation*. This biased assumption forms the basis of Neel's (1962) thrifty gene hypothesis as well as other arguments for a clash between the Indigenous body and a "modern diet". Any subsistence strategy (e.g., foraging or agriculture) will have times of food insecurity; a late migration of seasonal animals to hunt or a drought year causing crop failure, speak more to climatic fluctuations than to precarious or "primitive" ways of living. Even within the industrialized food industry climatic events can spike food prices, such as the concern with the devastating impacts on crop yields with the 2002 drought or the 2011 floods in Canada (Agriculture and Agri-Food Canada, 2015) – do we abandon supermarkets or do we make different food choices? In times of food scarcity other foods were relied on, as related by a member of the Thomson First Nation in British Columbia:

> "But one time, that year was famine. They had nothing, no fish, everything was scarce…So they went up Broadback [Mountain]…to try to get up to where this avalanche lily may be…they went up there in the spring. And the people that eats cow-parsnip…was the ones that survived. They're very valuable food, when Indians had that cow-parsnip…what they could dig out…survived" (Turner, 1990, cited in Helm, 1998, p. 24).

The view that Indigenous peoples would not have alternative food stuffs or cultural strategies in place to deal with such events again reflects a lack of understanding about Indigenous peoples' connection to their environment as well as their abilities to be innovative and adaptive. Systems of exchange through trade and feasting, for example, prevented large-scale famine (Kelm, 1998). The potlatch practiced among First Nations of the northwest coast saw redistribution of food and other items between groups and through reciprocal understandings allowed for a regional interdependence as a safety net: The potlatch promoted exchanges of food from those groups enjoying a temporary surplus to those groups suffering a temporary deficit (Piddocke, 1965).

Social organization and kinship also reflected different environments and permitted adaptive strategies thereby signaling the integrated nature of culture: Families could meet up and join with band affiliations as dictated by local kinship rules to hunt communally and in other seasons hunt or fish as nuclear families if resources were more meager in a given season. The bison hunt of the western plains, for instance, typically involved buffalo drives and jumps, and saw strictly regulated communal co-operation and organization between bands as well as bands and tribes; but in contrast, when the herds were small and scattered, individuals could hunt as they pleased (Dickason, 2006). By living in and adapting to a variety of local environments over the course of millennia, Indigenous Canadians had developed ways of coping with local ecological challenges. However, local systems of feasting and exchange, and socially constructed kinship systems, are not items typically discussed in terms of nutritional health or found underlying theories of genetic adaptation.

As Kelm (1998, p. 24) discusses, episodes of severe food shortages do seem to have occurred in the Indigenous past, and are reflected in stories (e.g., “starvation myths”) in Indigenous mythologies; however, it must be remembered that “such stories serve many functions other than simple historical record keeping”. As well, there is variation in food insecurity within starvation myths within a given culture area;

> “The difficulties of obtaining an adequate food supply must have been much more serious among the Tsimshian than among the Kwakiutl, for starvation and the rescue of the tribe by the deeds of a great hunter or by supernatural help are an ever-recurring theme which, among the Kwakiutl, is rather rare…Starvation stories of the Kwakiutl occur particularly among the tribes living at the heads of the inlets of the mainland, not among those who dwell near open sea, where seals, sea lions, salmon and halibut are plentiful” (Boas and Codere, 1966, p. 302; Kelm, 1998, p. 24).

Furthermore, Adelson (2000) notes that although starvation and hardship were often recounted in the interviews with the Whapmagoostui Cree, the meaning of the term "starvation" is contested in the literature, as is the degree to which people actually went without food or specifically without meat. Black-Rogers (1986, p. 375), for example, analyzed fur trade records and found *starving* could refer to "hunting for the belly, not for furs". Similarly, Turner (1894, p. 276) discussing the Cree of Ungava Peninsula noted that "Although their food consists of reindeer, ptarmigan, fish and other game, the deer is their main reliance, and when without it, however great the abundance of other food, [the northern Cree] consider themselves starving". Indeed, starvation is considered rare among foraging peoples, and malnutrition is seen as infrequent (Dunn, 1968). A recent survey of the ethnographic record of hunting and gathering peoples revealed no consistent threat of starvation (Benyshek and Watson, 2006). So where does this biased view of the constant threat of starvation come from?

Histories of Hunger

Contact between Indigenous peoples and Europeans in Canada is considered by some to have been initially a symbiotic relationship (Frideres, 2011). During the early days of the fur trade European hunters and trappers were dependent on the local Indigenous groups to help them survive, again pointing to the adaptive successes of Indigenous peoples to their local environments. Europeans were simply not prepared or able to handle the challenges of these new environments. However, the relationship between Indigenous peoples and those who would dominate Canada became one of colonization, marginalization and destitution for First Nations, Inuit, and Metis. With the collapse of the fur trade upon which many Indigenous communities had become dependent and the resultant decline in the wild meat supply, the creation of the reserve system to free up lands for white settlers and isolating Indigenous peoples from traditional hunting and fishing grounds, broken treaty promises further creating inhospitable conditions on the reserves, and the targeted policies of ethnocide in the residential schools, directly and harshly impacted the health and wellbeing of Indigenous peoples. With such economic and political marginalization, and no real access to health care or social assistance, poverty and malnutrition became endemic, further fueled by epidemics of infectious diseases, namely tuberculosis, to that point that “starvation became a constant companion” (Paul, 2006, p. 196).

Despite the great diversity among Indigenous peoples, the impact of colonization revealed a similar picture across Canada albeit beginning at different times of contact. Paul (2006) describes the destitution faced by the Mi’kmaq of Nova Scotia from the late 18th century through the 19th century:

> “Over the period 1760 to 1867, indirect genocide by starvation took a great toll. The groundwork for it had unintentionally been laid by the French…[who] had completely altered Mi’kmaq trading patterns and made them dependent upon an unsecure food supply. Upon their departure this arrangement proved disastrous for the Mi’kmaq. After 1763, with the wild meat supply drastically reduced by overhunting and fur trapping, and with their traditional fishing grounds taken over by hostile European fishermen, few traditional food sources remained, leaving them very vulnerable to famine…by 1883 the Mi’kmaq were on the verge of extinction.” (Paul, 2006, p. 195-196)

Miller (1982, p. 15 cited in Paul, 2006) further provides historical evidence for the widespread and severe state of starvation faced by the Mi’kmaq:

> "The situation not only continued, but worsened if that is possible, as in 1846 the natives at Digby were reported dying 'for want of food and sustenance'. In 1851 it was the Micmac in Cape Breton again, this time alleged to be in a state of famine. In 1855 the Micmac of New Glasgow 'were ready to drop from hunger', while in 1856 in nearby Pictou, the Indians were 'actually starving, and crying for food'. There can be no doubting an Indian Superintendent's 1861 assessment of all the Indians in Nova Scotia and Cape Breton as 'destitute and miserable'."

Young (1988, p. 35) discusses the depletion of game leading to periodic famines in subarctic Ontario noting that from the 1820's on the "fortunes of the Indians plummeted". With the caribou and moose becoming scarce and fur-bearing animals reduced from over-trapping many trading posts were abandoned further threating survival of the local Indigenous peoples. Reports of starvation were increasing with cases in Cat Lake in 1879 and of widespread starvation in Osnaburgh in 1883. As noted in a trader's journal entry; "…all the people were calling for something to eat. I wish I could have left Osnaburgh too to be clear of the [cries]" (HBC Archives, 1883, cited in Young, 1988, p. 35).

Starvation on the Prairies began during the mid- to late-19th century because the government did not fulfill its treaty obligations and through control of food rations. Peoples of Treaty 4, who signed partly because of their disappearing food source (the bison), had not received the promised farm equipment six years after signing; "they were starving, sick and ill-dressed for a tough winter" (Bednasek and Godlewska 2009, p. 447-448). Maureen Lux (2001, p. 38) argues that the government allowed starvation to occur at Fort Walsh as a "cynical and deliberate plan" to pressure the Cree to leave the area so it could be developed. Such deliberate plans lead to reports by Blackfoot Chief Old Sun and Sarcee Chief Bull Head that their people sold their rifles and horses and resorted to eating dogs, gophers and mice (Lux, 2001).

The impact of colonization was similar in British Columbia during the late 19th and early 20th centuries, as noted in Kelm's (1998, p. 27-29) discussion of the effect of marginalization and the reserve system on Indigenous food security:

> "Hunting territories were cut off from reserves, fenced, and put under the plough or converted to pasturage. Fishing technology was forcibly regulated to favour the commercial fishery at the expense of Indigenous harvesters… The laying out of the reserves constrained the ability of the First Nations to provide themselves with traditional foods, and also made supplementing the traditional diet with introduced crops [e.g., the potato] difficult… By the 1880s in the Cariboo… only land that could not be irrigated was left to be set aside for the Alkali Lake band… While the failure of one food supply would have created a difficult situation in the past, restricted access to the land meant that the people could no longer rely on the abundance of variety to see them through tough times. For instance, when the salmon run of 1879 failed for the Shuswap… the people were faced with starvation".

The desperation of Indigenous peoples was not due to their precarious subsistence strategy but rather by restricted access to the land. In 1879, faced with the threat of starvation Chief William of the Shuswap around Williams Lake wrote the Department of Indian Affairs (Kelm, 1998, p. 28):

> "I am an Indian Chief and my people are threatened by starvation. The white men have taken all the land and the fish. A vast country was ours. Its all gone. The noise of the threshing machine and the wagon have frightened the deer and the beaver. We have nothing to eat. My people are sick. My young men are angry…. A war with the white man will end in our destruction, but death in war is not so bad as death by starvation."

In the Canadian North, hunger came on the heels of different views of nature and contrasting value systems. As noted above, Indigenous peoples have an intimate relationship with the land and the animals; acting as environmental stewards, for example, keeping a natural balance. The white trappers, embracing food production and profit rather than balanced and reciprocal relationships, over-hunted and depleted the wildlife forcing conservation measures:

> "The general attitude of the white trapper is that the Territories is a fur country in process of depletion and they are out after their share; a trapper who is a stripper. He takes all he can and leaves nothing behind. He is not a settler in the commonly accepted sense of the term. He is only a transient ready to pull stakes and leave as soon as he has made his stake or finds that it does not pay him to stay. He is altogether an undesirable character who could and should earn his livelihood in other pursuits not open to Indians" (Parker, 1930, p. 3).

The over hunting by the white trappers lead to such a depletion of animals that "starving Indians" (Yellowknives and Chipewyans) were observed arriving at Fort Reliance "from every point on the compass, declaring that the animals had left the Barren Lands" (Back, 1970, p. 194). The desperation was summed up in the graphic headline in the Edmonton Journal on April 2nd, 1927: "Indians starving in Barrenlands; 23 have died during winter" highlighting that survivors were eating moccasins, old moose hides and strips of barbiche used for repairing dog harnesses and snowshoes.

And finally, the mid-20th century collapse of the fur trade-based economy and the ravages of tuberculosis that spread rapidly as Inuit living standards deteriorated lead to well-publicized and graphic accounts of starvation among Inuit groups living in the "barren grounds" to the west of Hudson Bay. Triggered largely by public reaction in southern Canada, an accelerated involvement of the Canadian Government in Nunanvut began in the 1950's and 1960's (Rigby et al., 2000) and relocation of the Inuit became the focus. However, the relocation policies, removing Indigenous peoples from their lands and associated traditional ecological knowledges, lead to a new kind of suffering: "We knew it was a hungry country" (Ahiarmiut leader Oulijoot relating life at Henik Lake, Mowat, 1959, p. 188).

As Laugrand and colleagues (200, p. 26) explain, relocation was mainly founded on economic and moral considerations as the administration viewed the Ahiarmiut as a "primitive" people needing to be integrated into Canadian society, and that their existence should have a sound economic base. Considered to be a "primitive", "lazy" and "indolent" people with "loose morals", the Ahiarmiut need to be removed from the local weather station at Ennadai and relocated:

> "The people at Oftedal Lake are not a representative group of Eskimo. They together with a few other small bands living on the barrens constitute the last remaining examples of 'primitive' Eskimos. They are, for the most part 'pagans'. Almost exclusively, they depend upon the migrating caribou herds to provide them with meat for food and with skins and sinews for clothing. The caribou herds, as you must know, have declined drastically during the last few years. This year there have been no caribou in the Oftedal Lake area and this has meant much hardship and misery for the Eskimos. I do not wish to excuse their conduct but it may be that prolonged hunger will often dull a man's conscience". (Kennedy, 1958, cited in Laugrand et al., 2009, p. 23).

With this view of the Ahiarmiut, government policies eventually destroyed the structure of Ahiarmiut society; the destruction of leadership and fragmentation of society that also involved ending the tradition of food sharing, a central value (Arviat, 2005; Laugrand et al., 2009) as recounted by an Ahiarmiut Elder;

> "Because the life changed completely, we didn't have a real leader any more. The government started to lead us instead of our leader. Everything changed. When everything changed we no longer lived like we did in Ennadai Lake. People started to have a hardship. In fact, four people died Pongalaq, Qajait, Angatarjuaq and Angmak died of starvation. [...] back in Ennadai Lake people were sharing whatever they had. But once they were moved to Henik Lake they were no longer sharing everything they had. They were each looking after their own family. Life changed. Therefore, some people died of starvation" (Laugrand et al., 2009, p. 29).

Elders' stories of the relocations of the Ahiarmiut from Ennadai Lake to Nueltin in 1950 and to Henik Lake in 1958 have been recorded (Arviat, 2005; Laugrand et al., 2009, p. 17-20) and reveal the pain, hardship, and suffering experienced by the Ahiarmiut with these deportations:

> "Even though my mother tried to breast feed her, she couldn't feed her so she died…she never had a chance to grow up because we were relocated to a different place"

> "…I grabbed a big piece of hide from the covers, removed the hair and I chewed it a long time, and when it was good and wet I put it into his mouth, my father's mouth, and he swallowed it. At least he had something in his stomach"

> "My baby was newborn. I would try to feed him but I had no milk at all. So we had a hard time. There was no food at all for us, not even for the newborn to have milk from me"

The suffering created by the forced relocation can be exemplified in the story of Kikkik:

> "Ootuk, stepbrother of Kikkik, and her husband Hallauk were camping with their children at North Henik Lake. Ootuk's son had already died of starvation. Ootuk shot Hallauk while he was jigging for fish on the lake. Then Kikkik and Ootuk fought with each other. Kikkik told one of her children to give her a knife and she stabbed Ootuk who was trying to shoot her. Kikkik then went with her five children to Padlei. They met some

> other people on the way to Padlei but could not keep up with them. They told them to wait in an igloo while they continued to Padlei. They waited for five days. Then Kikkik decided to leave two children behind. She buried them in a caribou sleeping bag in the snow, and with the other three went on to Padlei. The others had already reached Padlei. The manager warned the RCMP in Arviat and Corporal Callagher and Constable Laliberte chartered an airplane to search for the survivors. They found Kikkik and her children, not far from Padlei. When Kikkik told them her other children were dead they went to look for them and found the igloo with one of the children dead and the other one alive. This case received a lot of attention in the international press. A trial started on April 14, 1958 where Kikkik was acquitted from murder on both charges" (Laugrand et al., 2009, p. 24).

As Laugrand and colleagues (2009) discuss, the actions of Kikkik need to be seen from the perspective of starvation. Kikkik killed Ootuk in self-defense and left two of her children behind as a choice a woman had to make in the terrible conditions of starvation. The authors further note that the starvation was by no means a natural phenomenon but rather the result of the relocation of the Ahiarmiut by the Government, a fact that was hardly given any attention. Indeed, the coroner who examined the bodies of the Inuit who died claimed to find no evidence of starvation. However, as Tester and Kulchyski (1994, p. 233) explain;

> "Starvation in the Arctic is not the same as starvation in a temperate climate. Under Arctic conditions, the loss of body fat means death from hypothermia long before the body starts to consume protein and muscle mass in an effort to sustain itself. Therefore, Inuit dying of starvation in the Arctic does not fit the stereotypical image of starvation…".

The 1958 trial and story of Kikkik, as well as the famous cover of the 1956 *Life* publication depicting the Ahiarmiut as a "stone-age people" and Farley Mowat's books (1952, 1959), played an important role in creating of the image of the Ahiarmiut, and other northern peoples, as primitive and bound for extinction (Laugrand et al., 2009). A few years later Neel (1962) published his hypothesis on the thrifty genotype.

These histories of hunger make the connections of settler colonialism to starvation among Indigenous peoples in Canada clear. However, how can the starvation of people decades or centuries ago influence diabetes prevalence among Indigenous peoples today? Standard medical and clinical discourse situates diabetes solely within the contemporary body due to non-compliance with dietary and lifestyle recommendations leading to abnormal functioning (i.e., pathophysiology). How can these histories influence the body today? Through a developmental origins lens, it is revealed that the body remembers past atrocities.

Adapting to Starvation, Programming the Body

More recent hypotheses regarding the cause of diabetes suggest a developmental origin brought to focus by Hales and Barker's (1992) proposal of the "thrifty phenotype" in contrast to Neel's (1962) "thrifty genotype". In contrast to genetic causation, the thrifty phenotype hypothesis focuses on the developmental origins of disease and posits that an undernourished maternal environment (i.e., an undernourished pregnant woman) will result in reduced fetal growth via developmental plasticity (i.e., an undernourished fetus), which is associated with a number of chronic conditions, including obesity and diabetes, later in life. A commonly cited example of such early life metabolic adaptations in response to environmental cues is the Dutch Famine (~1944-1945) and its effects on maternal nutrition and the adult health of the exposed offspring. At the peak of the wartime "hunger winter" in the Netherlands, food rations were severely cut (< 800 calories per day) leading to severe undernutrition for pregnant women. A comparison of the individuals exposed to the famine *in utero* and individuals not exposed (gestated before or after the famine) revealed an association with numerous health problems for the exposed cohort; e.g., glucose intolerance, obesity, stress sensitivity, coronary heart disease, and breast cancer (Roseboom et al., 2008). The timing of exposure (i.e., what phase of gestation) determined which part of fetal development was impacted (e.g., development of particular organs or systems) which resulted in related poor health in adulthood. These findings reveal the role maternal nutrition plays in disease susceptibility later in life through programming of the fetus to that early nutritional environment.

Since Hales and Barker's (1992) original publication, numerous other studies have further investigated the impact of different maternal environments on fetal growth and the health of the offspring. In their review of the adult sequelae of intrauterine growth restriction (IUGR), Ross and Bealle (2008) discuss how the malnourished maternal environment leads to alterations in numerous fetal organs leading to obesity due to alterations in appetite regulation and increased adipogenesis (the development and differentiation of adipocytes or fat cells). Yet other studies, alternatively, have investigated the impact of overnutrition and related health concerns (e.g., Catalano et al., 2003; Heerwagen et al., 2010, Leiva et al., 2011). Catalano and colleagues (2003), for instance, studied the impact of maternal obesity and maternal gestational diabetes (GDM) on the developing fetus and found both conditions lead to fetal overgrowth (macrosomia) and an increase in adipose (fat) tissue which further lead to obesity in adolescence and glucose intolerance. A common view in studies investigating the impact of maternal obesity on fetal development is that maternal obesity reflects overnutrition or over-feeding. However, as noted above in the review by Ross and Bealle (2008), as well as the original thrifty phenotype hypothesis by Hales and Barker's (1992), maternal obesity may reflect the mother's own fetal undernutrition. How is the metabolic phenotype of the fetus altered if the obese mother herself was an undernourished fetus with an altered metabolic phenotype? What if the mother's obesity is not due to "access to unlimited calories" with the "Western diet" but rather to her altered metabolic phenotype due to her own mother's *lack of* access to nutrients? Can metabolic alterations in obese and diabetic maternal bodies give a clue to fetal programming as a result of starved mothers and grandmothers?

A Chemistry of Starvations Past?

> "Tlicho women stuff themselves up with food but still go hungry."
>
> (Tlicho participant, Yellowknife, March 28th, 2012)

A Tlicho woman stated the above comment during a *Tlicho Healthy Eating and Diabetes* workshop discussion regarding the role of obesity in increasing the risk of gestational diabetes and the need to maintain a healthy weight during pregnancy. To the Tlicho participant this comment may reflect her experiences with body weight; to an endocrinologist this reflects leptin resistance. *Leptin* is an adipose (fat) tissue-derived hormone produced in proportion to fat stores in the body and is often referred to as an "anti-obesity" hormone in that it has been seen as a "satiety signal" restricting food intake and limiting fat stores. In turn, *leptin resistance* refers to the body being resistant to the effects of leptin and, therefore, satiety is not reached, hunger persists, resulting in consuming more food. Overeating is commonly viewed as the key causal factor leading to obesity and the potential links with leptin resistance is purported to be synonymous with "obesity" (Myers et al. 2010, p. 645). Within this view, leptin resistance leads to a lack of satiety, resulting in overconsumption, which ultimately leads to obesity. However, for other researchers, the relationship is reversed. For example, Banks and colleagues (2006) propose that increased triglycerides (i.e., hypertriglyceridemia) associated with obesity impairs normal leptin function, because triglycerides inhibit leptin transport across the blood-brain-barrier (BBB). Seeing obesity as being resistant to an anorectic (i.e., leptin) as a paradox, Banks and colleagues (2006) postulate that since hypertriglyceridemia also occurs with starvation that triglyceride induced leptin resistance across the BBB evolved as an anorectic to the brain during starvation. In short, the hypertriglyceridemia of the obese body makes the brain think the body is starving.

Indeed, the phenomenon of persistent hunger and a lack of satiety, associated with leptin resistance, were noted decades before the scientific identification of the hormone leptin. From November 1944 to December 1945, Ancel Keys and colleagues (1950) conducted the *Minnesota Starvation Experiment* at the University of Minnesota. The aim of this clinical study was to determine the physiological and psychological effects of severe and prolonged dietary restriction (i.e., semi-starvation in severe famine) and to investigate the effectiveness of strategies for dietary rehabilitation (i.e., relief assistance to famine victims at the end of World War II). The results were published in 1950 in a two-volume text, *The Biology of Human Starvation* (University of Minnesota Press) and the phenomenon of leptin resistance seems evident during the third phase of the study involving re-nourishment:

> “Many Minnesota subjects commented that they were still ‘hungry’, though uncapable of ingesting more food, at the end of the very large meals that were the rule” (Keys et al., 1950, p. 843) …. Men frequently found it difficult to stop eating. No. 20 ‘stuffs himself until he is bursting at the seams, to the point of nearly being sick,’ and he still felt hungry;

> No. 120 reported he had to discipline himself to keep from eating so much as to become ill; No. 1 ate until he was uncomfortably full; and subject No. 30 had so little control over the mechanics of 'piling it in' that he simply had to stay away from food, because he could not find a point of satiation even when he was 'full to the gills'… Subject No.9 ate about 25 percent more than his pre-starvation amount; once he started to reduce but got so hungry he could not stand it…" (Keys et al., 1950, p. 847).

Given the relationship between leptin resistance and starvation, and Banks and colleagues' (2006) proposal that the obese body makes the brain thinks its starving, one may propose that leptin resistant obesity would lead to constant overfeeding with diabetes as the end result. However, not all obese people have diabetes and not all people with diabetes are obese, indicating a reconsideration of the relationship between obesity and diabetes (Saboor Aftab et al., 2014). Indeed, the focus has shifted from obesity as measured by body mass index (BMI) to central obesity as the key indicator of risk. As Sahakyan and colleagues' (2015, p. 827) investigation into cardiovascular mortality risks associated with central obesity and BMI, "persons with normal-weight [i.e. normal BMI] central obesity had the worst long term survival" as compared to those with high BMI's, particularly in the absence of central fat distribution. Similarly, Egeland and colleagues (2011) found central obesity in combination with triglyceride levels to be a better predictor of diabetes risk. These findings suggest a specific metabolic phenotype rather than overnutrition leading to diabetes. However, it may not only be central obesity and increased triglyceride levels that are sustained by this altered metabolic phenotype.

As Soeters and Soeters (2012) explain, there is an evolutionary benefit to insulin resistance: Insulin resistance, the hallmark of diabetes, is adaptive in starvation as it minimizes protein loss, thereby promoting survival as the protein content of the body is a major determinant of long term survival in starving individuals. In stress starvation, or starvation associated with illness or trauma, insulin resistance is even stronger (limiting glucose oxidation and minimizing protein loss) as metabolic processes intensify due to higher energy requirements. Peripheral organs (skin, bone, muscle) become catabolic resulting in net protein loss with amino acids taken up and utilized by central organs (liver, spleen, immune cells, healing tissues) for stress response. Is the body's adaptive approach to preserving the function of the central organs rather than peripheral organs the reason central obesity is of concern in diabetes and other chronic diseases?

The findings discussed above by Banks and colleagues (2006), Egeland and colleagues (2011), and Soeters and Soeters (2012) lead to two interesting points regarding a specific metabolic phenotype. First, if central obesity is the obesity of concern for being at risk for diabetes as well as other chronic conditions, it cannot directly reflect over-feeding as that should lead to overall obesity and would also address Soeters and Soeters (2012, p. 4) concern that the "role of insulin resistance in overfeeding is enigmatic". Second, although hypertriglyceridemia, leptin resistance, and insulin resistance are typically discussed in terms of their relationship to obesity, they are all also involved in the starvation response (Banks 2008). Indeed, as leptin resistance and insulin resistance often coexist in obese individuals, Myers and colleagues (2010, p. 643) observe that apart from increased body fat mass, the phenotype of individuals lacking leptin mirror the physiological response to starvation. But what is informing this specific metabolic phenotype mirrored in obesity and starvation?

In their review of the developmental origins of adipose tissue, Berry and colleagues (2013, p. 3939) describe adipose tissue as the "central nexus of metabolic communication and arbiter of thermoregulation" and in addition to serving as a storage depot, adipose tissue is now recognized as "the body's largest endocrine organ" controlling various aspects of systemic physiology by secreting hormones, lipids, and other factors, including leptin, insulin and triglycerides. Noting that different kinds of adipose tissue provide different contributions to metabolism, and that each kind is regionally deposited, they discuss visceral fat as having proximity to internal organs and being the fat of concern (i.e., central obesity) for health risks. Of key interest to this discussion, the authors further emphasize that "developmental sources are important to adipose development and regional distinctions…[and] that distinct developmental cues are likely to determine the complexity of the adipose lineage and that *all fat cells are not created equally*" (Berry et al., 2013, p. 3941, my emphasis). In sum, adipose stem cells that produce adipose tissue can be altered by a variety of mechanisms including environmental factors, thereby altering systemic physiology and the associated secretion of hormones and lipids (e.g., leptin and insulin).

As noted above, and in concordance with the thrifty phenotype hypothesis, Ross and Beale (2008) discuss how reduced fetal growth (or intrauterine growth restriction) due to a malnourished mother results in increased adiposity, as a result of increased adipogenesis, and associated alterations in the development of fetal organs. The authors further discuss how the increased adipogenesis is associated with altered development of adipocytes as adult intrauterine growth restricted offspring exhibit leptin resistance with leptin and insulin levels related to birth weight independent of adult obesity (Ross and Beall, 2008), again shifting the focus away from obesity to a developmental fetal origin of altered leptin and insulin levels. Further, altered leptin levels need to be considered with current understandings of the role of leptin. As Vickers (2007) notes, although initial understandings of leptin were confined to its role in energy homeostasis and obesity, the role of leptin in the body is now expanded to critical windows of development; the regulation of reproduction, glucose homeostasis, bone formation, wound healing, and the immune system. Therefore, a key question to consider with a developmental fetal origin of altered leptin levels and leptin's role in critical windows of development is what is its relationship with the earlier age of onset and a higher prevalence among Indigenous women, adolescents, and children as compared to the later age of onset and higher levels among non-Indigenous Canadian men.

Has the starvation response of the maternal environment (i.e., starving Indigenous mothers) been programmed into the adipose stem cells of the fetus thereby altering regional deposition of adipose tissue (central obesity) and leading to leptin resistance, insulin resistance, and hypertriglyceridemia? Given the histories of starvation Indigenous peoples in Canada have endured across time and space, and in line with the "Thrifty phenotype" hypothesis, the starvation response may be seen as a metabolic adaptation by the maternal body to survive reduced energy intake that has been programmed into the adipose stem cells of the fetus. Although this role of starvation in the origins of diabetes parallels Neel's (1962) hypothesis, Neel proposed his thrifty gene argument within an era of eugenics (and proposes eugenic considerations in his key publication) and his main, and still prevalent, assumption that Indigenous peoples routinely faced starvation pre-colonization is not supported in the literature. The colonial histories of starvation Indigenous peoples experienced in Canada with colonization discussed above, however, are well documented, and through a developmental rather than genetic lens reveal that diabetes among Indigenous peoples in Canada is not based in a genetic susceptibility (or a thrifty genotype) mismatching with the adoption of a western diet but rather to the oppressions of colonization and associated starvations leading to altered metabolic phenotypes over the generations. Rather than “primitive bodies” clashing with a “modern diet” diabetes among Indigenous peoples in Canada may be seen as a developmental disease of colonization.

Chapter 5

Starved Bodies, Programmed Generations: The Intergenerational Embodiment of Colonization[4]

Although genetic explanations for the higher prevalence of diabetes among Indigenous peoples in Canada have been claimed another common explanation has been that Indigenous peoples have gone through a *nutrition transition*; a shift away from "traditional foods", or foods hunted, fished, and trapped from the land, to less healthy "store foods", or processed foods purchased from the store, leading to obesity and diabetes. In response to the nutrition transition, health policies and nutritional guidelines focus on behavioral change, where healthy food choices and active living are promoted, and a return to the "traditional diet" is endorsed. The prevalence of diabetes among Indigenous peoples, however, differs regionally across Canada and not all Indigenous groups fit the standard view. Prevalence rates of diabetes among Indigenous peoples in Canada are generally highest in Atlantic Canada and are lowest in Northern Canada (i.e., Nunavut) with the prevalence among the Inuit in Nunavut being comparable to the general Canadian population, despite overweight and obesity being prevalent (Public Health Agency of Canada, 2011). This enigmatic situation among the Inuit (i.e., they are Indigenous so they ought to be at risk…) has lead some researchers to question the validity of using BMI measures among the Inuit claiming BMI cut-off points were developed for non-Indigenous populations (Hopping et al., 2010), or applying different measures focusing on abdominal obesity and triglycerides (Egeland et al., 2011) to obtain a more accurate predictor of diabetes. Does the regional variation

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[4] I intend on submitting this chapter for publication in *Medical Anthropology Quarterly*.

in diabetes prevalence among Indigenous peoples in Canada reflecting different historic times of contact and adoption of the “western lifestyle” and the consumption of “store foods” thereby abandoning their traditional diets thus initiating nutrition transitions at different points in time? Through a developmental lens, I explore the geographic variation in diabetes prevalence among Indigenous peoples in Canada. By situating epidemiological and anthropometric data within an intergenerational developmental framework, I reveal how colonial histories of starvation among Indigenous peoples in Canada lead to compromised reproductive biologies across generations, and how the number of generations since the initial onset of starvation in a given region correlates with contemporary prevalence rates of diabetes among Indigenous peoples.

More recent hypotheses regarding the cause of diabetes suggest a developmental origin. The concept of the *developmental origins of health and disease* (DOHaD) suggests environmental influences (e.g., maternal malnutrition) can alter development *in utero* or shortly after birth can lead to “programmed” alterations in fetal tissue structure and function (i.e., fetal programming), and can predispose the individual to cardiovascular, neuroendrocrine, and metabolic disorders later in life, such as obesity and diabetes (Barker, 2006; Gluckman and Hanson, 2006). Evidence from both human and animal studies further suggest such programmed effects could be transmitted to subsequent generations (Drake and Lui, 2010). In other words, environmentally induced changes in the parental phenotype are considered transmissible to offspring creating an “intergenerational effect”. Programmed effects in the mother, that reflect her mother’s and/or grandmother’s nutritional status, can influence the development of the offspring during her own pregnancy; in essence, the maternal phenotype becomes a new altered environment.

To understand how fetal growth restriction or altered development may be part of an adaptation to a poor intrauterine environment resulting from circumstances of the mother's life and how this can be passed down through generations, Newnham and colleagues (2009) discuss Barker's (1999) contribution to the debate surrounding the "French Paradox". The term *French Paradox* has been coined to refer to differences in the prevalence of coronary heart disease in France and Britain despite similar major risk factors (e.g., animal fat consumption, smoking, lack of exercise) in both populations: Death from ischemic heart disease in France is approximately one quarter than that in Britain. Some challenge the existence of the French Paradox due to under-certification of ischaemic heart disease in France, while others provide a variety of explanations, such as a specific effect of wine or difference in smoking patterns (Law and Wald, 1999). One proposed hypothesis to explain these findings cited the antioxidant properties in red wine as providing specific protection (Frankel et al., 1993); however other studies have challenged such alleged protection of alcohol (Feliciano et al. 2105; Muldoon and Kritchersky, 1996). Applying a developmental origins approach can provide greater insight into this "paradox" through a historical perspective (Barker, 1999); as Newnham and colleagues (2009, p. 230) note, an "explanation may be found in the study of nutrition of girls and pregnant women several generations ago".

Both the populations of France and Britain were chronically malnourished in the 1800s. In the latter part of the 19th century, the French introduced widespread nutritional support for infants and children; the impetus for this support, however, was not from public health but rather the military (Barker, 1999). Following a devastating defeat of the French Army in the Franco-Prussian War of 1871, "nutritional support programs were introduced to improve the nation's future military potential by improving infant survival and child health" (Newnham et al., 2009, p. 230). The British adopted similar initiatives after finding poor health in the men enlisted to fight in the Boer War, albeit three decades later. It has been suggested that this three decade advantage of the French in terms of infant and child health has now manifested itself as lower prevalence of cardiac mortality several generations later (Barker, 1999). This intergenerational effect can have large implications for health policy as Newnham and colleagues (2009, p. 230) note "the task of tackling the current epidemic of obesity and diabetes may need to extend over many generations". Clearly the biomedical view of health as a somatic state within an individual body, as well as the focus on individual compliance with dietary recommendations in the present as preventing or controlling diabetes, is challenged by a developmental origins perspective. Through a developmental lens, history becomes a non-modifiable determinant of health.

As noted in chapter 3, the view of history in biomedical perspective is often considered to be "family history" and, therefore, as reflecting a genetic basis. However, if a developmental approach is applied, environmental contexts affecting maternal health becomes critical, and the role of intergenerational effects emerges. For example, the fact African American women have higher rates of low birth weight babies as compared to European Americans, regardless of socio-economic status (e.g., income, education, housing and occupation) (Bogin, 2001), has been considered by some to be "racially" or genetically based. However, in the case of the birth weight of "biracial" infants (i.e., infants born to an African American mother and a European American father, or vice versa), Migone and colleagues (1991) found that the "race" of the mother was more a predictor of low birth weight than the "race" of the father (i.e., a higher percentage of the infants were of low birth weight if the mother was African American rather than European American). This suggests not only an intergenerational transmission of maternal programmed effects, rather than family genetics, but also draws attention to reproductive biology, or in the case of socially disadvantaged groups, compromised reproductive biologies due to histories of inequity, as discussed in chapter 3 with Jasienska's (2009) study regarding the impact of a history of slavery on contemporary African American reproductive biology. Evidence suggests diabetes is also transmitted across generations (Frienkel, 1980). Offspring of diabetic mothers are at four times the risk for developing diabetes, and the risk increases to five to six times if the mother is gestationally diabetic (Silverman et al., 1995; Pettit et al., 1991). Although the mechanisms underlying the intergenerational transmission of programmed effects remain unclear, potential explanations include: the persistence of environmental conditions; physiological, behavioral, and anatomical maternal effects; and epigenetic and non-genomic effects transmissible through the germline [5] (Drake and Lui, 2010).

In a discussion of the physiology of pregnancy, Cetin and Cardellicchio (2010) explain that factors beyond a balanced maternal diet strongly influence fetal development, and emphasize the physiological interaction of the mother, placenta, and fetus to guarantee fetal growth and development. As Barker (2006) notes, recent animal studies and observational data in humans (Barker 1998) suggest a mother's own fetal growth, and her dietary intakes and body composition, can exert major effects on the balance between fetal demand for nutrients and the materno-placental capacity to meet that demand. Exposure to undernutrition *in utero*, for example, results in an increased prevalence of obesity (as well as cardiovascular disease and

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[5] Germ line refers to a group of cells that give rise to the gonads. A mutation event in these cells may be transmitted to the offspring.

diabetes) in the offspring. The mother's body composition (pregravidic weight) can also influence fetal and pregnancy outcomes. Maternal obesity (BMI >30) is associated with pregnancy diseases including gestational diabetes mellitus (GDM) and high birth weight (HBW) or macrosomia (birth weight >4000 g) among others. Obese mothers have a three times higher risk of developing GDM as compared to non-obese mothers (Cetin and Cardellicchio, 2010). Placental function is a major factor influencing fetal nutrition and growth by regulating nutrient and oxygen flow to the developing fetus: In pathologic conditions such as GDM the role of the placenta is characterized by specific placenta phenotypes. An increased placental/fetal weight ratio has been reported in pregnancies complicated by GDM; the increased placental mass could augment nutrient exchange via an extended surface area for substrate transfer (Cetin and Cardellicchio, 2010). Both high maternal weight (and adiposity) and GDM are associated with an increased risk of diabetes in the offspring. Therefore, factors such as maternal diet and body composition, as well as the morphology of the placenta, can affect the interaction between the mother, placenta and fetus, and may be considered within a developmental intergenerational model (Table 2).

Obesity, GDM, and macrosomia, as well as diabetes, have been noted as prevalent among Indigenous peoples in Canada, most commonly studied among First Nations, and there is some evidence to suggest these conditions emerged successively following decades of economic and political marginalization that ultimately resulted in severe malnutrition (i.e., starvation) coupled synergistically with high rates of infectious diseases. A review of historical influences on the health and wellbeing of First Nations peoples sees economic and political marginalization as

Generation	Maternal Effects	Programmed Effects on Fetus
F0	Maternal malnutrition	Obesity (with sufficient food) in the next generation (F1)
F1	Maternal obesity increases risk of GDM	GDM increases risk of type II diabetes 5X-6X in offspring in F2 HBW or macrosomia in F2
F2	Type II diabetes	Offspring of mothers with type II diabetes are at 4X the risk for developing type II diabetes

Table 2: A developmental intergenerational model of diabetes considering maternal physiological effects and the subsequent programmed effects in the fetus.

key aspects leading to health disparities between Indigenous peoples and non-Indigenous Canadians. The embodiment of histories of inequity experienced by First Nations peoples can be investigated in a model incorporating anthropometric and epidemiological data within a developmental intergenerational framework. As the DOHaD model discusses the intergenerational transfer of fetal programmed effects from the maternal environment to the next generation (e.g., F0 to F1), the impact of a socially unequal history among First Nations peoples can be based on the emergence of various anthropometric and epidemiological measures. As discussed above, although most epidemiologic and anthropometric data on diabetes among Indigenous peoples in Canada focus on First Nations, the low prevalence of diabetes among the Inuit also fit this model.

Generation F0: Colonized Wombs

> "Indians are not subject to diabetes…
> the reason is not because they are all thin,
> for some of the older Indian women are very fat".
> Chase (1937, p. 369)

In what Young (1988, p. 40) describes as an era of "struggle for survival", the late 19th - early 20th century was a period of severe economic and political marginalization for Indigenous peoples in Canada. The demise of the fur trade economy of the 19th century, intentional disruption of cultural traditions, the confines of the newly created reserve system, broken treaty promises, and the forced acculturation of the residential schools, set the stage for extreme poverty and severely high levels of malnutrition coupled synergistically with infectious diseases. If infant mortality rates (IMRs) are considered as a measure of community health and wellbeing, the early 20th century IMR of 249-281 per 1000 live births for an Indigenous community in Manitoba (Moffat and Herring, 1999) speaks volumes. However, historical experiences are not uniform for all Indigenous peoples in Canada; not only does the timing of contact with Euro-Canadians vary from one region of Canada to another but also the kind of relationship that existed between Indigenous peoples and those who would colonize them. Arguably, what can be linked is a collection of histories of starvation among Indigenous Canadians.

Medical surveys of the mid-20th century reflect physical and mental symptoms and measures of starvation. For instance, impaired mental function and muscle wasting, both symptomatic of starvation, are noted in a medical report from 1948 investigating the nutrition and health of the James Bay Cree;

> "It was the impression of all observers that the Indians examined were short and not well muscled… It was also the impression of all observers that they moved slowly and were apathetic. The children were much more docile than white children. On comparing the Attawapiskat and the Rupert's House Bands, the latter band was more active physically and displayed more initiative (Vivian et al., 1948, p. 509) … The most striking finding was the extremely small calf circumference in these children. Their general body build

> was short and broad … About half the younger women (from 20 to 39 years of age) were 10 pounds or more underweight for the heights and builds … A considerable number of older women were grossly overweight … Also the *underweight is most prevalent during the main childbearing years when the nutritional needs of women are at the height*" (Vivian et al., 1948, p. 511, my emphasis).

Clearly severe undernutrition impacted the reproductive health of the women in this community. The coexistence of underweight children and obese mothers or older women has been noted in environments of poverty and food scarcity (e.g., Florêncio et al., 2001) and is in line with the programmed effect of obesity (as an altered phenotype) due to an undernourished maternal environment. Furthermore, an increase infectious diseases is also associated with environments of poverty and food scarcity; "The extremely high incidence of both pulmonary and extra-pulmonary tuberculosis constitutes the most serious problem. It reflects lack of sanitation and cleanliness … Also, poor nutrition probably is an important contributing factor" (Vivian et al., 1948, p. 516). Similarly, a nutrition health survey among an Indigenous community in northern Manitoba indirectly assessed a chronic history of undernutrition and mental symptoms of starvation with the high prevalence of TB;

> "Physical measurements of the Indians were not taken. The Indian today however is smaller than 40 years ago [based on clothing sizes sold in the past versus present]. Furthermore, in the past the Indians are said to have been energetic and accounts of their remarkable vigor have been perpetuated by both legend and record. In contrast, at present they generally show listlessness, indolence and inactivity. There is no doubt in the opinion of the older white inhabitants that there has been in the past 40 years a marked deterioration in the physical condition of the Norway House Indian" (Moore et al., 1946, p. 231) … It is not unlikely that poor nutrition is responsible in part at least for many characteristics of the Indian, such as shiftlessness, indolence and inertia which have long been regarded as inherent or hereditary traits. Furthermore, it is probable that their great

> susceptibility to many diseases, paramount amongst which is tuberculosis, may be attributable among other causes to the high degree of malnutrition arising from the lack of proper foods" (Moore et al., 1946, p. 233).

Evidently the medical specialists and nutritionists of the day knew chronic malnutrition was a constant threat to Indigenous peoples, however little was done and not only did the neglect continue, but nutritional experiments were undertaken in the residential schools to further medical knowledge about vitamin supplementation (Mosby, 2013). Moreover, medical and government officials viewed the poor health of First Nations peoples in racial and evolutionist terms, as in need of modernization or as evidence they were "doomed" and bound for extinction (Frideres, 2011). The IMR, for example, was seen as poor maternal health habits and addressed in a paternalistic approach; Indian mothers needed to be taught how to "mother" (Moffat and Herring, 1999). Similarly, tuberculosis among Indigenous peoples was racialized (i.e., "Indian tuberculosis"), reflecting a racially based genetic susceptibility, and therefore, little healthcare was provided (Lux, 2010). Despite the genetic/racialized understanding of disease origins, there was recognition of the role of inadequate housing: "As to be expected from their housing conditions, epidemics occur most frequently during the winter months … Tuberculosis is the greatest single cause of death, with a rate 14 times higher than that among the white population" (Moore et al., 1946, p. 226).

Today, tuberculosis is considered to be a disease of poverty and through a historical lens it is clear how the impoverished conditions on the reserves and in the communities guaranteed the "complete and rapid tuberculinization" of First Nations peoples (Waldram, Herring and Young, 2006, p. 70). Although Government officials were aware of a link between living conditions and tuberculosis, TB vaccine testing was carried out between 1933 and 1945 on hundreds of Indigenous babies in the Qu'Appelle region in southern Saskatchewan (Lux, 1998) for the benefit of vaccine development rather than the provision of healthcare to Indigenous peoples. In this historical period, severe malnutrition, synergistically coupled with the decimating rates of infectious diseases, set the stage for the F0 generation in the DOHaD model (Table 1) in the form of severe maternal undernutrition; undernutrition *in utero* leads to obesity in the F1 generation (given sufficient food for the offspring).

Generation F1: Compromised Wombs

> "…Nisga'a chiefs knew that the 'land question'
> would be answered in the bodies of their children…"
> (British Columbia, 1915, p. 166 cited in Kelm, 1998, p. 37)

The F1 generation is marked by the emergence of obesity, high birth weight (and macrosomia), and gestational diabetes mellitus (GDM) and a review of epidemiological studies over the decades seems to support the developmental intergenerational model proposed above (Table 2). In Canada, a rise in the prevalence of obesity among Indigenous peoples has been noted since the 1970's (Nutrition Canada, 1974). Obesity is now widespread among Indigenous peoples across Canada. There are different categorizations of obesity and among Indigenous peoples in Canada it is primarily of the "central type" (i.e., excessive abdominal fat around the stomach and abdomen), which is also associated with elevated cortisol levels and stress (e.g., Foss and Dyrstad, 2011) and some suggest that stress during pregnancy can cause elevated adiposity in the offspring (Dancause et al., 2015). Obesity among Indigenous peoples is manifest earlier in life (Young, 1996; Willows et al., 2007) and is more prevalent among First Nations women than

First Nations men and this sex difference in obesity has been consistently noted within high poverty areas (Law et al., 2007). Furthermore, maternal obesity is associated with gestational diabetes mellitus (GDM).

A high prevalence of GDM has been reported over the decades before the significant occurrence of diabetes among First Nations (Dyck et al., 2010). In northern First Nation communities in Saskatchewan, for example, Aljohani and colleagues (2008) found evidence that the prevalence of GDM increased in Manitoba from 1985 to 2004, with higher a higher prevalence on rural reserves and among First Nations women. More recently, Oster and colleagues (2014, p. 137) used provincial administrative data to generate an epidemiological profile of First Nations diabetes in pregnancy in the province of Alberta from 2000 to 2009 and found the prevalence of GDM was two and a half times for First Nations women as compared to non-First Nations women. However, they did not find an increase in the prevalence of GDM for First Nations women over the ten year period. The authors further note, "longitudinal data on pre-existing diabetes in pregnancy are limited. Other important maternal factors and pregnancy outcomes related to GDM and pre-existing diabetes in pregnancy have yet to be explored in this population".

Both obesity and GDM have been associated with high birth weights (HBW) and macrosomia (birth weight >4000 g.) (Caulfield et al., 1998; Dyck et al., 2001; Rodrigues et al., 2000). High birth weights and macrosomia have been reported for various First Nations communities since the 1960's. In a study from 1959-65, Partington and Roberts (1969, p. 508) note, "the average birth weights of the Cree Indians are of interest and confirm the impression of the local doctors and nurses that Indian babies are large at birth". Between 1990 and 1993, 29% of infants born at Sioux Lookout Zone, Ontario were macrosomic (Caulfield et al., 1998), and the James Bay Cree have had a prevalence of macrosomia over 37% between 1995 and 1996 (Rodrigues et al., 2000). Furthermore, some evidence exists that birth weights have increased among Indigenous Canadians; for example, Dyck and Tan (1995) found a 7% increase from 1975 to 1988 in Saskatchewan. More recently, Smylie and colleagues (2010) investigated birth outcome disparities among Indigenous peoples in Australia, Canada, New Zealand, and the United States through a systemic search of published literature and a review and assessment of existing perinatal surveillance systems. They found "significant and potentially preventable disparities" in Indigenous birth outcomes in all four countries, and note "the increased incidence of HBW is marked for First Nation/Status Indians living on and off reserve" (Smylie et al., 2010, p. 10).

Biomedical approaches to HBW have reflected a focus on individual risk factors. For example, Armstrong et al. (1998) investigated HBW among the James Bay Cree and found that although mother's age positively associated with infant birth weight, when maternal age and parity (i.e., the number of births) were put into the same model, only parity remained significantly related to birth weight. These findings suggest that it is more about factors impacting reproductive biology, or reproductive history, rather than an individual risk factor ("older mothers are at risk for…"). Further, interpretations of HBW and child growth patterns among First Nations peoples have been variable and reflect an underlying view, as discussed in chapter 2, of Indigeneity as risk. One researcher was prompted to create growth charts specific to a Cree population of James Bay (Lavallee, 1988), and debate has emerged regarding the need for ethnic specific growth charts (e.g., Kierans et al., 2008), or the appropriateness of the World Health Organization's Child

Growth Standards for defining Cree birth weight (Willows et al., 2011), as well as the underlying cause of growth differences between ethnic groups (Kierans et al., 2008; Position Statement of the Canadian Paediatric Society, 2004).

The association between fetal macrosomia and diabetes has been established, as has an underlying mechanism: Since glucose can pass the placenta but insulin cannot, maternal hyperglycermia exposes the fetus to high levels of glucose which leads to increased production of insulin by the fetal pancreas, that in turn acts as a fetal growth hormone, thus causing macrosomia. As Newnham and colleagues (2009, p. 234) note, "the mechanism underpinning how poorly controlled diabetes may cause fetal overgrowth has been known for many years, but the U-shaped relationship between birth weight [i.e., both low and high birth weight] and future glucose intolerance has only been described more recently". Given the history of deprivation of First Nation peoples (generation A) and the fact HBW emerges as early as the 1960's, one may presume maternal hyperglycemia existed prior to the visible anthropometric measures (i.e., obesity). Prolonged deprivation may have created "starving diabetics" in which HBW was the only biomedical indicator: As Diamond (2003) notes, diabetes symptoms disappear under starvation conditions.

Generation F2: Contemporary Wombs

The current prevalence of diabetes among Canadian First Nation peoples equates to the F2 generation in the DOHaD model (Figure 1). In contrast to non-First Nation Canadians, diabetes among First Nation peoples is a disease with earlier age of onset and a predilection for women during their reproductive years; women resident on reserves have a five-fold risk of death from

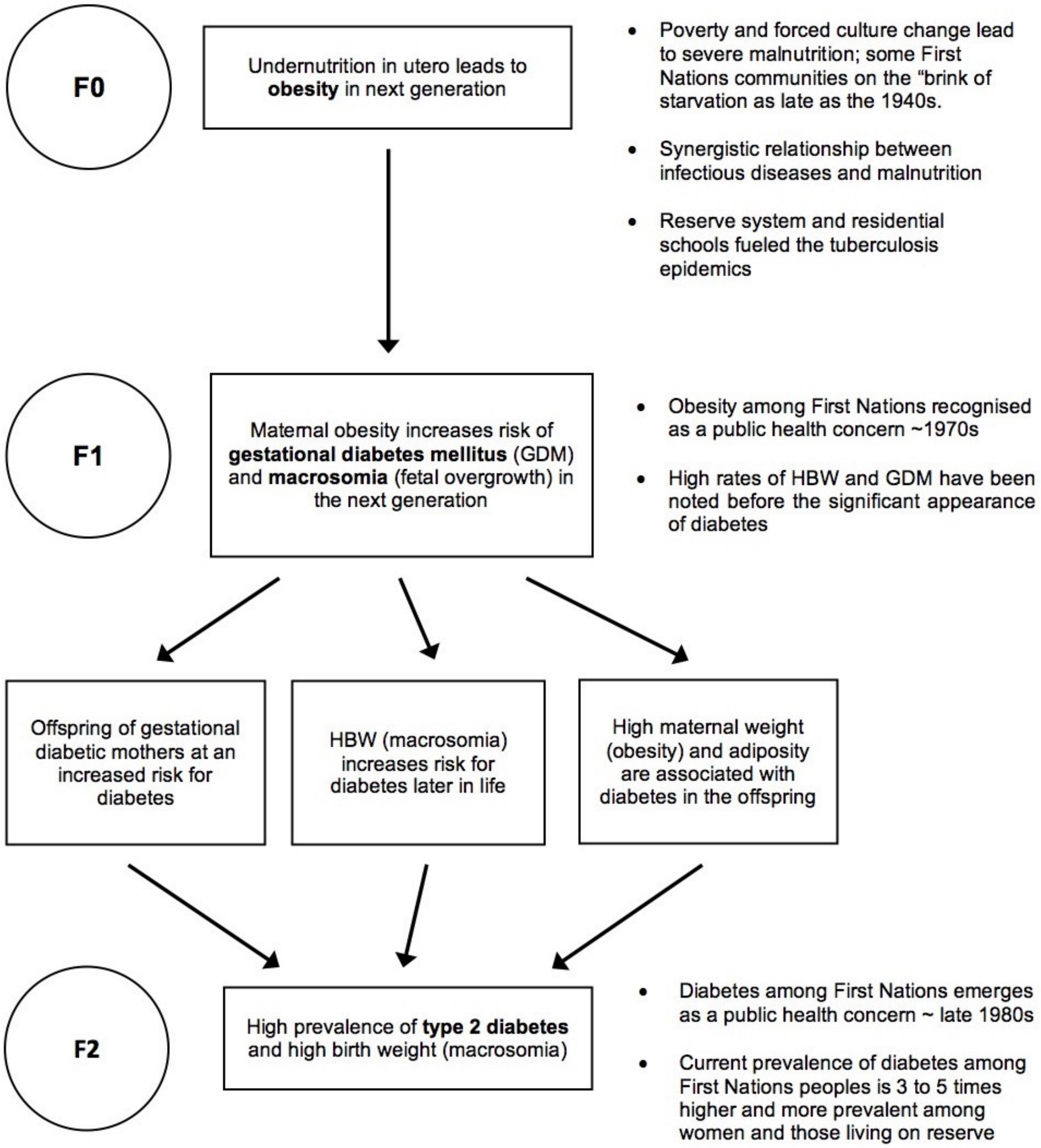

Figure 1: Developmental origins of diabetes among First Nations in Canada. Epidemiological and anthropometric measures appear to emerge in relative chronological order consistent with intergenerational transmission of fetal programming.

diabetes (Dyck et al., 2010; Harris et al., 2011; Jacklin et al., 2017; Public Health Agency of Canada, 2011; Young et al., 2000). As noted above, epidemiological data reveals the incidence and prevalence of diabetes is consistently higher among First Nation communities as compared to non-First Nation peoples, and the prevalence of diabetes differs from one Indigenous community to another (Hemmelgarn et al., 2007; Pioro et al., 1996; Green et al., 2003). In an earlier review, Young and colleagues (1990) found the prevalence of diabetes is higher in areas with the longest contact (e.g., eastern Canada and the Maritimes), and are more prevalent in southern Canada than in the North with the prevalence increasing from east to west in northern Canada. This regional variation is also evident in more recent reviews (Mansuri and Hanley, 2017; Public Health Agency of Canada, 2011).

As discussed above one interpretation of the sudden and rapid “explosion of diabetes” among First Nations peoples in Canada has been seen as a shift in diet to more calorie dense foods and the adoption of a more sedentary lifestyle (i.e., nutrition transition). The intergenerational developmental model of diabetes among Indigenous peoples, however, suggests a very different explanation for this “explosion”; namely, three generations (at least) having a metabolic and/or developmentally programmed susceptibility to the development of obesity and diabetes. Factors impacting the F0, F1 and F2 generations in this model would put all generations at increased risk for the development of diabetes and the culmination of developmental influences on the F2 generation may also explain the earlier age of onset of diabetes among young Indigenous people. The geographic variation in diabetes prevalence among Indigenous peoples in Canada can also be explained in terms of the cumulative effects of fetal programming over more generations in a given region. Table 3 outlines the beginning of intergenerational programming for different regions of Canada based on documented accounts of wide spread starvation: As discussed in chapter 4, starvation due to settler colonialism among Indigenous peoples has been documented

Onset of starvation	Maritimes (Nova Scotia)	Subarctic Ontario	Prairies	BC	NWT (Dene)	Nunavut (Inuit)
Late-18th century (~1775-1800)	F0	-	-	-	-	-
Early 19th century (~1800-1825)	F1	-	-	-	-	-
Mid-19th century (~1825-1850)	F2	F0	-	-	-	-
Mid-19th century (~1850-1875)	F3	F1	F0	-	-	-
Late 19th century (~1875-1900)	F4	F2	F1	F0	-	-
Early 20th century (~1900-1925)	F5	F3	F2	F1	F0	-
Mid-20th century (~1925-1950)	F6	F4	F3	F2	F1	F0
1950-1975	F7	F5	F4	F3	F2	F1
1975-2000	**F8**	**F6**	**F5**	**F4**	**F3**	**F2**
	Highest prevalence of diabetes					Lowest prevalence of diabetes (emergent)
					The prevalence of diabetes in the North increases east (Nunavut) to west (NWT)	

Table 3: Inter- and multi-generational transmission of programmed effects of starvation due to settler colonialism as the basis for the regional variation in diabetes prevalence among Indigenous peoples across Canada.

in Nova Scotia in the mid-18th century (Paul, 2006), in subarctic Ontario in the mid-19th century (Young, 1988), in the Prairies during the mid to late 19th century (Bednasek & Godlewska, 2009; Lux, 2001), in British Columbia in the late 19th –early 20th centuries (Kelm, 1998), in the Northwest territories in the early 20th century (Back, 1970; Edmonton Journal, 1927), and finally in Nunavut in the mid-20th century (Arviat, 2005; Laugrand et al., 2009; Tester & Kulchyski, 1994). By considering the time-period of each region's documented starvation as the F0 generation, and by considering each generation as approximately 25 years, the cumulative effects over generations give insight into regional variation in diabetes prevalence among Indigenous peoples in Canada.

Do contemporary prevalence rates of diabetes among Indigenous Canadians reflect a starvation legacy through genealogical family lines? Diabetes is known to cluster in families, hence the saying "diabetes begets diabetes", and the tendency for views of familial genetic predispositions. However, through a developmental lens, the metabolic legacy of a starved great grandmother could equate to three programmed generations. Depending on the number of children in each generation, as well as the average age of first pregnancy influencing the span of a generation, the numbers of individuals programmed from an ancestor's past starvation would quickly increase. But, one could also argue that different times of contact and culture change would lead to variation in the timing of the onset of local nutrition transitions and therefore account for the regional variation in diabetes prevalence among different Indigenous peoples. To explore this, a review of the colonial history of one Indigenous region with a low prevalence of diabetes is required.

The Tlicho: Last Place in the Diabetes Race

The Tlicho, formerly known as Dogrib, are a Dene people living in the central Northwest Territories (NWT). The Tlicho have been described by a diabetes educator as being “last in the diabetes race” in regards to having the lowest prevalence of diabetes among First Nations in Canada (Kevin White, personal communication, 2011). Although the prevalence of diabetes among the Tlicho is low (3.1%, Behchoko Health Centre, chart review, 2011), the same pattern of a higher prevalence among women seen in other First Nation communities is also evident among the Tlicho, and the prevalence of diabetes differ from one Tlicho community to another, with one community reporting no diabetes among its members (Behchokö Health Centre, chart review, 2011). Furthermore, there are no cases of diabetes among community Elders suggesting recent history is playing a role. In line with an intergenerational developmental origin of diabetes model, high birth weights have been noted among the Tlicho (Kevin White, personal communication, 2011) and obesity is considered a relatively new phenomenon (Tlicho Healthy Eating and Diabetes Program round-table discussion, October, 2011). However, the low prevalence of diabetes among the Tlicho may reflect differences in a more traditional lifestyle and diet (i.e., less of a nutrition transition), or, through a developmental lens, diabetes prevalence may reflect an emergent stage due to more recent historical factors.

To investigate this, one may compare the Tlicho region with its low prevalence of diabetes with another Indigenous region in Canada with a high prevalence of diabetes in terms of their different colonial histories (Table 4). In contrast to the Tlicho, First Nations communities in northwestern Ontario have some of the highest prevalence rates of diabetes; the community of Sandy Lake, for instance, has been noted to have one of the highest prevalence of diabetes in the

Northwest Ontario	Northwest Territories
One of the highest prevalence of diabetes	One of the lowest prevalence of diabetes
Wapekeka and Kasabonika: 2 remote Oji-Cree communities	Tlicho communities – 3 remote and 1 accessible to Yellowknife year-round road
Signed Treaty 9 in 1906	Signed Treaty 11 in 1921
Permanent settlements began in the 1930s	Permanent settlement for the remote communities began in the 1960s
People still go on the land hunting, trapping and fishing	People still go on the land hunting, trapping and fishing
Depletion of animals and accounts of starvation in the region early 1800s	Depletion of animals reported followed by accounts of starvation in 1920s

Table 4: Comparison of diabetes prevalence and colonial histories of northwest Ontario and the Northwest Territories.

world (Harris et al., 1997). Within northwestern Ontario, a recent study revealed that among 72 research participants from two First Nation communities, Wapekeka and Kasabonika, 36% were found to have diabetes (Imbeault et al., 2011). These Indigenous communities in the Northwest Territories and in northwestern Ontario share a few similarities as well as differences. Both regions are located within the subarctic culture area, however the Tlicho are a Dene people whereas the Wapekeka and Kasabonika are Oji-Cree. Wapekeka and Kasabonika in northwestern Ontario, and three of the four Tlicho communities (Whati, Gameti and Wekweeti) in the Northwest Territories, are remote fly-in communities (accessible by ice road in the winter). The largest Tlicho community of Behchoko is connected to Yellowknife by a year round road. Both regions came under treaties in the early 20th century: The Tlicho signed treaty 11 in 1921 whereas the First Nations of northwestern Ontario signed treaty 9 in 1906.

The First Nations of northwestern Ontario were provided permanent settlements starting in the 1930s, whereas in the Tlicho region (other than Behchoko which began as Fort Rae in the late 1800s) permanent settlements of Gameti, Whati, and Wekweeti began to emerge in the 1960s. A key argument about the impact of permanent settlements, or sedentarization, on Indigenous peoples is one would no longer be living actively on the land and would have access to stores thereby instigating the nutrition (and lifestyle) transition with the consumption of store foods leading to eventual poor health. This situation is worsened by the severe food insecurity remote communities in Northwest Ontario, as well as remote communities in northern Canada, face as market (store) foods are described as lower quality and often unaffordable (see Pal et al., 2013). However, people in both regions still go on the land hunting, trapping, and fishing (NWT Bureau of Statistics, 2016; Pal et al., 2013). From a nutrition transition perspective, it may be the approximately thirty-year difference in permanent settlement and access to store foods, and associated food insecurities, that lead to different timings of local nutrition transitions as explaining the different prevalence of diabetes between these two regions. However, a similar comparison of two regions with very different prevalence of diabetes but very similar histories of permanent settlement can be made between the James Bay Cree of northern Quebec and the Inuit of Nunavut that challenge this.

Although both the James Bay Cree of northern Quebec and the Inuit of Nunavut were moved off the land and into permanent settlements during the mid-20th century (~1950s) the prevalence of diabetes among the James Bay Cree has been recorded as 22% (Dannenbaum et al., 2008) whereas diabetes among the Inuit in Nunavut has been noted as low as 0.9% in 2000-2001 (Healey and Qayyum, n.d.), despite an increase in obesity. And going against the trend with diabetes seen in the rest of Canada the prevalence of diabetes among non-Inuit in Nunavut was 4.5%, with higher rates among non-Inuit males than non-Inuit females, whereas diabetes among Inuit females was higher than Inuit males (Healey and Qayyum, n.d.).

So, if the history of settlement into permanent communities and access to stores is not informing the difference in diabetes prevalence between the Tlicho in the Northwest Territories and the Wapekeka and Kasabonika in northwestern Ontario what other history may be considered? As with Indigenous lands across Canada, both regions in the Northwest Territories and northwestern Ontario have histories with the fur trade, albeit different histories. The history of the fur trade in northwestern Ontario, beginning in the mid-1600s (Pal et al., 2013; Young, 1988), is significantly longer than that in the Northwest Territories, and the decline of the fur trade is often seen as an economic downturn for Indigenous peoples. Both regions share the common experience of a decline in animal populations due to the over-harvesting by white trappers and the subsequent hunger, if not starvation. By the early 1800s there were signs of big game shortages in northwestern Ontario with caribou and moose becoming scarce and fur-bearing animals reduced from over-trapping leading to the abandonment of many trading posts further threating survival of the local Indigenous peoples with cases of starvation increasing (Young, 1988). However, in the Northwest Territories depletion of game and over-harvesting by white trappers was not recorded as a concern until the 1920s (Parker, 1930) followed by accounts of starvation in the NWT (Back, 1970). Is this 100-year difference in the decline in local wild food sources and subsequent hungers playing out intergenerationally within the bodies of these Indigenous peoples as revealed by different prevalence of diabetes? Similar to Barker's (1999) argument, discussed above, about the intergenerational impact of the different timings of French and British nutritional support for infants and children to explain the French Paradox, a 100 year difference in the timing of the onset of starvation would see several more programmed generations, resulting in a higher prevalence of diabetes, in northwest Ontario as compared to the Tlicho region.

Through a developmental lens, I explored the geographic variation in diabetes prevalence among Indigenous peoples in Canada by situating epidemiological and anthropometric data within an intergenerational developmental framework. I have argued that documented colonial histories of starvation among Indigenous peoples in Canada have been inscribed within Indigenous maternal bodies and have led to compromised reproductive biologies across the generations, as evidenced in high rates of maternal obesity, gestational diabetes mellitus, and high birth weight, including macrosomia, which underlie the explosion of diabetes rates among Indigenous peoples in Canada. Variation in diabetes prevalence in different Indigenous communities in Canada is linked to variation in contact, colonization, and the onset of starvation, and by using a genealogical framework, the intergenerational transmission of programmed effects from mothers to children reveals the basis of the "sudden explosion" of diabetes among Indigenous peoples in Canada and the potential number of generations impacted is correlated with a given region's prevalence of diabetes. Although colonial contact is often considered to inform the beginnings of settlement of Indigenous peoples and subsequent a nutrition transition to store foods and poor nutritional health, through a comparison of different Indigenous communities with low and high prevalence of diabetes, and more importantly, different colonial histories of starvation, the intergenerational embodiment of colonization is revealed.

Chapter 6

Birth Places, Embodied Spaces:

Tlicho Pregnancy Stories across the Generations[6]

The forced culture changes of colonization in Canada affected Indigenous societies at different points in time; colonization of the Tlicho (formerly Dogrib) region in the Northwest Territories (NWT) was considered to have been relatively recent. The profound changes to the lives of the Tlicho can be heard in the stories across the generations. To investigate the impact of colonization on Tlicho maternal health, I collected pregnancy and the birth stories from Tlicho women of different generations; generations were further expanded with the addition of Joan Ryan's work with Tlicho Elders in Whati, NWT, and Pertice Moffitt's discussions with younger Tlicho women in Behchoko, NWT. I collected pregnancy and birth stories from ten Tlicho women between the ages of sixty through ninety in the Tlicho communities of Behchoko and Whati over the summers of 2013 and 2014. The women met with me in their homes and most shared their stories in Tlicho with the aid of an interpreter. Grounded in women's narratives, particularly of Tlicho Elders and a traditional midwife, their stories reveal changes in the lived experiences of pregnancy and birth as reflecting different sociohistoric locations within histories of colonization—from birth on the land with community and midwives, to the beginnings of settlement and birth in the mission hospital in Rae, and to lone evacuation to Yellowknife for medicalized birth in a biomedical hospital.

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Birth, however, is not solely a physiological event but is shaped by cultural values and meanings, nor is a birth place simply a location in which a physiological event occurs. Since places are not only "in the landscape but simultaneously in the land, people's minds, customs, and bodily practices" (Munn, 1996 in Low, 2003, p. 15), birth places may be seen as social and cultural spaces endowed with cultural values and meanings fundamental in the rituals of birth. Similarly, the body may be seen as biological and social and cultural. Through the intersection of space, place, and the body, a space becomes embodied or, as Low (2003, p. 10-11) describes, an "embodied space," in which meaning is inscribed on the body. By considering changing Tlicho birth places as embodied spaces, I explore the social transformations in time and space brought about by the processes of missionization and medicalization to reveal how colonial histories of controlling birth experiences have become inscribed on Tlicho maternal bodies.

Birth on the Land: The Female Body as Powerful

The Tlicho are a Dene people occupying the region between Great Slave Lake and Great Bear Lake in the Northwest Territories. Today the Tlicho live in the four communities of Behchoko, Whati, Gameti, and Wekweeti. However, the traditional setting for the Tlicho saw extended families living on the land in bush camps for most of the year—hunting, trapping, and fishing seasonally. Women gave birth in the bush camps with the assistance of other women, including midwives. When a woman was "sick" (in labour), a pole was placed sideways for the woman to hold onto. She would kneel or position herself in a sitting or squat position with someone

Figure 2: Dene woman with baby in a moss carrier Fort Rae, 1924.
NWT Archives/Canada. Dept. of the Interior fonds./G-1979-001: 0165

holding onto her. The midwife, or other women assisting in the birth, would rub her stomach to help reduce the pain and to help the baby to be delivered faster. Once the baby was born, a midwife would tie and cut the umbilical cord, and apply a variety of medicines from the land, including rotten wood, black coal, or burnt dry willow, to help the cord heal and prevent infection. After cleaning the baby, the afterbirth was delivered. The mother was then cleaned up, and the baby was encouraged to breastfeed. The mother was then expected to rest for about a week, with other women assisting her, until she healed. Tlicho women, including Elders, recounted their childhood memories of birth on the land:

> "I saw twice but an Elder they chase us out. By the time we came back the woman was holding the baby … First I hear a baby cry…. I remember that it was me and my cousin, we're just sleeping, all suddenly whole bunch of women coming in and wood stove going fire … hurry up, hurry up…. I was wondering how come they are all rushing just banging, stove going, fire going, washing water's boiling, so there must have been about four or five midwives there helping each other and if anything goes wrong they know how to, how to [turn the baby]. That's why they were all there you know. Instructing each other like help each other" (TPS003).

Although some Elders recalled tragic birth events in which a woman died during delivery, they told other stories with laughter as they recalled being chased away by Elders: "As little kids, we peek in the little hole in the tent, we peek in there and they say, you guys don't look…. Because of you guys the baby's hard to be born…. It's so funny looking through" (TPS008).

As James Waldram and colleagues (2006) note, a widespread belief maintains that healing roles in Indigenous societies were primarily held by males (e.g., medicine men), and this may reflect a gender bias in the historical record, as European males would have been excluded from observing female activities or from speaking with them. Indigenous women did occupy healing roles, despite the poor state of the literature. Almost no details on Indigenous childbirth practices exist. Indeed, women were highly skilled birth attendants employing a variety of surgical practices and medicines from the land. Tlicho midwives were "gifted" and attended to not only births but "sicknesses" as well:

> “Women whose hands are really gentle that the woman doesn’t feel the pain, but still some women who are touching the woman experiencing giving birth they’re just in so much pain. “There are some people with different gifts,” that’s what [my mother-in-law] said. That’s the reason she was always being called. It’s just like whenever a woman is giving birth. Not only that, other kind of sickness too, she was being called” (TPS001).

A traditional Tlicho midwife explained how her own mother, also a midwife, directed her to become a midwife:

> “Because [I] had seen so many babies delivered that that’s the reason why [my] mom gave [me] the message that, after I’m passed you will help woman’s delivery of babies cause you’ve seen so much and you’ve seen lots and you know how to do it and you know how they feel, so every woman that’s sick with pregnancy [I] come over when her time is near for the delivery of the baby” (TPS005).

Other stories related women’s knowledge of a variety of medicines from the land; indeed, in discussions with Elders in Whati, Ryan (1993b) recorded a variety of spiritual approaches and traditional medicines—including spruce boughs, Labrador tea, tamarack, and otters chin—for a variety of concerns, such as engorged breasts, problems conceiving, breech births, and retained placentas. As one Tlicho Elder recalled, “After the delivery they boil that kind [of spruce bough] and they let the woman drink the juice, you know, to heal fast and not to feel pain any more cause after delivery they have pain, you know inside their tummy. So they let them drink that kind and then they don't feel pain. They heal fast” (TPS008).

A traditional midwife shared the story of delivering her daughter's baby, which needed to be repositioned:

> "[My] daughter was in labour. What happened was the baby was coming out but one side of the arm came out instead, you know the baby was sideway…. What [I] did then was put a lot of soap, lard on [my] hands and asked daughter if she's awake or you know conscious. She said yes so [I] pushed the baby back in and turned the baby around. But that was the way to deliver breech, the baby standing up. And that's how [I] delivered the baby, feet first" (TPS005).

Knowledge of wellbeing during pregnancy and birth was passed from Elders, grandmothers, and mothers to daughters: "Wherever they are, wherever the people, women are, you know, they just deliver the baby. Even the mothers they learn it from their mothers. I think that's how it was" (TPS008). By observing, experiencing, storytelling, and teaching, ways of knowing how to be well were passed on:

> "The elderly women, their mothers, they always encourage their daughters and they encourage their grandchild, granddaughter…. They carry a child so be careful. Don't eat that kind, they would tell you that … they were very watchful. But in those days the women were really strong, they were tough" (TPS001).

Another Tlicho woman recalled specific advice:

> "They used to tell them…. they have to move around so that their delivery, if the labour comes, it will be easier for them to deliver the baby. They had to move around all the time…so the baby can move around inside their womb. They used to tell them that if they don't move around too much then the baby will … attach to the womb and it will be hard for the baby to come out…. It's gonna be stuck" (TPS008).

Figure 3: Dene woman with child on her back, Fort Rae, [n.d.].
NWT Archives/Henry Busse fonds/N-1979-052: 1727

However, birth on the land involved more than the delivery of a child and the wellbeing of the mother. For the Tlicho, life on the land reflected the interconnected nature of humans, animals, and spirituality. Humans had reciprocal and responsible relationships with animals and the land. All living things had a life force, as reflected in the rituals of the hunt and the respect for the animals shown through these rituals. For instance, when a moose was killed, a bell was hung in a tree so other game would know that it had been handled properly and taken with thanks. Moose would then return to that area to be taken again (Ryan, 1993a). Similarly, after a kill and butchering, no parts could be left on the ground, and bones had to be covered by rocks or put in trees so the moose or caribou might reclaim them for its next life. If these rules were not followed, the animal would be offended and would not return to the area. Blood was handled carefully, since it represented the animal's life force. (Ryan, 1993a). Furthermore, mistreatment of bones could lead to sickness and/or bad luck for the hunter as one Tlicho Elder shared:

> "They don't throw bones anywhere because people don't go over it ... if its elsewhere and the people go over it, you know, walk over it or something, they can get sick with it … they live on traditional food off the land and if they don't respect their bones, they just throw them somewhere that's how you're not lucky, even to go on the land, you know, food … bad luck with the hunter. You have to have respect for it" (TPS006).

As with the invisibility of women in the literature in terms of Indigenous healing roles, most research has focused on the reciprocal relationship of the male hunter and the animals, and not about the responsibilities of females. However, everyone had responsibilities toward the hunt, including women. Beyond the practical aspects of preparing men for the hunt (e.g., clothing, food), woman also had a responsibility to maintain the balance between humans, animals, and the spirit world. In particular, women's blood (i.e., menstrual blood and the blood associated with childbirth) was seen as powerful; therefore, a variety of disciplined female behaviours were expected so as to not endanger the hunt: "A woman's blood could draw strength away from the hunter" (Ryan, 1993a, p. 23). Although the concept of "contamination" of trails and gear by women's blood is popular in the ethnographic literature on hunting-trapping societies, as Ryan clarifies, the Elders challenged this term. Instead, the term "endanger" rather than contamination was proposed, as it highlighted women's power and her ability to draw power away from men, which would affect their ability to hunt and endanger the group's survival:

> "Women could not step over meat, blood of hunting gear, menstruating women could not handle blood, and pubescent girls could not handle meat or blood, as

> women's blood could draw strength away from a hunter, even if he was on the trail and she was in camp. Animals also knew when a woman stepped over game or gear and would be affected enough to not allow themselves to be taken."
> (Ryan, 1993a, p. 24).

Upon puberty, Tlicho girls learned how to control their power and followed a variety of rituals. Pubertal girls were isolated in menstrual teepees, where they collected their own wood, water, and sometimes food. The experience was said to make them strong and to connect them to the spirit world (Ryan, 1993a). Girls (as well as boys) were also "tied" by their grandmothers; moose straps were tied to their ankles, waist, wrist, and neck. This was done to give them strength, courage, and wisdom, and also protected them from evil spirits (Ryan, 1993a). As one Tlicho woman recalled:

> "After, you know, when they get their first period they have to tie their fingers together with hide. They tie it together; it's always like this. So you know there's not gap in between the fingers. As they grow up, they will always have their fingers like that until their monthly goes…. They have to keep it tied until the monthly goes away and then you know they undo it, and when their monthly comes again they do it like every month" (TPS008).

The desire to balance the relationship between animals, humans, and the spiritual world, as evidenced in the rituals of the hunt, was also mirrored in birth rituals. Because of the male role in hunting, "the husband does not sleep with his wife for a month [following the birth of a child]. She will sleep by herself with the child" (TPS001). Following birth, the mother's movements were restricted because of her power:

> "As soon as the baby is born, they don't walk around inside they stay where they are; if they are going out they have to pull up the side of the tent and go out from

> there, they don't go out the doorway. They go out from the women's side of the tent to avoid sickness. Women would have their own cup and they would tie a string or something around the cup or the handle. That lady who has the baby can't use anybody's cup. This would last until she stops bleeding [either menstruation or the bleeding associated with childbirth]. They would also have their own washroom [similar to the menstrual teepees], separate from the men's" (TPS008).

Another woman explained the interrelationships of people and animals in the traditional treatment of the umbilical cord and afterbirth:

> "You cut the cord when the baby you know the cord comes out… Sometimes they cut the trees or the wood… [she] says you put it [umbilical cord] up there and then hop around, dance around, you know … give you luck to this child. Either they dance around or they just talk to it. And so they say when the whiskey jack comes and when it picks up the baby's cord they say this whiskey jack is going to be directing this guy for a good hunt … I always questioned [my mother-in-law] … you know when a baby is born, the afterbirth when it comes out, I said what do you do with those things you know because I remember when I worked in the hospital you know they just threw it away … [She] said sometimes if this child has been gifted, what they do is they bury that thing, they bury it, either on top of the tree or they bury it on top the … you know pole rack up there…. Yeah, eagle or some kind of animals … bear or type of animal … they say it takes it and that's how the child would grew well healthy and strong, you know, until he grows until manhood. Just like they would have prediction" (TPS001).

Birth on the land, therefore, reflected the interconnected nature of humans, animals, and spirituality. The relationship to the land informed the rituals of birth and emplaced Tlicho birth experiences. However, these rituals of birth would be suppressed as Tlicho spirituality came under the missionaries' agenda of assimilation. As Waldram and his colleagues (2006) discuss, Indigenous medical systems were subjected to a variety of oppressive measures; measures not aimed at medical practices per se but rather at aspects of Indigenous spiritualties and social life deemed to be prohibitive of assimilation. With suppression of Tlicho spirituality came a new interpretation of the female body.

Missionized Birth: The Female Body as Suffering

Missionization in the North, as with other areas of Indigenous Canada, began with a desire to save Indigenous "souls" through conversion to Christianity. As Waldram and colleagues (2006) explain, this dominant theme influenced other forms of forced assimilation couched in humanitarian, Christian terms. Since Indigenous people lacked knowledge of God, Jesus, and the sacraments, they were seen as "savages" in need of paternalistic care to become "civilized" (i.e., assimilated into Euro-Canadian cultural patterns and belief systems) (Waldram et al., 2006, p. 14). More Catholic institutions were eventually established, including residential schools, which removed the children from their oral traditions and the continuity of their generations.

The first missionaries arrived in the Fort Rae area around 1852, and with the missionaries came epidemics of infectious diseases. The traditional Dene belief systems could not account for, or counteract, the disastrous new epidemics that decimated communities. The loss of significant numbers of community members altered leadership roles and disrupted existing social structures, and paved the way for the onslaught by European Christian missionaries (Waldram et al., 2006, p. 291).

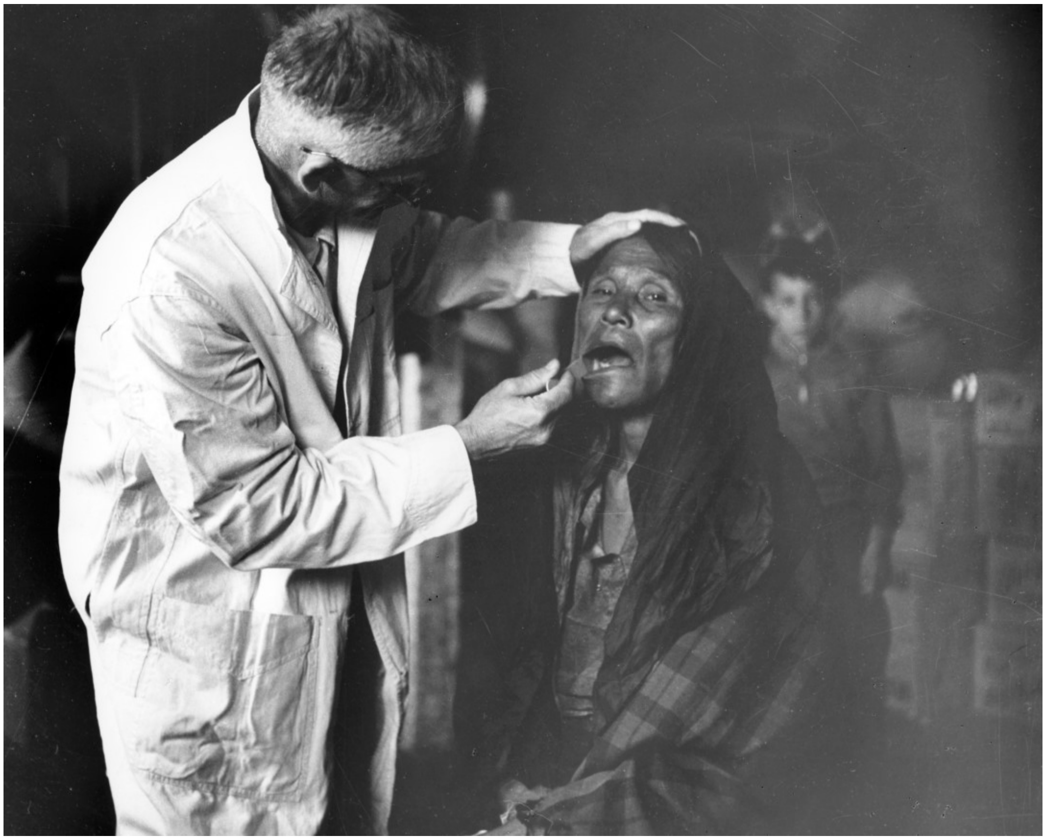

Figure 4: Dr. J.H. Riopel, District Medical Officer and Indian Agent, examines a Dogrib patient at Fort Rae, 1939. NWT Archives/Richard Finnie fonds/N-1979-063: 0053

Although the first doctor came to the region in 1900, visiting annually, infectious diseases (measles, tuberculosis, and influenza) took their toll in the 1920s and 1930s (Ryan, 1993a), and the Faraud Mission Hospital was established in Fort Rae (Behchoko) in 1940. As part of the Roman Catholic Mission, the hospital setting revealed a shift in the transfer of women's knowledge of birth:

> "At the hospital, the nuns delivered the babies without a doctor. The nuns would gather all the pregnant women and would teach them on how they're going to deliver the baby. That's how the nuns there explain it to them. Just like teaching so they know. Once we know, once they deliver the baby and everything was good, they took good care of you and everything was okay" (TPS008).

Figure 5: Roman Catholic Mission and Faraud Hospital in Behchoko (original image in colour). NWT Archives/Thomas Albert Donnelly fonds/N-2010-009: 0239

Despite the establishment of the mission hospital, people continued to live and give birth on the land until the development of the communities of Whati, Gameti, and Wekweeti in the 1960s and 1970s. In some cases, some women simply did not want to go to the hospital and wanted a midwife: “She was going to have a baby so they told her to go. Well, there was an old hospital here [Fort Rae] with nuns, sisters, but no doctor. So they asked her to go to the hospital but she wouldn’t listen. She doesn't want to have the baby deliver there” (TPS005).

As Ryan (1993b) notes, the overlay between Dene belief systems and Christian ones was extensive in the initial contact period; both became entwined and included many similar interpretations of the world and its Creator and spiritual events. This overlay of interpretations seems evident in stories related by the Elders. In discussions with the Elders about women's role in surgery (i.e., Caesarean sections), Ryan describes how the group had, at first, agreed that a baby would not be removed through Caesarean if the woman had died during pregnancy, but then a story was recounted:

> "[A woman] was sick or injured during the pregnancy and died. They didn't know what to do with her; they couldn't leave the body like that. The relatives asked Monique [a midwife] for help. Monique felt miserable having to make a decision about what to do. She told the other women not to mourn because she would take care of things. They prepared the body for surgery. While sharping the knife, she thought of the Creator. It would not be right to have the child buried inside the mother. She knew the Creator would give her the courage to perform the surgery and to do his will. She cut the stomach open. She wasn't afraid nor did she feel terrible. The body was partially frozen. She wasn't sure how far to cut down from the ribs so she cut across the abdomen. Then she took the baby out, placed it on a canvas cloth. Then she sewed the mother back up. Monique told this story to Marie Madeline Nitsiza. Not any one could do this type of surgery. It takes someone with a strong mind like herself who has spiritual powers. She was smart to use her spiritual power. She was a powerful spiritual person. They place the child under the mother's arm for burial" (Ryan, 1993b, p. 230).

Monique's daughter, also a midwife, recounted this story. After describing her admiration for her mother's strength, she stated clearly that she wanted the nurses or anyone else to know that if a woman dies with a baby in the womb, it must be taken out and that she wanted the story to go on. As she said, "this is why I give you this story" (TPS005).

Another story recounted by an Elder who worked at the Faraud Hospital provides insight into the overlay of belief systems:

> "[The wife] had two kids, two girls, and they all died. [I'd] seen them after they were dead. [The wife] was expecting the baby to be born that's why she died [in delivery]. And she has two babies on her back [gesturing to her shoulders], two girls, they died too so we just look at them. [The nuns] want people to look at them, so they were on a stretcher bed…pulling them around the hospital to let people look…. Couldn't deliver so the mother died … those two babies died in the womb too. So they had to take them out, they put them here [gesturing to shoulders]. So all the people has to look at it, that why they were pushing the bed around the hospital, so people can look at the lady that died with twins" (TPS008).

However, the overlay of interpretations is not complete. Whereas the traditional Tlicho perspective, described by the Elders in Whati, was that the baby needed to be taken out so that the spirit could escape (Ryan, 1993b), the Christian perspective focused on the importance of removing the fetus for the purpose of baptism, to save the soul (Savona-Ventura, 1995). As the Faraud hospital was a mission hospital run by nuns, it reflected not only the spiritual views Christianity informed by biblical stories but also its morality. Shari Julian (2010) discusses the story of Eve yielding to the seductions of the serpent, taking fruit from the Tree of Knowledge, and ultimately condemning Adam and all descendants to shame, hard work, painful childbirth, and suffering. Later theologians turned the story into the concept of "original sin," and with it, an eventual fear of female power and tensions about the female body (Julian, 2010, p. 258-9; Baik-Chey, 2010, p. 169). Eve became equated the "original sin," and the pain of childbirth became the "curse of Eve"—a phrase evident in early medical writings of women in labour (Purdy, 1945, p. 822). The female body was seen to embody suffering. As one Tlicho woman described birth in the mission hospital with the nuns: “It was okay. They just kept praying for your suffering. Unless you were a single mother, then no needle for you” (TPS010). The moral condemnation of childbirth out of wedlock was not part of traditional Tlicho views. If a man got a woman pregnant, whether single or married, he was responsible for her and the child’s wellbeing.

Although some Tlicho women has positive birth experiences at the Faraud Hospital, others were ambivalent of theirs. One Elder, who gave birth at the Faraud Hospital and later worked there, did note changing views of birth with the closure of the Faraud Hospital, and the development of the evacuation policy: “But back then every birth was successful, okay. But nowadays if they say the baby is big it can't be born they have to do cesarean; you know, open them up and take the baby out. Back then [with the nuns] it wasn’t like that. It was just successful; every child was born normal [natural birth]. Even big babies were born normal” (TPS008).

Although the “Indian problem” became medicalized with the onslaught of missionaries and the epidemics of infectious disease decimating Indigenous peoples (Waldram et al., 2006, p. 291), the full extent of the medicalization of birth began with the evacuation policy in the North. Closure of the “Indian hospitals” began in the 1960s, and in contrast, the number of nursing stations increased and developed as the backbone of the Medical Services Branch. Spiritualties, both Tlicho and Christian, eventually gave way to dominant biomedical discourse with its emphasis on technology and risk, which lead to new emplaced birth experiences and meanings inscribed on the female body.

Evacuated Birth: The Female Body as Risk

Beginning in the 1970s and still policy today, pregnant Tlicho women, as with other Indigenous women in rural and remote communities, are evacuated at thirty-six to thirty-right weeks gestational age—according to regional policy, or sooner if a high-risk pregnancy (Lawford and Giles, 2012)—and brought to Yellowknife, where they must give birth. Staying in hotels, boarding homes, or with family or friends, they wait to go into labour and to be admitted to a hospital. As one Elder who was evacuated in the early 1970s recalled her experience, "I had to fly in [to Yellowknife] because the nurse, they made us fly in about a month early. So we have to stay there until, um... Long wait" (TPS002).

Being away from family and community, one Tlicho Elder recalled thinking of her mother-in-law's advice while she waited in Yellowknife:

> "I was staying with a friend until the baby comes. I was staying up in Yellowknife and I don't know, I eat whatever I want to eat and she had so many different kinds of food. She cooks, she bakes … I don't know gave me heart burn, it was ever bad … so that's the reason why I just think of my mother-in-law. If I was at home would I be like this! She always warned me. What are you eating, don't eat that" (TPS001).

As Moffitt (2008, p. 29) discusses, contemporary childbirth for Tlicho women is medicalized and institutionalized predominately on risk discourse; risk informs prenatal evacuation policies. Consequently, the "safest birth place" becomes the hospital at the regional centre in Yellowknife. Labour and delivery in Behchoko, or one of the remote Tlicho communities, is considered to put mother and infant "at risk." Such perinatal risk factors include the following remote geographic locations with limited services; the potential for a variety of obstetrical emergencies; lack of skilled midwives and perinatal nurses; neonatal problems associated with substance abuse and sexually transmitted infections (Moffitt, 2008). Although Moffitt (2008) acknowledges that there are obstetrical complications associated with birth, she emphasizes that the socially constructed risk discourse developed not in response to obstetrical emergencies but rather to scientific and technological advances, accumulated knowledge, and colonizing power. With advanced technology, pregnancy and birth became more of an anomaly with a narrower range of what is considered a normal pregnancy (Thachuk, 2007). With pregnancy no longer viewed as a natural process, the female body becomes inherently at risk.

However, Tlicho women evacuated for birth in the 1970s had not lost their belief in their traditional birth practices: “I was [in Whati] and I was ready to give birth, I was in contraction… My [mother-in-law] was with me and I was okay and I was thinking if I don't go she’s going to deliver my baby. But then, um, auntie told me that [she] says I think that you’re in pain, you know, you should go with the plane” (TPS001). And what is actually informing “risk” is often contested, as one Elder summed up: “I think today you know because of the expensive, and you know, it’s kind of difficult for people to be travelling away from home. I think they should have midwives around just in case. You never know when the baby’s gonna come” (TPS001).

Traditional knowledge and beliefs are also prevalent in the stories of younger Tlicho women that Moffitt (2008) collected in her investigation of Tlicho perinatal health beliefs and health promotion. Tlicho women aim to keep themselves well in a “world “upside down” (Moffitt, 2008, p. 117). The metaphor “upside down” refers to a world in conflict with traditional Tlicho values and to the trauma, isolation, and alienation resulting from colonial and assimilationist interventions into the lives and lifeways of the Tlicho. As a result Tlicho, women struggle to "keep themselves well" within their colonized world of poverty, violence, and substance abuse. Risk to maternal and perinatal health, therefore, is not inherent in the female body but rather created by the legacies of colonization and the associated intergenerational trauma.

Accordingly, Karen Lawford and Audrey Giles (2012) argue the founding goals of the evacuation policy, which have roots in the late nineteenth century, were not related to good health but attempts to assimilate and "civilize" Indigenous peoples, which led to the marginalization of Indigenous pregnancy and birth practices, and coercive pressures to adopt the Euro-Canadian's so-called superior biomedical model. Indigenous maternal bodies "thus became a site on which colonial goals of assimilation and civilization could be realized" (Lawford and Giles, 2012, p. 332).

By considering birth places as embodied spaces, I reveal how colonial histories of missionization and medicalization created new emplaced birth experiences and inscribed Eurocentric meanings on Tlicho maternal bodies. Colonization became integrated into the lived experiences and rituals of birth and created birth places structured by the cultural values of the colonizer, whether saving souls or saving bodies. Evacuating Tlicho women to the "safest birth place" can be seen as removing them from their colonized communities without actually addressing key "risks" to maternal and perinatal health identified by Tlicho women. However, as Moffitt proposes, alternatively birthing in the community promises to improve perinatal health for women and their families, and allow women to have the support of family and friends and a more positive environment by fostering family unity through shared experience. Returning birth to the community would allow for traditional Tlicho customs of care by women during labour and childbirth to be revitalized and for perinatal care to be delivered in the women's language, which would afford more comfort and allow for improved knowledge transfer. Furthermore, attention to traditional practices would demonstrate respect, bolster Tlicho identity, and, in turn, improve overall health and wellness (Moffitt, 2008). Within this revitalized birthplace, the female body may be decolonized.

Chapter 7

Hearing Stories, Healing Bodies:
Seeing Indigenous Maternal Wellbeing Through Two Eyes

> “When [I] told [my] Mom it was time to deliver the baby then they set up everything like the tarp … they set it on the floor and then they put a moss on it. And then they put a pole across so [I] can hang onto it. Yeah, and that midwife’s behind [me], have to hold [my] head up and [my] chest up you know. And [I’ve] been having contractions all through the night, day and night like going on three days, and the midwives are so tired … the ones that were looking after [me] were so tired but then they didn’t know what to do. [Me] too, [I’m] just dozing off, going unconscious and regain conscious. And finally, they told that old guy, one of the old guys that lives there you know, to pray for [me] so when [I go] unconscious and then [I regain] conscious that’s when [I] realized these people were talking, saying that [I’m] not going to be able to make it, we have to pray. And that’s when [I] realized people were inside praying and then finally the baby was born … And [my] grandpa was kinda mad … at the baby, ‘You let you mother suffer so long so I’m going to put a name on you. You will be called Jiizo’ …” (TPS007).

The name Jiizo is derived from the Tlicho legends and stories of Molajiizo, a trickster-like character (not the same as the Trickster among the Plains Cree) who would do odd things people couldn’t even imagine. In the story referenced above by the Elder, Molajiizo asked a giant to carry him over Great Bear Lake to the other side. Sitting on top of the giant’s neck with his legs on the giant’s shoulders, Molajiizo had his hammer (he always has his hammer with him) and he would hit the giant on the head with it to make the giant go faster. Although the giant complained in pain, Molajiizo laughed and told the giant to go faster. “This is why”, the Elder explained, “grandfather put his name on the baby”. As discussed in chapter 6, I collected pregnancy and birth stories from different generations of Tlicho women to illuminate the lived experiences of colonization and its impact on maternal health. The Elder recalling the naming of her son as Jiizo shared her story of childbirth on the land; however, I was listening for factors impacting maternal health, and as will be discussed below, this reflects a key challenge to addressing maternal health disparities in Indigenous communities. In this chapter, I reveal how biomedical knowledge is grounded in a Eurocentric worldview that promotes a view of health which conflicts with aspects of Indigenous ways of knowing and perspectives on wellbeing. I argue that a new approach that acknowledges the validity of different knowledges and ways of knowing needs to be developed to remove the colonial lens and create new perspectives on Indigenous maternal wellbeing to decolonize health research and end the reproduction of colonial relationships.

Hearing Stories: Lived Colonial Experiences of the Tlicho

As discussed in previous chapters, colonization has been inscribed within Indigenous maternal bodies leading to compromised reproductive biologies, which manifest as health disparities. However, beyond physical embodiment, colonization also impacted Indigenous peoples socially, economically, politically, emotionally, mentally, and spiritually disrupting local ways of knowing and being. In terms of maternal health, this has led to young Tlicho women aiming to keep themselves well in a “world upside down” (Moffitt, 2008, p. 117), as discussed in chapter 6, referring to a world in conflict with traditional Tlicho values and to the trauma, isolation, and alienation resulting from colonial and assimilationist interventions into the lives and lifeways of the Tlicho. As noted in previous chapters, colonization of the Tlicho is relatively recent and the lived experiences of the impact of colonization on different aspects of Tlicho ways of knowing and being, as well as overall wellbeing, can be heard in the stories shared by Tlicho Elders.

As Ryan (1993c) explains, in the traditional setting, the Tlicho lived on the land and followed a seasonal round of activities that maintained them economically, spiritually, socially, and politically. Extended families lived in small hunting/trapping and fishing camps most of the year and most activities on the land were carried out under the guidance of a senior man who had expert skills in hunting and trapping, wisdom, and sometimes a "gift" (spiritual power). Tlicho ties to each other, to the land, and to the spiritual world were strong and reciprocal, and balance among the human, animal, plant and spiritual worlds allowed for survival and continuity of Tlicho culture. However, with colonization came the fur trade, infectious diseases, missionaries, and the residential schools. The residential schools devalued Tlicho culture and attempted to "erase the cultural practices and spiritual beliefs of the young people, as well as forbidding the use of their own languages" and as a result it "ruptured the continuity between generations, ripped the social fabric of the local cultures and destroyed the vital balance between the human, animal, natural and spiritual worlds" (Ryan, 1993c, p. 56).

With the development of the fur trade in the Northwest Territories, the Tlicho economy changed from a subsistence economy to one of cash plus subsistence, and resulted in fundamental changes in the trapping customs and the productive roles of men and women. Although men dominated the cash economy, both men and women continued to work within the subsistence economies (Ryan, 1993c). One Elder shared the hardships of her father not knowing how to trap.

> "… [Since] thirteen years [old] … [I] really work hard on the land, but back then people they survive by hunters that do trapping but my dad didn't know how to trap … he never

> went for trapping. So, people out on the land when they pitch up a tent their tent looks really good beautiful, nice brand new tent but our tent, it's just like a screen tent … you can just see right through the roof, you know, the northern lights you can just see that right through the tent…. If they're lucky they come back with fur and they trade it at the trading post here in Rae and we don't know if they give them money for it but then we know that they giving you know with one fur maybe they were given stove, pan, things were cheap you know they weren't expensive. So, they were given tent, stove, food whatever they want, you know, by fur and that's how people were live around that time. But for us my dad didn't know how to trap so he never went trap so that's why we were poor" (TPS009).

With contact and the fur trade also came epidemics of infectious diseases and beyond epidemiological understandings of morbidity and mortality was the social impact and personal suffering. As noted in chapter 6, although the first doctor came to the Tlicho region in 1900 and subsequently visited annually, infectious diseases, namely tuberculosis, measles, and influenza, took their toll during the 1920s and 1930s, and, indeed, by 1940 people felt the Tlicho people were on their way to extinction (Ryan, 1993c). The lived experiences of one Tlicho Elder, who was one of two children out of thirteen in her extended family camp to survive past childhood, reveal the impact of infectious disease epidemics on socializing children for traditional gender roles. The Elder recalled how her father taught her men's activities on the land, which was not uncommon when a man had older daughters but no son old enough, and these women were reported to have worked "just like a man" (Ryan, 1993c, p. 25). The Elder also shared how her mother would not teach her how do women's craft activities.

> "There's no kids just only [myself]. You know no small kids … [my] dad taught [me] really good on the land. [I] did hunting … for all kind of animals. [I] even used a shotgun, a 16 gauge and 12 gauge, 22 rifle, and 30-30 … [I] even know how to trap on the land too. And [I know] how to fix skin animals. And [my] dad taught [me] really

> well … learned men's activities on the land … [my] mother doesn't teach [me] how to sew but when mom sews you know she'd leave it there and then when [she] goes out [I go] sneaking there … maybe put in a few beads…but [my] mother doesn't know [I] did the work, put beads in there … and [I] just put it away right away before [my] mom comes in because if [my] mother sees [me] doing that she's gonna get mad" (TPS006).

The traumatic lived experiences of infectious disease epidemics can also be heard in the story another Elder shared of her tragic separation from her adoptive mother when her mother contracted tuberculosis and was forcibly escorted by the RCMP to the Faraud hospital in Behchoko. As her family were supposed to be heading on the land for trapping soon after she was born, she was too small to go with them, so her parents gave her to a couple to raise her in Behchoko.

> "[I don't know how big I was but I remember] that there was about ten RCMP, you know mounted police, they were standing right beside [my] adoptive mom. They said, 'you have to go to hospital because you're sick you know' … [At the] hospital here [my mom] was upstairs [with the other tuberculosis patients] … I asked my mom to come down to me but they said no so she asked those RCMP, nurse, or nuns, sisters whoever at there asked them to let the little baby up but they said no so I was just crying standing down … and [mom] was way up high upstairs. [I] was downstairs and that's where [mom] throws candies down to [me] … I was just crying … I don't want to leave her and what gonna do because the dad is a man and I can't live with a dad, you know, the dad can't raise me. So, what [the RCMP] did was they took me…you know follow the parents, [my biological] parents, they followed them throughout the land and with a boat or canoe, they followed them and find them. They hand [me] over to them, original [biological parents]" (TPS008).

These stories not only reveal the lived experiences of the impact of colonization on Tlicho culture on the local economy and gender roles, for instance, but also highlight the disruption of

Tlicho ways of knowing and being, severing the reciprocal ties to each other, to the land, and to the spiritual world and balance among the human, animal, plant and spiritual worlds that allowed for survival and continuity of the Tlicho worldview and associated cultural values. As argued in previous chapters, the lived experiences of colonization have been physically embodied and are manifest as health disparities, such as obesity and diabetes, and through a developmental origins of health and disease framework, maternal health must be the focus to address these disparities. However, biomedical approaches to maternal health are grounded in scientific knowledge and, as will be discussed below, a Eurocentric worldview. A biomedical worldview is in conflict with Indigenous ways of knowing and being and perceives Indigenous health through a colonial lens.

Healing Bodies: Decolonizing Approaches to Indigenous Maternal Wellbeing

As discussed in chapter 5, Indigenous women in Canada suffer disproportionately from maternal health disparities such as maternal obesity, gestational diabetes, and high birth weights. Biomedical approaches to addressing such health disparities within specific populations or groups typically focuses on biomedical knowledge transfer. As Janska (2008) explains, biomedical health knowledge refers to scientific medical information applied in the healthcare system in a community. This is achieved through *knowledge translation*, or the adjustment of health information into a language accessible to a targeted population or group, and through *knowledge transfer*, which is accomplished after identifying data dissemination strategies which enable medical information to be shared effectively to meet the needs of specific populations or groups. Health knowledge transferred into action, therefore, is envisioned as a tool for health promotion and improvement of peoples' lives (Janska, 2008). However, there are challenges to implementing health knowledge transfer in cross-cultural settings, especially within Indigenous communities.

> "Health knowledge translation and transfer to a variety of [Indigenous peoples] … are challenging because of their vast diversity including different levels of health literacy. Indigenous communities preserve at least in part their cultural, linguistic and social uniqueness that explains their *sensitivity to accept different knowledge*. Importantly, unlike many western models of health, [Indigenous] people's notion of health is often not individual, but one that encompasses the health of the whole community and the health of the ecosystem in which they live. Because of the holistic view of health, [Indigenous] peoples have pluralistic and holistic solutions to their health problems … Western health knowledge translation activities have to account for [these] significant cultural differences including contrasting philosophy of what knowledge is. Biomedical health measures may not be compatible with local understanding of health and local ways of sharing knowledge. Therefore, [Indigenous] communities often reject the imposed health services only because they are misunderstood" (Janska, 2008, p. 614-615, my emphasis).

Health literacy, in biomedical perspective, refers to the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (U.S. Department of Health and Human Services, 2000). However, biomedical knowledge is in itself a form of Eurocentric knowledge reflecting a specific worldview and associated cultural values. Rather than a "sensitivity to accept different knowledge", Indigenous perspectives on health and wellbeing are based in Indigenous ways of knowing and associated cultural values which may conflict with the values underlying biomedical knowledge. As discussed in chapter 6, young Tlicho women described trying to "keep myself well" in a "world upside down", referring to a world in conflict with Tlicho values and to the trauma resulting from colonial interventions into the lives and lifeways of the Tlicho (Moffitt, 2008). Therefore, any health interventions to improve Indigenous maternal health must move beyond biomedical knowledge translation and transfer to incorporate perspectives from these different ways of knowing.

Eurocentric knowledges, such as biomedical knowledge, reflect Eurocentric worldviews and associated cultural values. In contrast, Indigenous ways of knowing reflect local Indigenous worldviews and the cultural values specific to various Indigenous peoples. These different knowledges and ways of knowing further inform views of health and wellbeing. As Frideres (2011) explains, Eurocentric knowledge is based in science and involves data being collected objectively and empirically (i.e., positivistic). It is reductionist in that to understand the whole it must be fragmented and reduced to minimal constituent parts, analyzed, and then pieced back together according to the laws of cause and effect (i.e., causality). Causality, in turn, is dependent on time being linear: The cause must come before the effect. Eurocentric knowledge is hierarchical with humans above all other plants, animals, and the rest of nature leading to a view of realism. If you can measure something (i.e., quantification) means it exists; “Alternatively, if you can’t measure it, you cannot establish a truth value about [it] … science sees reality as being comprised of objective mathematical relationships” (Frideres, 2011, p. 45). Therefore, Eurocentric ways of knowing, based in scientific belief, see knowledge as equal to a justified, true belief, and these scientific understandings form the basis of biomedicine and inform the view of health as somatic and an emphasis on measuring the individual body (quantification and individualism) and pathophysiology (reductionism).

In contrast to the positivistic basis of Eurocentric knowledge, Indigenous ways of knowing are embedded in the cumulative experiences and teachings of people, transmitted through storytelling from generation to generation, and based in a connection to the land through ceremony (Frideres, 2011). Derived from Creator, ways of knowing are sacred and as such, all things, animate and inanimate, have a life force and are interconnected, existing in relationships to one another. As Frideres (2011, p. 47) describes, "knowledge, for Indigenous people, is not a thing in the world awaiting discovery", but rather Indigenous ways of knowing are shaped by human actions and goals, and emphasize respectful relationships. In contrast to the Eurocentric emphasis on individualism, within Indigenous ways of knowing the individual is connected to the whole and "people travel through life in a relational existence" (Frideres, 2011, p. 49). Within this relational existence, nothing can occur without a corresponding reaction, and, therefore, one may remain in balance through reciprocity further informing an interdependency. Key values inherent in Indigenous ways of knowing therefore include; sacred and respectful relationships, reciprocity, and interdependency.

One key difference between Eurocentric and Indigenous ways of knowing that informs different perspectives on health is a blurring of the boundary between the body and the spiritual. In Eurocentric perspective, health is grounded in the measurable, individual physiological body which is considered bounded and separate from other bodies. However, maintaining and nourishing the physical body is only part fulfilling Indigenous holistic views of wellbeing. To be healthy in the Cree sense, for example, is *miyupimaatisiiun,* or "being alive well", and as Adelson (2000) describes, has "everything to do with life on the land, and more broadly with 'being Cree' … [and] can only be fully understood within the context of the connections between land, health, and identity. [Cree] discussions of *miyupimaatisiiun* moves discourses on health beyond the boundaries of the physical body by connecting physiological wellness to social and political well-being" (p. 60). There is no word in Cree that translates into English as "health".

Therefore, Indigenous views on being healthy are better described as well-being, or being alive well, and provide a holistic view of the person rather than the biomedical view of an individual physiological body, or parts of (i.e., pathophysiology). The Medicine Wheel, for example, is a common symbol of Indigenous well-being and encompasses not only physical well-being but also emotional, mental, and spiritual aspects of life (Frideres, 2011). To be well, all four dimensions of life must be in balance as these four dimensions are interconnected. If one area is out of balance all other areas are affected. For the Anishinabeck, for instance, *Mnobmaadis* sees well-being as a balance between physical, emotional, spiritual, and mental spheres which relate to the spirit, family, and community worlds. Disease or illness is imbalance of one's worlds (Gracey et al., 2009). Similarly, the Kahnawà:ke idea of well-being, *Onkwehon:we*, involves the interconnectedness, relationships, responsibilities, and roles as well as knowing oneself as whole in spirit (Hovey et al., 2014). Further, well-being involves respectful, reciprocal relationships with family and community as well as the land. For the Kanien'kehá:ka, for instance, the value of working together for collective community benefit is represented in the concept *Ska'nikon:ra entewatste*, "being of one mind" (Hovey et al., 2014, p. 46).

Given these differences in biomedical and Indigenous perspectives on health and wellbeing, based in different worldviews and associated cultural values, approaches to improve Indigenous maternal health and wellbeing, such as biomedical knowledge transfer, must be reconsidered. Maternal health, in biomedical perspective, is grounded in the individual female body, as evidenced in discussions of pre- and post-natal health, and reflects a view of motherhood as achieved through the physiological processes of conception, gestation, and birth, ultimately removing individual maternal lived experiences from their social contexts and focusing on individual compliance. In contrast, as discussed in chapter 3, motherhood, in Indigenous perspective, is as an affirmation of women's power to bring forth life and defined her central role in traditional Indigenous societies according Indigenous women tremendous status in the family, community, and nation (Anderson, 2011). Thus, biomedical discourse sees the construction of specific narratives about motherhood and maternal health. Discourse, however, is more than a discussion or narrative about a given topic. Discourse may be a product of social power and dominance as well as a manifestation of power that serves the interests of the dominant group. As the biomedical narrative reflects Eurocentric knowledge and associated cultural values, it is therefore a colonial narrative that subsumes Indigenous maternal identities derived from local ways of knowing and promotes a view of maternal health that can conflict with Indigenous holistic understandings of wellbeing. From the perspective of critical discourse analysis, settler colonial power relations are established and reinforced through language use, and discourse reproduces ongoing colonialism in biomedical narratives of maternal health and shape Indigenous maternal experiences. A counter narrative needs to be developed that promotes a holistic view of the person, rather than a focus on an individual maternal body, and situates local Indigenous ways of knowing and associated cultural values at its core.

“Strong Like Two People”: Applying Two-Eyed Seeing to Tlicho Maternal Wellbeing

> “How does one ever measure the sadness a grandfather feels
> when his grandson cannot speak to him in Tlicho?”
> (Gibson et al., 2003, p. 40)

As discussed above, Indigenous peoples have a more holistic and collective view of wellbeing, as compared to the individualized and somatic biomedical view of health, and indeed, the Tlicho have their own unique understanding of wellbeing. This became evident in a workshop attempting to develop local health policy in the Tlicho region. As Gibson and colleagues (2003) explain, although the Canadian government uses various indicators, such as divorce rates, crime rates, family violence, suicide rates, and child apprehension to measure the health of communities (Northwest Territories Health and Social Services, 1998; 2005), these were not the themes raised as indicators of healthy living during workshop discussions. Instead, language and culture were the two key themes that emerged. Tlicho participants in the workshop raised such questions as; "How does one measure the strength of a culture? What would it mean to say that there are a certain number of people who hunt and trap on the land, when this kind of activity is about something else?" as well as the quote above about how do you measure the sadness of a grandfather (Gibson et al., 2003, p. 40).

For the Tlicho, as well as other Indigenous peoples, Elders serve as teachers as they pass on knowledge their have earned through their life on the land, hunting, trapping, and fishing, about how to live well through the generations. Each Tlicho person can earn the right to know about skills and values if they are in right relation with Elders and other people. As one Tlicho teacher suggested, "When we talk about values, we're talking about living the right way and doing the right thing" (Gibson et al., 2003, p. 40). Therefore, as Gibson and colleagues (2003) describe, a unique definition of wellness exists. Living well involves daily relationships with others achieved through speaking the language, eating food together, practicing skills, and learning through observation. Rather than the measurable indices informed by Eurocentric knowledge used in biomedical and public health approaches, every aspect of how to live well is about relationships. A person keeps well through social relationships with others, involving exchange of time, services, and food creating collective wellness. Or as Frideres, (2011, p. 49) notes, “people travel through life in a relational existence” emphasizing balance and cultural values of interdependency, reciprocity, and sacred, respectful relationships. Similarly, whereas biomedicine focuses on disease, Tlicho medicine focuses on wellbeing. As Ryan (1993a, p. 15) discusses, Tlicho traditional medicine is focused on well-being which is not simply the absence of disease or infirmity but is “a product of balance between the individual, the group, the human, animal, and spiritual worlds. Illness is caused by a lack of balance and harmony” seen as a result of a breach of respect and reciprocity between people, plants and animals which is a result of an individual’s actions.

Gibson and colleagues (2003) further explain how Tlicho leaders and community members identified the indicators of healthy living for Tlicho people through the analysis of values expressed in songs and stories. Listening to the legends and history told by Elders about animals, people, and the past is an example of how to live according to Tlicho ways. As a Tlicho health worker suggested, “We know people by the stories they tell us” (Gibson et al., 2003, p. 42). The Tlicho Elder sharing her story about her grandfather putting the name Jiizo on her son, discussed at the start of this chapter, reflects this view of the importance of stories and legends, and more importantly, listening to the stories being shared. Although I was listening to the story, I was listening for factors and events impacting maternal health, reflecting my Eurocentric knowledge-based education. I was not hearing the values and relations expressed in the Elder’s story.

As Indigenous scholar Margaret Kovach (2009) explains, the nature and structure of story causes difficulty for non-Indigenous systems due to its divergence from the Eurocentric temporal narrative structure with a focus on linearity of time. In Indigenous perspective, stories fasten themselves to place, not time. Whereas in Eurocentric perspective, a story may be seen as the plot of a narrative or an account of past events, this is not the case in Indigenous perspective. In Blackfoot, for example, story literally translates as "involvement in an event" (Kovach, 2009, p. 94). In general, there are two kinds of Indigenous stories. Stories that hold mythical elements (e.g., creation stories or teaching stories) and personal narratives of place, happenings, and experiences, such as those shared above by the Elders about their lived experiences of colonization, are one kind of story passed through oral tradition to the next generation. As Kovach (2009, p. 95) notes, "stories are vessels for passing along teachings, medicines, and practices that can assist members of the collective". Further, story contextualizes knowledge, the second kind of story. There is an inseparable relationship between story and knowing which can be extended to the interrelationship between narrative and research. Story is both method and meaning. Narrative functions as an intergenerational knowledge transfer (Cruikshank, 1998, cited in Kovach, 2009, p. 95).

> "Stories remind us of who we are and our belonging. Stories hold within them knowledges while simultaneously signifying relationships. In oral tradition, stories can never be decentralized from the teller. They are active agents in a relational world, pivotal into gaining insight into a phenomenon. Oral stories are born of connections within the world and are thus recounted relationally. They tie us to our past and provide a basis for continuity with future generations" (Kovach, 2009, p. 94).

These differences in story further highlight disconnects between Eurocentric and local Indigenous ways of knowing that is at the heart of the challenges to biomedical knowledge transfer and any attempt to address Indigenous maternal health disparities. Rather than biomedical knowledge transfer, a new knowledge production, combining Eurocentric and Indigenous ways of knowing, is required.

Etuaptmumk, or Two-eyed seeing, is a concept introduced by Mi'kmaw Elders Albert and Murdena Marshall from the First Nation of Eskasoni, Nova Scotia, and is derived from the belief that there are many ways of seeing or understanding the world. Two-Eyed Seeing is often explained as learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Eurocentric knowledges and ways of knowing, and learning to use both these eyes together, for the benefit of all (Institute for Integrative Science and Health website, n.d.). In their attempts to demonstrate how Indigenous and allied health promotion researchers learned to work together through a process of Two-Eyed Seeing to enhance Indigenous health promotion, Hovey and colleagues (2017, p. 1278) describe Two-Eyed Seeing as involving "a dynamic, changing, interactive, and relational process which generates new ideas, understandings, and information (Bartlett et al., 2012)". However, Elder Albert Marshall emphasizes that "Western academic perspectives tend to categorize or colonize knowledge and ways of knowing in an attempt to fit knowing, co-learning, and collaboration into a discipline or specific content/subject area" noting the challenges of incorporating the two ways of knowing. For Marshall and colleagues,

> "Two-Eyed seeing is hard to convey to academics as it does not fit into any particular subject area or discipline. Rather, it is about life: what you do, what kind of responsibilities you have, how you should live while on Earth … i.e., a guiding principle that covers all aspects of our lives: social, economic, environmental, etc. The advantage of Two-Eyed Seeing is that you are always fine-tuning your mind into different places at

> once, you are always looking for another perspective and better way of doing things (Barlett, Marshall, and Marshall, 2007, para. 1)".

The Tlicho have a similar concept to Two Eyed Seeing inspired by the vision of Tlicho Chief Jimmy Bruneau. In 1936, Chief Jimmy Bruneau, a strong proponent of education for his people, set out a vision to accept the worldview of the colonial settlers but to also to emphasize the skills, teachings, and traditions of the Dene. Another Tlicho Elder, Elizabeth Mackenzie, later interpreted and explained the words of Chief Jimmy Bruneau, saying, "…one person would be like two persons: One, knowing everything of the white culture and one, knowing of our ancestors' culture. That person would become very strong for if we know everything like two persons… there may be no one greater than us." It is from this interpretation that comes the Tlicho motto, "Strong like Two People", a motto used in Tlicho school and regional educational (Chief Jimmy Bruneau School website, n.d., para. 3). Through a Two-eyed Seeing framework, Tlicho ways of knowing and cultural values can be at the centre of a new approach to maternal wellbeing, along with biomedical knowledge, embodying the essence of "Strong like Two People". However, how research and methods are developed also needs to be reconsidered.

As Kovach (2009, p. 28) discusses, Indigenous communities, and their social and health concerns, have typically been "examined by non-Indigenous academics who pursue Western research on Western terms" and the Western based policies and practices that govern research lead to a reproduction of colonial relationships. As there are fundamental differences in Eurocentric and Indigenous worldviews and epistemologies, Kovach (2009, p. 29) identifies two challenges that must be addressed. First, finding and using a research approach that is not extractive (i.e., research approaches that left the people they studied disenfranchised from the knowledge they shared) and is “accountable to Indigenous community standards on research so as to honour the [Indigenous] worldview” must be the norm. Second, given the fundamental epistemological differences between Eurocentric and Indigenous thought, “this difference causes philosophical, ideological, and methodological conflicts for Indigenous researchers”. Thus, there is a need to employ Indigenous methodologies as a form of qualitative inquiry based in local Indigenous ways of knowing and a relational worldview. As Hovey and colleagues (2017, p. 1286) emphasize, “Indigenous grounded research and methodologies need to be engaged to address Indigenous community health issues”.

Rather than biomedical knowledge transfer, different Eurocentric and Indigenous perspectives, informed by Indigenous methodologies, may be transformed through Two-Eyed Seeing. As Hovey and colleagues state,

> “… creating shared ownership of new knowledge and ultimately, adaptation to, and reconfiguration of such knowledge back into research and health promotion practices that are inclusive of both perspectives. Knowing what to do, *seeing with both eyes* showed us that there can and needs to be a new and different approach for research and health promotion … It uncovers personal and professional identities, encultured ways of knowing, and historical divisions that need to be addressed and healed before eyes will be able to focus on an agreed-upon approach to re-viewing health promotion and research … it becomes vital to find a shared vision that can be neither situated within the Western or Indigenous way of knowing but somewhere in the space in-between our fusions of new horizons” (Hovey et. al., 2017, p. 1285-6).

Through Two-Eyed Seeing, new knowledges and perspectives on Indigenous maternal wellbeing can be explored. However, how maternal health and wellbeing is framed and approached is also of concern, as Reading and Wien (2013, p. 25) note, “It is clear that the origin of good health arises long before conception, with the historical, political, economic and social contexts into which we are born”. The *life course approach*, also known as the life course perspective or life course theory, refers to an approach for analyzing people's lives within structural, social, and cultural contexts. In particular, the approach focuses on the connection between individuals and the historical and socioeconomic context in which these individuals lived. As Mayers (2009, p. 414) explains, over the past 30 to 40 years, life course research has grown as an area of interdisciplinary study of human lives between birth and death, bringing together a variety of disciplines; anthropology, demography, economics, sociology, and developmental psychology. As such, life course perspective has become widespread across the social sciences, and “longitudinal data collections have not only proliferated, but have become the current gold standard of quantitative social science”. One of the fastest growing areas in life course research concerns the “trajectories of health out-comes and the mechanisms responsible for age-specific exposures to health risks and the age-specific differentials in the impact of such risks” (Mayers, 2009, p. 421).

Reading and Wien (2013) apply a life course perspective to the health inequalities and disparities experienced by Indigenous peoples in Canada and consider the social determinants of health across the life course linking social determinants, at proximal, intermediate, and distal levels, to health inequities. As discussed above, Indigenous ideologies embrace a holistic concept of health that reflects physical, spiritual, emotional and mental dimensions. However, as Reading and Wien (2013, p. 8) discuss, “it is the interrelatedness of these dimensions that is perhaps most noteworthy. It has become widely accepted in mainstream health literature and, to some extent practice, that a ‘silo’ approach to the prevention and treatment of ill-health fails to address the complexity of most health issues”. As the complex, intersecting and interrelated determinants and contexts of Indigenous health and wellbeing requires a model that permits researchers to explore the pathways that influence health and the points at which interventions can be more effective, Reading and Wien (2013, p. 26) propose the *Integrated Life Course and Social Determinants Model of Aboriginal Health* which “depicts life stages, socio-political contexts and social determinants as nested spheres of origin, influence and impact; each affecting the other in temporally and contextually dynamic and integrated ways”. This model incorporates the four dimensions of health - physical, spiritual, emotional and mental - across the life course. Further, this multi-dimensional model reflects Indigenous contexts and social determinants “that not only have a direct impact on health but also interact with one another to create vulnerabilities and capacities for health”. This model, incorporating a life course approach and grounded in Indigenous perspectives, would allow for the development of a new way of addressing Indigenous maternal health and wellbeing.

As discussed in previous chapters, colonization has been physically embodied leading to compromised reproductive biologies manifest as health disparities, and through a developmental origins lens, attempts to address these disparities must focus on maternal health.
Biomedical approaches addressing such health disparities and maternal health within specific populations or groups typically focus on biomedical knowledge transfer. However, biomedical knowledge is grounded in a Eurocentric worldview which conflicts with the worldview and cultural values of Indigenous ways of knowing. Further, these conflicting worldviews produce different understandings of health and wellbeing. The biomedical view of health as somatic is challenged in Indigenous perspective as maintaining and nourishing the physical body is only

part fulfilling Indigenous holistic views of wellbeing as relational and grounded in story, forcing a reconsideration of biomedical knowledge transfer as an approach to addressing health disparities and Indigenous maternal wellbeing. By acknowledging the validity of different knowledges and ways of knowing, a Two-Eyed Seeing approach, combining both biomedical knowledge and local Indigenous ways of knowing, and congruent with the Tlicho vision of "Strong like Two People", can allow for the creation of new perspectives and approaches to Tlicho maternal wellbeing. Furthermore, by incorporating Indigenous methodologies as a form of qualitative inquiry, the new knowledge created through a Two-Eyed Seeing approach can not only develop research and health promotion practices that are inclusive of both perspectives but also decolonize research and end the reproduction of colonial relationships. Finally, by using an approach to Indigenous maternal health that integrates Indigenous dimensions of wellbeing and life course into the social determinants of Indigenous health, the intersections of life stages, socio-political contexts, and social determinants of health can be explored and allow for the development of a new way of addressing Indigenous maternal health and wellbeing through a life course approach.

Chapter 8

Conclusion:

Decolonizing Indigenous Maternal Bodies through Reproductive Justice

“All diseases have two causes – one pathological and the other political”
(19th century physician Rudolf Virchow)

I have explored type II diabetes as a health disparity among Indigenous peoples through the lens of embodiment. Framed within the Developmental Origins of Health and Disease (DOHaD) model and applying a biocultural ethnographic approach, I have investigated the impact of the injustices of patriarchal colonialism on Indigenous maternal bodies and have revealed how oppressions have been embodied, leading to compromised reproductive biologies. These compromised reproductive biologies have lead to intergenerational maternal health disparities, such as maternal obesity, gestational diabetes, and high birthweight, and form the basis of the sudden explosion of high prevalence of diabetes among Indigenous peoples in Canada. As noted in the above quote, “All diseases have two causes – one pathological and the other political”, so to focus solely on these measurable maternal health disparities medicalizes the reproductive oppressions and associated health inequities inherent in the lived experiences of Indigenous women. The health inequities that underlie health disparities reflect past and contemporary injustices and, therefore, the key issue is social justice. As Bravemann and colleagues (2011) emphasize, there is a need to put health disparities within the broader context of ethics and human rights. Further, as McGibbon (2012) discusses, there is a need to reframe health inequities within the context of oppression to make the links between social structures and health explicit.

As Indigenous rights outlined in the *United Nations Declaration on the Rights of Indigenous Peoples* and Canada's *Truth and Reconciliation Commission's Calls to Action* make the right to health and culturally appropriate healthcare explicit, health equity must also been seen as a human right. To heal Indigenous maternal bodies and end the intergenerational transmission of maternal health disparities Indigenous maternal wellbeing must be seen through the lens of reproductive justice. By reclaiming the reproductive justice that was traditionally inherent in Indigenous communities, women's knowledge and the traditions and rituals around pregnancy and birth can also be reclaimed and allow for maternal self-determination and decolonization of Indigenous maternal wellbeing.

Exploring Oppression as a Determinant of Health

Indigenous peoples in Canada suffer disproportionately from health disparities such as obesity and diabetes. Diabetes, however, among Indigenous peoples in Canada reveals unique characteristics; namely, a prevalence rate of diabetes three to five times the Canadian average, higher prevalence among Indigenous women in contrast to higher prevalence among Canadian men, an earlier age of onset and an increase in prevalence among children and adolescents, and higher prevalence rates on reserves. As discussed in chapter 2, these unique characteristics have led to the construction of diabetes among Indigenous peoples as differences within the Indigenous body, as well as an inevitability of developing diabetes (e.g., a thrifty genotype), informing a view of Indigeneity as risk and geneticizing the socio-historic contexts, and associated oppressions, in which Indigenous bodies have been confined.

Although genetic explanations for this health disparity have been historically proposed, today diabetes is understood to have developmental origins. The Developmental Origins of Health and Disease (DOHaD) model posits that factors impacting the maternal environment (e.g., undernutrition) can alter fetal development and result in the onset of chronic diseases (e.g., obesity and diabetes) later in life. However, as Hoke and McDade (2015, p. 190) note, the DOHaD model is "rarely situated within the social, cultural or political economic context of the population examined". I investigated these contexts within which colonial histories have produced the developmental origins of health disparities, such as obesity and diabetes, through a biocultural theoretical perspective, and in particular I applied the biocultural synthesis, to investigate the embodiment of colonization as the basis for the unequal burden of diabetes among Indigenous peoples in Canada. As Levins and Lewontin (1998, p. xv) note, "Anthropology, properly construed, is not separable into the physical and the social. Anthropology is at the nexus of the biological and the social, a biocultural synthesis spanning an enormous range of comparative, historical, and dynamic material". Further, by employing an biocultural ethnographic approach, the "larger social, cultural and ecological context of human biology" (Wiley, 2004, p. 21) has been explored, and by combining biological and ethnographic data, links between health and life circumstances are revealed moving beyond mechanisms of health and disease solely within individual bodies (Roberts, 2015). As the "maternal environment", central to the DOHaD model, is not solely a physiological process impacted by environmental events but rather is a pregnant woman. The environmental events impacting the "maternal environment" are better described as the lived experiences of a pregnant woman. As such, through the lens of embodiment, I explored the intersection of colonial histories and Indigenous maternal bodies in the developmental origins of diabetes as a health disparity among

Indigenous peoples in Canada. I revealed how Indigenous bodies are not ahistoric but rather the contemporary high prevalence of diabetes are the result of an intergenerational transmission of the embodiment of colonial histories of oppression as well as ongoing settler colonialism informing the impoverished conditions in Indigenous communities and reserves.

The Intergenerational Embodiment of Oppression

Indigenous peoples around the world suffer from higher prevalence of obesity and diabetes. These health disparities have typically been explained as part of the global nutrition transition (i.e., shifts in dietary and physical activity patterns with the adoption of a western diet and lifestyle), reflected in nutritional outcomes such as changes in body composition. Consequently, a return to a traditional diet and less sedentary lifestyle (or at least incorporating physical activity) is promoted. In chapter 3, however, I have argued that historic and contemporary high prevalence rates of diabetes among different ethnic and Indigenous groups around the world may be seen as a mosaic of geographies of inequality through the intersection of history and place in the creation of local biologies. Rather than a global nutrition transition among non-compliant individual bodies reflecting a universal biology, I argue that it is local histories intersecting with unequal social bodies create local biologies that manifest as health disparities, such as differential prevalence of obesity and diabetes. Although there is great diversity among Indigenous peoples globally, what they share in common are colonial histories of oppression. As European patriarchy and misogyny came with colonialism, Indigenous women were impacted differently than Indigenous men, leading to a loss of status and removing them from their central and egalitarian positions in Indigenous communities. As maternal health is central to the DOHaD model, the declining status and lived experiences of Indigenous women would be inscribed within the bodies of their children and grandchildren as inscribed patriarchal colonial histories can be transmitted over generations through compromised reproductive biologies.

Indigenous health has been historically viewed through a colonial lens leading to flawed assumptions about Indigenous peoples and their ways of living as well as the role of a changing diet on health outcomes. As discussed in chapter 4, constructed stories of starvation, that Indigenous peoples were all nomadic hunters eking out an existence in a harsh or barren land and facing the constant threat of starvation, are not supported in the anthropological literature. These stories reflect erroneous assumptions about Indigenous peoples and their subsistence strategies. Colonial histories of hunger and starvation, however, have been well documented and, through a developmental origins lens, have lead to altered metabolic phenotypes over generations. Further, I have proposed a "chemistry of starvations past" to explore how endocrinological and other chemical changes of the starvation response are mirrored in current understandings of leptin resistance, insulin resistance, and hypertriglyceridemia associated with central obesity and diabetes. This leads to a key question to consider with a developmental fetal origin of altered leptin and leptin's role in critical windows of development; what is the relationship of this "chemistry of starvations past" with the earlier age of onset and higher prevalence of diabetes among Indigenous women, children, and adolescents?

In chapter 5, through a developmental origins lens, I explored the variation in the prevalence rates of diabetes among Indigenous peoples across Canada by situating published epidemiological and anthropometric data within an intergenerational framework. Although variation in diabetes prevalence among Indigenous peoples has been interpreted as different times of adopting a western diet and sedentary lifestyle (i.e., a nutrition transition), I revealed how colonial histories of starvation have been inscribed within Indigenous maternal bodies leading to compromised reproductive biologies across the generations, as evidenced in Indigenous maternal health disparities such as high prevalence of maternal obesity, gestational diabetes, and high birth weight (including macrosomia), and how the number of generations since the onset of starvation in a given region correlates with contemporary prevalence rates of diabetes among Indigenous peoples in Canada. Rather than local nutrition transitions impacting different Indigenous peoples at different points in time, diabetes among Indigenous peoples may be seen as a developmental disease of colonization where the oppressions of colonization have been embodied.

Health Equity as a Human Right: Indigenous Rights to Health and Wellbeing

In 2007, as a step towards addressing social justice for Indigenous peoples, the *UN Declaration on the Rights of Indigenous Peoples* (UNDRIP) was passed by the United Nations (UN). The Declaration sets out the individual and collective rights of Indigenous peoples, as well as their rights to culture, identity, language, employment, health, education, among other issues. Indigenous peoples have the right to the full enjoyment, as a collective or as individuals, of all human rights and fundamental freedoms as recognized in the Charter of the United Nations, the Universal Declaration of Human Rights and international human rights law (Article 1). It emphasizes the rights of Indigenous peoples to maintain and strengthen their own institutions, cultures, and traditions and to pursue their development in keeping with their own needs and aspirations.

In terms of Indigenous maternal wellbeing, several articles within the UN Declaration enshrine Indigenous rights to health and wellbeing and, in essence, the right to health equity . Indigenous peoples have the right, without discrimination, to the improvement of the economic and social conditions in the areas of health (among others) (Article 21.1). Indigenous peoples have the right to determine and develop priorities and strategies for exercising their right to development and, in particular, Indigenous peoples have the right to be actively involved in developing and determining health, housing, and other economic and social programmes affecting them and, as far as possible, to administer such programmes through their own institutions (Article 23). Further, Indigenous peoples have the right to their traditional medicines and to maintain their health practices (including conservation of their vital medicinal plants, animals and minerals). Indigenous individuals also have the right to access, without any discrimination, to all social and health services (Article 24.1). Indigenous individuals have an equal right to the enjoyment of the highest attainable standard of physical and mental health, and states shall take the necessary steps with a view to achieving progressively the full realization of this right (Article 24.2). Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions (Article 31.1).

For nearly a quarter century, Indigenous groups from various countries, including First Nations representatives from Canada, worked to have the UN pass this declaration. Although 144 countries adopted UNDRIP Canada initially refused to sign as the Canadian government was against acceptance of the legal proposition that Indigenous peoples have an unqualified right to self-determination (Frideres, 2011). Canada finally announced its endorsement of UNDRIP in 2010 but did not officially remove its objector status to UNDRIP until 2016, nearly a decade after its adoption by the General Assembly (Fontaine, 2016). The endorsement of UNDRIP has been seen by Canada's Truth and Reconciliation Commission as bringing Canadians closer to reconciliation.

Formed in result of the Indian Residential Schools Settlement Agreement, the *Truth and Reconciliation Commission* (TRC) was officially established in 2008 with the purpose of documenting the history and impacts of the Residential Schools on Indigenous peoples by allowing survivors to share their stories and lived experiences during public and private meetings across the country. The TRC released its Executive Summary of its findings in June of 2015, along with 94 "calls to action" regarding reconciliation between Indigenous peoples and non-Indigenous Canadians. The TRC officially ended in December of 2015 with a multi-volume report that concluded the residential school system amounted to cultural genocide.

In terms of Indigenous health and wellbeing, the principles of truth and reconciliation note that reconciliation must "create a more equitable and inclusive society by closing the gaps in social, health, and economic outcomes" that exist between Indigenous and non-Indigenous Canadians (Principle 5) and that the "perspectives and understandings of Indigenous Elders and Traditional

Knowledge Keepers of the ethics, concepts, and practices of reconciliation are vital to long-term reconciliation" (Principle 7). Several Calls to Action focus directly on Indigenous health and wellbeing noting that the current state of Indigenous health is the direct result of previous Canadian government policies, including the residential schools, and to recognize and implement the health-care rights of Indigenous peoples as identified in International and Constitutional law as well as under the Treaties (Call to Action 18). To address health disparities, measurable goals are to be established to identify and close the gaps in health outcomes between Indigenous and non-Indigenous communities (Call to Action 19) including indicators such as infant mortality, maternal health, infant and child health issues, among others. There is also a call to action to fund holistic healing initiatives, especially in the North, to address the physical, mental, emotional, and spiritual harms caused by the residential schools (Call to Action 20), as well as have those who can effect change in the Canadian health-care system to recognize and incorporate the value of Indigenous healing practices and use them in the treatment of Indigenous patients in collaboration with Indigenous healers and Elders (Call to Action 21).

Although the Calls to Action promote a more just relationship between Indigenous peoples and Canada, key criticisms make the shortcomings of the TRC clear. One key criticism of the TRC is its sole focus on the residential schools which promotes a narrative that colonial injustices are in the past (e.g., Coulthard, 2014). However, the horrors of the residential schools do not represent all of the "truths" about past and ongoing settler colonialism and associated oppressions in Canada. Through a developmental origins lens, health disparities among Indigenous peoples, such as obesity and diabetes, reflect the embodiment of the oppressions of past and ongoing colonization. The forced relocations, the sign or starve approaches to the treaties, forced confinement to the reserves denying access to traditional hunting grounds, and the over-harvesting of animals with the fur trade, for example, reflect various “truths” in addition to the cultural genocide of the residential schools. These “truths” underlie the causes of the starvations that began the intergenerational transmission of compromised reproductive biologies. Further, these compromised reproductive biologies are now emplaced within impoverished communities ensuring the intergenerational transmission continues. The truths of settler colonialism have been embodied and only through a social justice lens can the healing process begin to decolonize Indigenous maternal bodies.

Reproductive Justice: Applying a Social Justice Lens to Indigenous Maternal Wellbeing

> “Reproductive justice is the complete physical, mental, spiritual, political, economic, and social well-being of women and girls, and will be achieved when women and girls have the economic, social, and political power and resources to make healthy decisions about their bodies, sexuality and reproduction for themselves, their families and their communities, in all areas of their lives”
> (ACRJ, 2005)

Reproductive justice connects social justice issues with reproductive health. As *Federation du Quebec Pour le Planning des Naissances* (FQPN) (2014) explains, the reproductive justice movement emerged from Indigenous women and women of colour who realized the mainstream pro-choice movement in the United States, the main issue and often only issue, did not include them and did not address the issues most urgent and relative to them, such as forced sterilizations and coerced abortions, forced removal of their children, or limitations on the number of children they could have. Infringements on women’s rights and reproductive autonomy affected primarily

Indigenous women and women of colour in marginalized and/or impoverished positions. As a result, the concept of *reproductive oppression* was developed by some Indigenous women and women of colour to comprise the various types of violence and coercion that affect sexual, reproductive, and maternal health and rights.

Reproductive justice fights all forms of maternal oppressions and the conditions that reinforce and perpetuate these conditions. As Ross (2006), cited in FPQN, 2014, p. 1) states, “We believe that the ability of any woman to determine her own reproductive destiny is directly linked to the conditions in her community and these conditions are not just a matter of individual choice and access”. Given the impoverished conditions in many Indigenous communities discussed in chapter 2, as well as issues around intergenerational trauma and ongoing settler colonialism, Indigenous women face numerous barriers to maternal health equity. By applying a social justice lens to Indigenous maternal health, I focus on reproductive justice as few, if any, have linked reproductive oppressions with the developmental origins of health and disease (DOHaD), as Hoke and McDade (2015, p. 190) note, the DOHaD model is “rarely situated within the social, cultural or political economic context of the population examined”. However, the maternal environment, central to the DOHaD model, represents the lived experiences of a pregnant woman. Through a developmental lens, past and ongoing patriarchal colonialism has lead to the embodiment of multiple reproductive and maternal oppressions over generations, inflicted by the settler colonial body politic, resulting in compromised reproductive biologies and associated health disparities.

As noted by the *Canadian Research Institute for the Advancement of Women* (2014), struggles for reproductive rights must be linked to struggles against oppression and through an intersectional approach, an individual woman's bodily rights must be considered within the wider systems (e.g., racism, colonization, globalization, etc.) and structures of power (e.g., economy, legal system, etc.) which limits a women's control over her body. Choice is not possible with the struggles of the legacies of multiple forms of oppression and violence. In northern Canada for example, Indigenous women in rural and remote communities have difficulty finding local providers for prenatal care (e.g., midwives) and are instead evacuated to the south or a bigger centre at 36-38 weeks to await birth. Further, many find it very difficult to be separated from their own mothers, children, community, and culture during late pregnancy, and evacuation is seen to contribute to the loss of community birthing knowledge removing the women from traditional ways of giving birth surrounded by family and community (Canadian Research Institute for the Advancement of Women, 2014). A policy that began, as discussed in chapter 6 with the consideration of changing Tlicho birth places as embodied spaces, as social transformations in time and space brought about by the processes of missionization and medicalization and colonial histories of controlling birth experiences.

The sexual and reproductive rights of Indigenous women have been reaffirmed in a joint policy statement put forth by the Society of Obstetricians and Gynaecologists of Canada (2011). Sexual and reproductive rights include the right to prevention, treatment, education, information, and privacy. They also include the right to have timely, culturally safe, high quality care, the right to rely on traditional knowledge and share in the benefits of scientific advancement, and the right to make informed health decisions, among others. A review of reproductive health disparities is provided including high-risk pregnancies, complicated and pre-term delivers, maternal mortality, and low- and high-birthweight, as well as the disadvantageous socioeconomic conditions Indigenous women face including poverty, food insecurity, overcrowded and/or substandard housing, family and community disintegration, and political marginalization. These poor health outcomes are "exacerbated by inadequate access to health and social services that results from historical and ongoing forms of colonization, including structural barriers, racist and oppressive policies, … and complex social determinants of health" (Canadian Research Institute for the Advancement of Women, 2014, p. 634). Noting that Indigenous maternal health care is in a "state of crisis", the joint policy statement puts forth several recommendations including protection and promotion of the sexual and reproductive rights of Indigenous women, implementation of the recommendations of the UN Declaration on the Rights of Indigenous Peoples (specifically articles 23, 24.1, and 24.2), and support of the development of a federal-provincial-territorial Aboriginal birthing strategy to address the crisis in Indigenous maternal health care in a systemic way. The statement further recommends that cultural competence among health care providers is developed to ensure care is offered in a culturally safe way and tailored to the specific needs and interests of Indigenous women. However, as noted in chapter 7, biomedical approaches to health differ from Indigenous perspectives on wellbeing, based in different worldviews and associated knowledges. To address the "crisis" in maternal health care, and to provide culturally safe care, a new strategy based in reproductive rights and justice must be developed.

As noted in the UNDRIP and the TRC Calls to Action, there is a need to recognize and incorporate the value of Indigenous traditional knowledge and traditional healing practices. In chapter 7, I argued that a new approach that acknowledges the validity of different knowledges and ways of knowing needs to be developed to remove the colonial lens and create new perspectives on Indigenous maternal wellbeing. This is necessary in order to decolonize health research and end the reproduction of colonial relationships. Biomedical knowledge transfer is typically the focus of biomedical approaches addressing health disparities, however, biomedical knowledge is grounded in a Eurocentric worldview which conflicts with the worldview and cultural values of Indigenous ways of knowing. Further, these conflicting worldviews produce different understandings of health and wellbeing. The biomedical view of health as somatic is challenged in Indigenous perspective as maintaining and nourishing the physical body is only part fulfilling Indigenous holistic views of wellbeing as relational and grounded in story. By acknowledging the validity of different knowledges and ways of knowing, a Two-Eyed Seeing approach, combining both biomedical knowledge and local Indigenous ways of knowing can allow for the creation of new perspectives and approaches to Indigenous maternal wellbeing. Furthermore, by incorporating Indigenous methodologies as a form of qualitative inquiry and an integrated life course approach as a framework, the new knowledge created through a Two-Eyed Seeing approach can not only develop research and health promotion practices but also decolonize research and end the reproduction of colonial relationships.

Further, as Indigenous peoples strive to revitalize cultural traditions, languages, and ways of knowing, and reclaim their identities, I argue Indigenous maternal knowledges and the traditions, ceremonies, and rituals surrounding pregnancy and birth must also be reclaimed. As discussed in chapters 3 and 6, Indigenous women were often central to their communities, and sharing maternal knowledge across the generations was an inherent feature. By Indigenizing maternal health through revitalization of Indigenous perspectives on maternal knowledge and reproductive justice, maternal self-determination may be reclaimed and Indigenous maternal bodies and reproductive biologies may be decolonized.

To conclude, I have revealed that diabetes as a health disparity among Indigenous peoples reflects the maternal embodiment of colonial injustices and reproductive oppressions. These embodied colonial oppressions are manifest in compromised reproductive biologies and subsequent maternal health disparities which underlie the explosion of high prevalence of diabetes among Indigenous peoples in Canada. However, a sole focus on measurable health disparities medicalized the colonial reproductive oppressions and inequities Indigenous women have experienced. As health inequities underlie health disparities, the issue is one of social justice. Health equity must not only be seen as a human right but as an Indigenous right enshrined in the *United Nations Declaration on the Rights of Indigenous Peoples* and *Canada's Truth and Reconciliation Commission Calls to Action*. Reproductive justice was an inherent feature in Indigenous communities reflecting local worldviews and ways of knowing. By applying a reproductive justice lens to Indigenous maternal wellbeing not only may Indigenous maternal bodies begin to heal and end the intergenerational transmission of compromised reproductive biologies, but women's knowledge and the traditions, ceremonies, and rituals around pregnancy and birth may be reclaimed allowing for a process of maternal self-determination and decolonization of overall maternal wellbeing.

References

Asian Communities for Reproductive Justice (ACRJ). (2005). *A New Vision for Advancing Our Movement Reproductive Health, Reproductive Rights, and Reproductive Justice*. Retrieved from https://forwardtogether.org/wp-content/uploads/2017/12/ACRJ-A-New-Vision.pdf

Adelson N. (2005). The Embodiment of Inequity: Health Disparities in Aboriginal Canada. *Canadian Journal of Public Health* 96(2), S45-S61

Adelson N. (2000). *"Being Alive Well": Health and Politics of Cree Well-being*. Toronto: University of Toronto Press

Agriculture and Agri-Food Canada. (2015). Impact of Climate Change on Canadian Agriculture. Retrieved from http://www.agr.gc.ca/eng/science-and-innovation/agricultural-practices/agriculture-and-climate/future-outlook/impact-of-climate-change-on-canadian-agriculture/?id=1329321987305

Aljohani N, Rempel BM, Ludwig S, Morris M, McQuillen K, Cheang M, Murray R, Shen GX. (2008). Gestational Diabetes in Manitoba during a Twenty-Year Period. *Clinical Investigative Medicine* 31(3), E131-E137

Allen PG. (1986). *The Sacred Hoop*. Boston: Beacon Press.

Anderson K. (2011). Marriage, Divorce, and Family Life. In (MJ Cannon and L Sunseri, Eds.) *Racism, Colonialism, and Indigeneity in Canada*. Don Mills, Ontario: Oxford University Press.

Armstrong IE, Robinson EJ, Gray-Donald K. (1998). Prevalence of Low and High Birth Weight among the James Bay Cree of Northern Quebec. *Canadian Journal of Public Health* 89(6), 419-420

Arviat. (2005). Workshop with Elders and Youths Held in Arviat and Facilitated by J. Oosten and F. Laugrand. Manuscript and tapes. Unpublished documents. Cited in Laugrand et al., 2009

Back G. (1970). *Narrative of the Arctic Land Expedition to the Mouth of the Great Fish River, and Along Shores of the Arctic Ocean in the year 1833, 1834, and 1835*. Rutland, VT: Charles E. Tuttle Company, Inc. (Original work published 1836).

Baik-Chey S. (2010). Spirituality, Love, and Women. In (CA Kirk-Duggan and KJ Torjesen, Eds.) *Women and Christianity*, Santa Barbara, California: Praeger, Pp. 247-70.

Baker, R., Panter-Brick C., and Todd A. (1996). Methods used in Research with Street Children in Nepal. *Childhood* 3(2), 171-193

Baldry E, Cunneen C. (2014). Imprisoned Indigenous women and the Shadow of Colonial Patriarchy. *Australia and New Zealand Journal of Criminology* 47(2), 276-298

Banks WA, Farr SA, Morley JE. (2006). The Effects of High Fat Diets on the Blood–Brain Barrier rTansport of Leptin: Failure or Adaptation? *Physiology and Behavior* 88, 244–248

Barker DJP. (2006). Developmental Origins of Chronic Disease in Adult Life. In (NJ Temple, T Wilson, DR Jacobs, Eds.) *Nutritional Health: Strategies for Disease Prevention*. Totowa, NJ: Humana Press. Pp. 261-283

Barker DJP. (1999). Why Heart Disease Mortality is Low in France. Commentary: Intrauterine Nutrition may be Important. *British Medical Journal* 318, 1477-1478

Barker DJP. (1998). *Mothers, Babies and Health in Later Life*. Edinburgh: Churchill Livingstone

Bartlett C, Marshall M, Marshall A. (2012). Two-Eyed Seeing and Other Lessons Learned within a Co-Learning Journey of Bringing Together Indigenous and Mainstream Knowledges and Ways of Knowing. *Journal of Environmental Studies and Sciences*, *2*, 331–340

Bartlett C, Marshall M, Marshall A. (2007). *Integrative Science: Enabling Concepts within a Journey Guided by Trees Holding Hands and Two-Eyed Seeing*. Sydney, Nova Scotia, Canada: Institute for Integrative Science and Health Cape Breton University.

Beall CM. (2000). Tibetan and Andean Patterns of Adaptation to High Altitude Hypoxia. *Human Biology* 72, 201-228

Bednasek CD, Godlewska AM. (2009). The Influence of Betterment Discourses on Canadian Aboriginal Peoples in the Late Nineteenth and Early Twentieth Centuries. *The Canadian Geographer* 53(4), 444-461

Bellasari A. (2008). Evolutionary Origins of Obesity. *Obesity Reviews* 9(2), 165-80

Benyshek DC, Watson JT. (2006). Exploring the Thrifty Genotype's Food-Shortage Assumptions: A Cross-Cultural Comparison of Ethnographic Accounts of Food Security among Foraging and Agricultural Societies. *American Journal of Physical Anthropology* 131(1), 120-6.

Berry DC, Stenesen D, Zeve D, Graff JM. (2013). The Developmental Origins of Adipose Tissue. *Development* 140, 3939-3949

Bird SM, Wiles JL, Okalik L, Kilabuk J, Egeland GM. (2008). Living with Diabetes on Baffin Island: Inuit Storytellers Share their Experiences. *Canadian Journal of Public Health* 99(1), 17-21

Black-Rogers M. (1986). Varieties of 'Starving': Semantics and Survival in the Subarctic Fur Trade, 1750-1850. *Ethnohistory* 33, 353-383

Boas F. (1966). *Kwakiutl Ethnography*. (Edited and abridged by H Codere). Chicago: University of Chicago Press

Bogin B. (2001). *The Growth of Humanity*. New York: Wiley-Liss

Bogin B. (1999). *Patterns of Human Growth* (2nd Edition). New York: Cambridge University Press

Bogin B, Loucky J. (1997). Plasticity, Political Economy and Physical Growth of Guatemala Maya Children Living in the United States. *American Journal of Physical Anthropology* 102, 17-32

Bonvillain N. (2007). *Women and Men: Cultural Constructs of Gender* (4th Edition). Upper Saddle River, New Jersey: Pearson Education.

Bowcock HM. (1928). Diabetes Mellitus in the Negro Race: A Study of One Hundred Consecutive Cases. *Southern Medical Journal* 21(12), 994-999

Braveman PA, Kumanyika S, Fielding J, LaVeist T, Borrell LN, Manderscheid R, Toutman A. (2011). Health Disparities and Health Equity: The Issue is Justice. *American Journal of Public Health* 101 (Supplement 1), S149-S155

British Columbia. (1915). Proceedings. *Royal Commission on Indian Affairs for the Province of British Columbia*, 1912-1915. P. 166. Cited in Kelm, 1998

Campbell JR. (2015). Development, Global Change, and Traditional Food Security in the Pacific Islands. *Regional Environmental Change* 15, 1313-1324

Canadian Paediatric Society. (2004). Growth Assessment in Indigenous Children: Is There Need for a Change? *Paediatrics and Child Health* 9(7), 477-479

Canadian Research Institute for the Advancement of Women. (2014). *Sexual and Reproductive Justice in the North*. A FemNorthNet Fact Sheet. Retrieved from http://www.criaw-icref.ca/sites/criaw/files/CIE_HTS_SexualandReproductiveJustice.pdf

Catalano PM, Kirwan JP, Haugel-de Mouzonz S, King J. (2003). Gestational Diabetes and Insulin Resistance: Role in Short- and Long-Term Implications for Mother and Fetus. *The Journal of Nutrition* 133(5), 1674S-1683S

Caulfield LE, Harris SB, Whalen EA, Sugamori ME. (1998). Maternal Nutritional Status, Diabetes and Risk of Macrosomia among Native Canadian Women. *Early Human Development* 50, 293-303

Cetin I, Cardellicchio M. (2010). Physiology of Pregnancy: Interaction between Mother and Child. *Annales Nestle* 68, 7-15

Chase LA. (1937). The Trend of Diabetes in Saskatchewan, 1905 to 1934. *CMAJ* 36, 366-369

Chaufan C, Weitz R. (2009). The Elephant in the Room: The Invisibility of Poverty in Research on Type 2 Diabetes. *Humanity and Society* 33, 74-98

Chief Jimmy Bruneau School. (n.d.). About Us. Retrieved from http://cjbs.tlicho.ca/about-cjbs

Churchill W. (2004). *Kill the Indian, Save the Man: The Genocidal Impact of American Indian Residential Schools*. San Francisco, CA: City Lights Books

Coburn D, Denny K, Mykhalovskiy E, McDonough P, Robertson A, Love R. (2003). Population Health in Canada: A Brief Critique. *Canadian Journal of Public Health* 93(3), 392-396

Cohen MN, Armelagos GJ (Eds.). (1984). *Paleopathology and the Origins of Agriculture*. Orlando: Academic Press

Collins JW Jr., Butler AG. (1997). Racial Differences in the Prevalence of Small-for-Dates Infants Among College Educated Women. *Epidemiology* 8, 315-317

Coulthard GS. (2014). *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition*. Minneapolis, Minnesota: University of Minnesota Press.

Cruikshank J. (1998). *The Social Life of Stories: Narrative and Knowledge in the Yukon Territories*. Vancouver: UBC Press

Dancause KN, Lapante DP, Hart KJ, O'Hara MW, Elgbeili G, Brunet A, King S. (2015). Prenatal Stress due to a Natural Disaster Predicts Adiposity in Childhood: The Iowa Flood Study. *Journal of Obesity*. http://dx.doi.org/10.1155/2015/570541

Dannenbaum D, Kuzmina E, Lejeune P, Torrie J, Gangbe M. (2008). Prevalence of Diabetes and Diabetes-related Complications in First Nations Communities in Northern Quebec (Eeyou Istchee), Canada. *Canadian Journal of Diabetes* 32(1), 46-52

Dayavatne DARK. (2010). Impact of Ecology on Development of NIDDM. *Medical Hypotheses* 74, 986-988

de Janvry A. (2010). Agriculture for Development: New Paradigm and Options for Success. *Agricultural Economics* 41(S1), 17-36

Diabetes Canada. (2017). Living with Type 2 Diabetes. Retrieved from https://www.diabetes.ca/diabetes-and-you/living-with-type-2-diabetes

Diamond J. (2003). The Double Puzzle of Diabetes. *Nature* 425, 599-602

Dickason OP. (2006). *A Concise History of Canada's First Nations*. Don Mills, Ontario: Oxford University Press

Drake AJ, Liu L. (2010). Intergenerational Transmission of Programmed Effects: Public Health Consequences. *Trends in Endocrinology and Metabolism* 21(4), 206-213

Dressler WW. (1996). Culture, Stress and Disease. In (TM Johnson and CF Sargent, Eds.) *Medical Anthropology: Contemporary Theory and Method*, pp. 252-271. Westport, CT: Praeger

Duyar I, Özener B. (2005). Growth and Nutritional Status of Male Adolescent Laborers in Ankara, Turkey. *American Journal of Physical Anthropology* 128, 693-698

Dunn FL. (1968). Epidemiological Factors: Health and Disease in Hunter-Gatherers. In (I Devore and RB Lee, Eds.) *Man the Hunter*. Chicago: Aldine Publishing. Pp. 221-228

Dyck N. (1985). *Indigenous People and the Nation-State: Fourth World Politics in Canada, Australia and Norway*. St. John's, NL: Memorial University of Newfoundland.

Dyck RF, Klomp H, Tan L. (2001). From "Thrifty Genotype" to "Hefty Fetal Phenotype": The Relationship between High Birth Weight and Diabetes in Saskatchewan Registered Indians. *Canadian Journal of Public Health* 92(5), 340-344

Dyck R, Osgood N, Lin TH, Gao A, Stang MR. (2010). Epidemiology of Diabetes Mellitus among First Nations and non-First Nations Adults. *Canadian Medical Association Journal* 182(3), 249-256

Dyck RF, Tan L. (1995). Differences in High Birth Weight Rates between Northern and Southern Saskatchewan: Implications for Indigenous Peoples. *Chronic Diseases in Canada* 16(3). Retrieved from the Public Health Agency of Canada website www.phac-aspc.gc.ca

Edmonton Journal. (1927). *Indians Starving in Barrenlands: 23 have Died during Winter*. April 2, 1927. P. 22

Egeland GM, Cao Z, Young TK. (2011). Hypertriglyceridemic-Waist Phenotype and Glucose Intolerance among Canadian Inuit: The International Polar Year Inuit Health Survey for Adults 2007–2008. *CMAJ* 183(9), E553-E558

Favaro A, St. Philip E. (2014, May 27). *Maternal Health: Should Harper Focus on First Nations First? CTV News*. Retrieved from http://www.ctvnews.ca/health/maternal-health-should-harper-focus-on-first-nations-first-1.1841239

Federation du Quebec Pour le Planning des Naissances (FQPN). (2014). *Reproductive Justice, or Applying a Social Justice Lens to Sexual, Reproductive and Maternal Health and Rights*. Retrieved from http://www.fqpn.qc.ca/main/wp-content/uploads/2014/03/PDF-EN-COULEUR.pdf

Feit HA. (2000). The Cree of James Bay, Quebec, Canada. In (MMR Freeman, Ed.) *Endangered Peoples of the Arctic: Struggles to Survive and Thrive*. Westport, Connecticut: Greenwood Press. Pp. 39-57

Feliciano RP, Pritzel S, Heiss C. (2015). Flavonoid Intake and Cardiovascular Disease Risk. *Current Opinion in Food Science* 2, 92-99

First Nations Centre. (2005). *Sacred Ways of Life: Traditional Knowledge.* National Aboriginal Health Organization. Retrieved from http://www.naho.ca/firstnations/traditional-knowledge/

Florêncio TM, Ferreira HS, de Franca AP, Cavalcante JC, Sawaya AL. (2001). Obesity and Undernutrition in a Very-Low-Income Population in the City of Maceió, Northeastern Brazil. *British Journal of Nutrition* 86, 277–283

Fontaine T. (2016). *Canada Officially Adopts UN Declaration on Rights of Indigenous Peoples*. Retrieved from http://www.cbc.ca/news/indigenous/canada-adopting-implementing-un-rights-declaration-1.3575272

Foss B, Dyrstad SM. (2011). Stress in Obesity: Cause or Consequence? *Medical Hypotheses* 77(1), 7-10

Foster Z, Byron E, Reyes-García V, Huanca T, Vadez V, Apaza L, Pérez E, Tanner S, Gutierrez Y, Sandstrom B, Yakhedts A, Osborn C, Godoy RA, Leonard WR. (2005). Physical Growth and Nutritional Status of Tsimane' Amerindian Children of Lowland Bolivia. *American Journal of Physical Anthropology* 126, 343-351

Frankel EN, Kanner J, German JB. (1993). Inhibition of Oxidation of Human Low-Density Lipoprotein by Phenolic Substances in Red Wine. *Lancet* 341:454-457

Franks PW, Pearson E, Florez JC. (2013). Gene-Environment and Gene-Treatment Interactions in Type 2 Diabetes. *Diabetes Care* 36, 1413-1421

Frideres JS. (2011). *First Nations in the Twenty-First Century*. Don Mills, Ontario: Oxford University Press

Frienkel N. (1980). Of Pregnancy and Progeny. *Diabetes* 29, 1023-1035

Garro L. (1996). Intracultural Variation in Causal Accounts of Diabetes: A Comparison of Three Canadian Anishinaabe (Ojibway) Communities. *Culture, Medicine and Psychiatry* 20, 381-420

Garro L. (1995). Individual or Societal Responsibility? Explanations of Diabetes in an Anishinaabe (Ojibway) community. *Social Science and Medicine* 40(1), 37-46

Genné-Bacon EA. (2014). Thinking Evolutionarily About Obesity. *Yale Journal of Biology and Medicine* 87, 99-112

Gibson G, Martin J, Zoe JB, Edwards K, Gibson N. (2003). Setting Our Minds to It: Community Centred Research for Health Policy Development in Northern Canada. *Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health* 5(2), 33-54

Ginsburg F. (1989). Dissonance and Harmony: The Symbolic Function of Abortion in Activists' Life Stories. In (Personal Narratives Group, Ed.) *Interpreting Women's Lives: Feminist Theory and Personal Narratives*. Indianapolis: Indiana University Press. Pp. 59-84

Globe and Mail. (2015). 11 Facts About the Gap Between First Nations and the Rest of Canada. [Video recording]. Retrieved from https://www.youtube.com/watch?v=pWK6ChJw8hs

Gluckman P, Hanson M (Eds.). (2006). *Developmental Origins of Health and Disease*. Cambridge: Cambridge University Press

Goodman AH, Leatherman TL. (1998). Traversing the Chasm between Biology and Culture: An Introduction. In (Alan H Goodman and Thomas L Leatherman, Eds.) *Building a New Biocultural Synthesis: Political-Economic Perspectives on Human Biology*. Ann Arbor: University of Michigan Press

Gracey, M., King, M., & Smith, A. (2009). Indigenous Health Part 2: The Underlying Causes of the Health Gap. *The Lancet,* 374(9683), 76-85.

Grande S. (2003). Whitestream Feminism and the Colonialist Project: A Review of Contemporary Feminist Pedagogy and Praxis. *Educational Theory* 53(3), 329–346.

Green C, Blanchard JF, Young TK, Griffith J. (2003). The Epidemiology of Diabetes in Manitoba-Registered First Nation Population: Current Patterns and Comparative Trends. *Diabetes Care* 26, 1993-1998

Hadley C. (2005). Ethnic Expansions and Between-Group Differences in Children's Health: A Case Study from the Rukwa Valley, Tanzania. *American Journal of Physical Anthropology* 128, 682-692

Hales CN, Barker DJ. (1992). Type 2 (Non-Insulin-Dependent) Diabetes Mellitus: The Thrifty Phenotype Hypothesis. *Diabetologia* 35 (7), 595–601

Harris SB, Gittelsohn J, Hanley A, Barnie A, Wolever TMS, Gao J, Logan A, Zinman B. (1997). The Prevalence of NIDDM and Associated Risk Factors in Native Canadians. *Diabetes Care* 20(2), 185-187

Harris SB, Naqshbandi M, Battacharyya O, Hanley AJG, Esler JG, Zinman B. (2011). Major Gaps in Diabetes Clinical Care among Canada's First Nations: Results of the CIRCLE Study. *Diabetes Research and Clinical* 92(20, 272-279

HBC Archives. (1883). "Journal of Occurrence, Osnaburgh Post", HBC B/155/a/84, fol. 16, 9 March 1879; B/155/a/86, fol. 17, 27 June 1883. Cited in Young, 1988

Healey S, Qayyum A. (n.d.). *Diabetes in Nunavut 1997-2002*. Nunavut Department of Health and Social Services. Retrieved from http://pubs.aina.ucalgary.ca/health/55693E.pdf

Health Canada. (2003). *A Statistical Profile on the Health of First Nations in Canada*. Ottawa: Health Canada

Health Canada. (2000). *Diabetes among Aboriginal (First Nations, Inuit and Métis) People in Canada: The Evidence.* First Nations, Inuit and Métis Health. Retrieved from http://www.hc-sc.gc.ca/fniah-spnia/pubs/diseases-maladies/_diabete/2001_evidence_faits/index-eng.php

Heerwagen MJ, Miller MR, Barbour LA, Friedman JE. (2010). Maternal Obesity and Fetal Metabolic Programming: A Fertile Epigenetic Soil. *American Journal of Physiology - Regulatory, Integrative and Comparative Physiology*, *299*(3), R711–R722.

Hemmelgarn BR, Toth EL, King M, Crowshoe L, Ralph-Campbell K. (2007). Chapter 9: Diabetes and First Nations People in Alberta. *Alberta Diabetes Atlas 2007*: Institute of Health Economics, Pp.127-139

Hoke MK, McDade T. (2015). Biosocial Inheritance: A Framework for the Study of the intergenerational Transmission of Health Disparities. *Annals of Anthropological Practice* 38(2), 187-213

Hopping BN, Erber E, Mead E, Roache C, Sharma S. (2010). High Levels of Physical Activity and Obesity Co-Exist amongst Inuit Adults in Arctic Canada. *Journal of Human Nutrition and Dietetics* 23(supplement 1), 110-114

Horton S B, Barker J C. (2010). Stigmatized Biologies: Examining Oral Health Disparities for Mexican American Farmworker Children and their Cumulative Effects. *Medical Anthropology Quarterly* 24(2): 199-219

Hovey RB, Delormier T, McComber AM, Lévesque L,Martin D. (2017). Enhancing Indigenous Health Promotion Research Through Two-Eyed Seeing: A Hermeneutic Relational Process. *Qualitative Health Research* 27(9), 1278-1287

Hovey RB, Delormier T, McComber A. (2014). Social-Relational Understandings of Health and Well-being from an Indigenous Perspective. *International Journal of Indigenous Health,* 10(1), 35-54

Howe I. (1976). *World of Our Fathers*. New York: Harcourt Brace Jovanovich

Imbeault P, Haman F, Blais JM, Pal S, Seabert T, Eva M. Krümmel EM, Robidoux MA. (2011). Obesity and Type 2 Diabetes Prevalence in Adults from Two Remote First Nations Communities in Northwestern Ontario, Canada. *Journal of Obesity* doi:10.1155/2011/267509

Institute for Integrative Science and Health. (n.d.). *Two-Eyed Seeing*. Retrieved from http://www.integrativescience.ca/Principles/TwoEyedSeeing/

Jacklin KM, Henderson RI, Green ME, Walker LM, Calam B, Crowshoe LJ. (2017). Healthcare Experiences of Indigenous People Living with Type 2 Diabetes in Canada. *CMAJ* 189(3), E106-E112

Jaimes Guerrero MA. (2003). 'Patriarchal Colonialism' and Indigenism: Implications for Native Feminist Spirituality and Native Womanism. *Hypatia* 18(2), 58–69

Janska, E. (2008). Health Knowledge, Western. In *Encyclopedia of Public Health* (W Kirch, Ed.). New York: Springer. P. 614-617

Jasienska G. (2009). Low Birth Weight of Contemporary African Americans: An Intergenerational Effect of Slavery? *American Journal of Human Biology* 21, 16-24

Joslin EP. (1924). The Diabetic Problem of Today. *Journal of the American Medical Association* 83, 727– 729

Julian S. (2010). Sexuality, Politics, and Faith. In (CA Kirk-Duggan and KJ Torjesen, Eds.) *Women and Christianity*, Santa Barbara, California: Praeger, Pp. 165-84.

Kelm M. (1998). *Colonizing Bodies: Aboriginal Health in British Columbia 1900-50*. Vancouver: UBC Press

Kelm ME, (1996). '"A Scandalous Procession": Residential Schooling and the Re/Formation of Aboriginal Bodies, 1900–1950. *Native Studies Review* 11(2), 51–88

Kennedy RL. (1958). Letter to Mr. G.D. Ruttan, February 13. NAC/RG85. Cited in Laugrand et al., 2009

Keys A, Brozek J, Henschel A, Mickelsen O, Longstreet Taylor H. (1950). *The Biology of Human Starvation*. University of Minnesota Press.

Kierans WJ, Joseph KS, Luo Z, Platt R, Wilkins R, Kramer MS. (2008). Does One Size Fit it All? The Case for Ethnic-Specific Standards of Fetal Growth. *BMC Pregnancy and Childbirth* 8(1). doi: 10.1186/1471-2393-8-1.

Kirchengast S. (2017). Diabetes and Obesity: An Evolutionary Perspective. *AIMS Medical Science* 4(1), 28-51

Kmetic A, Reading J, Estey E. (2008). Taking a Life Course Perspective on Cardiovascular Disease and Diabetes in First Nations Peoples. *Canadian Journal of Nursing Research* 40(3), 58-78

Kovach M. (2009). *Indigenous Methodologies: Characteristics, Conversations, and Contexts*. Toronto: University of Toronto Press

Krieger N. (2001). Theories for Social Epidemiology in the 21st Century: An Ecosocial Perspective. *International Journal of Epidemiology* 30, 668-677.

Kuhnlein HV, Receveur O, Chan HM. (2001). Traditional Food Systems Research with Canadian Indigenous Peoples. *International Journal of Circumpolar Health* 60, 112-122

Labonte R, Robertson A. (1996). Delivering the Goods, Showing our Stuff: The Case for a Constructivist Paradigm for Health Promotion Research. *Health Education Quarterly* 23, 431-447

Labonte R, Polanyi M, Muhajarine N, Mcintosh, M, Williams A. (2005). Beyond the Divides: Towards Critical Population Health Research. *Critical Public Health* 15(1):5-17

Laugrand F, Oosten J, Serkoak D. (2009). Relocating the Ahiarmiut from Ennadai Lake to Arviat (1950-1958). In (B. Collignon and M. Therrien, Eds.) *Orality in the 21st Century: Inuit Discourse and Practices. Proceedings of the 15th Inuit Studies Conference.* Paris: INALCO.

Lavallee C. (1988). Anthropometric Measurements and Growth Charts for Cree Children of James Bay, from 0 to 5 Years Old. *Arctic Medical Research* 47, 204-208

Law C, Power C, Graham H, Merrick D. (2007). Obesity and Health Inequalities. *Obesity Reviews* 8 (supplement 1), 19-22

Law M, Wald N. (1999). Why Heart Disease Mortality is Low in France: The Time Lag Explanation. *BMJ* 318, p. 1471-1476

Lawford K, Giles A. (2012). Marginalization and Coercion: Canada's Evacuation Policy for Pregnant First Nations Women Who Live on Reserves in Rural and Remote Regions. *Pimatisiwin: A Journal of Aboriginal and Indigenous Community Health* 10(3), 327-40

Leacock E. (1980). Montagnais Women and the Jesuit Program for Colonization. In (E Leacock, Ed.) *Women and Colonization: Anthropological Perspectives*. New York: Praeger Publishers.

Leiva A, Pardo F, Ramírez MA, Farías M, Casanello P, Sobrevia L. (2011). Fetoplacental Vascular Endothelial Dysfunction as an Early Phenomenon in the Programming of Human Adult Diseases in Subjects Born from Gestational Diabetes Mellitus or Obesity in Pregnancy. *Experimental Diabetes Research* 2011, 1-18

Lemann II. (1911). Diabetes Mellitus Among the Negros. *New Orleans Medical and Surgical Journal* 63, 461-467

Levins R, Lewontin R. (1998). Foreword. In (AH Goodman and TL Leatherman, Eds.) *Building a New Biocultural Synthesis: Political-Economic Perspectives on Human Biology*. Ann Arbor: University of Michigan Press. Pp.xi-xv

Levy RS. (2005). *Antisemitism: A Historical Encyclopedia of Prejudice and Persecution*. Santa Barbara, California: ABC-CLIO

Lewontin R. (1991). *Biology as Ideology: The Doctrine of DNA*. Toronto, Ontario: House of Ananasi Press Inc.

Lie M. (2000). Two Generations: Life Stories and Social Change in Malaysia. *Journal of Gender Studies* 9(1), 27-43

LIFE Magazine. (1956). The Mesolithic Age Today. February 1956.

Livingstone FB. (1958). Anthropological Implications of the Sickle-cell Gene Distribution in West Africa. *American Anthropologist* 60, 533-562

Lock M. (2001). The Tempering of Medical Anthropology: Troubling Natural Categories. *Medical Anthropology Quarterly* 15(4), 478-492

Lock M. (1993). Cultivating the Body: Anthropology and Epistemologies of Bodily Practice and Knowledge. *Annual Review of Anthropology* 22, 133-155

Lopez A. (n.d.). *Pagans in Our Midst*. Mohawk Nation: Awkesasne Notes, cited in Smith (2011).

Low SM. (2003). Embodied Spaces: Anthropological Theories of Body, Space and Culture. *Space and Culture* 6(1), 9-18.

Lui J. (2006). Researching Chinese Women's Lives: 'Insider' Research and Life History Interviewing. *Oral History* 34(1), 43-52

Lux M. (2010). Care for the "Racially Careless": Indian Hospitals in the Canadian West, 1920-1950s. *The Canadian Historical Review* 91(3), 407-434

Lux M. (2001). *Medicine That Walks: Disease, Medicine, and Canadian Plains Native People, 1880–1940*. Toronto, ON: University of Toronto

Lux M. (1998). Perfect Subjects: Race, Tuberculosis, and the Qu'appelle BCG Vaccination Trial. *CBMH/BCHM* 15, 277-295

MacDonald D, Wilson D. (2013, June 19). *Poverty or Prosperity: Indigenous Children in Canada*. Ottawa, ON: Canadian Centre for Policy Alternatives. Retrieved from https://www.policyalternatives.ca/publications/reports/poverty-or-prosperity

Mansuri S, Hanley AJ. (2017). Diabetes among Indigenous Canadians. In (S. Dagogo-Jack, Ed.) *Diabetes Mellitus in Developing Countries and Underserved Communities*. Switzerland: Springer International Publishing. Pp. 235-250

Maybury-Lewis D. (2002). *Indigenous Peoples, Ethnic Groups, and the State* (2nd Edition). Boston: Allyn and Bacon

Mayer KU. (2009). New Directions in Life Course Research. *Annual Review of Sociology* 35, 413-433

McGibbon EA (Ed.). (2012). *Oppression: A Social Determinant of Health*. Black Point, Nova Scotia: Fernwood Publishing

McNeish JA, Eversole R. (2005). Introduction: Indigenous Peoples and Poverty. In (Eversole A, McNeish JA, and Cimadamore A, Eds.), *Indigenous Peoples and Poverty: An International Perspective*. London, UK: Zed Books.

Migone A, Emanuel I, Mueller B, Daling J, Little RE. (1991). Gestational Duration and Birth-Weight in White, Black, and Mixed-Race Babies. *Pediatric and Perinatal Epidemiology* 5, 378-391

Miller VP. (1982). The Decline of the Nova Scotia Micmac Population 1600-1850. *Culture* 2(3), 107-120. Cited in Paul, 2000

Moffat T, Herring A. (1999). The Historical Roots of High Infant Death in Indigenous Communities in Canada in the Early Twentieth Century: The Case of Fisher River, Manitoba. *Social Science and Medicine* 48, 1821-1832

Moffitt PM. (2008). *'Keep Myself Well': Perinatal Health Beliefs and Health Promotion Practices among Tlicho Women*. PhD Dissertation. University of Calgary.

Moore PE, Kruse HD, Tisdall FF, Corrigan RSC. (1946). Medical Survey of Nutrition among the Northern Manitoba Indians. *Canadian Medical Association Journal* 54, 223-233

Moreton-Robinson E. (2000). *Talkin' Up to the White Woman: Indigenous Women and Feminism*. St. Lucia, Australia: University of Queensland Press.

Moreton-Robinson E, Walter M. (2009). Indigenous Methodologies in Social Research. In (M. Walter, Ed.) *Social Research Methods*. Oxford: Oxford University Press. Pp. 95–109

Morgan LH. (1877). *Ancient Society*. New York: Henry Holt & Company

Morrison H. (1916). A Statistical Study of the Mortality from Diabetes Mellitus in Boston from 1895 to 1913, with Special reference to its Occurrence Among Jews. *Boston Medical and Surgical Journal* 175, 54-57

Mosby I. (2013). Administering Colonial Science: Nutrition Research and Human Biomedical Experimentation in Aboriginal Communities and Residential Schools, 1942–1952. *Histoire Sociale/Social History* 46(91), 145-172

Mowat F. (1959). *The Desperate People*. Boston: Little, Brown and Company

Mowat F. (1952). *People of the Deer*. Toronto: McClelland and Stewart

Muldoon MF, Kritchevsky SB. (1996). Flavonoids and Heart Disease. *BMJ* 312, 458-459

Munn ND. (1996). Excluded Spaces: The Figure in the Australian Aboriginal Landscape. *Critical Inquiry* 22(3), 446-65.

Myers Jr MG, Leibel RL, Seeley RJ, Schwartz MW. (2010). Obesity and Leptin Resistance: Distinguishing Cause from Effect. *Trends in Endocrinology and Metabolism* 21(11), 643-651

Nagy M. (2006). Time, Space and Memory. In (P Stern and L Stevenson, Eds.) *Critical Inuit Studies: An Anthology of Contemporary Arctic Ethnography*. Lincoln: University of Nebraska Press. Pp. 71-88

Nagy M. (1999). *Aulavik Oral History Project: English Translation and Transcriptions of Archival Tapes*. Inuvik: Inuvialuit Social Development Program.

Neel JV. (1962). Diabetes Mellitus: A “Thrifty” Genotype Rendered Detrimental by “Progress”. *American Journal of Human Genetics* 14, 353-362

Newnham JP, Pennell CE, Lye SJ, Challis JRG. (2009). Early Life Origins of Obesity. *Obstetrics and Gynecology Clinics of North America* 36, 227-244

Nicolucci A, Carinci F, Ciampi A. (1998). Stratifying Patients at Risk of Diabetic Complications: An Integrated Look at Clinical, Socioeconomic and Care-Rlated Factors. *Diabetes Care* 21(9), 1439-1444

Nolan CJ, Damm P, Prentki M. (2011). Type 2 Diabetes Across the Generations: From Pathophysiology to Prevention and Management. *Lancet* 378, 169-181

Nutrition Canada. (1974). *Nutrition Canada: Indian survey report*. Ottawa: Department of National Health and Welfare. Cited in Young, 1996.

Nuttal M. (1992). *Arctic Homeland: Kinship, Community, and Development in Northwest Greenland*. Toronto: University of Toronto Press

NWT Bureau of Statistics. (2016). Traditional Activities. Retrieved from http://www.statsnwt.ca/Traditional%20Activities/

O'Malley A. (1918). Irish Vital Statistics in America. Studies: *An Irish Quarterly Review* 7(28), 623-632

Optis M, Shaw K, Stephenson P, Wild P. (2012). Mold Growth in On-Reserve Homes in Canada: The Need for Research, Education, Policy, and Funding. *Journal of Environmental Health, 74*(6), 14–21.

Oster RT, King M, Morrish DW, Mayan MJ, Toth EL. (2014). Diabetes in Pregnancy among First Nations Women in Alberta, Canada: A Retrospective Analysis. *BMC Pregnancy and Childbirth* 14, 136-146 Retrieved from https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/1471-2393-14-136

Pal S, Haman F, Robidoux MA. (2013). The Costs of Local Food Procurement in Two Northern Indigenous Communities in Canada. *Food and Foodways* 21, 132–152

Pancoast H. (1898). Diabetes in the Negro. *John Hopkins Hospital Bulletin* 83, 40-41

Parker CC. (1930). Cited in Author Unknown. 1930. *Memorandum: Hon. Thomas G. Murphy*. October 28, 1930. In Indian Affairs Headquarters Files: Northwest Territories Game Laws. (Government Publication) 1930 - 1934, RG10, Volume 6742, File 420-6 3. p. 3.

Partington MW, Roberts N. (1969). The Heights and Weights of Indian and Eskimo School Children on James Bay and Hudson Bay. *CMAJ* 100, 502-509

Paul DN. (2006). *We were not Savages: A Mi'kmaq Perspective on the Collision between European and Native American Civilizations* (3rd edition). Halifax: Fernwood Publishing

Peacock SL. (2008). From Complex to Simple: Balsamroot, Inulin, and the Chemistry of Traditional Interior Salish Pit Cooking Technology. *Botany* 86, 116-128

Pettit DJ, Bennett PH, Saad MF, Charles MA, Nelson RG, Knowler WC. (1991). Abnormal Glucose Tolerance during Pregnancy in Pima Indian Women: Long Term Effects on Offspring. *Diabetes* 40(S2), 126-130

Piddocke S. (1965). The Potlatch System of the Southern Kwakiutl: A New Perspective. *Journal of Anthropological Research* 21(3), 244-264

Pioro M, Dyck RF, Gillis DC. (1996). Diabetes Prevalence Rates among First Nations Adults on Saskatchewan Reserves in 1990: Comparison by Tribal Grouping, Geography and with Non-First Nation People. *Canadian Journal of Public Health* 87, 325-328

Pollitt K. (1982). The Politically Correct Body. *Mother Jones* (May), 66-67.

Popkin BM. (2006). The Nutrition Transition is Speeding Up. In (NJ Temple, T Wilson, DR Jacobs, Eds.) *Nutritional Health: Strategies for Disease Prevention*. Totowa, NJ: Humana Press. Pp.37-47

Prentice AM. (2005). Starvation in Humans: Evolutionary Background and Contemporary Implications. *Mechanisms of Ageing and Development* 126, 976–981

Profet M. (1992). Morning Sickness as Adaptation: A Deterrent to Maternal Ingestion of Teratogens. In (JH Barkow, L Cosmides and J Tooby, Eds.) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. New York: Oxford University Press. Pp. 327-365

Public Health Agency of Canada. (2011). Chapter 6: Diabetes among First Nations, Inuit, and Métis populations. *Diabetes in Canada: Facts and Figures from a Public Health Perspective*. Retrieved from http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabete/facts-figures-faits-chiffres-2011/chap6-eng.php

Purdy G. (1945). Women in Labour. *British Medical Journal* 1, 822.

Reading CL, Wien F. (2009). *Health Inequalities and Social Determinants of Aboriginal Peoples' Health*. Prince George, BC: National Collaborating Centre for Aboriginal Health.

Richmond CAM, Ross NA. (2009). The Determinants of First Nation and Inuit Health: A Critical Population Health Approach. *Health and Place* 15, 403-411

Rigby B, MacDonald J, Otak L. (2000). The Inuit of Nunavut, Canada. In (MMR Freeman, Ed.) *Endangered Peoples of the Arctic: Struggles to Survive and Thrive*. Westport, Connecticut: Greenwood Press. Pp. 93-112

Riessman CK. (1993). *Narrative Analysis*. Qualitative Research Methods Series 30. Newbury Park, California: Sage Publications

Roberts EFS. (2015). Bio-Ethnography: A Collaborative, Methodological Experiment in Mexico City. *Somatosphere: Science, Medicine, and Anthropology*. Retrieved from http://somatosphere.net/2015/02/bio-ethnography.html

Rodrigues S, Robinson EJ, Kramer MS, Gray-Donald K. (2000). High Rates of Infant Macrosomia: A Comparison of a Canadian Native and a Non-Native Population. *The Journal of Nutrition* 130, 806-812

Roseboom T, de Rooij S, Painter R. (2006). The Dutch Famine and its Long Term Consequences for Adult Health. *Early Human Development* 82, 485-491

Ross L. (2006). *Understanding Reproductive Justice*. Retrieved from https://d3n8a8pro7vhmx.cloudfront.net/rrfp/pages/33/attachments/original/1456425809/Understanding_RJ_Sistersong.pdf?1456425809

Ross MG, Beall MH. (2008). Adult Sequelae of Intrauterine Growth Restriction. *Seminars in Perinatology* 32(3), 213–218.

Rudnicki W. (1958) *Report: Field Trip to Eskimo Point*. Ottawa: Department of Northern Affairs. Cited in Tester and Kulchyski, 1994

Ryan J. (1993a). *Final Report: Traditional Dene Medicine—Part I*. Tlicho Government.

Ryan J. (1993b). *Final Report: Traditional Dene Medicine—Part II (Database)*. Tlicho Government.

Ryan J. (1993c). *Final Report: Traditional Dene Justice Project*. Tlicho Government.

Saboor Aftab SA, Reddy N, Smith E, Barber TM. (2014). Obesity and Type 2 Diabetes Mellitus. *Internal Medicine* S6, 002. doi:10.4172/2165-8048. S6-002

Sahakyan KR, Somers VK, Rodriguez-Escudero, Hodge DO, Carter RE, Sochor O, Coutinho T, Jensen MD, Roger VL, Singh P, Lopez-Jimenez F. (2015). Normal Weight Central Obesity: Implications for Total and Cardiovascular Mortality. *Annals of Internal Medicine* 163(11), 827-835

Sahlins, M. (1972). *Stone Age Economics*. London and New York: Routledge

Sahlins, M. (1968). Notes on the Original Affluent Society. In (R.B. Lee and I. DeVore, Eds.) *Man the Hunter.* New York: Aldine Publishing Company. Pp. 85-89.

Sané P. (2001). The Role of the Social and Human Sciences in the Fight Against Poverty. *Management of Social Transformations (MOST) 10,* 1–2. Retrieved from http://www.unesco.org/most/newslet10e.pdf

Saundby R. (1897). Diabetes Mellitus. In (TC Albutt, Ed.) *A System of Medicine*. London: Macmillan, pp. 167–212

Savona-Ventura, C. (1995). The Influence of the Roman Catholic Church on Midwifery Practice in Malta. *Medical History* 39(1), 18-34

Scheper-Hughes N, Lock MM. (1987). The Mindful Body: A Prolegomenon to Future Work in Medical Anthropology. *Medical Anthropology Quarterly* 1(1), 6-41

Schultz LO, Bennett PH, Ravussin E, Kidd JR, Kidd KK, Esparza J, Valencia ME. (2006). Effects of Traditional and Western Environments on Prevalence of Type 2 Diabetes in Pima Indians in Mexico and the U.S. *Diabetes Care* 29(8), 1866-1871

Silverman BL, Cho NH, Metzger BE, Loeb CA. (1995). Impaired Glucose Tolerance in Adolescent Offspring of Diabetic Mothers. *Diabetes Care* 18(5), 611-617

Simoons FJ. (1978). The Geographic Hypothesis and Lactose Malabsorption. *American Journal of Digestive Diseases* 23, 963-980

Smith LT. (1999). *Decolonising Methodologies: Research and Indigenous Peoples*. London, UK: Zed Books.

Smith A. (2011). Sexual Violence as a Tool of Genocide. In (MJ Cannon and L Sunseri, Eds.) *Racism, Colonialism, and Indigeneity in Canada*. Don Mills, Ontario: Oxford University Press.

Smith-Morris CM. (2004). Reducing Diabetes in Indian Country: Lessons from the Three Domains Influencing Pima Diabetes. *Human Organization* 63(1), 34-46

Smylie J, Crengle S, Freemantle J, Taualii M. (2010). Indigenous Birth Outcomes in Australia, Canada, New Zealand and the United States – an Overview. *The Open Women's Health Journal*, (4), 7–17. Advance online publication. http://doi.org/10.2174/1874291201004010007

Society of Obstetricians and Gynaecologists of Canada. (2011). Sexual and Reproductive Health, Rights, and Realities and Access to Services for First Nations, Inuit, and Métis in Canada. *Journal of Obstetrics and Gynaecology Canada* 33(6), 633-637

Soeters MR, Soeters PB. (2012). The Evolutionary Benefit of Insulin Resistance. *Clinical Nutrition* 31(6), 1002-1007

Stevenson B. (2012). *We Need to Talk About an Injustice* [Video file]. Retrieved from https://www.ted.com/talks/bryan_stevenson_we_need_to_talk_about_an_injustice

Tester FJ, Kulchyski P. (1994). *Tammarniit (Mistakes): Inuit Relocation in the Eastern Arctic 1939-1963*. Vancouver: UBC Press

Thachuk, A. (2007). Midwifery, Informed Choice and Reproductive Autonomy: A Relational Approach. *Feminism and Psychology* 17(1), 39-56

Thomas WH. (1904). Medical Treatment of Diabetes. *Albany Medical Annals* 25(4), 358.

Toronto Star. (2011, September 9). Failing Kids in Our North: A Coroner's Report into Youth *Suicides on a Northern Ontario Reserve Underlines a Shameful Lack of Basic Services*. Retrieved from http://www.thestar.com/opinion/editorials/2011/09/09/failing_kids_in_our_north.html

Truth and Reconciliation Commission of Canada. (2015). *Truth and Reconciliation of Canada: Calls to Action*. Retrieved from http://www.trc.ca/websites/trcinstitution/File/2015/Findings/Calls_to_Action_English2.pdf

Tuchmann AM. (2011). Diabetes and Race: A Historical Perspective. *American Journal of Public Health* 101(1), 24-33

Turner LM. (1894). Ethnology of the Ungava District, Hudson Bay Territory. *Annual Report Bureau of American Ethnology*. Pp. 167-350. Cited in Adelson, 2000

Turner N, Thompson LC, Thompson MT, York AZ. (1990). *Thompson Ethnobotany: Knowledge and Usage of Plants by the Thompson Indians of British Columbia*. Memoir No.3. Victoria: Royal British Columbia Museum. Cited in Helm, 1998

Ulijaszek S. (2007). Bioculturalism. In (David Parkin and Stanley Ulijaszek, Eds.) *Holistic Anthropology: Emergence and Convergence*. New York: Berghahn Books.

United Nations. (2008). *United Nations Declaration on the Rights of Indigenous Peoples*. Retrieved from http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf

UNESCO. (2015). Poverty. Retrieved from http://www.unesco.org/new/en/social-and-human-sciences/themes/international-migration/glossary/poverty/

University of Waterloo. (2016). *Canadian Index of Wellbeing*. Retrieved from https://uwaterloo.ca/canadian-index-wellbeing/reports/2016-canadian-index-wellbeing-national-report/what-wellbeing

U.S. Department of Health and Human Services. (2000). *Healthy People 2010*. Washington, DC: U.S. Government Printing Office.

Vallianatos H, Brennand EA, Raine K, Stephen Q, Petawabano B, Dannenbaum D, and Willows ND. (2006). First Nations Women's Beliefs and Practices Concerning Weight Gain in Pregnancy and Lactation: Implications for Women's Health. *Canadian Journal of Nursing Research* 38, 102-119

Vivian RP, McMillan C, Moore PE, Robertson EC, Sebrell WH, Tisdall FF, McIntosh WG. (1948). The Nutrition and Health of the James Bay Indian. *CMAJ* 59(6), 505-518

Waldram JB, Herring A, Young TK. (2006). *Aboriginal Health in Canada: Historical, Cultural and Epidemiological perspectives* (2nd Edition). Toronto: University of Toronto Press

Washington Post. (1977). *Hunts On, Despite Seal Lobby Fervor*. Retrieved from https://www.washingtonpost.com/archive/politics/1977/03/04/hunts-on-despite-seal-lobby-fervor/d46b72b1-af6d-452a-a50f-5f4900de2be2/?utm_term=.660e5769c869

Whitty-Rogers J, Etowa J, Evans J. (2006). Becoming an Aboriginal Mother: Childbirth Experiences of Women from one Mi'kmaq Community in Nova Scotia. In (D. Memee Lavell-Harvard and Jeannette Corbiere Lavall, Eds.) *"Until our Hearts are on the Ground": Aboriginal Mothering, Oppression, Resistance and Rebirth*. Toronto, Ontario: Demeter Press. Pp. 34-61

Wiley AS. (2004). *An Ecology of High-altitude Infancy: A Biocultural Perspective*. New York: Cambridge University Press.

Wiley AS, Allen JS. (2017). *Medical Anthropology: A Biocultural Approach* (3rd Edition). New York: Oxford University Press.

Willows ND. (2005). Determinants of Healthy Eating in Aboriginal Peoples in Canada. *Canadian Journal of Public Health* 96 (supplement), S32-S36

Willows ND, Hanley AJG, Delormier T. (2012). A Socioecological Framework to Understand Weight-Related Issues in Aboriginal Children in Canada. *Applied Physiology, Nutrition, and Metabolism* 37(1), 1-13

Willows ND, Johnson MS, Ball GDC. (2007). Prevalence Estimates of Overweight and Obesity in Cree Preschool Children in Northern Quebec According to International and US Reference Criteria. *American Journal of Public Health* 97(2), 311-316

Willows ND, Sanou D, Bell RC. (2011). Assessment of Canadian Cree infants' birth size using the WHO Child Growth Standards. *American Journal of Human Biology* 23(1), 126-131

Wilson JG. (1912). Increase in the Death Rate from Diabetes: A Possible Explanation. *Medical Record* 82, 662-663

Wood JW, Milner GR, Harpending HC, Weiss KM. (1992). The Osteological Paradox Problems of Inferring Prehistoric Health from Skeletal Samples. *Current Anthropology* 33, 343-370

World Bank. (2000). *World Development Report 2000/2001: Attacking Poverty*. Washington, DC: World Bank.

Wynn T. (2002). Archaeology and Cognitive Evolution. *Behavioral and Brain Sciences* 25, 389-438

Young TK. (2003). Review of Research on Aboriginal Populations in Canada: Relevance to their Health Needs. *British Medical Journal* 327, 419-422

Young TK. (1996). Obesity among Indigenous Peoples in North America: Epidemiological Patterns, Risk Factors and Metabolic Consequences. In (A Angel, H Anderson, C Bouchard, D Lau, I Leiter, R Mendelson, Eds.) *Progress in Obesity Research 7*. John Libby and Company Ltd. Pp. 337-342

Young TK. (1988). *Health Care and Culture Change*. Toronto: University of Toronto Press

Young TK, Reading J, Elias B, O'Neil JD. (2000). Type II Diabetes Mellitus in Canada's First Nations: Status of an Epidemic in Progress. *Canadian Medical Association Journal* 163(5), 561-566

Young TK, Szathmary EJE, Evers S, Wheatley B. (1990). Geographic Distribution of Diabetes among the Native Population in Canada: A National Survey. *Social Science and Medicine* 31(2), 129-139

Zimmet P. (2000). Globalization, Coca-Colonization and the Chronic Disease Epidemic: Can the Doomsday Scenario be Averted? *Journal of Internal Medicine*, 247(3), 301-310.