The Incidence, Mortality, and Survival of Breast Cancer per HER2/HR Status in the United States: A Surveillance, Epidemiology, and End Results (SEER) 2018-2022 Database Analysis

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Background

- Breast cancer was one of the most prevalent oncology diagnoses among women worldwide in 2020 [1]
- The diagnosis is associated with a high economic burden and a significant impairment of patients' quality of life [2,3]
- Timely detection and early treatment may avoid disease progression and reduce the overall economic burden [2]
- Determining human epidermal growth 2 protein (HER2) and hormone receptor (HR) statuses is crucial for treatment planning and better prognosis [4,5]

Objective

- Investigate disease burden and survival of breast cancer in the US using the updated Surveillance, Epidemiology, and End Results (SEER) released in April 2025
- Explore and report the results across HER2/HR status categories among breast cancer patients in the US

Methods

Study Design

- This study retrospectively analyzed real-world data from the updated SEER database (available since April 2025)

SEER Database

- The SEER registry database is a program funded by the National Cancer Institute that aggregates data from population-based cancer registries across the US, constituting a nationally representative cancer database [6]
- The analysis was performed in the SEER database that includes 17 US cancer registries, using only the last 5 years of available data (2018 – 2022 period)

Patient Selection

- Patients with a breast cancer diagnosis were identified with the International Classification of Diseases for Oncology, Third Edition (ICD-O-3) 2023 Revision codes
- Both benign and malignant breast cancers were included
- Survival analysis included only patients with known age

Study Outcomes

- The outcomes were crude incidence rates, crude mortality rates, and annual survival rates
- Results were reported by HER2/HR status categories to show their influence on study findings
- Available patient demographics are also reported

Statistical Analysis

- Data was analyzed using SEER*Stat statistical software

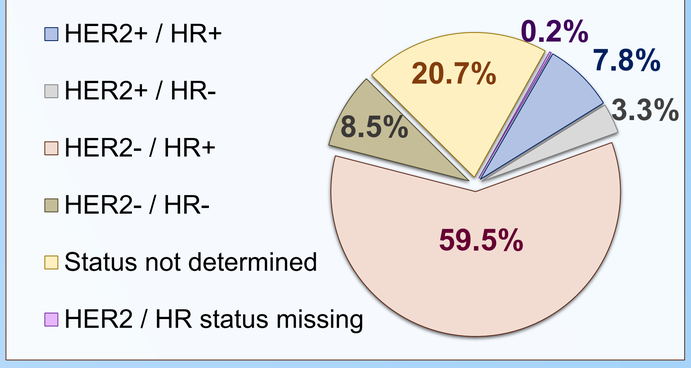
References

1. *Arnold et al. (2022). DOI: 10.1016/j.breast.2022.08.010*
2. *Franklin et al. (2024). DOI: 10.1007/s12325-024-02893-y*
3. *Heidary et al. (2023). DOI: 10.1177/10732748231168318*
4. *Bergeron et al. (2023). DOI: 10.1038/s41416-023-02287-x*
5. *Hashmi et al. (2024). DOI: 10.1155/2024/2540356*
6. *Che et al. (2023). DOI: 10.1186/s40779-023-00488-2*

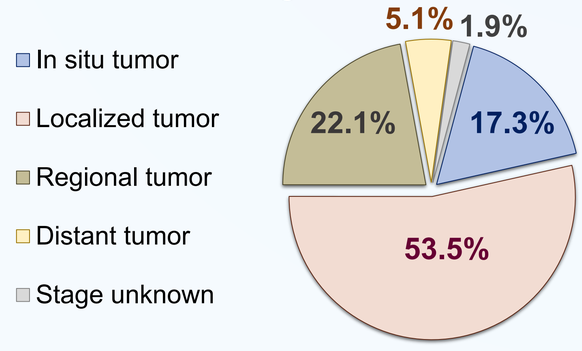
Results

- There were 377,387 unique patients in the US with a breast cancer diagnosis captured within the SEER database (2018-2022)
- Patients were predominantly females (99.2%), 20-64 years old (55.2%), non-Hispanic White (62.3%), married (55.2%), metropolitan county residents (90.4%), had a $65,000-90,000 annual household income (43.9%), and had a localized HER2-/HR+ breast cancer (40.6%)

HER2/HR Status Distribution

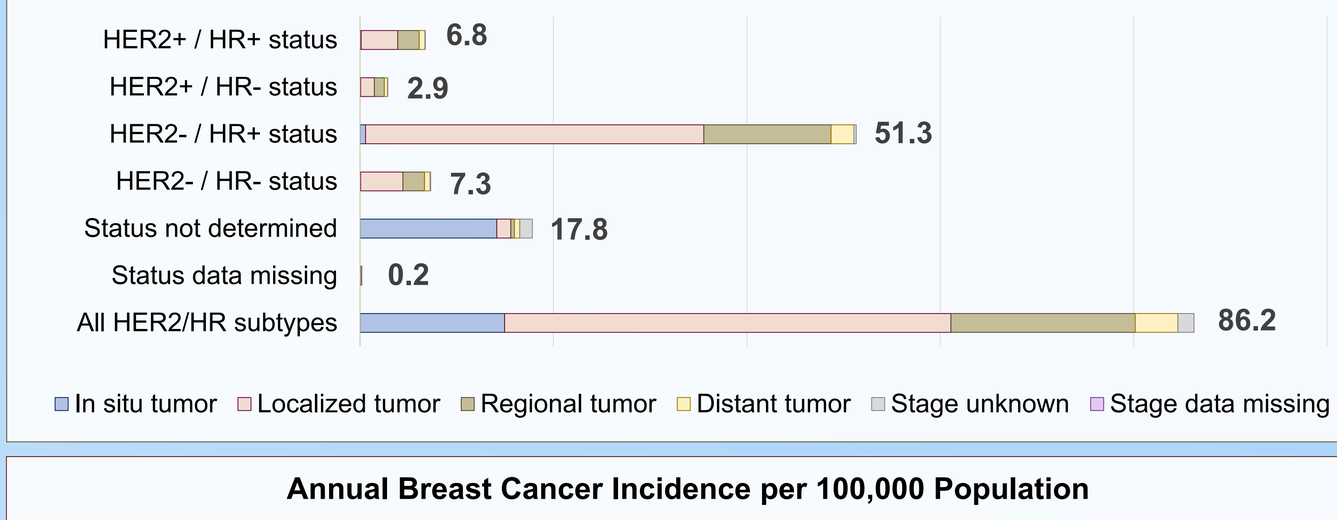


Cancer Stage Distribution

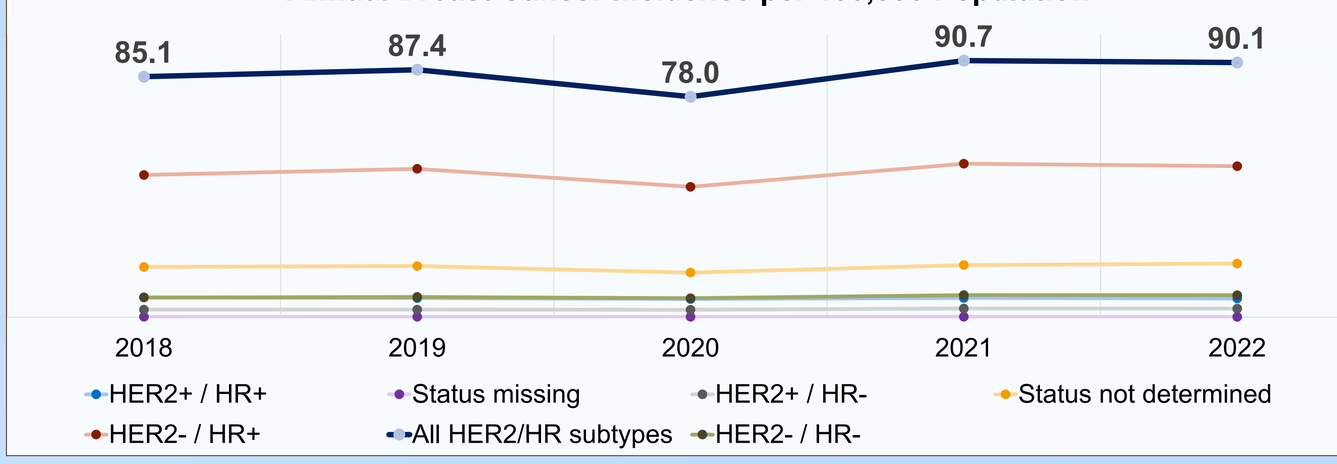


- Breast cancer incidence was 86.2/100,000 population, with the highest rate in the localized HER2-/HR+ group (35.0/100,000 population)

Breast Cancer Incidence per 100,000 Population (2018 - 2022)

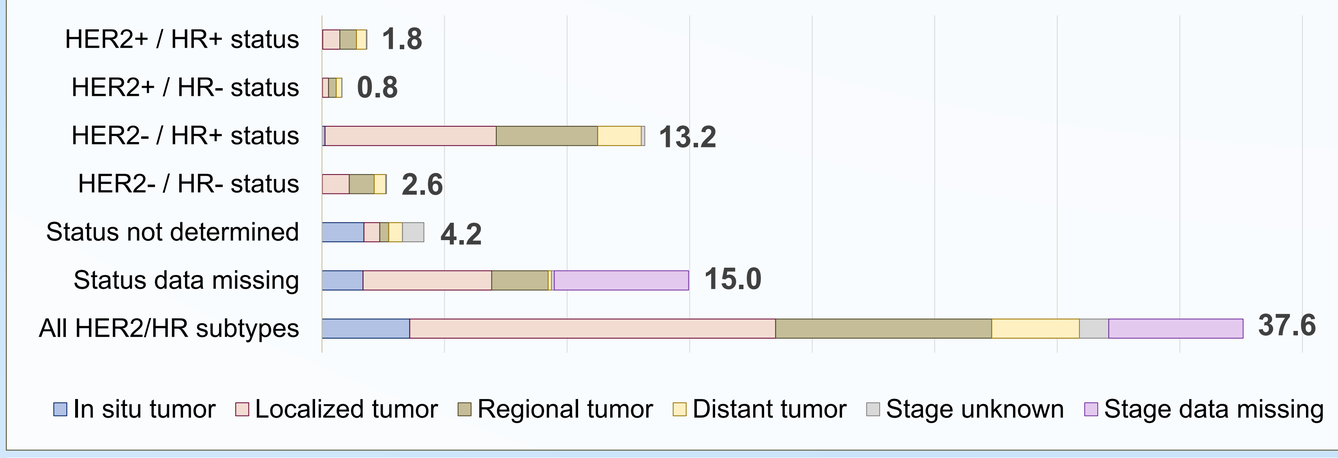


Annual Breast Cancer Incidence per 100,000 Population



- Breast cancer mortality was 37.6/100,000 population, with the highest rate in the localized HER2-/HR+ group (7.0/100,000 population)
- Mortality rates showed an increasing trend in the US from 2018 (34.0/100,000 population) to 2022 (41.9/100,000 population)
- The survival rates were similar between the years of diagnosis, but varied between the HER2/HR subtypes and breast cancer stages

Breast Cancer Mortality per 100,000 Population (2018 - 2022)



Survival Rates (patients diagnosed in 2018)	1-Year	2-Year	3-Year	4-Year
All subtypes	96.9%	94.1%	91.3%	88.6%
HER2/HR Status				
HER2+ / HR+ status	96.7%	94.6%	92.1%	89.2%
HER2+ / HR- status	95.5%	90.9%	87.9%	84.9%
HER2- / HR+ status	97.8%	95.2%	92.3%	89.5%
HER2- / HR- status	92.4%	85.5%	80.4%	76.3%
Breast Cancer Stage				
In situ	99.6%	99.0%	98.2%	97.3%
Localized	98.8%	97.2%	95.2%	93.2%
Regional (extension only)	91.3%	83.9%	77.4%	70.4%
Regional (lymph nodes only)	98.1%	95.1%	91.3%	87.5%
Regional (both mechanisms)	93.4%	82.6%	74.6%	68.5%
Distant	69.5%	55.0%	45.5%	37.1%

Key Findings

- The study demonstrated a high disease burden of breast cancer diagnosis on the US population in recent years
- Breast cancer predominantly affected females, with less than 1% of males in the US being diagnosed
- More than half of patients had the HER2-/HR+ status and/or localized breast cancer stage
- The reported incidence and mortality rates in the 2018-2022 period were high, depicting breast cancer as one of the most common and burdensome tumors
- Localized HER2-/HR+ breast cancer had the highest incidence and mortality rates among subtypes
- Trend analysis showed an increase in breast cancer incidence and mortality rates between 2018 and 2022
- Despite the high mortality rates, survival analysis showed a good prognosis for breast cancer patients in the US
- Annual survival rates after the first year of breast cancer diagnosis were 96-97%, while the 4-year rate was ~89% (including only patients diagnosed in 2018)
- Survival did not differ substantially among HER2/HR types, but the lowest rates were reported for HER2-/HR- tumors
- Regarding breast cancer stage categories, survival varied significantly between the subgroups, with distant tumors having the worst prognosis (only ~37% of patients survive 4 years after the diagnosis)

Future Studies

- Studies in the future should validate the findings of this analysis and expand the evidence pool by exploring the burden of breast cancer among other population subgroups in the US and assessing their quality of life

Limitations

- **Coding and reporting inconsistency** – data from all local cancer registries covered by the SEER program are collected without the central review, potentially causing inconsistencies and variability in terms of data input, coding practice, and reporting (i.e., different ID for the same patient that have visited two different clinics both covered by the SEER)
- **A lack of continuous healthcare follow-up** – there is no assurance that the patient did not visit other cancer centers for diagnostics, or follow-up that are not covered by the SEER program, causing a loss to follow-up bias
- **The generalizability of study findings** – SEER registry database is the most comprehensive national cancer database in the US, yet it covers only around half of the US population, which limits applying the study conclusion to the areas not covered by the SEER program

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