

Colorectal and Breast Cancer Screening Status for People in Ontario Provincial Correctional Facilities



Andres McConnon, AB,¹ Kinwah Fung, MSc,² Aisha Lofters, PhD,^{2,3} Stephen W. Hwang, MD,^{2,3}
Fiona G. Kouyoumdjian, PhD^{2,3,4}

Introduction: Primary care represents an opportunity to improve health for people who experience imprisonment, and screening for colorectal and breast cancer indicate primary care quality. The study objectives were to examine the proportion of people released from provincial correctional facilities who were overdue for colorectal or breast cancer screening on admission to the correctional facility and who were still overdue after 3 years, and to compare findings with data for the general population.

Methods: Administrative data were used to identify people eligible for colorectal and breast cancer screening who were released from provincial correctional facilities in 2010 (N=3,803 and N=249, respectively) and in the general population (N=2,757,584 and N=1,099,942, respectively) in Ontario, Canada. Chi-square tests and log binomial regression models were used to compare the proportion of individuals overdue for screening on admission or on July 1, 2010 for the general population, and still overdue after 3 years. Analyses were conducted in 2017 and 2018.

Results: Compared with the general population, people in the corrections group were 1.53 times (95% CI=1.50, 1.55) more likely to be overdue for colorectal cancer screening: 77.1% (95% CI=74.3, 79.9) vs 50.5% (95% CI=50.5, 50.6), and 2.25 times (95% CI=2.06, 2.46) more likely to be overdue for breast cancer screening: 65.9% (95% CI=56.2, 76.8) vs 29.3% (95% CI=29.2, 29.4, both $p<0.001$). They were also more likely to still be overdue 3 years later: 62.6% (95% CI=60.1, 65.2) vs 33.6% (95% CI=33.5, 33.6) for colorectal cancer and 52.2% (95% CI=43.6, 62.0) vs 20.2% (95% CI=20.1, 20.3) for breast cancer (both $p<0.001$).

Conclusions: People who experience imprisonment are less likely than the general population to access colorectal and breast cancer screening. This suggests the need to strengthen primary care for this population. Specifically, efforts should be made to improve access to colorectal and breast cancer screening, through health promotion, program delivery, and linkage to community services while in correctional facilities.

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INTRODUCTION

Worldwide, more than 10.3 million people are in prison at any given time,¹ and an estimated 30 million people move through prisons annually.² International and Canadian data reveal that the health of people who experience imprisonment is poor compared with the general population across a variety of indicators.^{3,4}

From the ¹Faculty of Medicine, McMaster University, Hamilton, Ontario, Canada; ²ICES, Toronto, Ontario, Canada; ³Centre for Urban Health Solutions, St. Michael's Hospital, Toronto, Ontario, Canada; and ⁴Department of Family Medicine, McMaster University, Hamilton, Ontario, Canada

Address correspondence to: Fiona G. Kouyoumdjian, PhD, Department of Family Medicine, McMaster University, 5th floor, David Braley Health Sciences Centre, 100 Main Street West, Hamilton, Ontario, L8P1H6, Canada. E-mail: kouyouf@mcmaster.ca.

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Primary care access decreases population morbidity and mortality,⁵ and offers the opportunity for people who experience imprisonment to prevent and manage medical and social problems. Screening for colorectal and breast cancer indicate primary care quality,⁶ yet there is a lack of data on colorectal and breast cancer screening in this population. Two small studies in California and Rhode Island using self-reported data found that a large proportion of people in prison were not up to date on colorectal and breast cancer screening, with 31% up to date for colorectal⁷ and 41%⁷ and 58%,⁸ respectively, up to date for breast cancer screening. In the California study, many participants lacked knowledge regarding colorectal and breast cancer screening,⁷ although most indicated that they would be willing to access cancer screening in prison.⁷ This suggests that the time in prison may represent an opportunity for health promotion and screening, including through primary care services.

The study objectives were to examine the proportion of people released from provincial correctional facilities in Ontario in 2010 who were overdue for colorectal or breast cancer screening at the time of admission, to determine the proportion who were still overdue after 3 years, and to compare these proportions with the general population. In addition, primary care use was explored in the years before and after admission to provincial correctional facilities.

METHODS

This retrospective cohort study compared data on people released from provincial correctional facilities in Ontario, Canada in 2010 with the general population in Ontario, Canada.

Provincial correctional facilities in Canada house people who are admitted prior to sentencing or sentenced to <2 years; people sentenced to ≥2 years are transferred to federal prison.⁹ The term *provincial correctional facilities* is used to represent all provincial facilities, including jails, detention centers, and correctional centers.

The Ontario Health Insurance Plan (OHIP), the public health insurance plan, pays for healthcare services including primary care and colorectal and breast cancer screening tests for Ontario residents.¹⁰ OHIP covers health care in provincial correctional facilities and in the community.

People in provincial correctional facilities access primary care for an initial assessment within weeks of admission or sooner if medically indicated, and subsequently access care based on identified need for ongoing or episodic care. No systematic program exists in provincial correctional facilities for colorectal or breast cancer screening.

Study Sample

For a separate study, the Ontario Ministry of Community Safety and Correctional Services provided identifying data on all adults

released in 2010 from provincial correctional facilities, including name, date of birth, sex, self-reported race, OHIP number, and dates of admission and release and reasons for release between 2005 and 2015 (to distinguish periods in custody and in the community). They transferred these data to ICES, an independent, non-profit organization funded by the Ontario Ministry of Health and Long-Term Care, which houses health administrative data for Ontario residents.

As described previously,¹¹ ICES staff used a validated strategy¹² to link people to a unique encoded OHIP number (ICES Key Number) which exists for people who are OHIP-eligible and is used across ICES databases. Linkage was direct using OHIP number if available and valid, or else deterministic or probabilistic using name, sex, and date of birth. The project team excluded linkages that seemed to be incorrect (Appendix Figure 1), and people with a release period of <1 day in 2010, on the assumption that these releases represented administrative status changes.

To identify individuals in the general population, the project team accessed data for all people who were OHIP-eligible on July 1, 2010 in the ICES registry of OHIP-eligible individuals, excluding people in the corrections group.

For both groups, the breast cancer screen-eligible population included women who were aged 50 to 69 for the 3 years before and 3 years after the index date, which was the date of the admission leading to the initial release for the corrections group and July 1, 2010 for the general population. These criteria were chosen based on the recommended screening interval and ages from national guidelines.¹³ Women with prior breast cancer or bilateral mastectomy were excluded. The colorectal cancer screen-eligible population included men and women aged 50 to 74 for the 2 years before and 2 years after the index date, based on the recommended testing interval for fecal occult blood testing, which is the most common test and is recommended by the provincial cancer agency. People were excluded if they had prior colorectal cancer, Crohn's or ulcerative colitis, or total colectomy, or if a physician had indicated screening ineligibility.

People were excluded from the corrections group if they had been incarcerated in federal prison since January 1, 2005, because healthcare use in federal prisons is not included in OHIP, or if their index date was prior to 2009, to maintain comparable periods of study for the corrections and general population groups.

Measures

The project team defined sex and neighborhood income quintile on the index date using data in the registry of OHIP-eligible people. For the corrections group, the project team used Ministry of Community Safety and Correctional Services data to define time in provincial correctional facilities and self-reported race. No individual-level race data were available for the general population.

The project team used OHIP data to identify primary care encounters, which were defined as visits to general practitioners or family physicians. Primary care use in the 3 years before and 3 years after the index date was examined as an indicator of primary care use around the index date, though this is not the recommended colorectal cancer screening interval.

The primary outcomes were whether screen-eligible individuals were overdue for breast and colorectal cancer screening on the index date. Overdue for breast cancer screening was defined as not having had mammography in the past 3 years. Breast cancer

screening was identified using codes in OHIP or the Ontario Breast Screening Program database. Overdue for colorectal cancer screening was defined as not having had a fecal occult blood test in the past 2 years, a barium enema in the past 5 years, or a large bowel endoscopy in the past 10 years. Colorectal cancer screening was identified using OHIP codes.

Statistical Analysis

ICES staff linked data and the project team conducted analyses in 2017 and 2018. The project team calculated the frequencies of age, sex, and neighborhood income quintile for both groups, and self-reported race and time in correctional facilities for the corrections group.

The project team calculated the proportion of people who were overdue for screening on the index date and still overdue at 3 years for both groups and compared groups using chi-square tests, and specifically comparing the proportion of overdue men and women in the corrections group. The proportion of people screened in provincial correctional facilities was calculated by using those who were up to date on the index date and those who were overdue on the index date but accessed screening in the subsequent 3 years.

For the corrections group compared with the general population, RRs and 95% CIs were calculated for the proportion overdue on the index date and still overdue at 3 years. The log binomial model was used to calculate the unadjusted RR and the RR adjusted for neighborhood income quintile, given the overrepresentation of people of lower SES in correctional facilities and the association between income and cancer screening.

For the whole corrections group—people overdue on the index date and people still overdue at 3 years—the project team calculated the proportion with any primary care encounters, and the median and IQR for the number of primary care encounters in the 3 years before and 3 years after the index date.

The project team completed STROBE and RECORD checklists (Appendix Table 1).¹⁴ The Hamilton Integrated Research Ethics Board approved the study.

A priori estimates were that there would be 3,000 men and 250 women eligible for colorectal cancer screening and 250 breast cancer screen-eligible women. With anticipated breast cancer screening rates of 55% in the corrections group and 65% in the general population and anticipated colorectal cancer screening rates of 50% in the corrections group and 60% in the general population,¹⁵ and a two-sided α of 0.05, the study power would be >0.8 to estimate screening prevalence within 7% for breast cancer, within 2% for men for colorectal cancer, and within 7% for women for colorectal cancer.

RESULTS

Of 53,955 people released from provincial correctional facilities in 2010, linkage was valid for 52,546 (97.4%; Appendix Figure 1). Applying inclusion and exclusion criteria, 249 women were eligible for breast cancer screening and 3,803 people for colorectal cancer screening in the corrections group, and 1,099,942 women were eligible for breast cancer screening and 2,757,584 people for colorectal cancer screening in the general population (Appendix Figure 1).

Table 1 shows sociodemographic characteristics of study participants. For the corrections group, the median length of the admission after the index date was 8 days (IQR, 2–43) for colorectal cancer screen-eligible individuals and 5 days (IQR, 2–23) for breast cancer screen-eligible individuals; most individuals spent 0 days in correctional facilities in the 3 years before and 3 years after that admission.

For the corrections group, 77.1% of people eligible for colorectal cancer screening were overdue on the index date (Table 2), with no significant difference between the percentage of women and men who were overdue (77.5% of men and 72.2% of women; $p=0.07$). At 3 years after the index date, 62.6% were still overdue for colorectal cancer screening. Of women eligible for breast cancer screening, 65.9% were overdue on the index date, and more than half were still overdue for breast cancer screening at 3 years.

Of people who were up to date on the index date (i.e., not overdue), 0.8% (7/872) had been screened for colorectal cancer while in a provincial correctional facility and 0% (0/85) had been screened for breast cancer in a provincial correctional facility. Of those who were overdue on the index date but screened in the subsequent 3 years, 2.4% (13/550) were screened for colorectal cancer and 0.0% (0/34) were screened for breast cancer while in a provincial correctional facility.

The percentage overdue for both colorectal and breast cancer screening on the index date was significantly higher for the corrections group compared with the general population ($p<0.001$; Table 2), with an RR of being overdue of 1.53 (95% CI=1.50, 1.55) for colorectal cancer screening and 2.25 (95% CI=2.06, 2.46) for breast cancer screening. The percentage of people still overdue at 3 years after the index date was also significantly higher for the corrections group compared with the general population group ($p<0.001$), with an RR of still being overdue of 1.87 (95% CI=1.82, 1.91) for colorectal cancer screening and 2.58 (95% CI=2.29, 2.91) for breast cancer screening.

Most people in the corrections group accessed primary care in the 3 years prior to the index date and in the 3 years after the index date (Table 3). For those who were overdue for breast cancer screening on the index date, 78% had had at least one encounter in the 3 years prior and the median number of encounters was 11 (IQR, 2–32). For those who were overdue for colorectal cancer screening on the index date, 74.4% had had at least one encounter in the prior 3 years and the median number of encounters was 6 (IQR, 0–17). The proportion with any encounters and the median number of encounters was also high for people overdue on the index date and still

Table 1. Characteristics of People Released From Provincial Correctional Facilities and the General Population in Ontario, Canada

| Characteristics on index date ^a | Colorectal cancer screen-eligible, n (%) | | Breast cancer screen-eligible, n (%) | |
|---|--|-------------------------------------|--------------------------------------|-------------------------------------|
| | Corrections group (N=3,803) | General population (N=2,757,584) | Corrections group (N=249) | General population (N=1,099,942) |
| Age group, ^b years | | | | |
| <60 | 2,770 (72.8) | 1,346,723 (48.8) | 111 (44.6) | 285,172 (25.9) |
| 60–69 | 966 (25.4) | 1,168,394 (42.4) | 87 (34.9) | 410,719 (37.3) |
| 70–72 | 67 (1.8) | 242,467 (8.8) | 51 (20.5) | 404,051 (36.7) |
| Sex | | | | |
| Male | 3,486 (91.7) | 1,264,100 (49.5) | – | – |
| Female | 317 (8.3) | 1,393,484 (50.5) | 249 (100) | 1,099,942 (100) |
| Self-reported race | | | | |
| Aboriginal | 168 (4.4) | – | 11 (4.4) | – |
| Black | 222 (5.8) | – | 7 (2.8) | – |
| White | 2,565 (67.4) | – | 163 (65.5) | – |
| Asian ^c | 244 (6.4) | – | 9 (3.6) | – |
| Hispanic | 22 (0.6) | – | 0 (0.0) | – |
| Other ^d | 582 (15.3) | – | 59 (23.7) | – |
| Neighborhood income quintile (1=lowest) | | | | |
| 1 | 1,299 (34.2) | 497,221 (18.0) | 91 (36.5) | 191,157 (17.4) |
| 2 | 793 (20.9) | 541,461 (19.6) | 52 (20.9) | 212,560 (19.3) |
| 3 | 613 (16.1) | 543,447 (19.7) | 40 (16.1) | 215,982 (19.6) |
| 4 | 496 (13.0) | 570,539 (20.7) | 28 (11.2) | 230,269 (20.9) |
| 5 | 368 (9.7) | 589,081 (21.4) | 21 (8.4) | 244,164 (22.2) |
| Time in provincial correctional facility, median (IQR), days | | | | |
| 3 years before index date ^a | 0 (0–7) | – | 0 (0–3) | – |
| Index admission ^a | 8 (2–43) | – | 5 (2–23) | – |
| 3 years after index admission ^a | 0 (0–19) | – | 0 (0–2) | – |

^aIndex date is the date of the admission leading to the initial release in 2010 in the corrections group or July 1, 2010 for the general population group. Index admission is the admission starting on the index date.

^bAge category <60 years includes adults aged 52 to 59 years for colorectal cancer screening and aged 53 to 59 years for breast cancer screening; Age category 60–69 years includes only adults aged 60–66 years for breast cancer screening.

^cIncludes South Asian, Southeast Asian, West Asian/Arabic.

^dIncludes other racial origin, declined to specify, and racial origin unknown.

overdue at 3 years for colorectal and breast cancer screening, respectively.

DISCUSSION

People who experienced imprisonment were significantly more likely to be overdue for breast and colorectal cancer screening than the general population. In the corrections group, almost two thirds of eligible women were overdue for breast cancer screening on admission to the correctional facility, twice the proportion overdue in the general population. Three quarters of individuals who were eligible for colorectal cancer screening were overdue for screening at the time of admission to the correctional facility, one and a half times the proportion overdue in

the general population. Three years later, the proportion overdue remained high, at more than half of breast cancer screen-eligible women and almost two thirds of colorectal screen-eligible people in the corrections group. The majority of people in the corrections group who did not access screening accessed primary care during the study period, and many had multiple primary care encounters.

In this study, the proportion of women in correctional facilities who were up to date for breast cancer screening status was lower than that found in two U.S. studies, at 34.1% compared with 41% in the California study and 58% in the Rhode Island study.^{7,8} Similarly, the proportion of people up to date for colorectal cancer screening status was lower than the proportion found in the California study, at 22.9% compared with 31%.⁷ These differences

Table 2. Cancer Screening Status of People Released From Provincial Correctional Facilities and the General Population in Ontario, Canada

| Cancer screening status | Corrections group | General population |
|--|-------------------|---------------------|
| Colorectal | | |
| Overdue on index date ^a | | |
| n/N | 2,931/3,803 | 1,393,400/2,757,584 |
| % (95% CI) | 77.1 (74.3, 79.9) | 50.5 (50.5, 50.6) |
| RR ^b (95% CI) | 1.53 (1.50, 1.55) | ref |
| ARR ^c (95% CI) | 1.44 (1.42, 1.46) | ref |
| Still overdue at 3 years after index date ^a | | |
| n/N | 2,381/3,803 | 925,277/2,757,584 |
| % (95% CI) | 62.6 (60.1, 65.2) | 33.6 (33.5, 33.6) |
| RR ^b (95% CI) | 1.87 (1.82, 1.91) | ref |
| ARR ^c (95% CI) | 1.72 (1.68, 1.76) | ref |
| Breast | | |
| Overdue on index date ^a | | |
| n/N | 164/249 | 321,991/1,099,942 |
| % (95% CI) | 65.9 (56.2, 76.8) | 29.3 (29.2, 29.4) |
| RR ^b (95% CI) | 2.25 (2.06, 2.46) | ref |
| ARR ^c (95% CI) | 1.99 (1.83, 2.17) | ref |
| Still overdue at 3 years after index date ^a | | |
| n/N | 130/249 | 222,192/1,099,942 |
| % (95% CI) | 52.2 (43.6, 62.0) | 20.2 (20.1, 20.3) |
| RR ^b (95% CI) | 2.58 (2.29, 2.91) | ref |
| ARR ^c (95% CI) | 2.29 (2.04, 2.58) | ref |

^aIndex date is the date of the admission leading to the initial release in 2010 in the corrections group or July 1, 2010 for the general population group.

^bRR=unadjusted relative risk.

^cARR=adjusted relative risk, which is the relative risk adjusted for neighborhood income quintile.

Table 3. Primary Care Encounters for People Released From Provincial Correctional Facilities in Ontario, Canada, by Cancer Screening Status

| Screening status | Primary care encounter in 3 years before index date ^a | | Primary care encounter in 3 years after index date ^a | |
|---|--|--------------|---|--------------|
| | Any, n (%) | Median (IQR) | Any, n (%) | Median (IQR) |
| Colorectal | | | | |
| All, N=3,803 | 3,009 (79.1) | 8 (1–20) | 3,292 (86.6) | 9 (2–20) |
| Overdue on index date, ^a N=2,931 | 2,182 (74.4) | 6 (0–17) | N/A | N/A |
| Still overdue at 3 years after index date, ^a N=2,381 | 1,704 (71.6) | 5 (0–16) | 1,946 (81.7) | 6 (1–17) |
| Breast | | | | |
| All, N=249 | 209 (83.9) | 14 (4–30) | 226 (90.8) | 12 (4–24) |
| Overdue on index date, ^a N=164 | 128 (78.0) | 11 (2–32) | N/A | N/A |
| Still overdue at 3 years after index date, ^a N=130 | 97 (74.6) | 10 (0–33) | 111 (85.4) | 7 (2–25) |

^aIndex date is the date of the admission leading to the initial release in 2010 in the corrections group. N/A, not applicable.

may be due in part to the use of administrative data in this study rather than self-reported data, which could overestimate cancer screening.^{16,17} Because differences in screening rates between this study and these U.S. studies were large, the authors propose that at least part of the difference in

screening rates is likely real. The lower screening rate in this study is surprising given universal healthcare coverage in Ontario. This large difference and low absolute screening rates suggest that substantial barriers to screening exist for this population and that lack of universal health insurance

is not the sole barrier to screening in the U.S. context. Also of note, this study's findings of the percentage overdue in the general population in Ontario were similar to those in provincial reports.¹⁵

Limitations

This study has several potential limitations. Although the rate of data linkage was high, some linkages may have been incorrect. This was likely uncommon, given the high proportion of direct or deterministic linkage. Some people in the general population group would have experienced imprisonment, such as a person released from a provincial correctional facility in 2009 but not also released in 2010. This exposure misclassification would likely have had a small effect given the large size of the general population group, and any bias would have been conservative. People eligible for screening on the basis of clinical indication, such as family history, were not identified, and it was not possible to differentiate tests done for screening or diagnostic purposes. Screening tests that took place in a hospital, outside of Ontario, on First Nations, or in federal prison were not captured. Though these potential sources of bias may have differentially affected the corrections and general population groups, it is unlikely that they would have substantially affected the results. The breast cancer screening interval in this study was 3 years,¹³ whereas current provincial guidelines in Ontario recommend an interval of 2 years.¹⁸ In the context of conflicting guidance, the relatively long period was selected to provide a conservative estimate of testing participation. This study reports screening status between 2008 and 2010, and over the subsequent 3 years. Although the proportion of people accessing screening may have improved since these data were collected, the difference in screening rates likely persists between people in correctional facilities and the general population because no specific policy or program has been implemented in provincial correctional facilities. Finally, this study examined screening rates and did not assess for an independent association between imprisonment and screening or between imprisonment status and screening. The RR of being overdue for screening remained positive after adjusting for neighborhood income quintile, but in the corrections group there is overrepresentation of other factors that may be associated with not accessing cancer screening and for which the authors did not adjust, such as black and Indigenous race and mental illness. These unadjusted (and partially adjusted) data showing relatively low screening rates highlight the need for a focus on this population and this setting for cancer prevention activities.

The low rates of colorectal and breast cancer screening in the corrections group are striking, in absolute terms and compared with the rates for the general population, and indicate a missed opportunity to prevent cancer in this population. Most people who were not screened accessed primary care during the study period. Given the high burden of comorbidity in this population,^{3,4} the attention of patients and healthcare providers during primary care encounters may be focused on specific conditions at the cost of other health conditions and preventive care.¹⁹ Especially in the period after release from correctional facilities, people who experience imprisonment have many urgent needs^{20–22} and may access primary care to address these issues rather than for preventive care.

These issues notwithstanding, if colorectal and breast cancer screening indicate primary care quality, this study reveals that primary care quality is suboptimal for the corrections population. Further, a substantial proportion of people in the corrections group did not access any primary care in the 3 years before and 3 years after the index date, respectively, suggesting there may also be substantial barriers to access to primary care. As most people spent only a few days in provincial correctional facilities over the study period, these data mainly reflect the quality and accessibility of primary care in the community rather than in correctional facilities.

Community- and corrections-based clinical and public health services could collaborate to define and address health promotion and healthcare needs for this population, for example through health promotion focused on preventive care,²³ linkage with population-based screening programs^{24,25} and community-based primary care,²⁶ and education of healthcare providers about the need for preventive care for people who experience imprisonment.

CONCLUSIONS

This population-based study found relatively low levels of participation in colorectal and breast cancer screening among people who experience imprisonment, despite substantial use of primary care. To enhance population-based strategies to prevent cancer, efforts should be made in screening initiatives to include people who experience imprisonment, and to include correctional settings as a place to promote health and provide or link with programs and care.

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Regarding author contributions, Fiona Kouyoumdjian conceived of the study. All authors contributed to the project design. Kinwah Fung and Fiona Kouyoumdjian conducted analyses. Fiona Kouyoumdjian and Andres McConnon wrote the initial draft of the manuscript and all authors revised the manuscript and approved the final draft.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <https://doi.org/10.1016/j.amepre.2018.11.011>.

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