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Disparities in Cancer Incidence, Stage, and Mortality at Boston Health Care for the Homeless Program

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Abstract

Introduction—Homeless people have a high burden of cancer risk factors and suboptimal rates of cancer screening, but the epidemiology of cancer has not been well described in this population. We assessed cancer incidence, stage, and mortality in homeless adults relative to general population standards.

Methods—We cross-linked a cohort of 28,033 adults seen at Boston Health Care for the Homeless Program in 2003–2008 to Massachusetts cancer registry and vital registry records. We calculated age-standardized cancer incidence and mortality ratios (SIRs and SMRs). We examined tobacco use among incident cases and estimated smoking-attributable fractions. Trend tests were used to compare cancer stage distributions with those in Massachusetts adults. Analyses were conducted in 2012–2015.

Results—During 90,450 person-years of observation, there were 361 incident cancers (SIR=1.13, 95% CI=1.02, 1.25) and 168 cancer deaths (SMR=1.88, 95% CI=1.61, 2.19) among men, and 98 incident cancers (SIR=0.93, 95% CI=0.76, 1.14) and 38 cancer deaths (SMR=1.61, 95% CI=1.14, 2.20) among women. For both sexes, bronchus and lung cancer was the leading type of incident cancer and cancer death, exceeding Massachusetts estimates more than twofold. Oropharyngeal and liver cancer cases and deaths occurred in excess among men, whereas cervical cancer cases and deaths occurred in excess among women. About one third of incident cancers were smoking-attributable. Colorectal, female breast, and oropharyngeal cancers were diagnosed at more-advanced stages than in Massachusetts adults.

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Conclusions—Efforts to reduce cancer disparities in homeless people should include addressing tobacco use and enhancing participation in evidence-based screening.

Introduction

About 2.3–3.5 million people experience homelessness annually in the U.S.[1] Homeless people have a high burden of behavioral and environmental risk factors for developing cancer. An estimated 68%–80% are current cigarette smokers,[2–7] and 29%–63% consume alcohol at problematic levels.[7–14] Dietary inadequacy[15–19] and prolonged sun exposure[7] are common. Chronic hepatitis C virus[20–24] and HIV[24–26] infections are disproportionately prevalent among homeless individuals and associated with a higher risk of certain cancer types.

Homeless people may also experience barriers to the diagnosis and treatment of cancer. Many lack health insurance and forego needed medical care.[27,28] Competing priorities for managing day-to-day subsistence needs[29] may detract from the perceived importance of cancer prevention and screening. Additionally, certain screening tests such as colonoscopy pose numerous logistic challenges in the setting of homelessness. Several studies have documented low rates of colorectal cancer screening among homeless individuals,[7,30–32] and completion of cervical cancer[7] and breast cancer[7,32,33] screening may also be suboptimal in this population. Even when structural barriers to cancer screening are reduced, uptake of certain screening tests may still be lacking,[34] perhaps due in part to anticipated discomfort or misperceptions about cancer risk.[7]

Despite the potential for adverse cancer outcomes, the epidemiology of cancer among homeless people has not been well described. In a prior study of mortality among homeless adults in Boston,[35] we found that cancer was the second leading cause of death overall and the leading killer among those aged 45 years and older. Studies of homeless and marginally housed individuals in Canada[36] and Sweden[37] have also documented a considerable number of cancer deaths. Although these studies found higher cancer mortality rates among homeless adults than in the general population, none examined the epidemiology of cancer incidence and stage at presentation to assess the contributions of excess risk and delays in diagnosis to these mortality disparities. A study of homeless men residing in Glasgow hostels in 1975–1993 estimated cancer incidence relative to less impoverished individuals and found an excess number of lung and upper aerodigestive malignancies,[38] pointing toward the potential role of tobacco and alcohol use in elevating the cancer risk in this population. There have been no subsequent studies to confirm these findings in more diverse or contemporary samples of homeless people.

To address this gap in evidence, we cross-linked a cohort of 28,033 homeless adults in Boston to cancer registry and vital registry records to assess cancer incidence, stage at diagnosis, and cancer mortality relative to the Massachusetts general population. Additionally, we examined tobacco use among incident cases and estimated the burden of smoking-attributable cancer.

Methods

Study Population and Setting

We assembled a cohort of all adults aged ≥ 18 years who had an in-person encounter at Boston Health Care for the Homeless Program (BHCHP) between January 1, 2003, and December 31, 2008. We measured observation time in person-years, starting at the date of first contact with BHCHP during the study period and continuing until the date of death or December 31, 2008. BHCHP serves >11,000 individuals annually in >90,000 outpatient medical, oral health, and behavioral health encounters through a network of >70 service sites based in emergency shelters, transitional housing facilities, hospitals, and other social service settings in greater Boston.[39,40] Individuals must be homeless to enroll in services at BHCHP, but some patients continue to receive care at the program after they are no longer homeless. We did not have housing status data for the cohort, but unpublished data on BHCHP patients seen in 2011 showed that 16% were housed.

Ascertainment of Cancer Cases

We identified cancer cases in the BHCHP cohort through cross-linkage to cancer incidence files at the Massachusetts Cancer Registry (MCR), a member of the North American Association of Central Cancer Registries and a bureau of the Massachusetts Department of Public Health (MDPH). MCR analysts internally conducted the data linkage using LinkPlus, version 2.0. LinkPlus is a probabilistic record linkage software program that uses expectation maximization algorithms and an array of linkage tools to compute linkage probability scores for possible record pairs based on the level of agreement and relative importance of various personal identifiers.[41] Linkages to MCR records were based on first name, middle name (when available), last name, date of birth, and social security number (SSN). There were minimal missing data for the core identifiers in the BHCHP cohort (0% for first name, last name, and birth date; 9% for SSN). Individuals could link to more than one MCR record if they were diagnosed with multiple cancers.

For those who linked to an MCR record, we used the International Classification of Diseases for Oncology, 3rd Revision (ICD-O-3) code listed in the registry file to categorize the cancer type according to the scheme used by the MCR (Supplemental Table).[42] ICD-O-3 is a multi-axial classification system that captures tumor site, histology, and behavior. We used the topography axis code to determine the cancer site, and we used the morphology axis code to delineate the cancer histology. In keeping with MCR protocol, we combined in situ urinary bladder tumors with malignant neoplasms of the urinary bladder.[42] Otherwise, we excluded in situ neoplasms and confined all analyses to tumors with malignant behavior (i.e., cancers).

We examined the stage at diagnosis for seven cancer types encompassing the five most common cancers among men and women in the cohort to assess whether homeless people experience delays in diagnosis relative to the general population. We used the Derived Surveillance, Epidemiology, and End Results (SEER) Summary Stage 2000 code listed in the cancer registry file to classify the stage at diagnosis as local (1), regional (2, 3, 4, or 5), distant (7), or unknown (9 or missing).

Among incident cases, we examined tobacco use status at the time of diagnosis for 11 cancer types that the U.S. Surgeon General[43] and the International Agency for Research on Cancer[44] consider tobacco-related: bronchus and lung, cervix uteri, colon and rectum, esophagus, kidney and renal pelvis, larynx, liver and intrahepatic bile ducts, oral cavity and pharynx, pancreas, stomach, and urinary bladder. In Appendix A, we present the details of a supplemental analysis estimating the burden of incident cancers attributable to tobacco smoking.

Ascertainment of Cancer Deaths

We identified deaths by cross-linking the BHCHP cohort with the MDPH Registry of Vital Records and Statistics death occurrence files for 2003–2008. We used LinkPlus, version 2.0 to perform this linkage based on a probabilistic approach detailed elsewhere[35] that was very similar to that used for the MCR linkage. We based causes of death on the ICD-10 underlying cause of death codes in the Massachusetts mortality file. Cancer deaths were those with an ICD-10 underlying cause code in the range C00–C97. We subdivided these deaths by cancer type according to the scheme used by the MCR (Supplemental Table).[42]

We reclassified deaths due to “malignant neoplasms of ill-defined, secondary, and unspecified sites” (ICD-10 C76–C80; n=15) as well as other vaguely defined sites (n=3) to more-specific site codes when MCR records provided sufficient detail to do so. An additional 15 death records had specific cancer site codes in the underlying cause of death field that differed from the cancer site code in the MCR records. In these instances, we regarded the MCR record as the gold standard (A MacMillan, Massachusetts Cancer Registry, written communication, 2014) and revised the cancer site on the death record to match it. Finally, six cancer deaths could not be linked to an MCR record because the cancer diagnoses were made at a Veterans Affairs facility, and an additional six cancer deaths had not been reported to the MCR. We analyzed these as cancer deaths but not as incident cancer cases because we lacked diagnosis dates. In a sensitivity analysis, we excluded these deaths from our mortality calculations and the findings were unchanged.

Statistical Analysis

We tabulated the overall and site-specific number of incident cancer cases and deaths that occurred on or after the index observation through December 31, 2008. We classified individuals who were diagnosed with cancer prior to their index observation as having a lifetime history of cancer, but we did not count these individuals as incident cases unless they developed a new cancer following the index observation.

We used age-standardized incidence ratios (SIR) and age-standardized mortality ratios (SMRs) to compare the observed numbers of cancer cases and deaths with the numbers expected based on cancer incidence and mortality rates in the general population. To estimate the expected number of incident cases, we multiplied cancer incidence rates in 10-year age bands for the 2004–2008 Massachusetts adult population[42] by the observed person-time in the corresponding age bands of the BHCHP cohort and summed this product across all age groups. To estimate the expected number of cancer deaths, we multiplied cancer mortality rates in 10-year age bands for the 2004–2008 Massachusetts adult population[45] by

the person-time in the corresponding age bands of the BHCHP cohort and summed this product across all age groups. We divided the observed number of events by the expected number of events to calculate the SIR and SMR, and we used “proc stdrate” in SAS, version 9.4 to compute exact 95% Poisson CIs.[46] We stratified all SIR and SMR analyses by sex.

Because we revised the SMR numerator of observed deaths caused by certain cancer types to resolve discrepancies with MCR records, we used a correction factor[47,48] to adjust the expected number of cancer deaths in the SMR denominator according to similar discrepancies known to occur in the general population.[49] Appendix B describes the methods we used to estimate the correction factor for each cancer type and the results of sensitivity analyses performed with and without correction for discrepancies between death records and cancer registry records.

Given the ordinal nature of cancer staging, we used the Cochran–Armitage trend test with exact two-tailed *p*-values to compare the type-specific cancer stage at diagnosis in BHCHP adults with the stage distributions for Massachusetts adults, which we obtained from the MCR. We excluded cases with an unknown or missing stage as well as cases diagnosed in 2003 because the MCR used a different staging scheme prior to 2004. Where applicable, we combined male and female cases in the stage analysis to improve statistical power. In subgroup analyses, we reassessed the trend tests for colorectal and female breast cancer stage among individuals diagnosed within the age ranges that the U.S. Preventive Services Task Force (USPSTF) recommends screening for these diseases (50–75 years[50] and 50–74 years,[51] respectively).

We conducted our analyses in 2012–2015 using Microsoft Excel 2003 and 2007 and SAS versions, 9.2–9.4. The Partners Human Research Committee and the MDPH IRB approved this study. In accordance with MCR requirements, we present non-zero counts <5 as “1–4” events to protect participant confidentiality.

Results

Overall, 28,033 adults were followed for a median of 3.3 years, yielding 90,450 person-years of observation. The mean age at cohort entry was 40.5 years, and two thirds of participants were male (Table 1). Forty-three percent were white, 29% were black, and 19% were Hispanic. About 1.3% (*n*=369) had a history of cancer diagnosed prior to the index observation, most commonly prostate (*n*=60), bronchus and lung (*n*=37), colon and rectum (*n*=36), breast (*n*=33), and oral cavity and pharynx (*n*=21) (Table 2).

Four hundred fifty-nine incident cancers occurred in 446 individuals. There were 361 incident cancers among men (SIR=1.13, 95% CI=1.02, 1.25) and 98 incident cancers among women (SIR=0.93, 95% CI=0.76, 1.14) (Table 3). The leading types of incident cancer among men were bronchus and lung (*n*=85, SIR= 2.30, 95% CI=1.84, 2.84), prostate (*n*=59, SIR=0.63, 95% CI=0.48, 0.81), colon and rectum (*n*=36, SIR=1.24, 95% CI=0.87, 1.71), liver and intrahepatic bile duct (*n*=34, SIR=4.31, 95% CI=2.99, 6.02), and oral cavity and pharynx (*n*=25, SIR=2.03, 95% CI=1.31, 3.00). Among women, the most common incident cancers were bronchus and lung (*n*=23, SIR=2.23, 95% CI=1.41, 3.35), breast (*n*=21,

SIR=0.59, 95% CI=0.37, 0.91), cervix uteri (*n*=10, SIR=4.42, 95% CI=2.12, 8.12), colon and rectum (*n*=7, SIR=0.99, 95% CI=0.40, 2.03), and oral cavity and pharynx (*n*=5, SIR=3.34, 95% CI=1.08, 7.79).

BHCHP adults were diagnosed with colon and rectum (p=0.002), female breast (p=0.02), and oral cavity and pharynx (p<0.001) cancers at significantly later stages than Massachusetts adults (Figure 1). Forty-one percent of colorectal cancers and 43% of oropharyngeal cancers had distant metastases at presentation. Although no breast cancer cases were distant at diagnosis, 68% were regionally advanced. The trends for colorectal cancer stage (p=0.001) and breast cancer stage (p=0.03) remained significant among those diagnosed within the recommended screening age ranges. There were no significant stage differences between BHCHP and Massachusetts adults for bronchus and lung (p=0.48), prostate (p=1.00), liver and intrahepatic bile duct (p=0.81), and cervical (p=0.62) cancers.

Eighty-eight percent of incident bronchus and lung cancers, 83% of incident oral cavity and pharynx cancers, and 75% of all 11 tobacco-related cancer types combined occurred in current smokers. An estimated 88% (95% CI=81%, 91%) of lung cancer cases and 60% (95% CI=45%, 71%) of oropharyngeal cancer cases were smoking-attributable. In total, about 157 (95% CI=147, 166) cancer cases were smoking-attributable, representing 34% (95% CI=32%, 36%) of all incident cancers in the BHCHP cohort. Appendix A contains the full results of the tobacco analysis.

There were 168 cancer deaths among men (SMR=1.88, 95% CI=1.61, 2.19) and 38 cancer deaths among women (SMR=1.61, 95% CI=1.14, 2.20). The leading causes of cancer death among men were bronchus and lung (*n*=61, SMR=2.39, 95% CI=1.83, 3.08), liver and intrahepatic bile duct (*n*=22; SMR=4.35, 95% CI=2.73, 6.59), colon and rectum (*n*=19, SMR=2.37, 95% CI=1.43, 3.70), oral cavity and pharynx (*n*=9, SMR=2.37, 95% CI=1.08, 4.49), and pancreas (*n*=9, SMR=1.62, 95% CI=0.74, 3.07) cancers. Among women, the leading causes of cancer death were bronchus and lung (*n*=14, SMR=2.31, 95% CI=1.26, 3.88) and breast (*n*=5, SMR=1.07, 95% CI=0.35, 2.50) cancers. Although fewer in number, deaths due to cervical cancer significantly exceeded the expected number (SMR=6.01, 95% CI=1.24, 17.6).

Discussion

In this study of more than 28,000 currently and formerly homeless adult clinic patients in Boston, men had a significantly higher cancer incidence rate and both sexes had significantly higher cancer mortality rates than expected based on Massachusetts general population estimates.

The excess burden of lung and oropharyngeal cancer in the BHCHP cohort is consistent with prior studies of homeless and marginally housed people in Scotland[38] and Canada.[36] We have previously estimated that more than 90% of lung cancer deaths in this cohort were tobacco-attributable.[52] The current study extends these findings in estimating that 88% of incident lung cancer cases and about one third of all incident cancer cases were attributable to tobacco smoking. These findings suggest that interventions to reduce tobacco use among

homeless people should be a pillar of primary prevention efforts. Additionally, the USPSTF now recommends lung cancer screening with computed tomography in 55- to 80-year-old adults with recent extensive smoking histories[53]; our prior analyses of cigarette smoking among homeless people[2] suggests that more than half in this age range might qualify for screening. Although the USPSTF has determined that there is insufficient evidence to recommend for or against oral cancer screening,[54] this is a low-cost and low-risk examination that can be readily performed in a medical, dental, or community setting[55–57] and should be strongly considered in this high-risk population with a heavy burden of advanced oropharyngeal cancer.

Although the incidence of colorectal cancer was not significantly elevated in comparison to the general population, BHCHP patients were diagnosed with colorectal cancer at a significantly later stage, contributing to excess colorectal cancer mortality among men. BHCHP women had a significantly lower incidence of breast cancer than Massachusetts women, but this did not translate into lower breast cancer mortality, likely due in part to the large proportion presenting with non-localized disease. Though these findings are limited by small sample sizes, they are concordant with a similar discrepancy in breast cancer incidence and mortality observed among African American women,[58] who are over-represented in this and other homeless samples relative to the general population. Although BHCHP maintains a close relationship with hospitals that offer comprehensive cancer screening services and has a medical respite facility where patients can prepare for colonoscopies, the advanced stage of breast and colorectal cancer diagnoses in the study cohort suggests the need for additional strategies to promote screening for these and other cancers. Patient-level interventions might include educational initiatives targeting cancer knowledge, attitudes, and beliefs; navigator programs to assist in attending offsite cancer screening appointments; and the provision of incentives for screening participation. Health system interventions might include initiatives to enhance provider counseling, as well as same-day or flexible scheduling models to improve the accessibility of cancer screening services.

Limitations

Study participants were patients of a large HCH program in Boston. This could have enriched the cohort with individuals at higher risk of cancer but likely presents a best-case scenario with respect to stage at diagnosis given the clinical resources of BHCHP and the high prevalence of health insurance coverage among homeless people in Boston. The accuracy of death certificates has been questioned,[59] but they appear to be reliable for selected cancer types[49,60] and we were able to verify them against cancer registry records. Additionally, decedents in this cohort underwent autopsy at a considerably higher rate than decedents in the Massachusetts general population.[35] Finally, we were unable to discern the potential role that differences in cancer treatment might have had on the excess cancer mortality seen in the study sample.

Conclusions

This cohort of homeless adults in Boston had a high burden of tobacco-related cancer and was diagnosed with screen-detectable malignancies at a later stage than Massachusetts

residents. Prevention efforts should focus on reducing tobacco use and enhancing completion of cancer screening.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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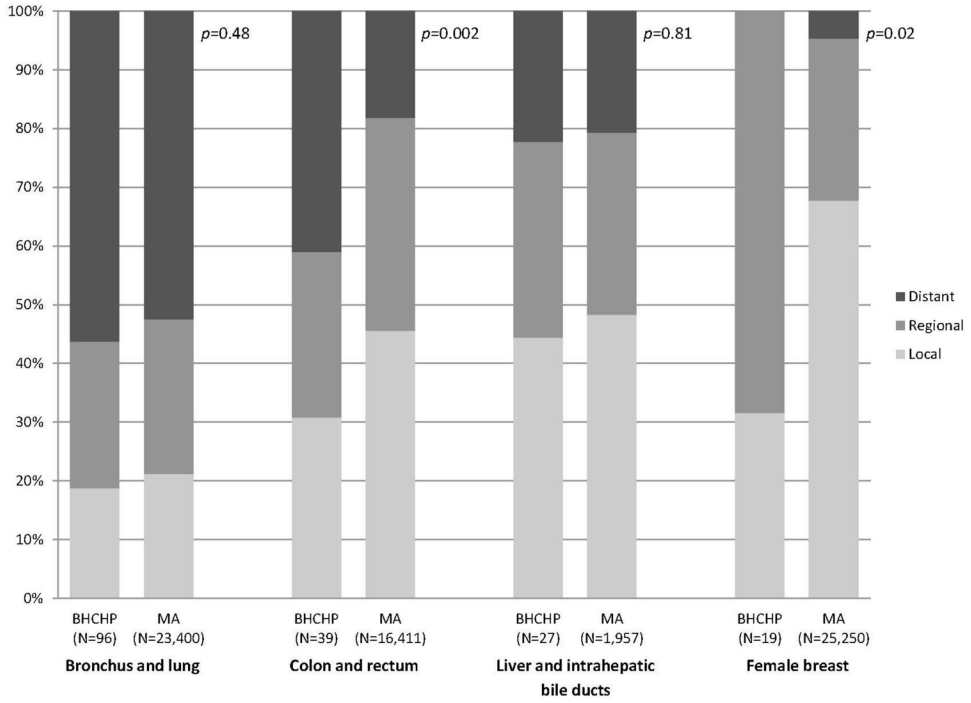

Figure 1.

Stage at diagnosis of selected cancer types in the BHCHP cohort and Massachusetts adults. BHCHP, Boston Health Care for the Homeless Program; MA, Massachusetts

Notes: p-values are for the Cochran-Armitage trend test. Stage comparisons for prostate (p=1.00), oral cavity and pharynx (p<0.001), and cervical (p=0.62) cancers are not shown for confidentiality reasons because of small counts for certain stages. Stages are based on the Derived SEER Summary Stage 2000 code, where local=1, regional=2, 3, 4, or 5, and distant=7.

Table 1

Characteristics of the Study Cohort

	All (N=28,033)	Male (N=18,612)	Female (N=9,421)
Age at cohort entry			
Mean (SD)	40.5 (12.4)	42.7 (11.7)	36.1 (12.6)
18–24 years, N (%)	3,491 (12.5)	1,320 (7.1)	2,171 (23.0)
25–34 years, N (%)	5,874 (21.0)	3,320 (17.8)	2,554 (27.1)
35–44 years, N (%)	7,930 (28.3)	5,663 (30.4)	2,267 (24.1)
45–54 years, N (%)	7,131 (25.4)	5,483 (29.5)	1,648 (17.5)
55–64 years, N (%)	2,796 (10.0)	2,217 (11.9)	579 (6.2)
65–74 years, N (%)	644 (2.3)	500 (2.7)	144 (1.5)
75–84 years, N (%)	149 (0.5)	100 (0.5)	49 (0.5)
≥85 years, N (%)	18 (0.1)	9 (0.1)	9 (0.1)
Sex, N (%)			
Male	18,612 (66.4)	18,612 (100)	-
Female	9,421 (33.6)	-	9,421 (100)
Race/ethnicity, N (%)			
White, non-Hispanic	11,912 (42.5)	8,476 (45.5)	3,436 (36.5)
Black, non-Hispanic	8,066 (28.8)	5,262 (28.3)	2,804 (29.8)
Hispanic	5,301 (18.9)	3,239 (17.4)	2,062 (21.9)
Other/unknown	2,754 (9.8)	1,635 (8.8)	1,119 (11.9)

Table 2

Number of Individuals With a History of Cancer Diagnosed Prior to the Index Visit.

Cancer site	N
All sites	369
Prostate	60
Bronchus and lung	37
Colon and rectum	36
Breast	33
Oral cavity and pharynx	21
Non-Hodgkin lymphoma	17
Urinary bladder	17
Testis	14
Kidney and renal pelvis	12
Melanoma	12
Cervix uteri	11
Larynx	10
Leukemia	10
Thyroid	10
Hodgkin lymphoma	7
Liver and intrahepatic bile ducts	7
Corpus uteri and uterus NOS	5
Multiple myeloma	5
Brain and other nervous system	1–4
Esophagus	1–4
Ovary	1–4
Pancreas	1–4
Stomach	1–4
Other and unknown sites	35

Note: Cell sizes of 1–4 are suppressed for confidentiality.

NOS, not otherwise specified

Table 3

Incident Cancer Cases and Deaths in the BHCHP Cohort, With Age-Standardized Incidence and Mortality Ratios

	Male				Female			
Cancer site/type	**Incident cases**	**SIR (95% CI)**	**Deaths**	**SMR (95% CI)**	**Incident cases**	**SIR (95% CI)**	**Deaths**	**SMR (95% CI)**
All sites	361	**1.13 (1.02–1.25)**	168	**1.88 (1.61–2.19)**	98	0.93 (0.76–1.14)	38	**1.61 (1.14–2.20)**
Brain and other nervous system	5	0.94 (0.31–2.20)	1–4	0.60 (0.07–2.15)	0	--	0	--
Breast	0	--	0	--	21	**0.59 (0.37–0.91)**	5	1.07 (0.35–2.50)
Bronchus and lung	85	**2.30 (1.84–2.84)**	61	**2.39 (1.83–3.08)**	23	**2.23 (1.41–3.35)**	14	**2.31 (1.26–3.88)**
Cervix uteri	N/A	--	N/A	--	10	**4.42 (2.12–8.12)**	1–4	**6.01 (1.24–17.6)**
Colon and rectum	36	1.24 (0.87–1.71)	19	**2.37 (1.43–3.70)**	7	0.99 (0.40–2.03)	1–4	1.61 (0.33–4.72)
Corpus uteri and uterus NOS	N/A	--	N/A	--	1–4	0.54 (0.15–1.38)	1–4	1.29 (0.03–7.17)
Esophagus	10	1.51 (0.73–2.78)	8	1.82 (0.79–3.59)	0	--	0	--
Hodgkin lymphoma	1–4	0.37 (0.01–2.07)	0	--	0	--	0	--
Kidney and renal pelvis	10	0.69 (0.33–1.26)	0	--	1–4	0.43 (0.01–2.40)	1–4	2.90 (0.07–16.2)
Larynx	8	2.07 (0.90–4.09)	1–4	3.13 (0.85–8.00)	0	--	0	--
Leukemia	6	0.82 (0.30–1.79)	1–4	1.28 (0.35–3.28)	0	--	0	--
Liver and intrahepatic bile ducts	34	**4.31 (2.99–6.02)**	22	**4.35 (2.73–6.59)**	1–4	3.58 (0.43–12.9)	0	--
Melanoma	8	**0.47 (0.20–0.92)**	1–4	1.77 (0.48–4.53)	1–4	0.29 (0.03–1.04)	0	--
Multiple myeloma	1–4	1.08 (0.29–2.76)	1–4	1.29 (0.16–4.67)	1–4	1.47 (0.04–8.21)	1–4	3.50 (0.09–19.5)
Non-Hodgkin lymphoma	10	0.72 (0.35–1.33)	1–4	0.33 (0.01–1.85)	1–4	0.31 (0.01–1.73)	0	--
Oral cavity and pharynx	25	**2.03 (1.31–3.00)**	9	**2.37 (1.08–4.49)**	5	**3.34 (1.08–7.79)**	1–4	2.81 (0.07–15.7)
Ovary	N/A	--	N/A	--	1–4	0.63 (0.08–2.29)	1–4	1.57 (0.19–5.66)
Pancreas	11	1.64 (0.82–2.94)	9	1.62 (0.74–3.07)	1–4	1.24 (0.15–4.48)	1–4	1.61 (0.20–5.83)
Prostate	59	**0.63 (0.48–0.81)**	1–4	0.92 (0.25–2.36)	N/A	--	N/A	--
Stomach	8	1.60 (0.69–3.15)	1–4	1.42 (0.39–3.63)	1–4	2.75 (0.33–9.95)	1–4	2.42 (0.06–13.5)
Testis	0	--	0	--	N/A	--	N/A	--
Thyroid	1–4	0.29 (0.03–1.03)	0	--	5	0.52 (0.17–1.21)	0	--
Urinary bladder	17	0.93 (0.54–1.49)	1–4	1.29 (0.35–3.30)	1–4	0.53 (0.01–2.97)	1–4	3.11 (0.08–17.3)

Note: Cell sizes of 1–4 are suppressed for confidentiality.

BHCHP, Boston Health Care for the Homeless Program; SIR, standardized incidence ratio; SMR, standardized mortality ratio; NOS, not otherwise specified