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Sociodemographic correlates of fecal immunotesting for colorectal cancer screening

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ABSTRACT

Objectives: Community fecal immunochemical testing (FIT) screening programs are important for detecting early disease and can be effective when promoted by primary care physicians. Screening rates remain low across Canada and may be associated with sociodemographic factors.

Design and methods: Fecal immunochemical testing results for a new community-based screening program were obtained from Calgary Laboratory Services from November 18, 2013 to May 31, 2014. Screening rates were determined for specific age and sex cohorts and sociodemographic factors were inferred from census Canada data. Poisson regression and generalized estimating equations were used to test associations of screening rate with sociodemographic variables.

Results: A total of 27,572 results were screened and included in our analysis. Recent immigrants (RR = 0.18, $P = <.0001$), Aboriginal First Nations (RR = 0.39, $P = 0.01$), Aboriginal Metis (RR = 0.14, $P = 0.0003$), visible minority Black (RR = 0.35, $P = 0.0002$), and higher education (RR = 0.65, $P = <.0001$) were associated with decreased screening. Visible minority Chinese (RR = 1.72, $P = <.0001$) were more likely to be screened. Household income was not associated with screening rate. Older individuals and females were less likely to be screened.

Conclusion: There is significant geographic variation in screening rates in Calgary. These are associated with a number of sociodemographic factors.

Introduction

Colorectal cancer (CRC) community fecal immunochemical testing (FIT) screening programs are important for detecting early disease [1–3] and can be very effective when promoted by family physicians [4–8]. Despite this, screening rates across Canada have been consistently low [9]. This is true even with recent endorsement by the Canadian Association of Gastroenterology of CRC screening guidelines [10]. Alberta, Canada introduced a new FIT screening program through family physicians in November 2013 [10,11]. This is offered to all individuals aged 50–74 years, free of cost and only through family physicians. As this is a new program in Alberta, there is no data to evaluate participation rates.

The reasons for low participations are unclear; however, sociodemographic factors such as minority ethnicity, education, income, sex, and age are associated with CRC screening rates [11–13]. These associations may be related to poor health care knowledge, physician bias towards screening programs, language barriers, and reduced access to health care among certain sociodemographic groups [3,14–18]. Organized screening programs have the potential to increase participation [11], but without knowing which factors are associated with under utilization of CRC screening [19], little can be done to boost screening rates.

By determining which sociodemographic variables and barriers are associated with under screening for CRC, it is hoped that efforts can be made to promote screening to the appropriate groups. In this manuscript we address this issue by examining the sociodemographic factors associated with screening rates in Calgary, Alberta.

Methods

Ethics statement

This research was approved by the University of Calgary Conjoint Research Ethics Board (ID 13-0376) prior to the start of data collection.

Study population and data sources

Data on a community FIT screening program was obtained from the Laboratory Information System (LIS) of Calgary Laboratory Services (CLS) for the first six and a half months of this program (November 18, 2013 to May 31, 2014). CLS is the sole provider of laboratory services

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to Calgary and surrounding areas (catchment population of 1.4 million persons). This date range was chosen as Alberta's new Colorectal Cancer Screening Clinical Practice Guidelines (CPG) were introduced in November 2013, introducing FIT screening for patients between the ages 50 and 74 years.

FIT collection kits are distributed to patients only through primary care physicians. Each patient was screened using one CRC screening kit. Samples were returned to CLS for testing on an automated analyzer, OC-Sensor Diana, with a positive cut off value of 75 ng/mL. All test results reported by CLS (and therefore all patients receiving screening) were extracted into an excel file. Only individuals residing within the City of Calgary were included in the analysis. In cases where more than one test result existed per patient, the first test result was chosen for analysis and the others were removed from the dataset. Only patients included in the Alberta clinical practice screening guidelines (i.e. between the ages of 50 and 74) were included in the analyses.

Along with test results, month of testing, patient provincial health number, age, and sex were also extracted from our LIS. Provincial health care numbers were then used to obtain each patient's postal code from an Alberta Health Services database. Postal codes were then used to assign individuals to Census Canada census dissemination areas. Following this linkage, all identifying information was removed from the dataset.

Screening effort was then determined for each of the census dissemination areas by summing the number of patients tested in each age group (50–54, 55–59, 60–64, 65–69, 70–74) and sex cohort and dividing this by the number of individuals in that age and sex cohort present in that census dissemination area in the 2011 Canada census. That provided FIT screening rates for each census dissemination area.

In addition to the individual level variables of age and sex, sociodemographic variables were inferred at the level of census dissemination area from the 2011 Canada census. Group level sociodemographic variables considered included: recent immigration status (immigrated within the last five years), Aboriginal First Nations, Aboriginal Metis, Census Canada defined visible minority status “Chinese”, visible minority status “Black”, education level, and median household income. Chinese and Black ethnic groups were chosen for analysis as they were the largest minority groups within Calgary.

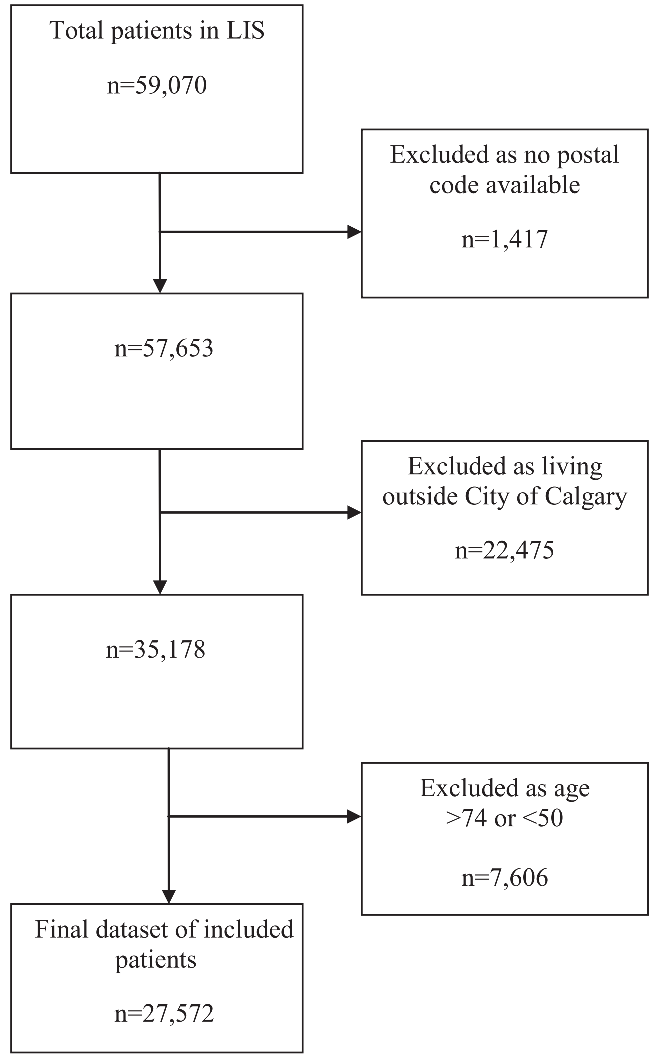

Fig. 1. Study flow diagram.

Statistical analysis

To graphically illustrate variations in FIT screening rates, hot spot analysis maps were produced using ArcGIS software v.9.3. The software uses the Getis-Ord Gi* statistic [20], producing z-scores that identify statistically significant hot (increased screening) and cold (decreased screening) spots, depending on the standard deviations of the data from the mean in specific census dissemination areas.

Statistical inference regarding sociodemographic variables associated with testing rate was performed using the generalized estimating equations (to account for the hierarchical nature of the data) version of Poisson regression in SAS v.9.2. Coefficients for all models were considered statistically significant if their associated P values were <0.05. The statistical significance of each variable was assessed independently with categorical variable (age group and sex) held constant at an arbitrary reference state, sociodemographic variables held constant as the absence of that variable and the sole continuous variable (median household income) reported as the significance of each increase in income of $100,000 CDN. Visible minority groups were referenced to all other ethnic groups not included in this model. Finally, the differences in screening rates associated with individual sociodemographic variables are reported as relative risk (RR) for the independent contribution of that variable to the analysis.

Results

Data on 59,070 FIT results were available in our LIS, of which 27,572 results met our inclusion criteria (Fig. 1).

The ArcGIS hot spot analysis illustrates significant differences in screening rates throughout the city (Fig. 2). Fit screening rates varied among neighbourhoods from a low of 0.2% to a high of 25.8% in the first 6.5 months of the screening program. Using a cutoff of 75 ng/mL to define a positive test, the positivity rate for the period covered in this study was 9%. The mean screening rate during this period was 2.8%. Table 1 shows the sociodemographic variables associated with FIT screening rates. There were multiple inequities in screening rates associated with sociodemographic groups. Specifically, recent immigrants (RR = 0.18, $P = <.0001$), Aboriginal First Nations (RR = 0.39, $P = 0.01$), Aboriginal Metis (RR = 0.14, $P = 0.0003$), visible minority “Black” (RR = 0.35, $P = 0.0002$), and those with a university education (RR = 0.65, $P = <.0001$) were less likely to be screened. Visible minority “Chinese” (RR = 1.72, $P = <.0001$), however had a higher screening rate. Interestingly, an increase of household income by $100,000 was not significantly associated with screening rate ($P = 0.08$). The age group of 70–74 was the least likely to be screened. Screening rates increased with each younger age cohort. Overall, females had a slightly lower rate of screening than males (RR = 0.95, $P = <.0001$).

Discussion

Community CRC screening programs are still relatively new in Canada, with all provinces having organized programs, but none of the three territories having screening programs in place [10,19,21].

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