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Background

- Colorectal cancer (CRC) is the 3rd most common type of cancer diagnosed in Canada in both men and women
- Wait times while moving through the cancer diagnosis and treatment pathways are a persistent public health concern because longer wait times may impact cancer stage, survival, patient anxiety and highlight inefficiencies in the health care system
- We define the diagnostic interval as the number of days in between the patient's first diagnostic related encounter with the health care system to the diagnosis of colorectal cancer
- Rural populations are vulnerable to poor health outcomes, which could be linked to geographic access to care and include issues such as a longer diagnostic interval
- If the diagnostic interval is higher in rural areas, it may be associated with, and therefore ameliorated by, changes in health care services that are related to the diagnostic process

Purpose

- Describe the variation in the diagnostic interval for colorectal cancer patients in Ontario by degree of rurality of their residence
- Describe the association between diagnostic interval and geographic access to key diagnostic resources

Generalized Diagnostic Pathway

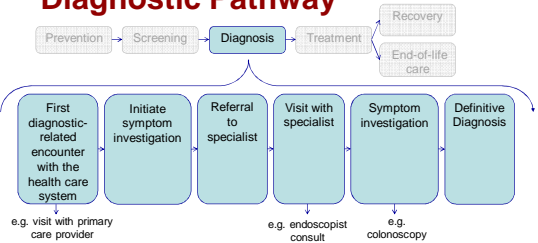


Figure 1 Components of the diagnostic interval within the cancer care continuum. Examples referring to colorectal cancer. Figure adapted from Cancer Care Ontario¹ and The Aarhus Statement².

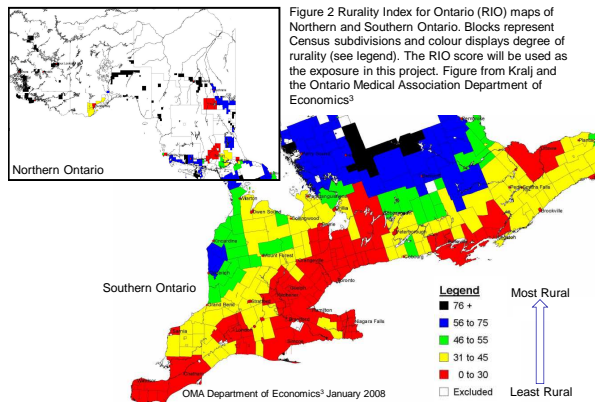


Figure 2 Rurality Index for Ontario (RIO) maps of Northern and Southern Ontario. Blocks represent Census subdivisions and colour displays degree of rurality (see legend). The RIO score will be used as the exposure in this project. Figure from Kralj and the Ontario Medical Association Department of Economics³

Objectives

- To compare the Ontario colorectal cancer stage distribution across regions grouped by Rurality Index for Ontario (RIO) categories
- To determine whether patients living in Census subdivisions with a higher degree of rurality have a longer diagnostic interval
- To map the relationship between the diagnostic interval, rurality and key colorectal cancer diagnostic resources through a geographic information system (GIS) mapping exercise

Methods

Overview:

- Retrospective cohort design
- Data sources include administrative databases available through the Institute for Clinical Evaluative Sciences (ICES) Health Services Research Facility at Queen's University (see Figure 3)
- Incident colorectal cancer cases from the years 2007-2011 will be identified using the Ontario Cancer Registry (OCR)
- Diagnostic interval and a Rurality Index for Ontario (RIO) score will be calculated for each patient
- Data linkage through ICES will allow us to describe the variation in stage and the diagnostic interval for patients by degree of rurality of their residence as well as to take into account potential confounders (see Figure 4)

Data sources:



Figure 3 Administrative data sources that will be linked through the Institute for Clinical Evaluative Sciences (ICES)

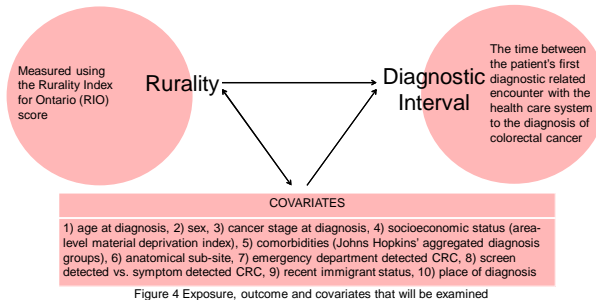


Figure 4 Exposure, outcome and covariates that will be examined

Exposure: Rurality

- The Rurality Index for Ontario (RIO) is an ordinal measure that uses a 0-100 scale, where a higher score represents a higher degree of rurality
- The score is assigned by units of Statistics Canada Census subdivisions (see Figure 2)
- The RIO score is based on three weighted components: the population, the travel time to the nearest advanced referral centre and the travel time to the nearest basic referral centre
- We will categorize the RIO scores into 6 groups
- There are several ways to define rurality, the RIO was chosen to describe rurality over other methods because it was made for health services planning
- The RIO is used by the Ministry of Health and Long Term Care and the Ontario Medical Association to administer programs that primarily develop policies and incentives for physician recruitment

Methods (continued)

Outcome: Diagnostic interval

- The diagnostic interval is the time (in days) between the patient's first diagnostic related encounter with the health care system to the definitive diagnosis of colorectal cancer (CRC)
- See Figure 5 below for an explanation of how the diagnostic interval is calculated
- The time window in which we will look back for relevant CRC diagnostic encounters will be determined separately for each type of encounter using control charts
- The control charts will serve as a decision tool to help identify at which time a patients' health care encounter frequencies surpassed a background rate
- We will plot weekly counts in the months immediately preceding the CRC diagnosis against the background rate which will be the average weekly count in the 18-24 month interval before diagnosis

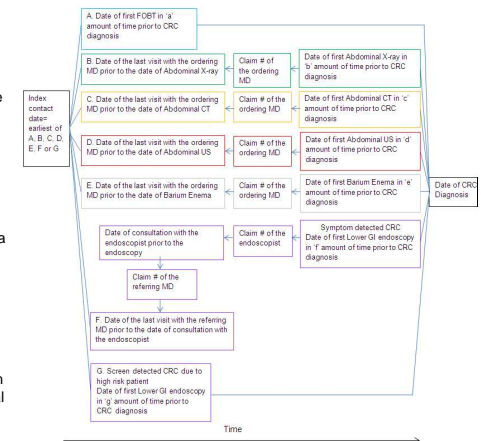


Figure 5 Diagnostic interval is calculated using the date of CRC diagnosis and looking back in time from that date for the first relevant gastrointestinal investigation. The claim number of the ordering physician for the diagnostic investigation is used to determine the date of the patient's last visit with the ordering physician. The earliest date of the patient visit (A-G) preceding the gastrointestinal investigation is defined as the index contact. Figure adapted from Singh and colleagues⁴. FOBT Fecal occult blood test; CRC colorectal cancer; CT computer tomography; US ultrasound; GI gastrointestinal; MD medical doctor.

Analysis Strategy:

- Objective 1) Descriptive statistics will be used to examine the difference in stage distribution across RIO categories. Differences will be tested using a chi-square test for trend and logistic regression.
- Objective 2) Median diagnostic interval will be plotted against RIO scores stratified by stage. A multivariate quantile regression model will be performed at the 50th and 90th percentiles to analyse differences. The fully adjusted model will be used as there will be sufficient statistical power and not a great number of possible confounders. Attention will be made to identify any collinear relationships in the covariates.
- Objective 3) Basic geographic information system (GIS) mapping using ArcGIS software will be used to overlay the combination of median diagnostic interval and RIO scores. Two key diagnostic resources, geographic access to a colonoscopy and the presence of diagnostic assessment programs will be mapped and interpreted.

Public Health Relevance

- Modify or create programs and guidelines to improve the colorectal cancer diagnostic process of those living in rural Ontario
- Better identification of rural populations in need and the system-related barriers that contribute to a late diagnosis in rural Ontario may ultimately lead to an increase in the number of people who survive their colorectal cancer
- Enlighten health care professionals and researchers on the multidimensionality of access to health care in rural populations and in general

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