# Association of marginalization and PSMA-PET in prostate cancer: An analysis of the Ontario PSMA-PET Registry for Recurrent Prostate Cancer

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## ABSTRACT

**Introduction:** Prostate-specific membrane antigen positron emission tomography (PSMA PET) is a new standard for the imaging of high-risk or recurrent prostate cancer. While marginalization disparities exist for prostate cancer, less is known in the context of PSMA PET. The objective of the study was to determine if marginalization was associated with access, PET positivity, management change, radiation use, and survival of prostate cancer in a universal healthcare system.

## KEY MESSAGES

- In Ontario, Canada, access to PSMA PET is available through a prospective, multicenter registry and is covered by the Provincial Health Agency.
- Prior studies have shown differences between prostate cancer socioeconomic group in the Ontario prostate cancer context.
- We found lower socioeconomic groups were under-represented among men receiving PSMA PET, like Ontario Diagnostic and Survivor cohorts.
- We found no association of marginalization disparities with PET positivity, management change, or radiation use among those receiving PSMA PET.

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**Methods:** Patients enrolled in the Ontario PSMA PET Registry for Recurrent Prostate Cancer (PREP) between 2018 and 2022 were included. The Ontario Marginalization Index (material resources, racialized/newcomer, age/labor force, household/dwellings) was used. Outcomes included access, PET positivity, management change, radiation use, and survival. Cox proportional hazards and logistic regression models examined the association between marginalization and outcomes. Provincial administrative databases were leveraged to generate a diagnosis and a survivorship cohort of prostate cancer patients who received primary treatment to compare with the PSMA PET cohort.
**Results:** There were 4034 patients in the PSMA PET cohort. Patients at higher material marginalization quintiles were under-represented in the PSMA PET Registry Database. Similar under-representation was noted in the diagnosis (n=123 128) and survival (n=56 753) cohorts. Within the PSMA cohort, marginalization dimensions were not significantly correlated with PET positivity, management change, or radiation use.
**Conclusions:** Marginalization quintiles across PSMA PET access were similar in distribution to prostate cancer diagnoses and survivor cohorts. We found no association of marginalization with PET positivity, management change, or radiation use among those receiving PSMA PET.

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## INTRODUCTION

Prostate Specific Membrane Antigen (PSMA) positron emission tomography (PET) is a new standard for the imaging of men with prostate cancer. There are recommendations by the American Urology Association, Society of Urologic Oncology and American Society for Radiation Oncology in using PSMA PET in staging of high-risk prostate cancers as well as in the biochemical recurrent and metastatic settings [1,2]. PSMA PET tracers have been demonstrated to have higher sensitivity and specificity for detecting small-volume metastatic disease as compared to conventional imaging [4]. This increased accuracy has led to changes in clinical management as demonstrated by the FALCON trial that found the PSMA PET scan resulted in a change of management in 64% of biochemical recurrent patients [5]. Management change in the PREP cohort has also been previously described demonstrating a change in 58% of the enrolled patients [6].

In Ontario, Canada, initial access to PSMA PET was available through the prospective multicenter PSMA PET for Recurrent Prostate Cancer (PREP) registry. This registry was launched in 2018 and offered the scans at six academic hospitals across the province of Ontario using the PSMA tracer ($^{18}$F)–DCFPyL [3] under a Health Canada Clinical Trials Application as there were no Health Canada approved PSMA PET radiopharmaceuticals at the time the Registry was launched.

Canada has universal access to healthcare, including cancer care services, through a public single payer system. However, even in the context of publicly funded healthcare,


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socioeconomic status (SES) disparities can exist in prostate cancer. A previous study in Manitoba, Canada reported that as income levels increased, patients were more likely to receive radical prostatectomy rather than radiation for localized prostate cancer [7]. In addition, lower income prostate cancer patients had reduced survival compared to higher income patients in the Danish public healthcare system [8]. However, less is known regarding SES in the context of PSMA PET. One objective of this study was to determine if marginalization was associated with PSMA PET access, PET positivity, management change, radiation utilization and survival of prostate cancer patients in a universal health care system. For example, increased marginalization might be anticipated to result in delays in access to appropriate diagnostics like PSMA PET or reduced access to therapies required after diagnosis like radiotherapy.

## METHODS

### Study cohorts and data sources

The Ontario PSMA PET Registry for Recurrent Prostate Cancer (PREP) as well as provincial administrative databases were used to conduct this study. Patients who received a PSMA PET scan were identified from the prospective PREP registry (NCT03718260). Details regarding the registry have been described previously [6]. In summary, patients were included between December 2018 and September 2022 if they met criteria into one of six predefined cohorts. Cohort 1 included patients who were node-positive or had persistently detectable PSA within 3 months after radical prostatectomy. Cohort 2 included patients with biochemical failure after initial radical prostatectomy. Cohort 3 included patients with biochemical failure after radical prostatectomy followed by adjuvant salvage pelvic radiotherapy. Cohort 4 included biochemical failure after radical prostatectomy despite salvage hormone therapy. Cohort 5 included biochemical failure after radical prostatectomy following lesion-directed treatment or oligometastatic disease. Cohort 6 included biochemical failure following primary radiation therapy. A small number of patients were imaged under "Cohort 7" as an adjudicated access process for indications outside of the other clinical scenarios. Patients reported here were limited to the Cohorts 1-6 patients. Patients initially were required conventional imaging including CT abdomen/pelvis and bone scan within 3 months prior to study enrollment and PET imaging in order to rule out extensive metastases based on conventional imaging. In 2020, eligibility criteria were changed to require conventional imaging for Cohorts 1-6 only if the PSA at enrollment was more than 10ng/ml given the low diagnostic yield of conventional imaging for extensive metastases at lower PSA levels. Patients were excluded if the prostate cancer has substantial sarcomatoid, spindle cell or neuroendocrine small cell components, extensive metastatic disease with conventional scans (>4 metastatic sites), prior PSMA PET within 6 months and Eastern Cooperative Oncology Group (ECOG) performance status >1.

### Ontario marginalization index (ONMARG)

The Ontario Marginalization Index (incorporating metrics of material resources, racialized and newcomer, age and labour force, and household and dwellings) was used to assess measures of


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marginalization [9]. The measures are based on data from the dissemination areas of the Canadian Census. The first quintile represents the least marginalized while the fifth quintile represents the most marginalized.

Material resources indicators include proportion of the population unemployed, low-income, no high-school diploma, lone parent families, total income from government transfer payments and living in dwellings in need of repair. Racialized and newcomer indicators including proportion of the population who are recent immigrants or who self-identify as a visible minority. Age and labour force indicators include proportion of the population aged 65 and not participating in labour force. Housing and dwellings indicators include proportion of the population living alone, in apartment buildings, in dwellings not owned, single/divorced/widowed, moved in the past 5 years and number of persons per dwelling.

Marginalization was compared with a diagnosis cohort and survivorship cohort. The diagnosis cohort consisted of patients with incident prostate cancer diagnosis between November 2018 and March 2023 identified from the Ontario Cancer Registry (OCR). Patients were excluded if they had missing marginalization information. The survivorship cohort consisted of patients among the diagnosis cohort who were alive on March 31 2023 and who received primary cancer treatment at least one year prior. Patients were excluded if they had stage IV cancer or no evidence of a cancer treatment.

**Radiation utilization**

A key management change resulting from PSMA PET is the utilization of lesion directed therapy like stereotactic radiation. Access to radiation treatments can potentially also be affected by marginalization. We examined radiation utilization as a function of marginalization among the PSMA PET cohort. Radiation treatment information were retrieved from the Cancer Activity Level Reporting (ALR).

**Patient characteristics**

Age was defined as age at time of scan. Residence (urban vs rural) and neighbourhood income quintile (after tax) was retrieved from the Canadian Census. PSA at baseline was defined at time of PSMA PET scan. Time between primary treatment and PSMA PET scan was categorized as $<2$ vs $\geq 2$ years. Conventional imaging included CT, MRI or bone scan. Metastasis type included bone only, lymph node only, mixed, viscera only and none. Extent of metastasis derived from PSMA PET included no local only, locoregional failure, extensive metastasis, oligometastatic and no metastasis.

**Outcomes**

Outcomes included access, survival, PET positivity, management change and radiation utilization. PET positivity was based on a positive PSMA PET result. Management change was based on the pre-PET and post-PET questionnaires completed by the referring physician as part of the registry documenting intended treatment. Radiation utilization was identified in the ALR and was defined as use within 6 months of the PSMA PET scan.


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### Statistical analysis

Descriptive analyses were performed using chi-squared test to compare proportions within categorical variables and analysis of variance (ANOVA) test to compare means of continuous variables between pre- and post-regionalization intervals. We used logistic regression models to assess the association between each of the four ONMARG dimensions and PET positivity, change in management, and radiation use with adjustment for covariates. We reported odds ratios (ORs) of outcome in ONMARG dimension quintiles 2–5 vs quintile 1 (least marginalized) with 95% confidence intervals. We also used Cox proportional hazards models and reported hazards ratios (with 95% CIs) of all-cause mortality following PSMA PET scan in ONMARG dimension quintiles 2–5 vs quintile 1.

For model covariates, we adjusted for age, patient residence, neighborhood income quintile, time between primary treatment and scan, patient recruitment phase, biochemical failure type, PSA at the time of scan, extent of metastasis derived from PSMA PET (not included in the logistic regression models where our binary outcome was PET positivity), and treatment management change (only included in logistic regression models where our binary outcome was radiation use).

Neighborhood after tax income quintile was not included as a covariate in the logistic or Cox proportional hazards models which included ONMARG material resources marginalization to avoid multicollinearity between these variables. Similarly, residence type was not included in the models which included ONMARG household and dwelling marginalization and age was excluded as a covariate from the model that included age and labour force marginalization. All covariates were chosen *a priori*.

Additionally, we used univariate logistic regression models to calculate odds ratios associated with being from the diagnosis cohort vs the PSMA PET cohort and the survivorship cohort vs the PSMA PET cohort within each of the ONMARG dimension quintiles.

Analyses were conducted using SAS software version 9.4 (Cary, NC).

## RESULTS

### Baseline characteristics

The baseline characteristics of the 4,034 patients identified in the PSMA PET cohort is described in Table 1. The median age was 71 years. Eighty-eight percent of the cohort lived in urban residence as compared to 12% who lived rural residence. Patients from the highest material resources marginalization quintile were more likely to be from urban residences as compared to the lowest quintile (92.7% vs 90.3%, 0<0.0001). When stratified by material resources marginalization, there was no difference in baseline disease characteristics across the marginalization quintiles including baseline PSA (p=0.71), Gleason grade (p=0.83) and metastases type (p=0.39).

The time between primary treatment and PSMA PET scan for the majority of patients (76.9%) was more than 2 years. The overall PSMA PET positivity rate was 70.5%. Findings of


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the PSMA PET included local disease (16.4%), locoregional failure (16.8%), oligometastatic (24.8%), extensive metastases (12.5%) and negative (29.5%).

**Access**

Patients at higher material marginalization quintiles were under-represented in the PSMA PET cohort (Q1 27.81%, Q2 22.58%, Q3 19.33%, Q4 17.29%, Q5 13.00%).

We compared access among patients in the PSMA PET cohort with two other provincial cohorts. Under-representation at higher material marginalization quintiles of the PSMA PET cohort were also demonstrated in the diagnosis cohort (N=123,128) and a survival cohort (N=56,753). Similar to the PSMA PET cohort, under-representation was also noted in the diagnosis (Q1 23.7%, Q2 22.5%, Q3 20.0%, Q4 17.7%, Q5 16.0%) and survival (Q1 23.7%, Q2 21.9%, Q3 20.1%, Q4 18.2%, Q5 16.0%) cohorts (Table 2).

Patients in the least marginalized quintile were significantly more likely to be in the PSMA cohort as compared to the diagnosis (Q1 OR 1.24 [1.16-1.34; p<0.0001) or survival (Q1 OR 1.24 [1.15-1.33]; p<0.0001) cohort. Meanwhile, patients in the most marginalized quintile were less likely to be in the PSMA cohort as compared to the diagnosis (Q5 OR 0.78 [0.71-0.86; p<0.0001) or survival (Q5 OR 0.78 [0.71-0.86; p<0.0001) cohorts (Supplementary Table 1).

**PET positivity, management change, radiation utilization**

Within the PSMA PET cohort, there was no difference in PET positivity (p=0.60), management change (p=0.99) or radiation utilization (p=0.11) across the material resources marginalization quintiles as demonstrated in Figure 1. Table 3 reports the odds ratios for PET positivity, management change and radiation utilization by all Ontario marginalization index dimensions. Marginalization quintiles was not significantly correlated with PET positivity (material p=0.94, racialized/newcomer p=0.04, age/labour p=0.72, household/dwellings = 0.56), change in management (material p=0.40, racialized/newcomer p=0.86, age/labour p=0.06, household/dwellings = 0.99) or radiation utilization (material p=0.96, racialized/newcomer p=0.25, age/labour p=0.05, household/dwellings = 0.30).

**Survival**

After adjusting for patient factors, increased material marginalization was positively correlated with increased all-cause mortality (adjusted hazards ratio (95% CI) vs Q1: Q2: 1.02 (0.59-1.75), Q3: 1.67 (1.01-2.76), Q4: 1.81 (1.07-3.07), Q5: 1.44 (0.76-2.67) (Table 4). The Cox proportional hazards model for material marginalization is reported in Figure 2.

**DISCUSSION**

Lower resource population were less commonly represented in the PSMA PET cohort and distributions were comparable to the general prostate cancer diagnosis and survivorship cohorts. As material marginalization increased, there was a gradient of increasing all-cause mortality, however PSMA PET related parameters and outcomes were not affected. This includes no association of marginalization with PET positivity, management change or radiation utilization


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among those receiving PSMA PET. The finding that the lowest marginalization quintile was also less likely to be represented in the diagnostic and treatment cohorts suggests that inequities to appropriate prostate care may lie primarily at the "front end" of access with less inequities experienced among men who are already "in the system", receiving care [10,11].

In a previous study Washington and Deville Jr. reviewed inequities in diagnostic imaging for prostate cancer and found race, age and SES as important variables. Patients with higher income were more likely to receive imaging appropriate according to guidelines [12]. In an analysis of the SEER-Medicare database in the United States, patients in the highest income quintiles were more likely to have overutilization of bone scans and pelvic CT/MRIs [13]. In Australia, with the introduction of a government rebate, access to MRI for prostate cancer staging improved in disadvantaged populations as measured by the IRSAD (Index of Relative Socioeconomic Advantage and Disadvantage). However, access to PET imaging remained poor in patients with lower SES at the time of the analyses with the absence of federal funding [14]. This highlights the need to consider socioeconomic factors to ensure optimal use of diagnostic imaging in men with prostate cancer.

To our knowledge, this is the first study assessing the impact of marginalization on PSMA PET utilization. Strengths of the study includes province-wide access to PSMA PET with linkages to provincial databases for outcomes like survival and radiation utilization. In addition, marginalization quintiles for the PSMA PET cohort were compared to large diagnosis and survivor cohorts to allow for comparability to the general prostate cancer population.

Limitations of the study include use of data restricted based on available databases. For example, access to data like PSA laboratory data, pathologic grade, utilization of systemic therapies and interventions other than radiation utilization was not available for our analysis. In addition, the Ontario Marginalization Index is designed to measure marginalization at an area level. This means it may not accurately reflect individual experiences of marginalization. Our study findings must also be carefully considered when comparing to other regions in Canada and cannot be generalized to non-universal healthcare systems. Additionally, race and ethnicity were not available, although visible minorities are partly accounted for in the racialized and newcomer indicator in the Ontario Marginalization Index. Stern et al. [15] have noted that there was a lower risk of prostate cancer-specific mortality among South Asian men in Canada. While Black men has been established as a risk factor for prostate cancer mortality, there was no observation of increased risk of prostate-cancer mortality among Black men in that study. As investigated by Patki et al. [16], there is poor reporting of race, ethnicity, socioeconomic status and education attainment in randomised trials in prostate cancer. Of 256 trials, only 3 reported education attainment and 1 reported socioeconomic status. We support the call for continued need in research in disparities, even in universal healthcare systems.

In conclusion, there was no additional disparities noted for patients in accessing PSMA PET compared to the marginalization quintile distributions for prostate cancer diagnoses and survivors. We further found no association of marginalization with PET positivity, management


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change or radiation utilization among those receiving PSMA PET. Taken together, our data suggests equitable access to appropriate prostate care diagnostics and therapies in general is an overarching concern versus additional factors specific to PET scanning. Identifying disparities will help to improve equitable access of healthcare resources, such as PSMA PET, in the future.

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## REFERENCES

1. Eastham JA, Auffenberg GB, Barocas DA, et al. Clinically localized prostate cancer: AUA/ASTRO guideline, part I: Introduction, risk assessment, staging, and risk-based management. *J Urol* 2022;208:10-8. https://doi.org/10.1097/JU.0000000000002757
2. Lowrance W, Dreicer R, Jarrard DF, et al. Updates to advanced prostate cancer: AUA/SUO guideline (2023). *J Urol* 2023;209:1082-90. https://doi.org/10.1097/JU.0000000000003452
3. Young S, Metser U, Sistani G, et al. Establishing a provincial registry for recurrent prostate cancer: Providing access to PSMA PET/CT in Ontario, Canada. *Front Oncol* 2021;11:722430. https://doi.org/10.3389/fonc.2021.722430
4. Chow KM, So WZ, Lee HJ, et al. Head-to-head comparison of the diagnostic accuracy of prostate-specific membrane antigen positron emission tomography and conventional imaging modalities for initial staging of intermediate- to high-risk prostate cancer: A systematic review and meta-analysis. *Eur Urol* 2023;84:36-48. https://doi.org/10.1016/j.eururo.2023.03.001
5. Scarsbrook AF, Bottomley D, Teoh EJ, et al. Effect of (18)F-fluciclovine positron emission tomography on the management of patients with recurrence of prostate cancer: Results from the FALCON trial. *Int J Radiat Oncol Biol Phys* 2020;107:316-24. https://doi.org/10.1016/j.ijrobp.2020.01.050
6. Metser U, Zukotynski K, Mak V, et al. Effect of 18F-DCFPyL PET/CT on the management of patients with recurrent prostate cancer: Results of a prospective multicenter registry trial. *Radiology* 2022;303:414-22. https://doi.org/10.1148/radiol.211824
7. Oake JD, Harasemiw O, Tangri N, et al. The association between income status and treatment selection for prostate cancer in a universal health care system: A population-based analysis. *J Urol* 2021;206:1204-11. https://doi.org/10.1097/JU.0000000000001942
8. Dalton SO, Olsen MH, Johansen C, et al. Socioeconomic inequality in cancer survival—Changes over time. A population-based study, Denmark, 1987-2013. *Acta Oncol* 2019;58:737-44. https://doi.org/10.1080/0284186X.2019.1566772
9. St. Michael's Hospital (Unity Health Toronto) and Public Health Ontario. *2021 Ontario marginalization index: User guide*. Toronto, ON; 2023.
10. de Jager P, Aleman D, Baxter N, et al. Social determinants of access to timely elective surgery in Ontario, Canada: A cross-sectional population-level study. *CMAJ Open* 2023;11:E1164-80. https://doi.org/10.9778/cmajo.20230001
11. Zygmunt A, Kendall CE, James P, et al. Avoidable mortality rates decrease but inequity gaps widen for marginalized neighborhoods: A population-based analysis in Ontario, Canada from 1993 to 2014. *J Community Health* 2020;45:579-97. https://doi.org/10.1007/s10900-019-00778-8
12. Washington C, Deville CJ. Health disparities and inequities in the utilization of diagnostic imaging for prostate cancer. *Abdom Radiol (NY)* 2020;45:4090-6. https://doi.org/10.1007/s00261-020-02657-6
13. Falchook AD, Hendrix LH, Chen RC. Guideline-discordant use of imaging during work-up of newly diagnosed prostate cancer. *J Oncol Pract* 2015;11:e239-46. https://doi.org/10.1200/JOP.2014.001818

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14. Kelly BD, Perera M, Bolton DM, et al. Social determinants of health: Does socioeconomic status affect access to staging imaging for men with prostate cancer? *Prostate Cancer Prostatic Dis* 2023;26:429-31. https://doi.org/10.1038/s41391-022-00508-7
15. Stern N, Ly TL, Welk B, et al. Association of race and ethnicity with prostate cancer-specific mortality in Canada. *JAMA Netw Open* 2021;4:e2136364. https://doi.org/10.1001/jamanetworkopen.2021.36364
16. Patki S, Aquilina J, Thorne R, et al. A systematic review of patient race, ethnicity, socioeconomic status, and educational attainment in prostate cancer treatment randomized trials—is the evidence base applicable to the general patient population? *Eur Urol Open Sci* 2023;54:56-64. https://doi.org/10.1016/j.euros.2023.05.015

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## FIGURES AND TABLES

**Figure 1.** Distribution of positron emission tomography (PET) positivity, management change, and radiation utilization of the prostate-specific membrane antigen (PSMA) PET cohort across material resources marginalization quintiles.

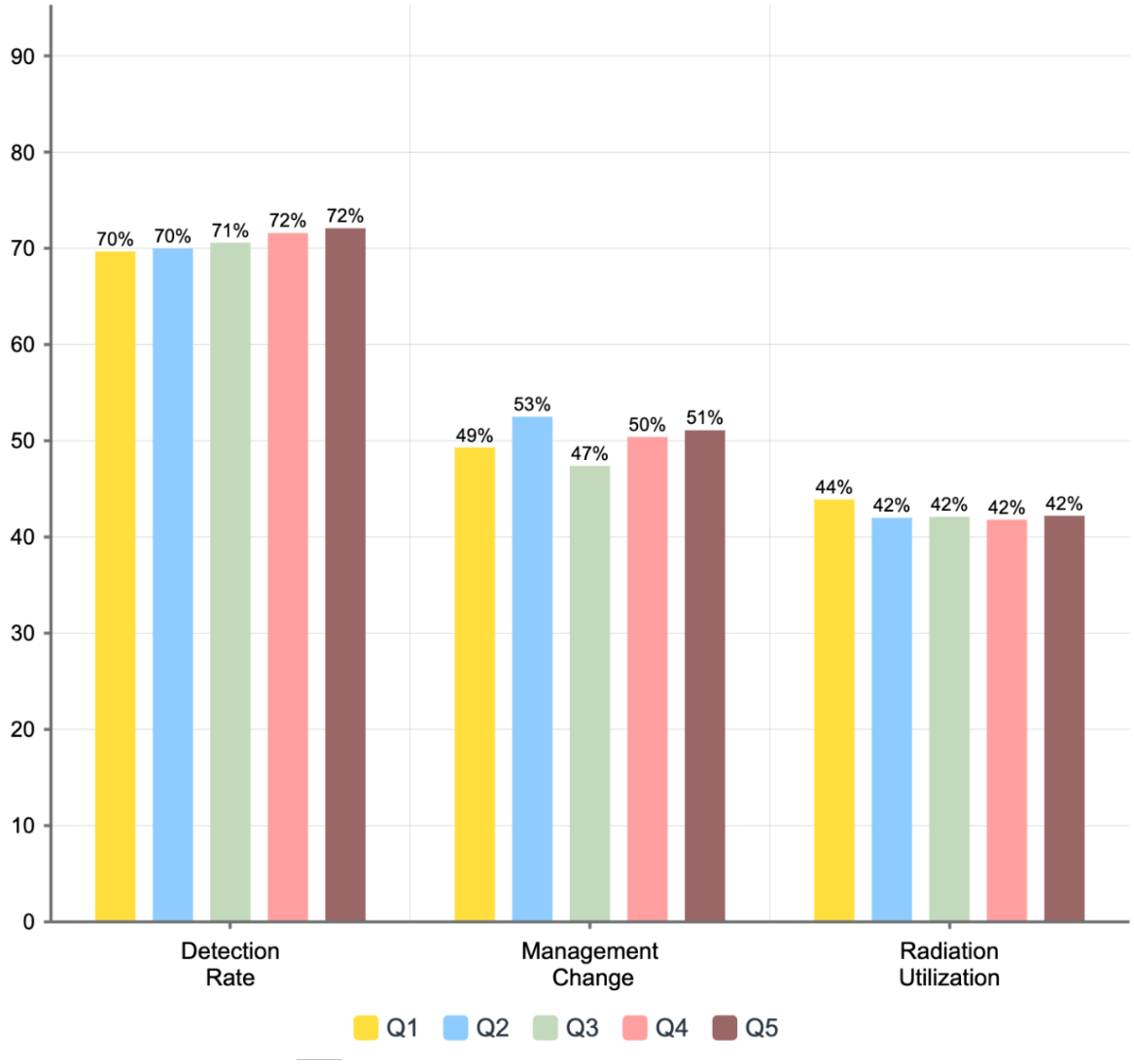



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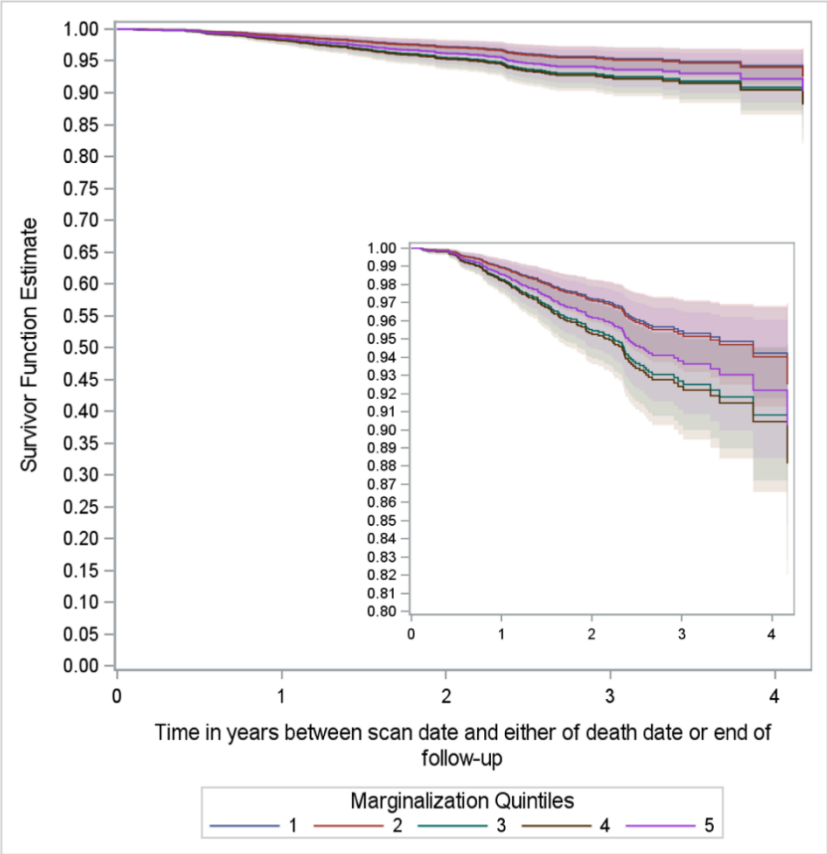
**Figure 2.** Cox proportional hazards model by Ontario Marginalization Index material resources marginalization dimension.




| **Table 1. Baseline characteristics for patients stratified by Ontario Materialization Index material resources marginalization dimension** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Characteristic** | **Total** (n=4034) | **Quintile 1** (n=1124) | **Quintile 2** (n=910) | **Quintile 3** (n=778) | **Quintile 4** (n=700) | **Quintile 5** (n=523) | **p** |
| Age | 71.0 (66.0–76.0) | 72.0 (67.0–76.0) | 71.0 (66.0–76.0) | 71.0 (67.0–75.0) | 72.0 (67.0–76.0) | 71.0 (65.0–76.0) | 0.0691 |
| Residence | | | | | | | **<0.0001** |
| Urban | 3546 (88.0%) | 1011 (90.3%) | 777 (85.6%) | 663 (85.2%) | 610 (87.1%) | 485 (92.7%) | |
| Rural | 483 (12.0%) | 109 (9.7%) | 131 (14.4%) | 115 (14.8%) | 90 (12.9%) | 38 (7.3%) | |
| Neighborhood income quintile | | | | | | | |
| 1 | 558 (13.8) | | | | | | |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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 715 (17.7) | | | | | | |
| 3 | 800 (19.8) | | | | | | |
| 4 | 843 (20.9) | | | | | | |
| 5 | 1118 (27.7) | | | | | | |
| PSA at baseline | | | | | | | 0.7107 |
| <0.3 ng/mL | 868 (21.5) | 451 (11.2) | 133 (11.8) | 104 (11.4) | 88 (11.3) | 69 (9.9) | |
| 0.3–<0.5 ng/mL | 451 (11.2) | 507 (12.6) | 136 (12.1) | 116 (12.7) | 87 (11.2) | 102 (14.6) | |
| 0.5–<1.0 ng/mL | 507 (12.6) | 2209 (54.7) | 603 (53.6) | 497 (54.6) | 424 (54.5) | 394 (56.3) | |
| 1.0+ ng/mL | 2209 (54.7) | 868 (21.5) | 252 (22.4) | 193 (21.2) | 179 (23.0) | 135 (19.3) | |
| Time between primary treatment and scan | | | | | | | 0.0366 |
| 2+ years | 3081 (76.9) | 881 (79.3) | 705 (77.9) | 595 (76.8) | 505 (73.1) | 395 (75.7) | |
| <2 years | 923 (23.1) | 230 (20.7) | 200 (22.1) | 180 (23.2) | 186 (26.9) | 127 (24.3) | |
| Gleason grade group | | | | | | | 0.8319 |
| 1–3 | 1530 (74.2) | 1530 (74.2) | 420 (73.0) | 338 (74.4) | 301 (73.8) | 274 (74.1) | |
| 4–5 | 533 (25.8) | 533 (25.8) | 155 (27.0) | 116 (25.6) | 107 (26.2) | 96 (25.9) | |
| Conventional imaging | | | | | | | 0.5336 |
| Positive | 285 (24.7) | 285 (24.7) | 89 (25.9) | 67 (27.0) | 53 (25.2) | 42 (21.0) | |
| Negative | 871 (75.3) | 871 (75.3) | 254 (74.1) | 181 (73.0) | 157 (74.8) | 158 (79.0) | |
| PSMA PET result | | | | | | | 0.5989 |
| Positive | 2845 (70.5) | 2845 (70.5) | 775 (69.0) | 639 (70.2) | 550 (70.7) | 503 (71.9) | |
| Negative | 1190 (29.5) | 1190 (29.5) | 349 (31.0) | 271 (29.8) | 228 (29.3) | 197 (28.1) | |
| Metastasis type | | | | | | | 0.3850 |
| Bone only | 365 (9.0) | 365 (9.0) | 98 (8.7) | 85 (9.3) | 63 (8.1) | 73 (10.4) | |
| Lymph node only | 1331 (33.0) | 1331 (33.0) | 359 (31.9) | 312 (34.3) | 253 (32.5) | 236 (33.7) | |
| Mixed | 418 (10.4) | 418 (10.4) | 111 (9.9) | 104 (11.4) | 86 (11.1) | 67 (9.6) | |
| Viscera only | 69 (1.7) | 69 (1.7) | 15 (1.3) | 13 (1.4) | 19 (2.4) | 17 (2.4) | |
| None | 1852 (45.9) | 1852 (45.9) | 541 (48.1) | 396 (43.5) | 357 (45.9) | 307 (43.9) | |
| Derived finding | | | | | | | 0.2550 |
| Local only | 662 (16.4) | 662 (16.4) | 192 (17.1) | 125 (13.7) | 129 (16.6) | 110 (15.7) | |
| Locoregional failure | 678 (16.8) | 678 (16.8) | 190 (16.9) | 165 (18.1) | 121 (15.6) | 123 (17.6) | |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Extensive metastasis | 505 (12.5) | 505 (12.5) | 123 (10.9) | 121 (13.3) | 96 (12.3) | 93 (13.3) | |
| Oligometastatic | 1000 (24.8) | 1000 (24.8) | 270 (24.0) | 228 (25.1) | 204 (26.2) | 177 (25.3) | |
| No metastasis | 1190 (29.5) | 1190 (29.5) | 349 (31.0) | 271 (29.8) | 228 (29.3) | 197 (28.1) | |
| Patient cohort | | | | | | | 0.2118 |
| 1 | 248 (6.1) | 65 (5.8) | 56 (6.2) | 43 (5.5) | 49 (7.0) | 35 (6.7) | |
| 2 | 1461 (36.2) | 432 (38.4) | 314 (34.5) | 280 (36.0) | 246 (35.1) | 189 (36.1) | |
| 3 | 1020 (25.3) | 281 (25.0) | 255 (28.0) | 173 (22.2) | 184 (26.3) | 127 (24.3) | |
| 4 | 257 (6.4) | 65 (5.8) | 52 (5.7) | 55 (7.1) | 50 (7.1) | 35 (6.7) | |
| 5 | 171 (4.2) | 57 (5.1) | 30 (3.3) | 41 (5.3) | 21 (3.0) | 22 (4.2) | |
| 6 | 878 (21.8) | 224 (19.9) | 203 (22.3) | 186 (23.9) | 150 (21.4) | 115 (22.0) | |
| Treatment management change | 2016 (50.0) | 547 (48.7) | 475 (52.2) | 372 (47.8) | 355 (50.7) | 267 (51.1) | 0.3525 |
| Use of radiotherapy within 6 months following scan | 1716 (42.5) | 481 (42.8) | 392 (43.1) | 330 (42.4) | 292 (41.7) | 221 (42.3) | 0.9861 |
| Death | 139 (3.4) | 31 (2.8) | 24 (2.6) | 34 (4.4) | 31 (4.4) | 19 (3.6) | 0.1129 |

Data are presented as n (%) or median (interquartile range). Bold p-values represent statistical significance.

**Table 2. Ontario marginalization index quintiles stratified by PSMA-PET cohort, diagnosis cohort, and survival cohort**

| | | **Cohorts** | |
|---|---|---|---|
| **Quintiles**‡ | **PSMA-PET PREP (n=4034)** | **Diagnosis (n=27 502)** | **Survival (n=56 732)** |
| Material resources | | | |
| Q1 (least marginalized) | 1124 (27.86%) | 6517 (23.70%) | 13462 (23.73%) |
| Q2 | 910 (22.55%) | 6188 (22.50%) | 12439 (21.93%) |
| Q3 | 778 (19.28%) | 5511 (20.04%) | 11411 (20.11%) |
| Q4 | 700 (17.35%) | 4866 (17.69%) | 10318 (18.19%) |
| Q5 (most marginalized) | 523 (12.96%) | 4420 (16.07%) | 9102 (16.04%) |
| Racialized and newcomer | | | |
| Q1 (least marginalized) | 834 (20.67%) | 5748 (20.90%) | 11795 (20.79%) |
| Q2 | 837 (20.74%) | 5805 (21.11%) | 11810 (20.82%) |
| Q3 | 859 (21.29%) | 5548 (20.17%) | 11606 (20.46%) |
| Q4 | 784 (19.43%) | 5305 (19.29%) | 11203 (19.75%) |


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| | | | |
|---|---|---|---|
| Q5 (most marginalized) | 721 (17.87%) | 5096 (18.53%) | 10318 (18.19%) |
| Age and labor force | | | |
| Q1 (least marginalized) | 633 (15.69%) | 4506 (16.38%) | 8634 (15.22%) |
| Q2 | 731 (18.12%) | 4833 (17.57%) | 9532 (16.80%) |
| Q3 | 725 (17.97%) | 4881 (17.75%) | 10138 (17.87%) |
| Q4 | 817 (20.25%) | 5524 (20.09%) | 11280 (19.88%) |
| Q5 (most marginalized) | 1129 (27.98%) | 7758 (28.21%) | 17148 (30.23%) |
| House and dwellings | | | |
| Q1 (least marginalized) | 819 (20.30%) | 5240 (19.05%) | 10562 (18.62%) |
| Q2 | 801 (19.85%) | 5425 (19.73%) | 10967 (19.33%) |
| Q3 | 877 (21.73%) | 5680 (20.65%) | 11446 (20.18%) |
| Q4 | 732 (18.14%) | 5373 (19.54%) | 11356 (20.02%) |
| Q5 (most marginalized) | 806 (19.98%) | 5784 (21.03%) | 12401 (21.86%) |

Data are presented as n (%).

**Table 3. Odds ratios for PET positivity, change in management and radiation use by Ontario marginalization index quintiles of material resources, racialized and newcomer, age and labor force, and house and dwellings**

| | | **Outcomes** | |
|---|---|---|---|
| **Quintiles** | **PET positivity**[†] | **Change in management**[‡] | **Radiation use**[‡] |
| **Material resources** | | | |
| Q1 (least marginalized) | 1.00 (Reference) | 1.00 (Reference) | 1.00 (Reference) |
| Q2 | 1.00 (0.81–1.25) | 1.17 (0.96–1.43) | 1.03 (0.85–1.25) |
| Q3 | 1.06 (0.84–1.33) | 0.96 (0.78–1.19) | 1.04 (0.85–1.29) |
| Q4 | 1.06 (0.83–1.36) | 1.03 (0.82–1.29) | 0.96 (0.77–1.20) |
| Q5 (most marginalized) | 1.11 (0.84–1.48) | 1.09 (0.84–1.41) | 1.04 (0.80–1.34) |
| Racialized and newcomer | | | |
| Q1 (least marginalized) | 1.00 (Reference) | 1.00 (Reference) | 1.00 (Reference) |
| Q2 | 0.86 (0.68–1.10) | 1.05 (0.85–1.31) | 0.98 (0.79–1.21) |
| Q3 | 0.81 (0.64–1.03) | 0.94 (0.75–1.16) | 0.97 (0.78–1.21) |
| Q4 | 0.67 (0.52–0.86) | 1.02 (0.82–1.28) | 1.12 (0.89–1.40) |
| Q5 (most marginalized) | 0.79 (0.60–1.04) | 1.02 (0.80–1.31) | 0.85 (0.66–1.08) |
| Age and labor force | | | |
| Q1 (least marginalized) | 1.00 (Reference) | 1.00 (Reference) | 1.00 (Reference) |
| Q2 | 0.91 (0.70–1.19) | **1.35 (1.06–1.72)** | 0.97 (0.76–1.24) |

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| | | | |
|---|---|---|---|
| Q3 | 0.85 (0.65–1.12) | 1.22 (0.95–1.56) | 0.95 (0.74–1.22) |
| Q4 | 0.83 (0.64–1.09) | **1.36 (1.07–1.73)** | 1.27 (1.00–1.61) |
| Q5 (most marginalized) | 0.88 (0.67–1.14) | **1.36 (1.07–1.73)** | 1.16 (0.92–1.47) |
| House and dwellings | | | |
| Q1 (least marginalized) | 1.00 (Reference) | 1.00 (Reference) | 1.00 (Reference) |
| Q2 | 0.85 (0.67–1.08) | 1.01 (0.81–1.26) | 0.83 (0.67–1.04) |
| Q3 | 0.89 (0.70–1.14) | 0.95 (0.76–1.19) | 0.81 (0.65–1.01) |
| Q4 | 0.98 (0.75–1.27) | 0.97 (0.77–1.23) | 0.80 (0.64–1.02) |
| Q5 (most marginalized) | 1.02 (0.78–1.34) | 0.99 (0.78–1.25) | 0.82 (0.65–1.05) |

Data are presented as odds ratios (95% confidence interval). Bold odds ratios represent statistical significance. †Adjusted for treatment scan time, study phase, patient cohort, PSA value. ‡Adjusted for treatment scan time, study phase, patient cohort, PSA value, metastasis type, PET result.

**Table 4. Multivariable cox proportional hazard model by Ontario marginalization index quintiles of material resources, racialized and newcomer, age and labor force, and house and dwellings†**

| **Quintiles** | **Survival†** |
|---|---|
| Material resources | |
| Q1 (least marginalized) | 1.00 (Reference) |
| Q2 | 1.02 (0.59–1.75) |
| Q3 | 1.67 (1.01–2.76) |
| Q4 | 1.81 (1.07–3.07) |
| Q5 (most marginalized) | 1.44 (0.76–2.67) |
| Racialized and newcomer | |
| Q1 (least marginalized) | 1.00 (Reference) |
| Q2 | 0.54 (0.29–0.97) |
| Q3 | 1.13 (0.69–1.86) |
| Q4 | 1.14 (0.69–1.90) |
| Q5 (most marginalized) | 0.84 (0.46–1.50) |
| Age and labor force | |
| Q1 (least marginalized) | 1.00 (Reference) |
| Q2 | 0.99 (0.53–1.82) |
| Q3 | 0.68 (0.36–1.29) |
| Q4 | 0.96 (0.53–1.75) |
| Q5 (most marginalized) | 1.03 (0.60–1.83) |

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| | |
|---|---|
| House and dwellings | |
| Q1 (least marginalized) | 1.00 (Reference) |
| Q2 | 1.33 (0.76–2.37) |
| Q3 | 1.35 (0.79–2.34) |
| Q4 | 1.11 (0.61–2.02) |
| Q5 (most marginalized) | 0.98 (0.54–1.80) |

Data are presented as hazard ratios (95% confidence interval). Bold hazard ratios represent statistical significance. †Adjusted for treatment scan time, study phase, patient cohort, PSA value, metastasis type.

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