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Addressing the persistence of Tuberculosis Among the Canadian Inuit Population: The need for a social determinants of health framework

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Addressing the persistence of Tuberculosis Among the Canadian Inuit Population: The need for a social determinants of health framework

Abstract

Canadian Aboriginal people have poorer levels of health than the general population. A serious issue is the high rate of tuberculosis (TB) among the Inuit population; rates are much higher than those of the general Canadian population. Several social determinants of health (SDOH), including household crowding and poverty, are strongly correlated with TB prevalence. In this paper, we describe the medical and social determinants of TB, and critically examine the TB literature specific to the Inuit population. The majority of studies recommend biomedical interventions for the treatment of TB. Few researchers have employed the social determinants of health theory to steer their research, and even fewer researchers suggest improving living and social conditions in Inuit communities as a way of eradicating TB. We conclude with research and policy recommendations.

Keywords

Tuberculosis, Canada, Aboriginal, Inuit, social determinants of health, poverty

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Introduction

Compared with the general population of Canada, Aboriginal people¹ experience a significantly higher burden of morbidity and mortality (Adelson, 2005; Codon, 2005; Frohlich, Ross, & Richmond, 2006; MacMillan, MacMillan, Offord, & Dingle, 1996). The roots of this inequality lie in a legacy of colonial relations, dispossession from traditional lands and territories, rapid cultural change and dependency (Bartlett, 2003; Gracey & King, 2009; Waldram, Herring, & Young, 2006). Like other vulnerable populations, factors such as material deprivation and a low social position have strongly influenced patterns of Aboriginal health (Krieger, 2001; Navarro, 1990). As Adelson (2005) notes, health disparities are directly and indirectly associated with social, economic, cultural and political inequities; the end result of which is a disproportionate burden of ill health and social suffering upon Aboriginal populations of Canada (p. S45). The consequences for health and disease in the Aboriginal population include higher rates of heart disease, type II diabetes, and infectious diseases, such as tuberculosis (Adelson, 2005; Wilson & Rosenberg, 2002).

A significant health issue unique to the Canadian Aboriginal population is the persistence of tuberculosis (TB) infection. While TB has been all but eradicated among the general Canadian population, Aboriginal Canadians continue to experience prevalence rates of TB that are 10-20 times that of the general Canadian population (Nguyen et al., 2003). A closer examination of patterns of TB among the Aboriginal population reveals a highly unequal burden. Among the Inuit population, prevalence rates are 20-50 times higher than the general population (Nguyen et al., 2003). See Figure 1 for crude numbers of TB cases in Canada from 1985 to 2009 and Figure 2 for rates of TB per 100,000 in Canada from 1997 to 2007 (Health Canada, 1996, 2001; Public Health Agency of Canada, 2007, 2008, 2009). In a recent interview with the CBC's *The Current*, Dr. Isaac Sobol, Chief Medical Officer of Health in Nunavut reported that rates of TB in Nunavut were the highest they have been since the creation of the territory in 1999 (Sobol, 2010). In 2010, for example, 99 cases of the disease were reported in Nunavut, bringing the overall rate to 62 times higher than that for the general Canadian population (Sobol, 2010). Though TB rates among the Inuit have decreased since the 1950s, the recent increase of TB cases emphasizes the fact that the disease is a serious and emergent Inuit health issue (Nguyen et al., 2003). See Table 1 for percentage of Inuit population reporting diagnosis of TB in 2006 for the four Arctic regions (Statistics Canada, 2006b).

In explaining the recent spike in TB prevalence, Dr. Sobol identified a number of social environmental determinants, including substandard housing, nutrition, and sanitation as factors influencing high TB rates in Nunavut (Sobol, 2010). The poor living conditions of the Inuit are well documented, as is the high prevalence of TB (Bjerregaard, Young, Dewailly, & Ebbesson, 2004; Grzybowski & Allen, 1999; Hotez, 2010; Kunimoto, Chedore, Allen, & Kasatiya, 2001; Loppie Reading & Wien, 2009; Møller, 2010; Nguyen et al., 2003; Richmond, 2009). Indeed, evidence from around the globe suggests that the determinants of TB are not purely biomedical (Barr, Diez-Roux, Knirsch, & Pablos-Méndez, 2001; Clark, Riben, & Nowgesic, 2002; Dubos & Dubos, 1952, 1987; Elender, Bentham, & Langford, 1998; Farmer, 1999; FitzGerald, Wang, & Elwood, 2000; Gibson, Cave, Doering, Ortiz, & Harms, 2005; Mangtani, Jolley, Watson, & Rodrigues, 1995; Møller, 2010; Rubel & Garro, 1992; Spence, Hotchkiss, Williams, & Davies, 1993; Wanyeki et al., 2006). Rather, there is a growing base of evidence to substantiate the strong pathways between TB incidence and various social and economic determinants (Cantwell, McKenna, McCray, & Onorato, 1998; Clark et al., 2002; Elender et al., 1998; Farmer, 1996; Farmer, 2000; Spence et al., 1993). In the Canadian literature around Aboriginal TB however, only a handful of studies (Clark et al., 2002; Møller, 2010) have incorporated a social

¹ As defined under the Canadian constitution, section 35(2), the Aboriginal population of Canada refers to First Nations, Métis and Inuit.

determinants of health (SDOH) framework for understanding and describing patterns of TB. Because of the strong policy reliance on biologically and genetically based scientific evidence in Canada (Kiefer, Frank, Di Ruggerio, Dobbins & Manuel et al., 2005), the lack of evidence detailing the links between social circumstance and TB incidence means that initiatives designed to combat TB in Canada's North have not focused on social, economic, or environmental factors. However, the rise in TB rates in Inuit communities within the past 10 years emphasizes the severity of this health issue. Biomedically based initiatives have not adequately targeted the socioeconomic factors that influence TB, which suggests that perhaps it is time for more holistic initiatives that can combat the medical *and* socioeconomic factors that underlie high TB prevalence rates. In the following paper, we describe TB in Canadian Inuit communities, including historical factors, demographics and initiatives to lower rates of the disease. We also explain SDOH theory and its connection to Inuit health. We critically examine the TB literature, including recommendations made by researchers for eradicating the disease. Finally, we argue for the use of a SDOH theoretical framework in TB research among the Canadian Inuit population as a policy response that may help to eradicate the disease.

Population Health and SDOH Theory

Population health is a framework for understanding that economic, social and environmental structures can both support and constrain the health of community members (Evans & Stoddart, 1994; Raphael, 2001), thereby moving conceptual understandings of health and disease beyond the traditional domains of genetics and access to health care. Population health was founded in the 1980s by an interdisciplinary group of economists and health policy analysts of the Canadian Institutes for Advanced Research (Frank, 1995). Conceptually, population health emerged as a framework for thinking about why some people, and peoples, are healthier than others – that is, a conceptual framework for the determinants of health at individual and population levels (Evans & Stoddart, 1994; Frank, 1995).

The main tenets of the population health framework are three-fold. First, the major determinants of human health status, particularly among advanced, capitalist societies, are not those of medical care inputs and utilization, but cultural, social and economic factors – at both the population and individual levels (Evans & Stoddart, 1994). The effect of these factors is expressed universally through profound social gradients in health status (Wilkinson, 1997). Second, at the population level, societies with both a high level and a relatively equitable distribution of wealth enjoy higher levels of health status (Kaplan and Lynch, 1997). Third, at the individual level, one's immediate social and material environments and the way that these environments interacts with one's psychological resources and coping skills are important determinants of health (Frank, 1995).

Throughout the world, people who are vulnerable and socially disadvantaged have less access to health resources, get sicker, and die earlier than people in more privileged social positions (Evans, Whitehead, Diderichsen, Bhuiya, & Wirth, 2001). The greatest share of health problems is attributable to the social conditions in which people live and work, referred to as the SDOH (Marmot & Wilkinson, 1999). The World Health Organization (WHO, 2010) defines SDOH as “the conditions in which people are born, grow, live, work and age”. Included in the WHO's definition are factors such as social support, food, unemployment, stress, the social gradient, early life, addiction, transport, work and social exclusion (Wilkinson & Marmot, 2003).

Within the Canadian context, federal and provincial governments draw from a population health framework as a means of creating health and social policy (Legowski & McKay, 2000; Robertson, 1998). Canadian policy includes several social indicators identified by the WHO list of social determinants, and also includes gender, the physical environment, social environments, income and social status, education, social support networks, personal health practices and coping skills, healthy child

development, culture, health services, employment and working conditions, and biology and genetic endowment (Advisory Committee on Population Health, 1996, as cited in Richmond & Ross, 2009).

Understanding the Medical and Social Pathways of TB

TB is an infectious disease that primarily affects the lungs (though it can also affect bones, kidneys or lymph nodes) and is passed through coughing; one must breathe in the TB bacteria to contract the infection (Health Canada, 2009; Long, Njoo, & Hershfield, 1999). The bacteria *Mycobacterium tuberculosis* causes the TB infection (Health Canada, 2009). The infection does not always advance to the stage of disease, but those with the infection can still pass it on to others (Health Canada, 2009). Though contact with an infected person is necessary, some people are more at risk for developing TB disease than others. For example, those with HIV, diabetes, immunosuppressive illness or renal disease are at a higher risk of advancement of TB from infection to disease (Long et al., 1999). Skin tests are used to determine if a person has TB infection, and chest x-rays are taken to find out if the infection has advanced to the disease (Health Canada, 2009). TB can be treated with antibiotics (Health Canada, 2009).

Globally, research indicates a positive correlation between incidence of TB and various SDOH including malnutrition, crowded housing and inadequate ventilation, low levels of sanitation, low socioeconomic status and poverty, alcohol and drug abuse, high levels of stress and poor health care access (Baker, Das, Venugopal, & Howden-Chapman, 2008; Clark et al., 2002; Clark & Cameron, 2009; Grzybowski & Allen, 1999; Long et al., 1999).

Several researchers have identified a positive relationship between household crowding and prevalence of TB in Indigenous (Clark et al., 2002) and non-Indigenous communities (Baker et al., 2008; Wanyeki et al., 2006). Clark et al.'s (2002) study statistically examined the connection between household crowding and socioeconomic status and TB infection in First Nation communities in Canada. Wanyeki et al. (2006) also explored the association between TB and household crowding in Montreal; Aboriginal peoples were not the focus of the study. Baker et al. (2008) looked at TB and crowding in New Zealand. Generally, these studies point to rates of TB infection that are negatively correlated with household income, and positively correlated with higher levels of density. Lower socioeconomic households tend to experience higher crowding, with poor circulation of air and more people breathing in this infected air (Wanyeki et al., 2006). Spence et al. (1993) identified positive correlations between poverty and rates of TB in Liverpool, England. The authors were inconclusive regarding how poverty affected rates of the disease, though malnourishment was suggested as a possibility (Spence et al., 1993). Elender et al. (1998) explored connections between poverty, ethnicity and AIDS and prevalence of TB in England and Wales from 1982-1992. Barr et al. (2001) examined poverty as an influence increasing prevalence of TB infection in New York City. In the above two studies (Barr et al., 2001; Elender et al., 1998;) strong positive correlations with poverty were identified, and in both cases, it was suggested that malnutrition played a significant mediating role between poverty and TB infection. Though the SDOH listed above are connected to high rates of TB, many have not been studied extensively in the Canadian context, and very rarely among Inuit (Clark & Cameron, 2009; Grzybowski & Allen, 1999).

As outlined above, the strong association between TB and various SDOH, including household crowding, poverty and malnutrition have been documented in studies with diverse populations from around the world. In particular, researchers have discovered a strong correlation between household crowding and elevated rates of TB. Both household crowding and malnutrition are connected to poverty, and therefore form important risk factors for TB infection and disease. Due to the strong

correlation between SDOH and TB, initiatives to combat the incidence of the disease should take SDOH into account.

Overview of Inuit Health in Canada: Persistence of TB

The Inuit population in Canada resides in *Nunaat* (“Inuktitut expression for Inuit homeland”), which spans across the Arctic as four distinct areas (Tait, 2008, as cited in Richmond, 2009, p. 473). Inuvialuit includes the northern part of the Northwest Territories, including Banks Island and parts of Victoria and Melville Islands; Nunavut is the newest territory in Canada and includes those Arctic islands not included in Inuvialuit; Nunavik is in Quebec’s north; and Nunatsiavut includes the northeastern coast of Labrador (Richmond, 2009; Tait, 2008). These 4 regions are the home of the majority of Canada’s Inuit (77%) (Tait, 2008).

The Inuit population experiences lower levels of health than the non-Aboriginal population, including lower life expectancy, higher infant mortality, higher prevalence of both chronic and infectious diseases, higher levels of accidental death, violent death and suicide, and higher levels of substance abuse (Bjerregaard et al., 2004; Kirmayer, Fletcher & Boothroyd, 1998; Richmond, 2009; Tester & McNicoll, 2004; Wilkins et al., 2008). In addition to having lower levels of health, the Inuit also experience significantly lower standards of living than other Aboriginal populations as well as the non-Aboriginal Canadian population (Adelson, 2005; Møller, 2010). See Tables 2, 3 and 4 for social indicators including, income, unemployment, and incidence of crowded housing (Statistics Canada, 2006a, 2006c, 2006d). This poor standard of living negatively affects Inuit health and contributes in important ways to the high rates of disease and social problems listed above (Adelson, 2005), including TB.

The social determinants of Inuit health have contributed to the poor levels of health and high prevalence of TB among the Inuit population of Canada. The Inuit have suffered several major lifestyle changes connected to colonization that have negatively impacted their health. For example, during the 1960s many nomadic Inuit families were forcibly relocated by the government. According to the government, this relocation was done in order to provide them with a better quality of life, and to provide a physical presence in areas of the Arctic that were not occupied (Berkes, Diduck, Fast, Huebert, & Manseau, 2005; Damman, Eide, & Kuhnlein, 2007). These relocations significantly changed ways of life among the Inuit. They were not familiar with the land bases of their new homes and unable to carry on the collection of traditional foods and resources (Berkes et al., 2005; Indian and Northern Affairs Canada, 1996). This meant that the Inuit were unable to continue consuming their traditional diets and began to purchase more innutritious, pre-packaged foods (Pretty & Samson, 2006; Richmond & Ross, 2009).

In addition to changing the diets of the Inuit, the government relocations also altered their daily traditional activities. Entrance into the wage economy was necessary, and the low availability of employment left many families struggling on social assistance (Indian and Northern Affairs Canada, 1996; Pretty & Samson, 2006). This created poor living conditions in many Inuit communities, which are still prevalent today (Møller, 2010). For example, 31% of Inuit live in crowded homes (“more than one person per room”), and many homes are in poor condition (28% “in need of major repairs”), without running water (Møller, 2010; Loppie Reading & Wien, 2009, p. 9). Compared with the general Canadian population, Inuit experience lower levels of education attainment, higher infant mortality, shorter life expectancy, significantly higher rates of suicide, higher morbidity, and higher levels of unemployment (Hicks, 2007; Møller, 2010; StatsCan, 2001 a, b; Nunavut Department of Health and Social Services, 2002). Many communities also suffer from high rates (higher than the average for Canada) of sexual, physical, and substance abuse (Møller, 2010; StatsCan, 2001 a, b).

TB prevalence among the Inuit remains much higher than levels for the non-Aboriginal population. For example, the non-Aboriginal population in Canada exhibits rates of TB approximately 1-2/100,000 (Grzybowski & Allen, 1999). In contrast, the level for the Inuit population in Nunavut for 2005 was approximately 150/100,000 (Møller, 2010). Historical conditions including colonialism are responsible for introducing the disease to the Inuit, as well as for perpetuating its existence in communities (Møller, 2010). For example, European settlers introduced new diseases to Inuit communities upon their arrival to the Arctic (Bjerregaard et al., 2004). The following section provides a historical overview of TB in the Inuit population, a summary of medical treatments used to combat TB, and an overview of current Inuit living conditions.

Historical Background of TB among the Inuit Population of Canada

Though TB is a major contemporary health issue in Inuit communities, the disease did not originate in Canada. TB started as an epidemic in Europe in the 1600s, and was transferred from Europe to North America with European colonizers (Grzybowski & Allen, 1999; Møller, 2010). Inuit in the Arctic were exposed to TB in the 19th and early 20th century by European settlers and explorers, which was much later than other Aboriginal groups (e.g. Aboriginal peoples in western and eastern Canada were exposed 200 and 300 years ago respectively) (Bjerregaard et al., 2004; Grzybowski & Allen, 1999; Møller, 2010). The Inuit did not have any natural immunity to the disease and many died before they could be treated (Clark et al., 2002; Grzybowski & Allen, 1999; Møller, 2010). The government did not respond to the TB crisis in Inuit communities until after World War II, once many Inuit had already died from the disease (Møller, 2010). At this point in time “the Inuit population in Canada had the highest reported rate of tuberculosis in the world” (Kunimoto et al., 2001, p. 642).

After World War II, the Canadian government initiated several interventions to combat TB in Inuit communities. In the early 1950s, the primary method of treatment for TB was to send affected persons to sanatoria (Bjerregaard et al., 2004; Grzybowski & Allen, 1999; Møller, 2010) According to Grzybowski and Allen (1999), “sanatorium treatment isolated infected patients and provided rest, nutritious food, fresh air, education and rehabilitation” (p. 1026). Though this description provides a relatively positive image of sanatoria treatments, many Inuit have a different view of these facilities. Sanatoria treatment required the infected person to be taken far from their homes, families and communities and placed in isolation, sometimes for years (Møller, 2010). Though rates of TB did drop among Inuit, many suffered social and mental trauma due to the extended periods of time during which they were unable to see their families (Bjerregaard et al., 2004; Kunimoto et al., 2001; Møller, 2010). Sanatoria treatment helped prevent the spread of TB but had the undesirable effect of seclusion from one’s family.

In addition to sanatoria treatment, a TB vaccine has also been used to help prevent the disease among the Inuit. In 1924, Dr. Camille Guérin and Dr. Albert Calmette developed a vaccine called bacille Calmette-Guérin (BCG vaccine), which was and still is given to babies (Grzybowski & Allen, 1999; Nguyen et al., 2003; Bjerregaard et al., 2004). The BCG vaccine is used in regional TB programs spearheaded by Health Canada (Health Canada, 2005). Aboriginal infants in areas with a high prevalence of TB are provided with the vaccine (Public Health Agency of Canada, 2010).

Pharmaceuticals are used to combat TB disease once it has developed. The first type of anti-TB drug used was streptomycin, though it did not always cure the disease; TB would often become resistant to the drug (Grzybowski & Allen, 1999). Drugs (para-aminosalicylic acid salts and isoniazid) were developed later on that, when taken with streptomycin, were almost always able to cure TB (Grzybowski & Allen, 1999). Currently, two sets of antibiotics are used to treat TB, which depend on the strain of the disease. First-line antibiotics can cure TB that is not drug resistant, while second-line antibiotics are used

for multi-drug resistant TB (MDR-TB) (Health Canada, 2009). Extensively drug resistant TB (XDR-TB) is even more difficult to treat than MDR-TB, as this strain of TB is resistant to second-line antibiotics (Health Canada, 2009).

Current Strategies for Eliminating TB among the Canadian Inuit

In addition to the TB treatments listed in the previous section, the literature on TB among the Inuit identifies a number of other recommendations for the control and eradication of the disease. These recommendations fall into several categories, including prevention, testing and treatment of TB infection and disease following the biomedical model; a holistic approach that includes culturally sensitive prevention, testing and treatment of TB; and finally, an approach that addresses the larger social and economic factors that can lead to TB infection and persistence. Though not all of the articles involve the examination of TB in Canadian Inuit communities, they are still relevant examples of recommendations.

The majority of the articles reviewed suggested traditional biomedical methods of preventing, treating and testing TB in the Canadian Inuit population. A study by Nguyen et al. (2003) suggested contact tracing and treating latent TB infections within the Inuit population of Quebec. Kunimoto et al. (2001) recommend similar solutions for Canadian Inuit, including tracing transmission of the disease through DNA fingerprinting and treating latent infections. The importance of treating latent infections was emphasized, as “the transmission of the disease was largely between contacts within communities and not intercommunity, as had previously been suspected” (Kunimoto et al., 2001, p. 645). Clark and Cameron (2009) examined TB among Canadian First Nations, and suggest that “the degree of transmission and risk of infection in the population will depend upon medical and public health interventions” (p. 225). Smeja and Brassard (2000) advise for case finding and testing of Canadian Cree individuals with a higher risk for TB. Other authors (Grzybowski & Allen, 1999; Long et al., 1999; Menzies et al., 1999) recommend preventative therapy, TB antibiotics, and use of the BCG vaccine. Menzies et al. (1999) further recommend that patients be isolated and stay outdoors to prevent passing the infection to others. In a study specifically targeting TB among Canadian Aboriginal peoples, FitzGerald et al. (2000), suggests standard biomedical treatments, including “directly observed therapy”, which is “the direct observation of the ingestion of medication by a health care worker or surrogate” for patients who do not comply with medications (p. 352).

Very few articles suggested addressing social and economic factors as a method of decreasing rates of TB, and studies that did recommend this option did not elaborate on the concept. For example, FitzGerald et al.’s (2000) article suggested that substance abuse and housing should be addressed as a method of decreasing TB rates; however, the means by which health policy, or TB programs more specifically, might incorporate these recommendations was not defined. Clark et al. (2002) recommend improving “overcrowded housing and other socio-economic determinants of TB to eliminate TB in First Nations communities” (p. 944). Similarly, Baker et al.’s (2008) New Zealand study concludes that “reducing or eliminating household crowding could decrease TB incidence in NZ and globally” (p. 715). Though Barr et al. (2001) recognize poverty as a risk factor for TB, they only recommend that treatment be focused on poor areas, and not on addressing the issue of poverty itself. Finally, while Richmond’s (2009) study does not focus specifically on TB, the research supports the links between Canadian Inuit health and the SDOH (particularly social support). Though the links between SDOH and TB rates have been identified, few researchers advise addressing these determinants as a way to decrease rates of the disease; of those that do, little detail for policymakers is provided.

Two studies (Gibson et al., 2005; Møller, 2010) critically evaluate the effectiveness of traditional biomedical recommendations for the eradication of TB in Canadian Aboriginal communities, and they

identify the need for more holistic approaches – those that nurture biomedical, social, and economic solutions for TB eradication. Gibson et al. (2005) examined issues connected to TB prevention and treatment among Aboriginal peoples and immigrants in Alberta. The researchers discovered that Aboriginal peoples with TB experienced stigmatization by the non-Aboriginal population and healthcare workers and had negative memories of TB sanatoria, both of which affected their acceptance of biomedical TB therapies (Gibson et al., 2005). The authors of this study recommend culturally sensitive TB information provided in Aboriginal languages, and recognize the need for Aboriginal health care professionals (Gibson et al., 2005). For example, though “directly observed therapy” (FitzGerald et al., 2000, p. 352) may be effective in ensuring patients take their TB medication, this method may not be appropriate in Inuit culture. Though the researchers recognize social and economic factors affecting rates of TB, they did not recommend addressing these issues as a method of decreasing rates of the disease. In contrast, Møller’s (2010) study on TB among Inuit in Nunavut included interviews with Inuit regarding their experiences with TB. The interviewees offered rich insight regarding methods that would be more effective for the prevention and treatment of TB (Møller, 2010). For example, interviewees reported that personal, orally transmitted stories about TB experiences would be more effective than written information (Møller, 2010). Negative relationships with healthcare professionals and culturally inappropriate methods were also named as issues hindering TB treatment (e.g. Inuit cultural values include accepting guests into the home, which may be an issue when healthcare professionals recommend isolation for TB patients) (Møller, 2010). Møller (2010) concludes that key social and economic factors, the primary one being poverty, must be addressed to lower rates of the disease.

Discussion: Employing a SDOH Framework for TB Research and Policy

In this paper, we have illustrated that the connection between the SDOH and TB has been recognized in studies from all over the world. TB rates among the Inuit of Canada continue to be much higher than rates for the non-Aboriginal population, and it is well established that the poor quality living and social conditions of the Inuit are connected in significant ways to these high rates (Cantwell et al., 1998; Clark et al., 2002; Elender et al., 1998; Møller, 2010; Nguyen et al., 2003; Sobol, 2010). In spite of a global base of evidence that substantiates this connection, few Canadian researchers have applied a SDOH theoretical framework to guide their research, and fewer still have recommended addressing the SDOH as a method of lowering TB rates (Clark et al., 2002; Møller, 2010). Rather, within this literature, there has been a continued focus on traditional biomedical methods of prevention, testing and treatment (Clark & Cameron, 2009; Kunimoto et al., 2001; Nguyen et al., 2003; Smeja & Brassard 2000).

In addition to lowering rates of TB among the Inuit population of Canada, there is evidence to suggest that improving living and social conditions can reduce the risk of other diseases as well. For example, it is known that the determinants of health that influence rates of TB (e.g., poverty, overcrowding) are also powerfully shaping other diseases such as shigellosis (Clark et al., 2002), HIV and malaria (Farmer, 1996). Indeed, many diseases prevalent among Canadian Inuit are directly connected to poverty, including respiratory infections (meningitis, pneumonia, septic arthritis), acute otitis media, trichinellosis, toxoplasmosis and giardiasis (Hotez, 2010). Clearly, the role between poverty and infectious disease, including TB, cannot be ignored. Though the biomedical method of prevention, testing and treating TB solely as a disease outcome has substantially lowered rates of TB among the Inuit, this model has not been successful in eradicating the disease altogether. In order that we can begin to combat rates of TB experienced by Canada’s Inuit population, both through research and policy, serious consideration must be given to the social and economic determinants of the disease.

Part of the challenge to creating effective health policy requires understanding of existing health needs (Kiefer et al., 2005). In the context of Inuit TB, this will require a more thorough conceptualization

of the factors that place people at risk for disease in the first place (Marmot and Wilkinson, 1999). As we described in an earlier section, the effects of colonialism and shift to market economy are quite apparent in the current health and social status of the Inuit population (Bartlett, 2003; Gracey & King, 2009; Pretty & Samson, 2006; Waldram et al., 2006). Because of the rapid change in way of life, various basic needs in relation to the SDOH remain quite marginally met in many Arctic communities (e.g., employment, income, food security), and in some cases not at all (Tait, 2005). Clearly, there is a need to better define and understand the health and social needs of the Inuit population.

In relation to future research, our results point to the importance of drawing from a SDOH framework, and moreover, to the importance of understanding how environmental, social, economic and historical processes related to TB can exacerbate health inequalities over time. We argue that the current research and policy approaches used to examine and treat TB are incomplete; one only need to look as far as the example of Nunavut's explosion of TB cases in 2010 as a measure of success under the current biomedical model. Complex health problems require complex solutions; it is necessary that TB researchers widen their scope of understanding and incorporate more integrated approaches and methods to better understand the underlying risk factors for TB, and to frame their evidence base in a way that promotes policy uptake.

The application of the SDOH theory to TB research has the potential for far-reaching consequences. By creating a more complete, in-depth picture of the social and economic risk factors that make the Inuit population more susceptible to TB means not only that incidence rates of the disease may be lowered with appropriate medical and socioeconomic interventions, but that rates of other infectious diseases may also drop, thereby leading to improved quality of life among Inuit (Clark et al., 2002; Farmer, 1996; Hotez, 2010). Health policies, health programs and future health research on the social determinants of TB must recognize the complex historical, political and social context that has shaped current patterns of the disease and seriously contemplate interventions that can holistically encompass these experiences.

Policy Recommendations

SDOH have a profound influence on TB rates among the Inuit population and need to be considered by policymakers. Though biomedical interventions have successfully lowered rates of TB, the disease continues to persist in the Canadian population, particularly the Inuit population. Policymakers need to address SDOH in order to eradicate the disease. This recommendation is echoed by Brian Graham, from the Chronic Disease Policy Group for The Canadian Lung Association: "We need to ensure that our strategy for combating the disease also focuses on such social determinants as poverty and housing. We look forward to partnering with the federal government to ensure that the domestic fight against TB is diverse in scope and aggressive in effort to eradicate this formidable disease" (Canadian Lung Association, 2010). In addition to focusing on SDOH in TB policy, policymakers also need to increase efforts among the Inuit population (Canadian Lung Association, 2010). For example, the federal government has developed TB REACH, which includes \$100 million for global TB prevention and treatment programs (Canadian Lung Association, 2010). Though the Canadian Lung Association "commends the federal government's recent commitment to international tuberculosis (TB) control, it urges the government to continue working with provincial and territorial partners to reduce alarming rates of TB among Inuit, First Nations and Métis" (Canadian Lung Association, 2010).

The arguments made both in this paper and by the Canadian Lung Association emphasize the importance of policymakers not only to continue focusing on TB in the Inuit population, but also introduce policies to improve the social and living conditions in the North. Short term policy initiatives should include increased funding for TB programs, culturally appropriate TB education and awareness,

and holistic research approaches that encompass both biomedical *and* socioeconomic frameworks for understanding pathways for addressing TB in the Inuit population. Long term policy initiatives should include improvements to housing, nutritious food subsidization, the creation of economic opportunities and the development of an Inuit- centred elementary and secondary curriculum. The above changes have the potential to lower, and potentially eradicate TB from the Canadian Inuit population.

Conclusion

Though TB rates among the Inuit have decreased since the 1950s, the recent increase of TB cases, particularly in the territory of Nunavut, emphasizes the fact that the disease is a serious and emergent Inuit health issue (Nguyen et al., 2003). The SDOH, in particular poverty, strongly influence rates of TB in the Canadian Inuit population (Sobol, 2010; Møller, 2010). Unfortunately, few researchers have employed the SDOH theory to steer their research, and even fewer researchers suggest improving living and social conditions in Inuit communities as a way of eradicating TB. Rather, many suggest traditional biomedical prevention, testing and treatment. While TB has been all but eradicated among the general Canadian population, it is deeply troubling that patterns of TB among the Inuit population continue to grow. This suggests that the current biomedical models of treatment are not sufficient on their own in the Inuit context. We conclude that TB needs to be recognized not only as a disease of poverty in the Arctic, but as a social issue in its own right. Policy makers (e.g. Health Canada) have framed TB as a medical issue, therefore recommending medical solutions, which have not been entirely effective. By framing TB as a social issue, affected individual and communities, and the organizations that represent their interests, can argue for policy makers to address the social conditions that fundamentally underlie the disease.

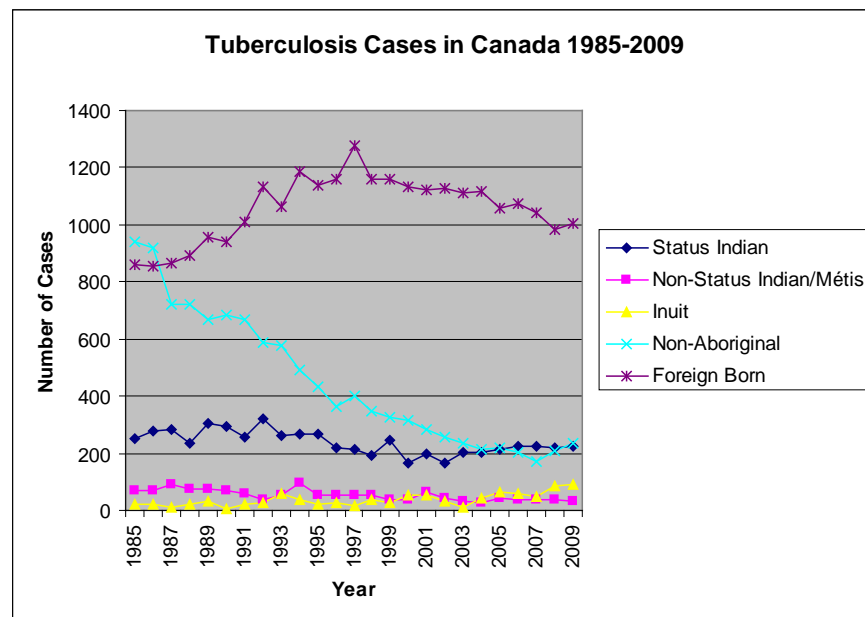


Figure 1. Tuberculosis Cases in Canada 1985-2009, Source: Health Canada, 1996, 2001; Public Health Agency of Canada, 2007, 2008, 2009.

*Data for Figure 1 available in Appendices

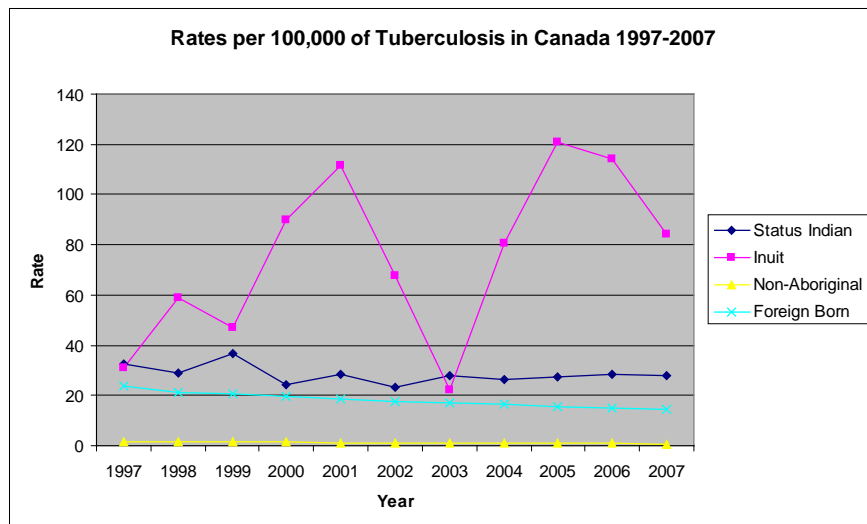


Figure 2. Rates per 100,000 of Tuberculosis in Canada 1997-2007, Source: Public Health Agency of Canada, 2007.

*Data for Figure 2 available in Appendices

Table 1

Percentage of Inuit Population Reporting Diagnosis of Tuberculosis in 2006 for the Four Arctic Regions of Canada

Inuit Region	Population	% Diagnosed with Tuberculosis
Inuit Nunaat	25,120	5
Nunatsiavut	1,540	N/A
Nunavik	5,850	3 ^E
Nunavut	15,490	6
Inuvialuit	2,240	4 ^E
Outside Nunaat	10,740	4 ^E
Canada	35,860	5

*E- "use with caution"

Source: Statistics Canada, 2006b

Table 2

Percentage of Population Living in Crowded Housing in Canada 2005 (crowding- more than one person per room)

Aboriginal Status	% in Crowded Housing
Non Aboriginal Identity Population	2.9
Métis	3.4
North American Indian	14.7
Inuit	31.1

Source: Statistics Canada, 2006a

Table 3

Average Income in Canada for 2000 and 2005

Aboriginal Status	Average Income (\$)	
	2000 (2001 Census)	2005 (2006 Census)
Non Aboriginal Ancestry Population	33,752	35,934
Registered Indian Status	33,390	35,501
Métis	24,914	28,227
Inuit	22,295	25,461

Source: Statistics Canada, 2006c

Table 4

Unemployment in Canada for 2000 and 2005

Aboriginal Status	Unemployment (%)	
	2000 (2001 Census)	2005 (2006 Census)
Non Aboriginal Identity Population	7.1	6.3
Métis	14	10
North American Indian	22.2	18
Inuit	22.2	20.3

Source: Statistics Canada, 2006d

Appendix

Aboriginal Status	Year											
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Status Indian	253	280	283	236	303	295	259	322	260	268	265	218
Non-Status Indian/Métis	67	69	89	75	73	72	58	39	55	95	56	51
Inuit	22	22	12	21	34	8	22	26	58	35	24	26
Non-Aboriginal	941	919	720	724	666	682	670	587	576	490	431	364
Foreign Born	861	855	868	891	959	940	1009	1135	1063	1186	1140	1159

Aboriginal Status	Year												
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Status Indian	212	191	247	167	199	165	204	202	213	223	225	218	223
Non-Status Indian/Métis	52	53	39	36	63	43	32	25	41	36	36	36	30
Inuit	18	35	28	56	53	33	11	41	63	61	46	87	89
Non-Aboriginal	403	347	326	314	283	257	233	214	218	201	170	209	237
Foreign Born	1279	1161	1161	1133	1124	1127	1110	1115	1057	1072	1042	985	1003

Figure 1. Data: Tuberculosis Cases in Canada 1985-2009

Source: Health Canada, 1996, 2001; Public Health Agency of Canada, 2007, 2008, 2009

Aboriginal Status	Year											
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	
Status Indian	32.8	29	36.6	24.2	28.3	23	27.9	26.4	27.4	28.2	27.9	
Inuit	30.9	58.7	47	89.9	111.4	67.8	22.1	80.4	120.7	114	84.2	
Non-Aboriginal	1.7	1.4	1.3	1.3	1.2	1.1	1	0.9	0.9	0.8	0.7	
Foreign Born	23.9	21.2	20.8	19.6	18.4	17.8	16.9	16.6	15.4	15.2	14.4	

Figure 2. Data: Rates per 100,000 of Tuberculosis in Canada 1997-2007

Source: Public Health Agency of Canada, 2007

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