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If only they had accessed the data: Governmental failure to monitor pulp mill impacts on human health in Pictou Landing First Nation

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ABSTRACT

For over fifty years, Pictou Landing First Nation (PLFN), a small Mi'kmaw community on the northern shore of mainland Nova Scotia, Canada, has been told by a Joint Environmental Health Monitoring Committee (JEHMC) mandated to oversee the health of the community that their health has not been impacted by exposure to 85 million litres of pulp mill effluent dumped every day into what was once a culturally significant body of water bordering their community. Yet, based on lived experience, the community knows otherwise, and despite countless dollars spent on government and industry-sponsored research, their concerns have not gone away. Using biopolitical theory, we explore why JEHMC never fully implemented its mandate. We will use a Mi'kmaw environmental 'theoretical' framework to demonstrate that indicators of a relational epistemology and ontology that have been consistently and persistently overlooked in Indigenous environmental health research demands that Indigenous connections to the air, land and water must be taken into consideration to get a full understanding of environmental health impacts. Guided by the principle of *Etuaptmumk* (Two-Eyed Seeing), which brings together the strengths of both western and Indigenous knowledge, and employing a community-based participatory research approach, we use data that could have been accessed by the JEHMC that might have signaled that human health studies were warranted. Further, we developed an environmental health survey that more appropriately assesses the impacts on the community. Finally, we will discuss how an Indigenous-developed framework can adequately assess the impacts of land displacement and environmental dispossession on the health of Indigenous communities and illustrate how our framework can serve as a guide to others when exploring Indigenous environmental health more broadly.

1. Introduction

Situated on the northern shore of mainland Nova Scotia, Canada, Pictou Landing First Nation (PLFN) is a small Mi'kmaw community of 490 on-reserve members (Indigenous and Northern Affairs Canada, 2019). The Mi'kmaq are indigenous to the Atlantic provinces of Canada. From 1967 until January 31, 2020, the Nova Scotia Government permitted a nearby pulp mill to dump 85 million litres of effluent per day into a culturally significant tidal estuary bordering PLFN, known to the community as *A'se'k* (Castleden et al., 2017). *A'se'k* translates to 'the other room' in the Mi'kmaw language and was where PLFN members traditionally accessed foods, medicines, and berries, and carried on cultural, recreational and spiritual activities (Lewis et al., 2016). *A'se'k* has been the repository of the Boat Harbour Effluent Treatment Facility (BHETF) for over 50 years. Once the BHETF became operational, fish kills were immediate. Once an extension of 'home', *A'se'k* became a place of disease and death.

In Canada, Section 91(24) of the *British North America Act* (1867) places 'Indians and lands reserved for Indians' under the jurisdiction of the federal government. Section 35 of the *Indian Act* allows a provincial legislature to take reserve lands with the consent of the Governor in Council (Prime Minister and Cabinet), subject to an amount that is agreed upon by the parties to be set aside for the use of the Band (Justice Laws Website, 2020). This is what happened when the riparian rights (a

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right to access or use the shore, bed, and water) to *A'se'k* were signed over to the province for $60,000 in 1966 so that the estuary could be used to receive the effluent from the mill (Paul, 2006). During the 1970s, PLFN sought compensation from the provincial government for the damages created by locating the BHETF within their traditional territory. The province ended negotiations in 1982, refusing to recognize PLFN's claim (Parliament of Canada, 1995). In 1986, PLFN filed suit against the federal government alleging breach of its fiduciary duty to safeguard their interests and reached an out-of-court settlement in 1993 for $35 million (Parliament of Canada, 1995).

The *Pictou Landing Indian Band Agreement Act (The Act),* ratified in Parliament on February 16, 1995, formalized the *Pictou Landing Indian Band Settlement Agreement* (1993) and ensured that $35 million would be the full amount for which the Government of Canada could ever be held liable for damages related to the BHETF (Parliament of Canada, 1995). The *Act* also established a Joint Environmental Health Monitoring Committee (JEHMC), which is comprised of representatives of Canada (Department of Indian Affairs, Health Canada, Department of Justice, and Environment Canada), as well as representatives of PLFN (JEHMC, 1996).

The JEHMC has been mandated since 1993 to investigate human and animal health in and around PLFN through examining exposure to toxins in the water they drink, the air they breathe, the food they eat, and through their skin (JEHMC, 1996, p. 2). The PLFN representatives on the JEHMC seemingly have had little influence in mandating studies that might address or, more appropriately, reflect the concerns of their community. A human health risk assessment conducted by CanTox on behalf of the JEHMC, and a synthesis report of studies relevant to the work conducted under the auspices of JEHMC, concluded there have been no negative impacts from the BHETF on the health of PLFN members (CanTox, 1997; Dillon Consulting Limited, 2012), despite lived experience telling PLFN community members otherwise.

In 2010, thirteen Mi'kmaw women from the Pictou Landing Native Women's Group (NWG), who meet regularly to address the needs of the women in the community, had enough of the provincial government allowing *A'se'k* to be used as the BHETF (Lewis et al., 2016) and enough of JEHMC telling them that the health of their community had not been impacted. The women agreed, "there have been lots of studies on trees, water … but none on us. Our health is our main concern" (Pictou Landing Native Women's Group, 2010, p. 7). The research reported on in this paper has been conducted with the NWG by a Mi'kmaw scholar, under the direction of non-Indigenous academics. We will demonstrate that the physical health of PLFN has in fact been impacted, and furthermore, that the JEHMC failed in their obligation to monitor the health of the community.

The JEHMC never gathered baseline health data in the community. Had they done so, comparisons to existing Statistics Canada health datasets could have been made between PLFN and other populations which may have signaled that further investigation was warranted. Further, concerns such as cancer, for example, could have been investigated, as federal government representatives have access, through Statistics Canada, to the Canadian Cancer Registry, an administrative database which has collected patient diagnosis data since 1992 (Lewis et al., forthcoming).

In this paper, we will show how biopolitical theory, which is the intersecting field of human biology and politics (Foucault et al., 2008), can explain why this government-led oversight committee has never fully implemented its mandate. Further, our empirical data shows how readily this could have been accomplished had they chosen to do so. We will use a Mi'kmaw environmental 'theoretical' framework to demonstrate that indicators of a relational epistemology and ontology can and need to be measured to get to a full understanding of environmental health impacts on Indigenous peoples. Finally, we will discuss how an Indigenous-developed framework can adequately assess the impacts of environmental dispossession and land displacement on the health of Indigenous communities and illustrate how our framework can serve as a guide to others when exploring Indigenous environmental health more broadly.

1.1. Biopolitics in Indigenous contexts

Foucault defines biopolitics as an "attempt, starting in the eighteenth century, to rationalize the problems posed to governmental practice [in the modern state] by phenomena characteristic of a set of living beings forming a population …" (Foucault et al., 2008, p. 317). Biopolitics provides a theoretical framework to examine the ways in which settler colonialism targets, displaces, and seeks to assimilate, alienate, and make invisible Indigenous peoples in their homelands (Morgensen, 2011). Typically, under colonialism, surveys are used as instruments of domination (Legg, 2005), and as O'Neil (1993) notes, were employed as a technology (instrument) of biopolitics to "paint a grim picture of the state of well-being in Aboriginal communities" (O'Neil, 1993, p. 197). This was done in *A Survey of the Contemporary Indians of Canada: A Report on Economic, Political, Educational Needs and Policies* (Cairns, 1966), more commonly known as the Hawthorne Report, and in *Indian Conditions: A Survey, Department of Indian Affairs (1981)* (O'Neil, 1993) which Tuck and Yang (2014) might argue, reinforced the biopolitical norm.

The way that data are presented, highlighted, or obscured dictates knowledge formation (Legg, 2005). In this case, the pattern of obscuring pre-dates JEHMC. The Nova Scotia Water Resources Commission released a report in 1970 indicating that odors coming from the effluent would be of little concern since the site was remote from local development, residences, and habitation (Rust Associates Ltd, 1970), obscuring the fact that the effluent washed ashore on PLFN. Through such reporting – biopolitical narrative – the Mi'kmaq were made invisible and thus decisions were made that could have (and indeed did) put them in harm's way.

Moreover, the methodologies used by consultants such as the ones sanctioned by JEHMC are not grounded in an understanding that a loss of connection to land and environment will manifest in negative health outcomes for Indigenous peoples. The NWG set out to determine if their health had been impacted by collecting their own data, to make comparisons with existing government data (Statistics Canada) and, in effect, to conceivably change the narrative.

1.2. Disrupting the biopolitical architecture of a western health framework

As Tuck and Yang (2014) have argued, we recognized the need to interrogate the biopolitical architecture of power. By 1997, the health literature had clearly established that Indigenous health is understood to be inclusive of the physical, mental, emotional and spiritual aspects of health (Royal Commission on Aboriginal Peoples, 1996). In fact, Health Canada had funded and contributed advice to support the development of the inaugural First Nations and Inuit Regional Health Survey (RHS) in 1997 which reflected this understanding (First Nations and Inuit Regional Health Survey, 1999, p. 4). By 2007, the National Aboriginal Health Organization (NAHO) had extended that definition to include "the balance among the physical, mental, emotional and spiritual realms, as well as the environment, culture, family, and community, and that First Nation well-being flows from balance and harmony among all these elements of personal and collective life" (National Aboriginal Health Organization, 2007, p.1). Additionally, Indigenous health experts were highlighting the need to consider distal determinants of health that reflect the political, social and economic reality within which Indigenous people survive in a colonial state like Canada (McCormick et al., 1997; Reading and Wien, 2009). We designed our study guided by these culturally relevant definitions of Indigenous health.

We were also guided in our work by *Etuaptmumk* (a Mi'kmaw concept translating to 'Two-Eyed Seeing'), a principle that has garnered wide acceptance in recent years by Indigenous researchers to bring together the strengths of both western and Indigenous knowledge

systems to gain insights into complex issues around health, land, and environment that might otherwise escape our consideration (Bartlett et al., 2012; Iwama et al., 2009). Engaging an Indigenous knowledge system is meant to elucidate how Indigenous peoples see and experience the world around them (Martin, 2012), not to diminish the place of western research approaches. Rather, *Etuaptmumk* honours that there are multiple ways of knowing about the world, and that autonomous epistemologies and ontologies can complement each other in discovering new truths (Goulding et al., 2016; Greenwood et al., 2017; Hovey et al., 2017; Rowan et al., 2015).

Etuaptmumk refocuses the understanding of Indigenous beliefs that link humankind and the natural world and the important connection to the land and environment (Marsh et al., 2015; McKeon, 2012), therefore, we were able to centre a place-based and relational epistemological and ontological understanding of the Mi'kmaw place in the world by developing a Mi'kmaw environmental health 'theoretical' framework. We note, however, that although concepts derived from western theory are used as heuristic tools only to mediate what Indigenous knowledge conveys, they must not decontextualize or distort the knowledge that is shared (Kuokkanen, 2000; Lewis et al., forthcoming).

The Mi'kmaw do not share their knowledge in terms of epistemology, ontology, or theory. In fact, Battiste and Youngblood Henderson (2000) would argue that attempting to fit the interpretation of Indigenous knowledge into western models enacts "epistemic violence" (p. 96). But as we discern the knowledge system through the Mi'kmaw language, we can demonstrate these concepts in a Mi'kmaw framework that can generate variables that can be measured. For example, *kisu'lt melkiko'tin* is the Mi'kmaw word for the place of creation, an "ecological order or vantage point from which [the Mi'kmaq] construct their worldview, language, knowledge and order" (Battiste and Youngblood Henderson, 2000; Youngblood Henderson, 2000, p. 257). *Weji-sqalia'timk* expresses the understanding of the origin of people as rooted in the land (Sable et al., 2012). *Tlilnuo'lti'k* reflects Mi'kmaw ontology and translates to "how we maintain our consciousness" (Battiste and Youngblood Henderson, 2000, p. 35), or "the process of maintaining the Mi'kmaw worldview" (Battiste, 2000, p. 263). *Netukulimk* reflects a value system or a set of rules and obligations for being on the land and the sustainable use of resources (Prosper et al., 2011). This Mi'kmaw environmental 'theoretical' framework (Lewis et al., forthcoming) guides us as we look to the consequences of land displacement and environmental dispossession on the health of the PLFN community.

Using a community-based participatory research (CBPR) approach, we developed *Alaptmeg aqq mawte'meg mst gogwe'l klamon ula utan jajigkaktow/Looking and gathering everything so this community will be healthy - Identifying, Documenting, Mapping, and Mobilizing Environment and Health Knowledge in Pictou Landing: An Environmental Health Survey* (EHS). CBPR is not just a methodology but is rather (or also) a philosophical approach or orientation to research that seeks to engage with research participants as co-researchers in research that is meaningful to them (Castleden et al., 2008; Latulippe, 2015; Wallerstein and Duran, 2010). The NWG guided the team as we developed the questions they wanted answered (Lewis et al., 2016).

1.3. Generating Mi'kmaw data and accessing existing data

Drawing from two existing surveys - the Communities for a Better Environment Survey (Cohen et al., 2012) and the RHS, the EHS included 297 questions (Lewis et al., 2016). Thirteen Research Assistants (RAs) from the NWG membership were hired to help with data gathering (Lewis et al., 2016). Preliminary data was presented to the NWG and the community and we ended with a 59% response rate ($n = 279$), based on a population of 470 at the time (Lewis et al., 2016).

To facilitate comparisons between the health outcomes in PLFN to other First Nation populations in Canada, data was accessed from publicly available national and regional RHS reports concerning the health and well-being of on-reserve populations (First Nation Information Governance Centre (FNIGC), 2016; Union of Nova Scotia Indians, 2013). To facilitate comparisons of health outcomes in PLFN to the health outcomes of non-Indigenous populations at the Pictou County District Health Authority (PCDHA), provincial, and national levels, we accessed the Canadian Community Health Survey (CCHS) 2014 data, a national survey conducted by Statistics Canada that collects data every two years related to health status for all Canadians ages 12 years and older, excluding on-reserve First Nation populations (Statistics Canada, 2015). The detailed microdata file is held at Research Data Centres (RDC) supported by Statistics Canada to provide researchers and federal government researchers with secure access to population and household survey datasets (Statistics Canada, 2018).

1.4. Indigenizing constructs of health data

To interrogate the biopolitical narrative that the health of PLFN has not been impacted, our starting point in the EHS was the NAHO definition of health. We present four outcome (dependent) health measures: physical health (health rating), mental health (depression), emotional health (happy), and spiritual health as dependent variables. While self-rated health is deemed a meaningful and reliable measure of current health from a western medical model (Bowling, 2005; Wilson et al., 2011), we have to ask if this question captures what Sibthorpe et al. (2001) refer to as the 'phenomenologic' conceptualization of health as understood in an Indigenous context (p. 1662) when an Indigenous person is asked to rate their health. Although there are challenges in capturing the phenomenological conceptualization of health across social groups (Angel and Thoits, 1987), the FNIGC has kept the self-reported health measure in their survey instruments for over two decades now as a measure that would allow, on a population basis, comparability to other Canadians (FNIGC, 2011). Self-reported physical health rating was measured by asking participants to rate health, with responses of excellent, good, fair, poor, don't know, refused, or missing, which we then collapsed to 'poor/fair', 'good/excellent', and 'DK/Ref/Missing'. We further recoded to a variable of 'Physical Health – Good to Excellent' with responses of no, yes, 'DK/Ref/Missing'.

Mental health from a western perspective is defined as psychiatric disorders ranging from anxiety and depression to panic disorders or post-traumatic stress disorder (Canadian Mental Health Association, 2015). Depression, as an indicator of mental health, can include feelings of poor mood and diminished interests (Bombay et al., 2009). For Indigenous peoples, mental wellness is defined as the state in which an individual can achieve his or her full potential, can cope with the normal stresses of life, and can make a contribution to their community, supported by culture, language, Knowledge Holders, families, and spirituality (First Nations and Inuit Health, 2015, p. 1), factors which have been undermined by colonialism (Gone, 2013; Kirmayer et al., 2003). There are known limitations to using self-reported mental health measures that include the risk of omission or over-reporting as a result of exaggeration of symptoms, unrealistic self-appraisal, a lack of self-awareness, or deception (Kelley et al., 2017). Recognizing this, mental health (depression) was measured by asking if participants felt down or depressed in the last year. Responses of often/sometimes were recoded to 'yes', never to 'no', and don't know, refused and missing to 'DK/Ref/Missing'.

Emotional health in a western context can be measured by asking how a respondent feels (Lee et al., 2001). In Indigenous contexts, it is well documented that those who are grounded in their culture and traditions are happier, but that colonization, the residential school system, land displacement, and environmental dispossession have impacted cultural values, sacred knowledge, language and practices, all of which are essential determinants of individual, family, and community wellbeing (Adelson, 2005; Kant et al., 2014; Kirmayer et al., 2003). It is also recognized that connection to land is essential to emotional well-being in Indigenous communities (Cunsolo Willox et al., 2012, 2013; Tobias and Richmond, 2014). Emotional health (happiness) was

measured by asking if participants normally felt happy and interested in things, with responses of no, yes, and 'DK/Ref/Missing'.

Spiritual health can be defined in terms of spiritual wellbeing, a sense of peace, purpose, or meaning in life, a feeling of being grounded or connected (Levesque and Li, 2014). Indigenous peoples' connection to land is important to maintain spiritual beliefs and teachings (McIvor et al., 2009; Richmond, 2018). The ability to engage in traditional activities and take care of the earth are central to Indigenous identity and is the basis of socialization (Ford et al., 2010; Greenwood and de Leeuw, 2007). A disconnection of that attachment leaves a community and its members wounded (Duran and Duran, 2000). Spiritual health in the EHS was measured by asking how important traditional spirituality is with responses of not important, important, somewhat important, very important, not applicable, don't know, refused, and missing, recoded to 'not important', 'important', and 'NA/DK/Ref/Missing'. We further recoded to a variable of 'Spirituality Important' with responses of no, yes, 'DK/Ref/Missing'.

To interrogate the biopolitical narrative, we use measures of income and employment as examples from the social determinants of health, which the Public Health Agency of Canada (2016) recognizes as influencing the health of populations, and we present these as explanatory (independent) measures. The provincial and national RHS (2008/10) reports that more than half of First Nation adults (ages 18 years and older) earn incomes of less than $20,000, asking adults to provide total personal income from all sources and before deductions for the past calendar year (FNIGC, 2016), with national response categories from $0 up to over $80,000 (FNIGC, 2016) and the provincial response categories ranging from $0 up to over $50,000 (Union of Nova Scotia Indians, 2013). The EHS asks "For each household member, what is the current annual income (if working off-reserve, before taxes)?" with responses ranging from 'less than $9999' to 'over $100,000', not applicable, don't know, refused, and missing. The RHS did not report not applicable, don't know, refused, and missing, so we recoded those categories in the EHS to missing. We recoded to report data for ages 18 years and older as well.

The CCHS asks respondents ages 14 years and older what is the highest certificate, diploma or degree completed (less than high school, high school, trade certificate or diploma, college certificate or diploma, university certificate or diploma below bachelor's level, bachelor's degree, university certificate or diploma or degree above bachelor's level, not applicable, don't know, refusal, or not stated). The EHS asks participants "For each household member, what is the highest level of education completed?" (less than high school, high school, college/trade school, bachelor's degree, master's degree, or doctoral degree, don't know, refused, and missing), and we recode to report only for ages 14 years and older. Responses were recoded to 'high school or less', and 'college and higher'. Don't know, refused, and missing were recoded to 'DK/Ref/Missing'.

In the CCHS, respondents (ages 15 to 75) were asked if they worked at a job or a business in the last week, including part-time jobs, seasonal work, contract work, self-employment, baby-sitting, and any other paid work, regardless of the number of hours worked. Responses included yes, no, permanently unable, not applicable, don't know, refusal, or not stated. Permanently unable was recoded to 'no', while not applicable, don't know, refusal, or not stated were recoded to 'NA/DK/Ref'. In the EHS, participants were asked "For each household member, what is your current employment status?" with responses including full-time, part-time, unemployed, seasonal, retired, on leave, never worked, don't know, refused, missing. The EHS was recoded for those between the ages of 15 and 75 to "Working?", with 'no' for unemployed, retired, and never worked, 'yes' for full-time, part-time, seasonal, and on leave, and don't know, refused, and missing recoded to NA/DK/Ref/Missing.

To disrupt the western framework of health further, we need to go beyond the social determinants of health approach to account for the biopolitical architecture of power that has been imposed on Indigenous peoples in Canada under colonialism, and which is still impacting their health and well-being. To illustrate how biopolitics has disrupted the relational worldview of the Mi'kmaw, and to show how this disruption in the connection to *A'se'k* impacts health and well-being, we are guided by the Mi'kmaw environmental 'theoretical' framework to include a measure which reflects the consequences of land displacement and environmental dispossession. Activities such as harvesting and gathering are not only functional in terms of providing sustenance, but are activities that meet many Indigenous peoples' physical, spiritual, mental and emotional needs (Wilson, 2003). In the EHS, land displacement and environmental dispossession was measured by asking the participants to reply to the following statement, "I feel the air, land, and water around me will hurt me." Indigenous peoples are not meant to be afraid of their environment, yet in PLFN, people are. Response choices ranged from strongly agree, agree, neither agree or disagree, disagree, strongly disagree, don't know, refused, and missing. Strongly agree and agree were recoded to 'yes', neither agree or disagree recoded to 'neither', disagree and strongly disagree to 'no', and don't know, refused, and missing recoded to one category of 'DK/Ref/Missing'.

We also include measures of residential school attendance and racism. Residential school attendance came about as a result of biopolitics and biopower. The EHS asks, "Did any of the following attend residential school? Responses included 'no' or 'yes' to the following choices of male/female parent, male/female parents' parent, male/female parents' grandfather/grandmother, male/female parents' great-grandfather/great-grandmother, don't know, refused, and missing. Don't know, refused, and missing were recoded to 'DK/Ref/Missing'.

Racial discrimination is defined as the process by which members of a socially defined racial group are treated unfairly because of membership in that group (Krieger, 2001). Foucault viewed racism as a normalizing or regulating mechanism which allows some races to be viewed as inferior to others (Foucault et al., 2004). Racism, and the inevitable stress of being socially excluded, is linked with poorer mental and physical health and wellbeing outcomes (Bombay et al., 2014a). In the EHS, participants were asked if they had ever experienced racism with responses of no, yes, don't know, refused, and missing recoded to 'DK/Ref/Missing'.

We acknowledge that we could present many more variables. The EHS was a 297-question survey generating over 400 variables, but we are limited in this study to what can be presented at this time. What we have chosen to present here is meant to illustrate that an Indigenous-developed framework, guided by *Etuaptmumk,* can more appropriately assess the impacts on Indigenous health and well-being. We now present our findings.

2. Results

The first narrative we interrogate is JEHMCs claim that the health of PLFN has not been impacted. Using descriptive statistics, in Table 1 we present the four dimensions of health (physical, mental, emotional, and spiritual), reflecting NAHOs definition, that should be in balance.

The data reveals that the four dimensions of health are not in balance. While two-thirds (64%) of all PLFN participants rate their physical health as good to excellent, one-third (32%) rate their health as poor to fair. One-half (50%) report that they have felt down or depressed in the past year, yet according to the Mental Health Foundation of Nova Scotia (n.d.), we should have expected that mental health typically impacts only one in five people, or 20% of the population. Eighty-four percent (84%) of participants report that they are happy or interested in things, which appears to contradict the findings that half of the participant's report that they have felt down or depressed in the past year. However, humour is often seen as a coping strategy (Samson and Gross, 2012). In fact, Luginaah et al. (2010) note how residents of the Aamjiwnaang First Nation, which sits in the midst of the largest petrochemical industrial complex located just outside of Sarnia, Ontario, often joke and use humour when they talk about odors coming from emissions or hear the constant sound of emergency sirens that warn community residents to

Table 1
Four dimensions of health in Pictou Landing First Nation health.

Measure	%
Physical Health – Good to Excellent	
No	32
Yes	64
DK/Ref/Missing	4
Mental Health Rating (Depression)	
No	37
Yes	50
DK/Ref/Missing	13
Emotional Health Rating (Happy)	
No	7
Yes	84
DK/Ref/Missing	9
Spirituality Important	
No	23
Yes	64
NA/DK/Ref/Missing	13

Note: Source: EHS, 2014
n = 279.

move indoors to avoid exposures due to accidental chemical releases. Elsewhere, Iwasaki and Bartlett (2006) have noted that Indigenous people often use humour as a stress-coping mechanism, seeing laughter as culturally meaningful and healing. Lastly, sixty-four percent (64%) of participants report that they find traditional spirituality important. However, in PLFN many practice Catholicism, which plays a central role in the community. In fact, they are home to an important Catholic mission site that has existed since 1758 which they view as important to their cultural identity and traditions (Lelièvre, 2012).

Indigenous peoples are historically denied access to the conditions that could improve their socio-economic status (Reading and Wien, 2009) and are one of the most economically disadvantaged and vulnerable groups in Canada who do not enjoy comparative social status to their non-Indigenous counterparts (Palmater, 2011). In fact, up until 1979, the federal government promoted a narrative in the Indian Health Policy that 'Indian' health was rooted in poverty, community decline, and apathy, for which only the Indian community itself can change in order to achieve physical, mental, and social well-being (Health Canada, 2007). So, the second narrative we interrogate is whether earning a higher income manifests in better health outcomes for PLFN, using a measure of income as an explanatory influence on health, In Table 2 we use descriptive statistics to present health outcomes in PLFN compared to the other First Nation populations at the provincial and national level earning more than $20,000.

What we should expect to see are comparable health outcomes at comparable income levels, if income is a predictor of health outcomes. Yet what we see is that despite more participants (52%) in PLFN earning more than $20,000 compared to the national (42%) and provincial (41%) First Nation adult population, only 54% of PLFN adults report good to excellent health outcomes, compared to 77% at the national level and 81% at the provincial level. Thus, we conclude that, according to the dominant biopolitical narrative, income as a determinant of health does not operate as expected in PLFN.

Table 2
Health Outcomes for First Nation Adults Earning More than $20,000.

	Adults (18 years and older)	
	Income More than $20,000	Good to Excellent Health Yes
	%	%
First Nations - Canada	42	77
First Nations – Nova Scotia	41	81
Pictou Landing First Nation	52	54

Note.
Health Rating: National RHS n = 11,043; NS RHS n = 710; EHS n = 174.
Sources: FNIGC, 2016; UNSI 2013; EHS, 2014.

As we continue to interrogate the biopolitical narrative in Table 3, we use measures of educational attainment and employment status to compare physical health outcomes in PLFN to those of the non-Indigenous population at the county, provincial, and national levels. We use a chi-square test of independence to examine the relationship between each of the dependent and independent variables.

The social determinants of health approach tells us that higher education and employment levels should predict better health outcomes. However, for PLFN neither determinant operates as expected, compared to the non-Indigenous populations. Approximately a third less in PLFN experience better physical health outcomes compared to the non-Indigenous population at all levels when they report higher education or are working.

To disrupt the western framework even further, we now move to a measure of Indigenous health that is informed by the Mi'kmaw environmental 'theoretical' framework. In Table 4, we examine PLFN participant beliefs whether the environment will hurt them to explore how a relational epistemology and ontology that values connections to the air, land and water is connected to health. When Mi'kmaq think of environment, they are encompassing their relations to the air, land, and water around them (Prosper et al., 2011), something which is sacred and meaningful. A chi-square test of independence is performed to examine the relationship between each of the dependent and independent variables.

We use this measure to show how biopolitics has disrupted the relational worldview. Assessing this relationship illuminates how impactful siting the BHETF at *A'se'k* has been for the health of PLFN members. According to the data, 88% of participants report good to excellent physical health when they are not fearful of their environment, compared to only 45% for those who are, and 84% are depressed when fearful compared to only 63% when they are not fearful. However, similar to what was noted in Table 1, being fearful of the environment does not seem to affect happiness, perhaps as a coping strategy. Finally, spirituality is more important (85%) to those who are fearful of their environment than to those who are not (67%).

In Table 5 we confront the impacts of colonialism as structural determinants of health using the experiences of residential school attendance and racism. It is argued that understanding how structural determinants affect health will contribute to a deeper understanding of the inequities we find in the overall health and well-being of Indigenous peoples (de Leeuw et al., 2018). A chi-square test of independence is performed to examine the relationship between each of the dependent and independent variables.

PLFN has survivors of the Shubenacadie Indian Residential School that was located just sixty miles from the community. In Table 5, the data shows that 4% more of those with a history of residential school attendance in their family (71%) report good to excellent physical health than those who do not (67%). This finding seems counterintuitive; that if, according to Bombay et al. (2014b), residential school experience has an intergenerational impact on survivors and their families, we should expect that those with a history will have poorer health outcomes. We will look at this as a factor of age in Table 6. Those who have a history of residential school attendance in their families report feeling down or depressed (61%), just slightly more than those who do not (56%). Slightly more (97%) of those with no history of residential school report being happy than those who do have a history of residential school attendance (90%). As previously noted, humour can be a coping mechanism with laughter seen as culturally meaningful and healing. Lastly, only 60% of those with a family history find traditional spirituality to be important compared to 80% of those who do not have this same history. This should not be surprising, given that traditional spirituality was specifically targeted by the Indian residential

Table 3
Education and employment as explanatory for health outcomes.

Measure	PLFN		PCDHA		Nova Scotia		Canada	
	Poor to Fair %	Good to Excellent %	Poor to Fair %	Good to Excellent %	Poor to Fair %	Good to Excellent %	Poor to Fair %	Good to Excellent %
Education								
High School or less	43	57	**45	**55	***15	***85	***9	***91
College/higher	41	59	**11	**89	***11	***89	***9	***91
Working								
No	42	58	**28	**72	***22	***78	***18	***82
Yes	46	54	**14	**86	***7	***93	***6	***94

***p < 0.001; **p < 0.01; *p < 0.05.
Note.
Source: PLFN EHS, 2014; CCHS, 2014
Education: PLFN $n = 193$; PCDHA $n = 39{,}512$; NS $n = 808{,}959$; Canada $n = 29{,}982{,}131$.
Employment: PLFN $n = 185$; PCDHA $n = 39{,}512$; NS $n = 808{,}959$; Canada $n = 29{,}982{,}131$.
Note: DK/Ref/Missing are suppressed.

Table 4
Environmental dispossession and health outcomes.

Measure	Health Rating Good to Excellent		Depressed		Happy		Spirituality Important	
	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)
Environment								
No	12	88	*37	*63	12	88	33	67
Neither	50	50	*50	*50	9	91	25	75
Yes	55	45	*16	*84	15	85	15	85

***p < 0.001; **p < 0.01; *p < 0.05.
Note: Source: EHS, 2014
Note: NA/DK/Ref/Missing are suppressed.
n = 126.

school system. We note that residential school experience is only significant for happiness and spirituality.

Racism is significant across all dimensions of health. Those who have not experienced racism are healthier (84%) than those who have experienced it (56%). Those who have not experienced racism are less depressed (25%) than those who have (76%), and those who have not experienced racism are happier (97%) than those who have (89%). Finally, those who have not experienced racism find spirituality less important (60%) than those who have (81)%.

As indicated above, in Table 6 we explore physical health, depressional, and residential school attendance history as a factor of age. A chi-square test of independence is performed to examine the relationship of age in each of the variables.

The youngest age group (under the age of 19 years) experience the best physical health with 50% reporting good to excellent health compared to only 7% from those over the age of 50 years, and they are the least depressed (19% compared to ages 20–49 years (57%) and over 50 years (24%)). The youngest age group also represent 41% of those with intergenerational residential school experience but are the healthiest and least depressed, which may skew the results in Table 5.

3. Discussion

Guided by *Etuatpmumk* we brought together measures that interrogate the biopolitical narrative about Indigenous health in Canada, and guided by an Indigenous understanding of health, we demonstrate that we can measure a relational worldview. Some might challenge that we could have gone further in exploring these types of measures. While true, we only intend here to demonstrate the minimal amount of data it required to show that the health of PLFN has in fact been impacted. We further recognize that the findings we have presented here are all at the bivariate level. This is intentional. As stated previously, we wanted to demonstrate, at a minimum, what it would have taken the JEHMC to collect empirical data. Presenting the data at the bivariate level further demonstrates that it did not take complicated statistical analytical skills to reveal the health impacts of the BHETF on the health of PLFN.

The Truth and Reconciliation Commission (2015) recognizes that the political policies and mechanisms used within Canada's colonial history as a biopolitical state continue to impact the health of Indigenous peoples and their communities to this day. This cannot be demonstrated more clearly. We argue that Canada, as a colonial state, continues to employ biopolitics to regulate and manage the health of Indigenous people in order to justify displacing them from their lands and regulatory bodies are exemplar of biopolitics (Jasanoff, 1986 as cited in Holifield, 2010).

Identifying the biopolitical regimes evident within government structured bodies like the JEHMC make the decisions coming out of them less potent because it is possible to highlight how the studies conducted by them exist only to further a narrative that can be approved

Table 5
Interrogating the impacts of the structural determinants on Pictou Landing First Nation health.

Measure	Health Rating Excellent		Depressed		Happy		Spirituality Important	
	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)
Residential School								
No	33	67	44	56	**3	**97	**20	**80
Yes	29	71	39	61	**9	**90	**40	**60
Racism								
No	***16	***84	***75	***25	*3	*97	***40	***60
Yes	***44	***56	***24	***76	*11	*89	***19	***81

***p < 0.001; **p < 0.01; *p < 0.05.
Note: Source: EHS, 2014
Note: NA/DK/Ref/Missing are suppressed.
n = 279.

Table 6
Health and residential school experience as a factor of age in Pictou Landing First Nation.

	Age 0–19 years	Age 20–49 years	Over 50 years
Health rating Excellent***			
No	10	52	38
Yes	50	43	7
Depressed***			
No	60	30	10
Yes	19	57	24
Residential School Attendance			
No	39	41	20
Yes	41	48	11

***p < 0.001; **p < 0.01; *p < 0.05.
Note: Source: EHS, 2014
Note: NA/DK/Ref/Missing are suppressed.
n = 279.

by a colonial state still functioning in a biopolitical mode. Tuck and Yang (2014) call the 'discourse of objectivity' in knowledge production 'code' for power, where meaning is derived from the dominant narrative, not necessarily from what is observed, and certainly not from what is observed by those who are oppressed (p. 812). If biopolitics is about silencing voices, the JEHMC has done so. Indigenous peoples need to have the tools to resist and disrupt the narrative of regulatory bodies like the JEHMC that repress appropriate and adequate investigations into Indigenous health outcomes when they assert that they have been harmed by the consequences of land displacement and environmental dispossession.

Government and regulatory agencies have argued that conducting human environmental health risk assessment using appropriate Indigenous cultural exposures is too expensive or time-consuming (Holifield, 2010; Ranco et al., 2011; Todt et al., 2010). It does not have to be. The framework is now developed. Furthermore, developing measures that reflect a relational epistemology and ontology to highlight Indigenous connections to the air, land and water around them does not have to be complicated as we have shown using the Mi'kmaw environmental 'theoretical' framing that centred the importance of *A'se'k* to Mi'kmaw health. The Indigenous knowledge generated from this framework allows us to convey to the reader how the Mi'kmaw understand their place in the world and contextualized how the effluent facility has impacted the Mi'kmaw epistemological and ontological foundations.

4. Conclusion

The health of PLFN has been assessed from a number of governmental and industry perspectives, yet none have adequately accounted for the pulp mill's impacts on Mi'kmaw health. In particular, the mandate given to JEHMC has never been adequately implemented, thus putting the community of PLFN at risk. Concerning the use of data from the *Environmental Health Survey*, which reflected health concerns the NWG wanted to explore, our data show health outcomes that more accurately reflect the lived reality of PLFN residents, and all that they have endured for fifty years (and longer with respect to the colonial encounter). Most importantly, we were able to demonstrate that health impacts do not operate uniformly across the four dimensions of Indigenous health when employing a more culturally and experientially appropriate definition of health. Further, by centering a place-based and relational epistemological and ontological understanding of the Mi'kmaw place in the world, we were able to reflect how land displacement and environmental dispossession have impacted PLFN. Although this Indigenous developed framework applies to Mi'kmaw people specifically, this approach can be applied to Indigenous communities more broadly by adapting it to the specific community in their local context.

Clearly a miscarriage of healthcare, this research marks the first time that the health of the PLFN community has ever been assessed, and we have done so incorporating a Mi'kmaw framework. Our data can now serve as a benchmark for the health of PLFN moving forward. The approach taken here aims to illustrate that the methodology being employed by government-led oversight committees is demonstrably ill-equipped to assess Indigenous health and we call for Indigenous-led oversight in developing, and assessing, culturally relevant human health risk assessments associated with development industries of any kind in Indigenous territories.

Credit author statement

Diana Lewis: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Visualization, Supervision, Project administration, Funding acquisition. Sheila Francis: Writing - review & editing. Kim Francis-Strickland: Writing - review & editing. Heather Castleden: Supervision, Writing - review & editing, Project administration, Funding acquisition. Richard Apostle: Supervision, Formal analysis, Writing - review & editing.

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Appendix A. Supplementary data

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