

Incidence and Mortality Changes of Screening Preventable and Detectable Cancers in Rhode Island, 1995–2018

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Cancer is the 2nd leading cause of death among men and women in Rhode Island.¹ Over the last few decades, advances in cancer screening, diagnosis and treatment have lowered cancer mortality.² Screening for breast, cervical and colorectal cancers has become a public health priority as these are highly prevalent cancers whose health outcomes are greatly improved when they are identified at early or precancerous stages. In short, early detection for these cancers saves lives.³⁻⁵

The study examined incidence and mortality changes from 1995 through 2018 for breast, cervical and colorectal cancers, and discussed implications of screening efficacy.

METHODS

From the Rhode Island Cancer Registry (RICR) data, newly diagnosed malignant cancers* of the breast (female only), cervix, and colon/rectum were identified, using the *International Classification of Diseases for Oncology 3rd revision (ICD-O-3)* site/behavior coding: C500-C509/3 (breast), C530-539/3 (cervix uteri), and C180-C209, C260/3 (colon and rectum). Stage at cancer diagnosis was also extracted and analyzed, using the diagnosis year-specific “Summary Staging” systems (Summary Staging | SEER Training (cancer.gov)).

Cancer mortality data, 1995–2018, provided by the National Center for Health Statistics (NCHS) were accessed and summarized using SEER*Stat software v8.3.9 (SEER*Stat Software (cancer.gov)). Causes of death were classified by NCHS, according to the *International Classification of Diseases (ICD-Classification of Diseases, Functioning, and Disability (cdc.gov))*.

Cancer type-specific denominator populations were defined to approximate cancer screening starting ages: ≥40 years old for female breast cancer, ≥20 years old for cervical cancer, and ≥50 years old for colorectal cancer. U.S. Preventive Services Task Force (USPSTF) Recommendations have been regularly updated and changed, including cancer screening ages.³⁻⁵ Age cutoffs used in this study reflect the past and the current screening practices to demonstrate screening effects on cancer incidence and mortality throughout the study period.

Finally, incidence and mortality rates were age-adjusted based on the US 2000 Standard Population (19 age groups: Census P25-1130) and presented per 100,000 Rhode Island men and/or women. For the trend analyses during the

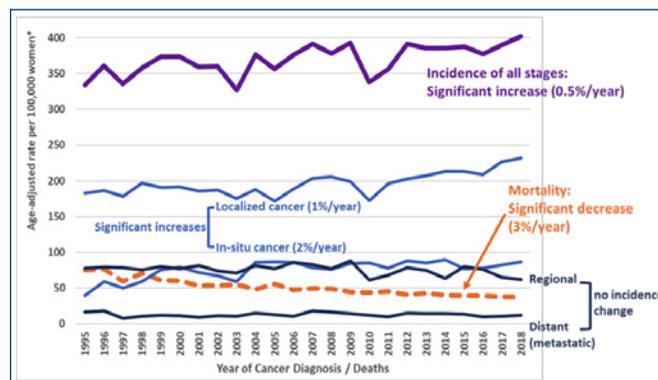
studied period (1995–2018), annual percentage change (APC) of the rates was computed and statistical significance was evaluated (at p value <0.05).

RESULTS

Female breast cancer (Figure 1)

Among Rhode Island women ages 40 years and older, incidence of malignant breast cancer (including in-situ lesions) slightly increased from 1995 to 2018 by 0.5% annually. Parallel to overall incidence change, in-situ and localized cancer diagnoses increased by 2% and 1% per year, respectively. Incidence of regional and distant (metastatic) cancer remained stable during the years. Meanwhile, mortality rate (deaths caused by breast cancer) significantly declined by 3% per year, on average, from 1995 to 2018.

Figure 1. Changes of Breast Cancer Incidence and Mortality, Women Age ≥40 years, Rhode Island Cancer Registry, 1995–2008



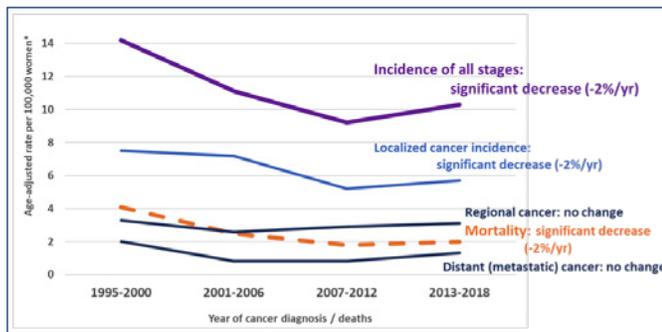
* Adjusted to US Standard Population 2000 (19 age groups – Census P25-1130) “In-situ (carcinoma in situ)” is abnormal cells, confined to epithelium. “Localized” cancer is confined to the organ of origin without extension beyond the primary organ. “Regional” cancer has spread to adjacent organs or structures, or to regional lymph nodes. If the cancer has spread to parts of the body remote from the primary tumor, it is classified as “distant” stage.

Data Sources: Rhode Island Cancer Registry (incidence) & National Center for Health Statistics (mortality), summarized using SEER*Stat Software version 8.3.9

Cervical cancer (Figure 2)

From 1995 to 2012, continuous and significant declines were observed in both incidence and mortality rates among Rhode Island women ages 20 years and older, and then these rates plateaued since 2012. Trendline of localized cancer

Figure 2. Changes of Cervical Cancer Incidence and Mortality, Women Age ≥ 20 years, Rhode Island Cancer Registry, 1995–2008



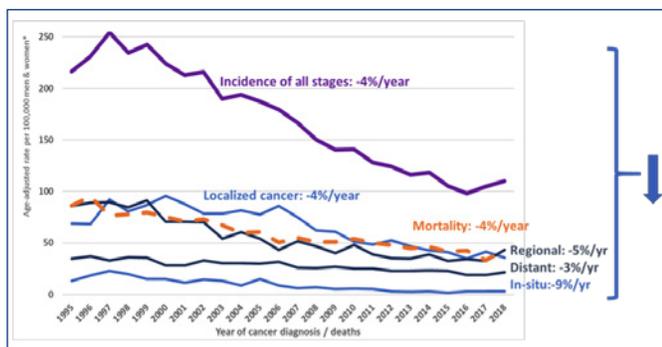
* Adjusted to US Standard Population 2000 (19 age groups – Census P25-1130)
 “Localized” cancer is confined to the organ of origin without extension beyond the primary organ. “Regional” cancer has spread to adjacent organs or structures, or to regional lymph nodes. If the cancer has spread to parts of the body remote from the primary tumor, it is classified as “distant” stage. “In-situ” lesions of the cervix were not collected by central cancer registry from 1996-2017, according to the Rhode Island State Regulation for the Cancer Registry.
 Data Sources: Rhode Island Cancer Registry (incidence) & National Center for Health Statistics (mortality), summarized using SEER*Stat Software version 8.3.9

diagnoses was shown parallel with that of overall incidence; meanwhile, cancer diagnoses diagnosed at more advanced stages (regional and distant) did not show a significant change during the period.

Colorectal cancer (Figure 3)

Since 1995, newly diagnosed colorectal cancers steadily declined among Rhode Island men and women ages 50 and older. This decrease over the past 24 years was remarkable, and cancer rates in recent years were half of what they were in the late 1990s. Cancer diagnoses at all stages, and colorectal cancer deaths significantly decreased over the past decades.

Figure 3. Changes of Colorectal Cancer Incidence and Mortality, Men and Women Age ≥ 50 years, Rhode Island Cancer Registry, 1995–2018



* Adjusted to US Standard Population 2000 (19 age groups – Census P25-1130)
 “In-situ (carcinoma in situ)” is abnormal cells, confined to epithelium. “Localized” cancer is confined to the organ of origin without extension beyond the primary organ. “Regional” cancer has spread to adjacent organs or structures, or to regional lymph nodes. If the cancer has spread to parts of the body remote from the primary tumor, it is classified as “distant” stage.
 Data Sources: Rhode Island Cancer Registry (incidence) & National Center for Health Statistics (mortality), summarized using SEER*Stat Software version 8.3.9

DISCUSSION

Population-level (statewide) cancer incidence and mortality reports may conceal crucial heterogeneity in the risk of cancer development and death by age at cancer diagnosis, latency period, tumor characteristics, treatment, underlying predisposing conditions, and other clinical and individual factors. Despite these limitations, cancer statistics derived from cancer registry and vital records (death certificates) provide valuable measures to assess screening efficacy in decreasing the screening detectable and preventable cancer burden and mortality.^{6,7} Mortality rates, in particular, can be a better indicator in evaluating screening outcomes than incidence, because they are less affected by biases resulting from changes in detection technologies and frequencies.⁸

Observing changes of cancer incidence for early-detected and advanced cancers associated with cancer screening implementations, increases in early-stage disease and decreases in late-stage tumors are not always seen. For instance, among breast cancer screening eligible women in Rhode Island, rising incidence and falling mortality imply a mixed effect on screening: true increases of the disease and overdiagnosis by screening.⁹ From 1995–2018, increasing breast cancer rates were mainly driven by increasing diagnoses in in-situ and localized cancers. Stabilized rates of advanced cancer diagnoses and fewer cancer deaths are combined effects of effective cancer screening and treatment.^{9,10}

Reductions in cervical cancer diagnoses at localized cancer and mortality can be attributed to the effective screening (Papanicolaou testing) and successful treatment of precancerous lesions.⁴ However, stagnant improvement both in cancer prevention and deaths may reflect an increasing proportion of adenocarcinoma which is often undetected by conventional cytology and increasing prevalence of underlying HPV infections.^{11,12} These new trends underscore the importance of HPV vaccination uptake and HPV DNA co-testing (preferred screening method for women aged 30 to 65 years by current guideline).⁴

Colorectal cancer rates have steadily decreased among Rhode Islanders for the last two decades. This reduction can be attributed to increases in screening among at-risk populations.¹⁰ Screening for colorectal cancer can identify the presence of precancerous and cancerous cell growths, thereby preventing the cancer development and improving colorectal cancer treatment outcomes.³ Nationwide, colorectal cancer is rising among younger adults leading the USPSTF to recommend average-risk individuals to initiate screening at age 45 instead of 50.^{3,13} Studies suggest that modern dietary habits and obesity may correlate with colorectal cancer rate increases in younger generations, but further research is needed.¹³ This increase in colorectal cancer incidence among younger populations has yet to be observed in Rhode Island.

*RICR collects, processes and reports on primary cancers only. Recurrent or metastatic cancers are not reportable to RICR, according to the Rhode Island State Regulation for the Cancer Registry.

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Disclosure

The authors declare no conflict of interest.

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