

# Time Trend of Incidence Rates in Cancers With and Without Commonly Adopted Guideline-Recommended Screening (CGRS) in the US, 2000-2018

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## INTRODUCTION

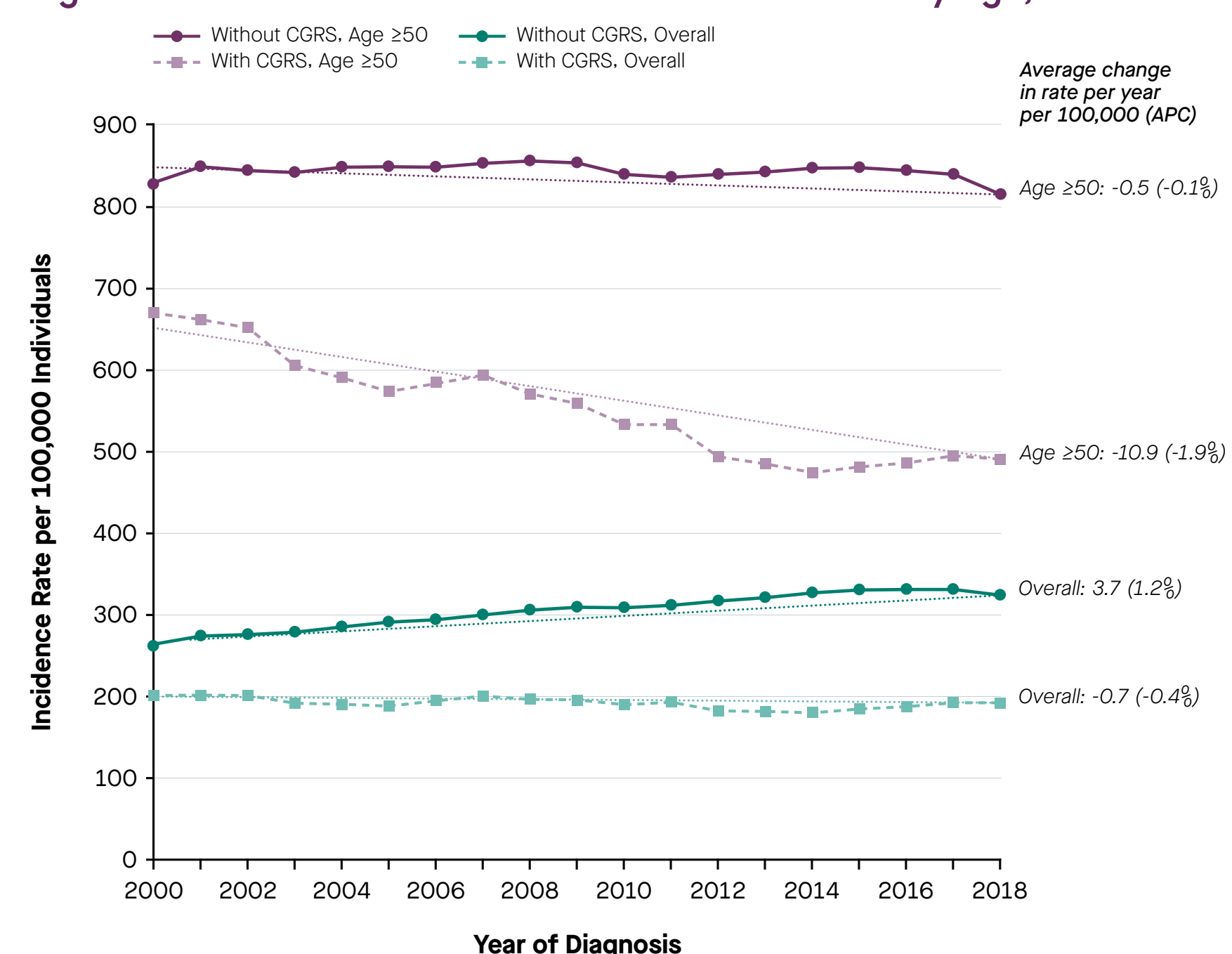
- Current cancer screening guidelines in the United States (US) exist for the general population to avert late-stage cancer diagnoses and deaths
- However, only four cancer types, including breast cancer (BC), colorectal cancer (CRC), cervical cancer (CC), and prostate cancer (PC), have commonly adopted guideline-recommended screening (CGRS) (Table 1),<sup>1-5</sup> and show variability in real-world screening adherence<sup>6</sup>
- Cancer types that lack available screening tests or do not have CGRS account for approximately 70% of cancer deaths in the US<sup>7</sup>
- The aging population of the US will likely drive up the overall cancer burden in terms of cancer incidence and cumulative deaths due to cancer
- While numerous prevention and early detection initiatives exist to diagnose cancers in individuals before they become symptomatic, there are still considerable disparities in cancer care between sexes and across certain racial and ethnic groups.<sup>8</sup> These disparities may result in a disproportionate burden of cancer in certain subpopulations
- To date, time trends in cancer incidence rates among cancers with versus without recommended screening paradigms have not been well characterized

## OBJECTIVE

- To investigate the long-term time trends in cancer incidence rates across cancer types with and without commonly adopted guideline-recommended screening

## KEY RESULTS: CANCER BURDEN HAS INCREASED OVER TIME IN THE US, PARTICULARLY FOR CANCER TYPES WITHOUT COMMONLY ADOPTED GUIDELINE-RECOMMENDED SCREENING AND IN CERTAIN SUBPOPULATIONS

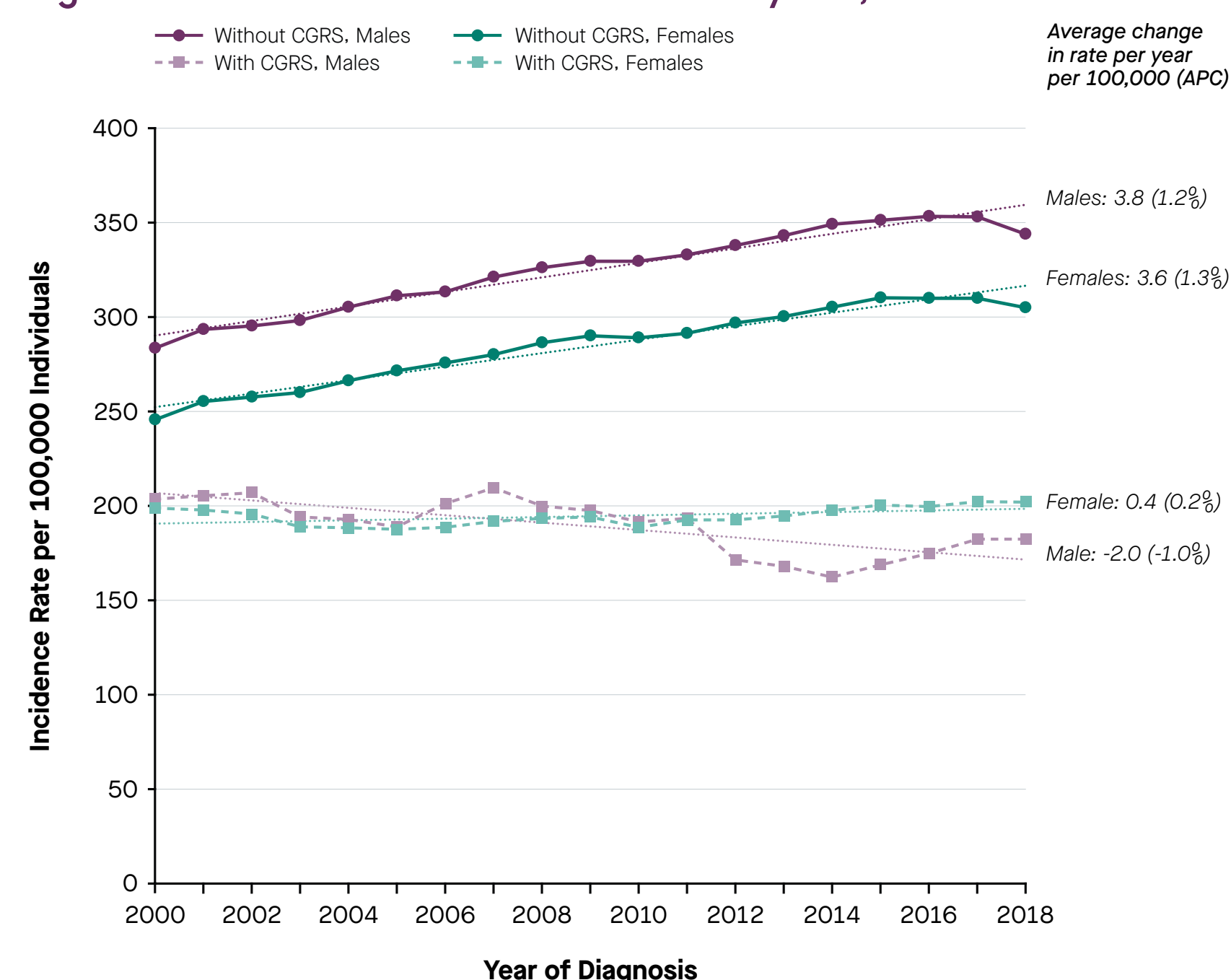
Figure 1. Time Trends in Cancer Incidence Overall and by Age, 2000-2018



APC, annual percent change; CGRS, commonly adopted guideline-recommended screening. Linear trend line displayed as dotted line for each group. Rates were not age-standardized to the 2000 US standard population in order to demonstrate the impact of the aging population over time.

- From 2000 to 2018, incidence rates of cancers without CGRS in the overall population increased steadily per year by 1.2% [95% Confidence Interval (CI): 1.1 – 1.4%] (Figure 1; solid green line), whereas the incidence rates of the 4 cancers with CGRS remained constant in the overall population (-0.4% [95% CI: -0.6 – -0.1%]) (Figure 1; dashed green line)
- Overall incidence of cancers without CGRS was 264.1 per 100,000 in the year 2000 [standard error (SE) = 0.1], increasing to 324.0 per 100,000 [SE = 0.5] in 2018
- Nearly 40% of all cancer cases, both with and without CGRS, were locally advanced or metastatic in 2015 [data not shown]

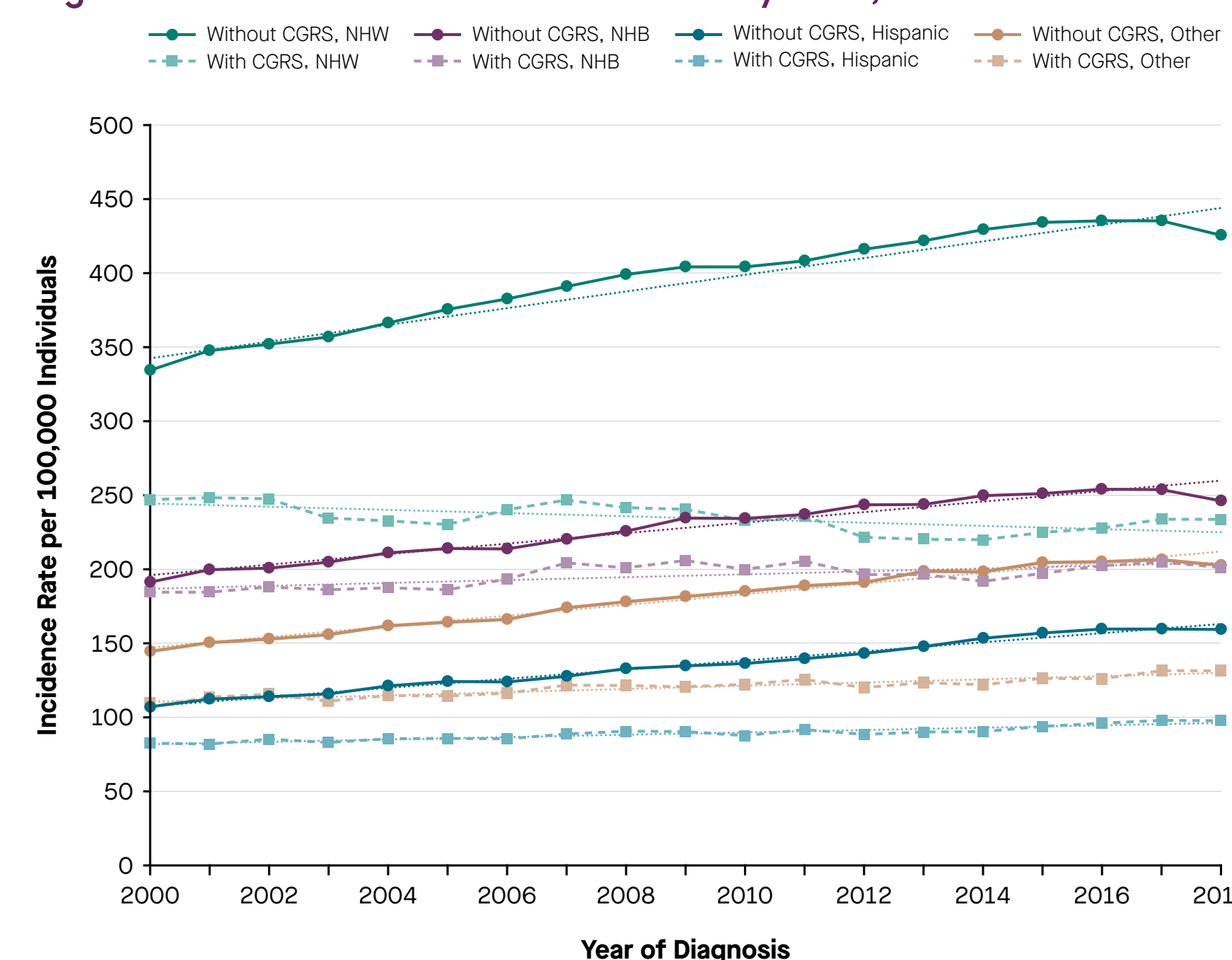
Figure 2. Time Trends in Cancer Incidence by Sex, 2000-2018



APC, annual percent change; CGRS, commonly adopted guideline-recommended screening. Linear trend line displayed as dotted line for each group. Cancer types with CGRS include colorectal and prostate cancer for males, and breast, colorectal, and cervical cancer for females.

- For individuals ≥50 years of age, incidence rates of cancers without CGRS remained constant over time (-0.1% [95% CI: -0.2 – 0.0%]), while incidence rates for cancers with CGRS decreased -1.9% [95% CI: -2.2 – -1.6%] per year. (Figure 1; purple lines)
- Incidence rates of cancers without CGRS increased by 1.2% [95% CI: 1.0 – 1.3%] per year for males, and 1.3% [95% CI: 1.1 – 1.4%] for females, while incidence rates of cancers with CGRS stayed constant in females (0.2% [95% CI: 0.0 – 0.4%]) and decreased in males (-1.0% [95% CI: -1.5 – -0.6%]) (Figure 2)

Figure 3. Time Trends in Cancer Incidence by Race, 2000-2018



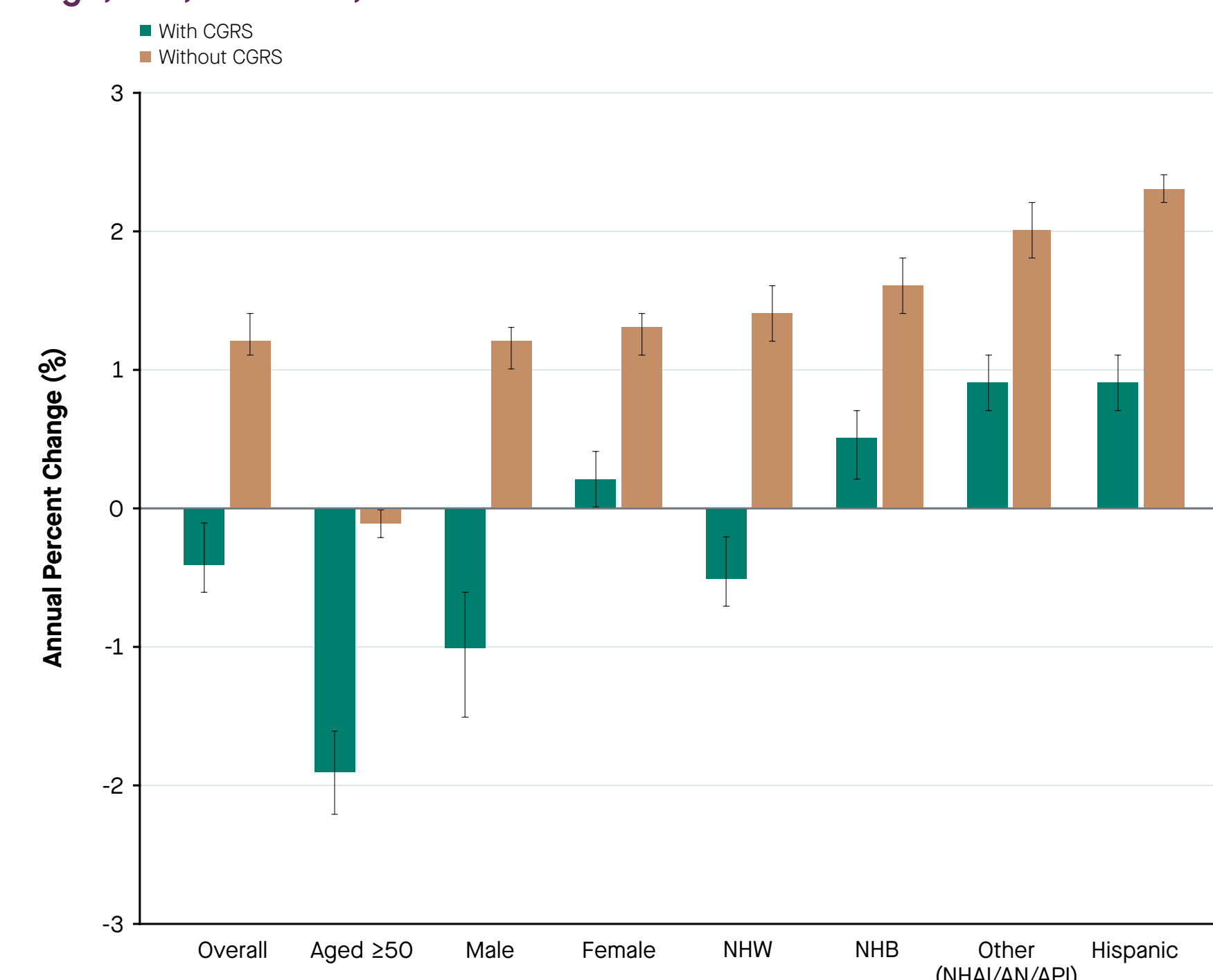
CGRS, commonly adopted guideline-recommended screening; NHB, Non-Hispanic Black; NHW, Non-Hispanic White. Linear trend line displayed as dotted line for each group. Racial group [Other] includes Non-Hispanic American Indian/Alaska Native and Non-Hispanic Asian or Pacific Islander.

Table 2. Annual Percent Change in Cancer Incidence by Race, 2000-2018

Race	Screening	Average change in rate per year per 100,000	Annual percent change* (95% CI)
White, non-Hispanic	With CGRS	-1.1	-0.5% (-0.7 – -0.2%)
	Without CGRS	5.6	1.4% (1.2 – 1.6%)
Black, non-Hispanic	With CGRS	1.0	0.5% (0.2 – 0.7%)
	Without CGRS	3.5	1.6% (1.4 – 1.8%)
Hispanic	With CGRS	0.8	0.9% (0.7 – 1.1%)
	Without CGRS	3.1	2.3% (2.2 – 2.4%)
Other	With CGRS	1.1	0.9% (0.7 – 1.1%)
	Without CGRS	3.6	2.0% (1.8 – 2.2%)

CGRS, commonly adopted guideline-recommended screening; CI, Confidence Interval. \*Average change in cancer incidence rate per year per 100,000 individuals. Racial group [Other] includes Non-Hispanic American Indian/Alaska Native and Non-Hispanic Asian or Pacific Islander.

Figure 4. Annual Percent Change in Cancer Incidence, Overall And by Age, Sex, and Race, 2000-2018



APC, Asian or Pacific Islander; CGRS, commonly adopted guideline-recommended screening; NHA/AN, Non-Hispanic American Indian or Alaska Native; NHB, Non-Hispanic Black; NHW, Non-Hispanic White. Error bars indicate 95% confidence interval.

- Differences in APC were observed in cancers with and without CGRS across all the race groups assessed
- Incidence rates of cancers without CGRS increased per year, most notably among Hispanic (2.3% [95% CI: 2.2 – 2.4%]), NHB (1.6% [95% CI: 1.4 – 1.8%]), and Other (2.0% [95% CI: 1.8 – 2.2%]) patients (Figure 3; Table 2)
- Incidence rates of cancers with CGRS decreased only in NHW patients (-0.5% [95% CI: -0.7 – -0.2%]) while increasing or staying constant for all other races (NHB: 0.5% [95% CI: 0.2 – 0.7%]; Hispanic: 0.9% [95% CI: 0.7 – 1.1%]; Other: 0.9% [95% CI: 0.7 – 1.1%]) (Figure 3; Table 2)

## CONCLUSION

- Cancer burden remains substantial and is increasing over time as the population ages, particularly in the majority of cancer types with no guideline-recommended screening and in certain subpopulations, such as Hispanic and Non-Hispanic Black patients
- There remains an unmet medical need for novel screening techniques that can detect more cancer types earlier

## REFERENCES

1. Siu AL, et al. *Ann Intern Med.* 2016;164(4):279-296.
2. US Preventive Services Task Force, et al. *JAMA.* 2018;320(7):674-686.
3. US Preventive Services Task Force, et al. *JAMA.* 2016;315(23):2564-2575.
4. Moyer VA, et al. *Ann Intern Med.* 2014;160(5):330-338.
5. US Preventive Services Task Force, et al. *JAMA.* 2018;319(18):1901-1913.
6. Kim A, et al. Poster presented at the AMCP Nexus Congress 2021; Denver, CO; October 18-21, 2021. Abstract 10550.
7. Estimated deaths per year in 2021 from American Cancer Society Cancer Facts and Figures 2021.
8. Siegel R, et al. *Cancer Statistics, 2022. CA Cancer J Clin.* 2022;72:7-33.
9. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER\*Stat Database: Incidence - SEER Research Limited-Field Data, 21 Registries, Nov 2020 Sub (2000-2018) - Linked To County Attributes - Time Dependent (1990-2018) Income/Rurality, 1969-2019 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, released April 2021.
10. Fedewa SA, et al. *J Natl Cancer Inst.* 2021;113(8):1044-1052.
11. Office of Disease Prevention and Health Promotion. Healthy People 2020. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Published 2014. Updated October 27, 2021. Accessed September 28, 2021.

## DISCLOSURES

Study funded by GRAIL, LLC, a subsidiary of Illumina, Inc. AK and ZC are employed by GRAIL, LLC, a subsidiary of Illumina, Inc, with equity in Illumina, Inc.

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## METHODS

- The Surveillance, Epidemiology, and End Results (SEER) database was analyzed using SEER\*Stat from 2000 to 2018 for cancer types with and without CGRS, using International Classification of Diseases for Oncology 3rd edition (ICD-O-3) codes<sup>9</sup>
- Crude cancer incidence rates (per 100,000 persons) were calculated for cancers with and without CGRS, and trends in incidence were described as annual percent change (APC) using the weighted least-squares method

Table 1. Cancer Types with Commonly Adopted Guideline-Recommended Screening

Cancer Type*	USPSTF-Recommended Screening Modality <sup>1-5</sup>
Breast	Mammography
Cervical	Cytology and high-risk human papillomavirus testing
Colorectal	Stool-based tests (e.g., Cologuard), colonoscopy, CT colonography, flexible sigmoidoscopy
Prostate	Prostate-specific antigen test (on an individual basis)

CT, computerized tomography; USPSTF, United States Preventive Services Task Force. \*Lung cancer, which does have guideline-recommended screening, was not included due to low adherence (ranging from 1 – 59%<sup>10</sup>) to low-dose computerized tomography screening in eligible individuals.

- Incidence rates were further stratified by age (<50 years of age, ≥50 years of age), sex (male, female), and race (Non-Hispanic White [NHW], Non-Hispanic Black [NHB], Hispanic [all races], and Other [including Non-Hispanic American Indian/Alaska Native and Asian or Pacific Islander])

## DISCUSSION

- Current data suggest there is a clear increase in cancer burden over time for cancers without CGRS; consistent with the literature, these data indicate that advanced age an important risk factor for cancer overall<sup>8</sup> (Figure 4)
- Among individuals ≥50 years of age, cancer incidence rates for cancers without CGRS remained pronounced over time, with the majority of cases being later-stage cancers [data not shown], but incidence rates of cancers with CGRS trended downward over time in those ≥50, potentially due to the effects of screening and early detection

- While overall cancer incidence rates historically tend to be higher among males than females,<sup>9</sup> an upward trend in the incidence of cancers without CGRS over time was seen for both males and females
- Additionally, a decrease in the incidence of cancers with CGRS was observed among males, which may be attributed to prostate-specific antigen screening for PC, which is currently done on an individual basis
- Cancer occurrence varied considerably among racial groups, as incidence rates of cancers with CGRS remained constant among the Hispanic and NHB groups but decreased among NHW patients, suggesting the former groups may encounter barriers to early cancer detection among other risk factors

- Furthermore, incidence rates of cancers without CGRS increased in all groups, particularly in the Hispanic, Non-Hispanic Black, Non-Hispanic Asian or Pacific Islander, and Non-Hispanic American Indian or Alaska Native racial groups, thereby highlighting the need for more efficient and accessible screening for these cancer types
- Better adherence to existing screening guidelines should be encouraged, given that screening adherence remains below national target goals<sup>11</sup>
- The gap in incidence between cancers with CGRS and cancers without CGRS may be addressable through the development of new screening modalities for more cancer types