



# Do water service provision contracts with neighbouring communities reduce drinking water risk on Canadian reserves?



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## ABSTRACT

In 2011, 39% of drinking water systems on Canadian First Nations' reserves were classified as high risk [31]. In recent years some First Nations have contracted water services from neighbouring communities through "Municipal Type Agreements", or "MTAs". Using a unique data set of 804 First Nations' water systems, we explore both factors that influence participation in MTAs, and the effect of participation on the likelihood that a First Nations' water system will be under a boil water advisory. Our empirical analysis consists of two probit models. The first model describes the likelihood that a First Nation will participate in a MTA. The second estimates the likelihood that a First Nations' water system will be under a boil water advisory. Our primary finding is that participation in a MTA significantly reduces the likelihood that a First Nations' water system will be under a boil water advisory. This is an important consideration when developing incentives or institutions that influence infrastructure collaboration between First Nations and non-First Nation communities.

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## 1. Introduction

The quality of drinking water on Canadian First Nations' reserves<sup>1</sup> is of widespread concern to First Nations and non-First Nations people alike. As of 2011, 39% of drinking water systems on Canadian reserves were classified as "high risk", which implies that they are not adequately equipped to deal with exposure to contamination [31]. Boil water advisories (BWAs) are a common indicator of drinking water quality issues, and saw a 35% increase in prevalence in First Nation communities between 2006 and 2014 [20,46]. A BWA is an announcement issued when "the water in a community's water system is contaminated with faecal pollution indicator organisms (such as *Escherichia coli*) or when water quality is questionable due to operational deficiencies (such as inadequate chlorine residual)" [23], and requires that tap water be brought to a "rolling boil" for a minimum of one minute in order for it to be rendered safe for human consumption [21,23]. BWAs can range from weeks to years in duration, and are only rescinded once the contamination event or operational deficiency has been resolved<sup>2</sup>. Many BWAs on First Nations' reserves are long-term,

persisting for twelve months or longer [35,48].

The challenges of providing adequate drinking water services in rural areas are legion, and these challenges – finance, economies of scale, planning capacity, etc. – are not isolated to First Nations' communities. Approximately 15.4% and 14.4% of non-First Nation Canadian drinking water systems are ranked "fair" and "very poor", respectively, for the condition of their pipes, plants, reservoirs, and pumping stations [16]. The estimated replacement cost for these insufficient drinking water systems is \$25.9 billion, or \$2082 per Canadian household.

In recent years, some First Nations have sought partnerships with neighbouring non-First Nation communities for the provision of drinking water services on their reserves. These partnerships, classified as "Municipal Type Agreements" (hereafter referred to as "MTAs"), take the form of a contract between a First Nation Band<sup>3</sup> and the local government of a neighbouring municipality or township. Aboriginal Affairs and Northern Development Canada (AANDC)<sup>4</sup>, the Canadian Federation of Municipalities (FCM)<sup>5</sup>, and

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<sup>1</sup> A reserve is a "[t]ract of land, the legal title to which is held by the Crown (i.e. the Canadian Federal government), set apart for the use and benefit of [a First Nation] [Band]" [1].

<sup>2</sup> BWAs issued in response to evidence of bacteriological water quality conditions are rescinded when two consecutive bacteriological tests, collected a minimum of 24 hours apart, produce negative results for the problem contaminant. Precautionary BWAs issued due to evidence of poor operational conditions are rescinded once the treatment, distribution, or operational malfunction has been corrected [20].

<sup>3</sup> A First Nation Band is a body of First Nations people "for whose collective use and benefit lands have been set apart or money is held by the Crown, or [a body of First Nations people] declared to be a Band for the purposes of the Indian Act" [1]. Each First Nation Band is governed by a council, usually consisting of a chief and several councillors, selected through an electoral or customary process.

<sup>4</sup> AANDC encourages MTAs in situations where they are the least cost alternative to other forms of service delivery [24,3].

<sup>5</sup> The FCM promotes MTAs through the "First Nations – Municipal Community Infrastructure Partnership Plan" (CIPP), which provides resources (i.e. toolkits, case studies, agreement templates, workshops, etc.) to First Nations and municipalities interested in forming these contracts [11,15].

many First Nations leaders support MTAs as one means of reducing water service provision costs and enhancing water quality on reserves. The growing popularity of these voluntary agreements appears to be prima facie evidence of their mutual gains. For example, Nelles and Alcantara [33] survey 93 cooperative arrangements between First Nation and non-First Nation communities and conclude that these types of jurisdictional agreements are on the rise, as “... both First Nations and municipal governments have progressively recognised the mutual benefits of collaboration” (pp. 327).

Servicing agreements between local governments, like MTAs, are a growing means of improving community service provision throughout North America and Europe. These agreements are the subject of an expanding literature in the field of economics (prominent examples include: [19,26,27,29,43,45]). The majority of this literature identifies and evaluates factors that lead to the emergence of these agreements. Social capital between communities, community characteristics, and cost considerations are frequently emphasised [19,26,43,45]. With the exception of Steiner [43], none of the aforementioned literature evaluates the impact of these agreements on the quality of the service provided.

Our research addresses this gap in the literature. Specifically, we assess whether participating in a MTA improves water quality on First Nations' reserves. To our knowledge, ours is the first study to examine the extent to which MTAs actually enhance water quality on First Nations' reserves. Our empirical analysis of 804 First Nations' water systems generates a number of important findings. We find that MTA participation reduces the likelihood of a water system on a First Nations' reserve being under a BWA. We also find that geographic remoteness (measured as the distance from each reserve to its closest proximal population centre<sup>6</sup>) influences the likelihood that a First Nation will participate in a MTA, as well as the population and population density on reserve. One important observation, from a policy perspective, is that there are many First Nations in close proximity to neighbouring population centres that are not currently participating in MTAs.

The remaining sections of this paper are organised as follows. First, a background section briefly outlines institutional differences between First Nation and non-First Nation communities in Canada. In this section we pay particular attention to differences in drinking water quality standards and monitoring. We also outline key characteristics of MTAs, and their role in water service provision on reserves. The following section, Section 3, outlines factors that influence First Nations' decisions to participate in MTAs. Specifically, we identify a number of reserve characteristics that influence the costs of MTA participation and negotiation. In Section 4, the data section, we define and review variables that will be included in the empirical analysis. This is followed by a specification of our empirical approach in Section 5. Section 6 then discusses our primary empirical results, and an additional sensitivity analysis is discussed in Section 7. Lastly, we provide conclusions and a discussion of the key policy implications of our findings in Section 8.

## 2. Background

The Walkerton Inquiry<sup>7</sup> emphasised the important role of

institutions and regulatory oversight in determining individual actions affecting water quality [34]. In this regard, it is important to recognise that First Nations' reserves fall into a jurisdictional gap with respect to drinking water quality standards. In Canada, drinking water safety and regulatory standards are set and enforced at the Provincial level, and do not apply to water services on First Nations' reserves. First Nations are under Federal jurisdiction as specified by the Indian Act [12], and drinking water quality guidelines for water systems on their reserves exist at the Federal level under AANDC. However, to date these guidelines are not enforceable [6,10]<sup>8</sup>. And Canada is the only OECD country that does not have enforceable national drinking water quality standards [7]. Hence, a key distinction between Canadian population centres and First Nations' reserves is that water systems in Canadian population centres are held to uniform standards of water quality and safety that apply to all population centres within a Province; these Provincial standards do not apply to water systems on First Nations' reserves, and First Nations' are not subject to enforceable standards by the Federal government.

This jurisdictional gap leads to substantive differences in water quality monitoring between First Nation and non-First Nation communities within a Province. For example, in the Province of Ontario, inspectors from the Provincial Ministry of the Environment (MOE) ensure that water systems in population centres are being properly sampled and monitored on a regular basis [47]. And the MOE mandates a BWA if water quality does not meet Provincial standards. In contrast, Health Canada recommends that a BWA be issued on a First Nations' reserve when water quality does not meet Federal guidelines. However, monitoring responsibilities and the decision to implement a BWA ultimately fall under the jurisdiction of the First Nation Band. First Nations receive funding and assistance from Health Canada<sup>9</sup> to implement their own community standards (based on Federal guidelines), to develop their own community-based water quality monitoring programmes, and to train water quality monitors [20]. In some cases, an external monitor is hired by the First Nation Band, or by Health Canada (with the permission of the Band). This decentralised approach to monitoring and standards on First Nations' reserves has not adequately addressed water quality concerns. In 2006, an expert panel on safe drinking water for First Nation communities argued that “the federal government has never provided enough funding to First Nations to ensure that the quantity and quality of their water systems [is] comparable to that of off-reserve communities” [44].

One potential pathway to improved water quality for a First Nation is to purchase water from a nearby population centre. In some cases, as a result of jurisdictional and financial differences, these population centres may be in a better position to ensure water quality than the First Nation. In a MTA, the First Nation Band receives water that is treated and monitored according to water quality standards set by the Province. MTA stipulations vary, but typically they identify the quantity of treated drinking water to be purchased, the price per unit<sup>10</sup>, and state that the First Nation

<sup>6</sup> The Canadian census defines a population centre as an area with a population of at least 1000 and a population density of 400 persons or more per square kilometre, based on the current census population count [39]. Prior to 2011, these areas were referred to as “urban areas”.

<sup>7</sup> In 2000, *E. coli* bacterial contamination resulted in the deaths of seven people and the illness of thousands of others in the city of Walkerton Ontario. A subsequent assessment of the situation identified the institutions governing water quality monitoring and reporting as inadequate (for more information see the Walkerton Inquiry website: <http://www.waterprotection.ca/cwa/walkerton.htm>).

<sup>8</sup> A *Safe Drinking Water for First Nations Act* was passed in 2013, enabling the creation of federal drinking water quality standards for First Nations' communities (this legislation is available from the Justice Laws Website here: <http://laws-lois.justice.gc.ca/eng/acts/S-1.04/page-1.html>). It has faced significant resistance from First Nations groups that feel that it infringes on their jurisdiction [10], and will hold First Nations Bands to an unachievable standard without providing any additional resources [9]. To date, no Federal standards have been developed or implemented.

<sup>9</sup> Canadian Provinces and Territories are responsible for delivering healthcare to the majority of Canadians, but the Federal government also has key roles and responsibilities in areas that affect health and healthcare, which are the mandate of Health Canada. These include: food safety, health care delivery to First Nations and Inuit peoples, the promotion of innovation in healthcare, and the proliferation of health related information [22].

<sup>10</sup> The template for MTAs published by the FCM recommends pricing based on

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