

## Gun Safety: A Call to License Arms

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Canada's indigenous population (which includes the First Nations, Inuit, and Metis) suffers from startling health inequities that have been largely attributed to the persisting effects of colonization leading to poverty, overcrowding, and unemployment (Macaulay, 2009). As important social determinants of health, these conditions have played a critical role in the progression of both communicable and non-communicable disease epidemics amongst the indigenous population, including tuberculosis (TB) and human immunodeficiency virus (HIV). The prevalence of TB and HIV within the indigenous population is approximately 34 times and 2 times greater than in the non-indigenous population, respectively (PHAC, 2012; PHAC, 2016). The government of Canada has responded to these striking discrepancies by implementing national HIV and TB prevention and control programs which include initiatives targeted toward the indigenous population (PHAC, 2004; PHAC, 2014). However, these programs fail to adequately address the strong association between HIV and TB, and the importance of this association in the treatment and prevention of disease. The need to address this association is further magnified within indigenous populations which suffer from both these infections at aberrantly high rates.

Individuals infected by HIV are at a greatly increased risk of both active and latent tuberculosis infections (LTBIs) (up to 37 times greater risk of TB infection (WHO, 2009)), and co-infection with these two pathogens poses a significant challenge to the prevention and control of TB (PHAC, 2012). Current Canadian TB prevention programs pay very limited attention to the role of HIV and instead focus on contact tracing and outbreak investigation, screening for LTBI and active TB disease, and managing cases of active TB through directly observed therapy (DOT) (PHAC, 2012). However, the use of a DOT-based approach has not been successful in limiting the incidence of TB cases that are associated with HIV infection, suggesting that DOT-based approaches may not be enough to control TB in populations where HIV is more prevalent (Dye & Floyd, 2006).

The Centers for Disease Control and Prevention and World Health Organization recommend that all patients presenting with TB be tested for HIV infection and similarly recommend that all HIV patients be tested for signs of TB infection (CDC, 2012; WHO, 2011). These recommendations have been incorporated into Canadian guidelines but the rate of TB-HIV co-infection in Canada is still unknown because the HIV status of most TB patients is not reported (HIV status was only reported in 40% of TB cases in 2009) (PHAC, 2012). The underreporting of HIV status despite its inclusion in national guidelines indicates an inability or unwillingness of Canadian officials and

health care providers to recognize the importance of HIV-TB co-infection. Changes to this philosophy must begin at the federal level, and it will largely be up to the Public Health Agency of Canada (PHAC) to improve its oversight of TB management practices and ensure the national guidelines are adhered to.

**Table 1.** Summary of TB prevention strategies in populations with a high burden of HIV.

Infection Prevention Strategy	Description of Strategy
Directly-Observed Therapy (DOT)	A strategy used to ensure that TB infected patients are adherent to therapy, ensuring effective treatment and limiting the spread of infection. The patient meets with a health care worker every day and takes their TB medicines while the worker observes. The health care worker also asks the patient about any problems or side effects while taking the medication (Karumbi & Garner, 2015). Often combined with quarantine and contact tracing strategies.
Isoniazid Preventive Therapy (IPT)	Isoniazid taken daily for at least six months, and ideally for nine months. The main groups targeted for this therapy are those at most risk of progressing to TB disease. These are HIV-infected individuals and those who are contacts of active TB patients (WHO, 2008).
Isoniazid Preventive Therapy combined with Antiretroviral Therapy (IPT/ART)	The implementation of IPT combined with concomitant ART. ART involves using one or more antiretroviral drugs to prevent HIV replication and slow progression of HIV-related disease in individuals infected with the virus.

The problem of HIV-TB co-infection is not unique to Canada and has been identified as a serious public health concern in several countries and populations around the globe (Janssen et al., 2014; Saraceni et al., 2014; Kaur et al., 2013; Gao et al., 2010). Because of this, there have been several

studies investigating strategies to prevent the spread of HIV and TB. Anti-retroviral therapy (ART) has been the mainstay of HIV treatment for decades, but evidence has shown that highly active anti-retroviral therapy (HAART) (the use of multiple ART drugs that act simultaneously on separate viral targets) also has an impact on TB incidence and can reduce the prevalence of TB among HIV-infected individuals by more than 80% (Badri et al., 2002; Williams et al., 2010). It has been estimated that, if ART is started as soon as a patient tests positive for HIV, the incidence of HIV-associated TB could be reduced by as much as 98.4% by 2050 (Badri et al., 2002; Williams et al., 2010).

Another approach that has been studied is the use of isoniazid preventive therapy (IPT) in HIV-infected individuals. IPT involves the treatment of at-risk individuals with a daily dose of isoniazid to prevent the spread of active TB and the reactivation of latent TB; it is an inexpensive and cost-effective approach that has been associated with a TB risk reduction of 35% in HIV-positive patients (Ayele et al., 2015). Furthermore, the combination of both ART and IPT has been shown to reduce the risk of TB by up to 89% in people living with HIV and has proven particularly effective in settings with a high incidence of both infections, as is observed in indigenous populations of Canada (Golub et al., 2009; Golub et al., 2007).

While the use of ART to treat HIV infections in Canada is standard, many indigenous communities are rural or remote and do not have adequate access to health care professionals (Oosterveer & Young, 2015; Wardman et al., 2005). Because of this, the preventive impact of ART on TB is likely not being realized in Canada's indigenous populations. The evidence suggests a more effective approach would be the development HIV-TB treatments centers in high incidence regions, where diagnostic testing, disease surveillance, and a combined ART/IPT strategy could all be carried out in one location. This combination has proven effective in managing populations with a high burden of disease, as mentioned previously, and being offered at locations in the center of these epidemics would help to increase access to these resources and halt the spread of disease. A majority of healthcare in Canada is managed provincially but the federal government is responsible for some specific populations, including Canada's indigenous population (Health Canada, 2018). Because delivery of health care to indigenous peoples falls under federal rather than provincial jurisdiction, it would be relatively easy to institute a national policy outlining publicly-funded drug coverage of ART and IPT therapies in high-burden populations. Such a policy could face resistance due to the upfront cost of drug coverage, but generic ART drugs are emerging that drastically lower the cost of therapy. This combined with IPT, a relatively low-cost control strategy, creates a viable alternative to current disease-control strategies.

Canada's response to alarming rates of both HIV and TB among indigenous populations has been insufficient, as infection rates remain high and the health disparities between indigenous and non-indigenous Canadians are still large. Current attempts to control TB and HIV in these high-burden populations have been ineffective, and a more integrated approach should be adopted by the PHAC moving forward. The creation of dedicated HIV-TB care centers with publicly-funded drug coverage would be costly and strain already tight federal budgets, but generic therapies are coming to market that are much more affordable. Additionally, the initial cost of preventive strategies would likely be offset by limiting the complications of these infections and improving health

disparities in Canada's most vulnerable populations, thereby saving Canada's health care system millions of dollars.

## About the Author

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