Water Quality and Human Health:
Gastro-intestinal Illness in Small Communities in BC

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Introduction

High-quality drinking water is fundamental to maintaining human health and well-being. Drinking water quality is threatened by contamination with waterborne bacterial and protozoan pathogens that exist in the environment and enter drinking water supplies via various pathways. Once pathogens enter a drinking water supply, waterborne gastro-intestinal (GI) illness outbreaks and sporadic cases are likely to occur in the absence of effective water treatment.

Climate change, in particular changes in precipitation patterns, an increasing frequency of extreme weather events and rising temperatures, is expected to impact both water quality and the distribution disease. Despite these concerns, research examining the risk of waterborne GI illness in the context of a changing climate in small communities is limited, particularly with respect to sporadic illness, with none specifically exploring this issue within BC.

Goals and Objectives

Overarching Goal
To examine the potential impacts of future climate change on the risk of waterborne GI illness in small communities in BC.

Specific Research Objectives
1) Describe the temporal and spatial distribution of GI illness in the study communities.
2) Examine and quantify the association between precipitation, extreme precipitation events, temperature and snow melt and the risk of waterborne GI illness in the study communities.
3) Establish linkages between the physical characteristics of the aquifer or surface water system and the vulnerability for pathogens in water supplies.

Proposed Methods

Study Design
- 8 communities from across BC have been selected as study communities for this project.
- Study communities were selected to ensure a mix of water regimes in both rain and snow dominated regions of the province. This design enables comparisons between different water regimes as well as other factors (i.e. agriculture) that vary across communities.

Data and Data sources
- Illness data is a time series of 5 reportable pathogens (Campylobacteria, Cryptosporidium, Giardia, Salmonella and Cryptosporidium) between 1996 and 2010 extracted from the IPHIS database managed by the BC Center for Disease Control (BCCDC).
- All environmental data has been extracted from Environment Canada’s National Climate Data Information Archive. Variables include: daily maximum, minimum and mean temperature, daily precipitation and daily snow depth.

Data Analysis
- An examination of temporal trends and seasonality in the illness time series for each community.
- Illness cases for each community will mapped using a GIS to link cases to a water source.
- The association between GI illness and climatic risk factors will be modeled with a Poisson regression adapted for times series using weekly times series.
- To date, some preliminary results have been generated examining monthly time series trends in one pilot community.

Next Steps
- Further analysis into the characteristics of each community including: soil types, well characteristics, water system management and land use patterns.
- If a significant relationship is found between climatic factors and risk of GI illness, further analysis, such as climate modeling and projections of future risk will be conducted.
- Findings will be disseminated to a climate change adaptation audience and to public health and water management professionals in each study community. This will ultimately improve water quality protection and prevent illness protecting human health and well-being in similar climate-sensitive water regimes.

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For further information about this project please contact Lindsay Galway at lpg@sfu.ca

References: