

What We Missed

Quantifying Undiagnosed Cancer Cases in the US during COVID-19, March-December 2020

Todd Burus, MA, MAS¹ • Feitong Lei, PhD^{1,2,4} • Bin Huang, DrPH, MS^{1,2,4} • W. Jay Christian, PhD, MPH⁴ • Pamela C. Hull, PhD^{1,2} • Amanda R. Ellis, PhD³ • Svetla Slavova, PhD^{3,5} • Thomas C. Tucker, PhD, MPH^{1,3} • Krystle A. Lang Kuhs, PhD, MPH^{1,3}

¹ UK Markey Cancer Center; ² UK College of Medicine; ³ UK College of Public Health; ⁴ Kentucky Cancer Registry; ⁵ Kentucky Injury Prevention & Research Center

Objective

The COVID-19 pandemic disrupted the normal course of cancer screening and detection in the US. A nationwide analysis of the extent of this disruption using cancer registry data has not been conducted.

Key Findings

- An estimated 134,395 cancer cases went potentially undiagnosed from March to December, 2020.
- Rates of all-sites cancer incidence were 28.6% lower than expected during the initial three months of the pandemic.
- Rates of screenable cancers were 13.9% lower than expected.

Methods

- Data source: US Cancer Statistics Public Use Database, 2022 Submission.
- Calculated monthly cancer incidence rates from Jan 2018-Dec 2020 for all-sites cancer and 11 specific cancer sites, with variables for age, sex, race, urbanicity, state of residence, and stage at diagnosis.
- Fit autoregressive integrated moving average (ARIMA) models with postulated interruptions to rates from Jan 2018-Dec 2020. Used fitted models to predict expected rates for Mar-Dec 2020 without pandemic.
- Compared expected vs observed rates and analyzed for significant differences in overall rates and among subgroups.

Results

Table 1. Potentially Missed All-Site and Screenable Cancer Cases, by Study Period During the COVID-19 Pandemic (March 1 Through December 31, 2020), USCS Public Use Database

Cancer type and period	Observed rate ^a	Expected rate (95% PI)	Relative difference (95% PI)	Potential missed cases, No. (95% PI)
All cancer sites				
March-May	80.7	113.1 (108.2 to 118.2)	-28.6 (-31.7 to -25.4) ^b	88 830 (75 568 to 102 837)
June-December	245.8	262.4 (255.4 to 269.4)	-6.3 (-8.8 to -3.8) ^b	45 565 (26 479 to 65 032)
March-December	326.5	375.4 (367.5 to 383.5)	-13.0 (-14.9 to -11.2) ^b	134 395 (112 544 to 156 680)
Screenable cancers^c				
March-May	28.6	41.3 (39.7 to 43.0)	-30.9 (-33.6 to -28.0) ^b	35 032 (30 564 to 39 710)
June-December	89.5	95.8 (93.5 to 98.2)	-6.6 (-8.8 to -4.3) ^b	17 298 (10 918 to 23 806)
March-December	118.1	137.1 (134.5 to 139.9)	-13.9 (-15.6 to -12.2) ^b	52 330 (45 034 to 59 767)

Abbreviations: PI, prediction interval; USCS, US Cancer Statistics.

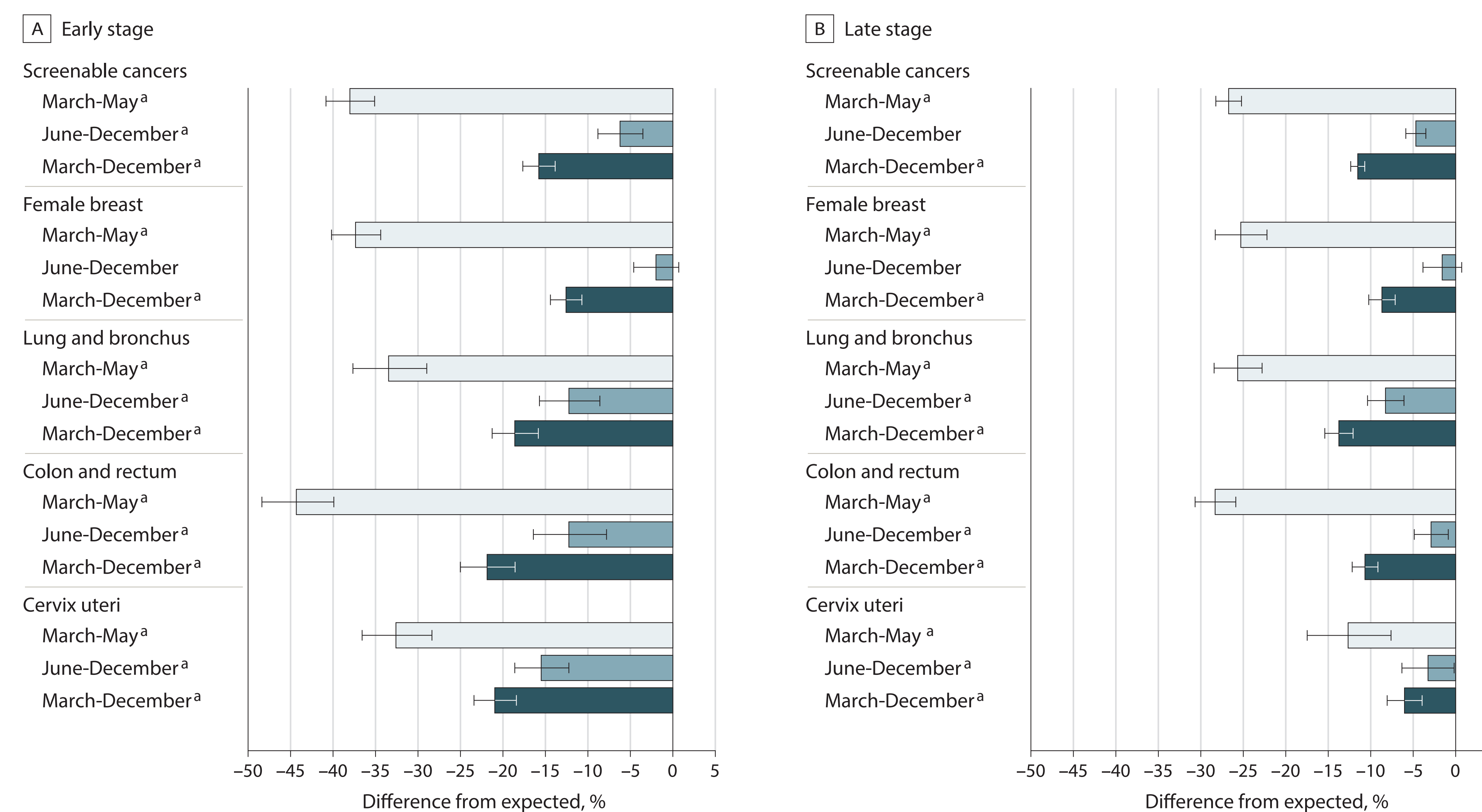
^a Rates per 100 000 people in the population and age-adjusted to the 2000 US standard population.

^b Statistically significant disruption in observed vs expected incidence rates,

based on 95% PI not including 0.

^c Screenable cancers were defined as female breast, lung and bronchus, colon and rectum, and cervix uteri.

Figure 2. Percentage Difference Between Observed and Expected Incidence Rates for Screenable Cancers, by Site, Stage, and Time Period, March 1 Through December 31, 2020

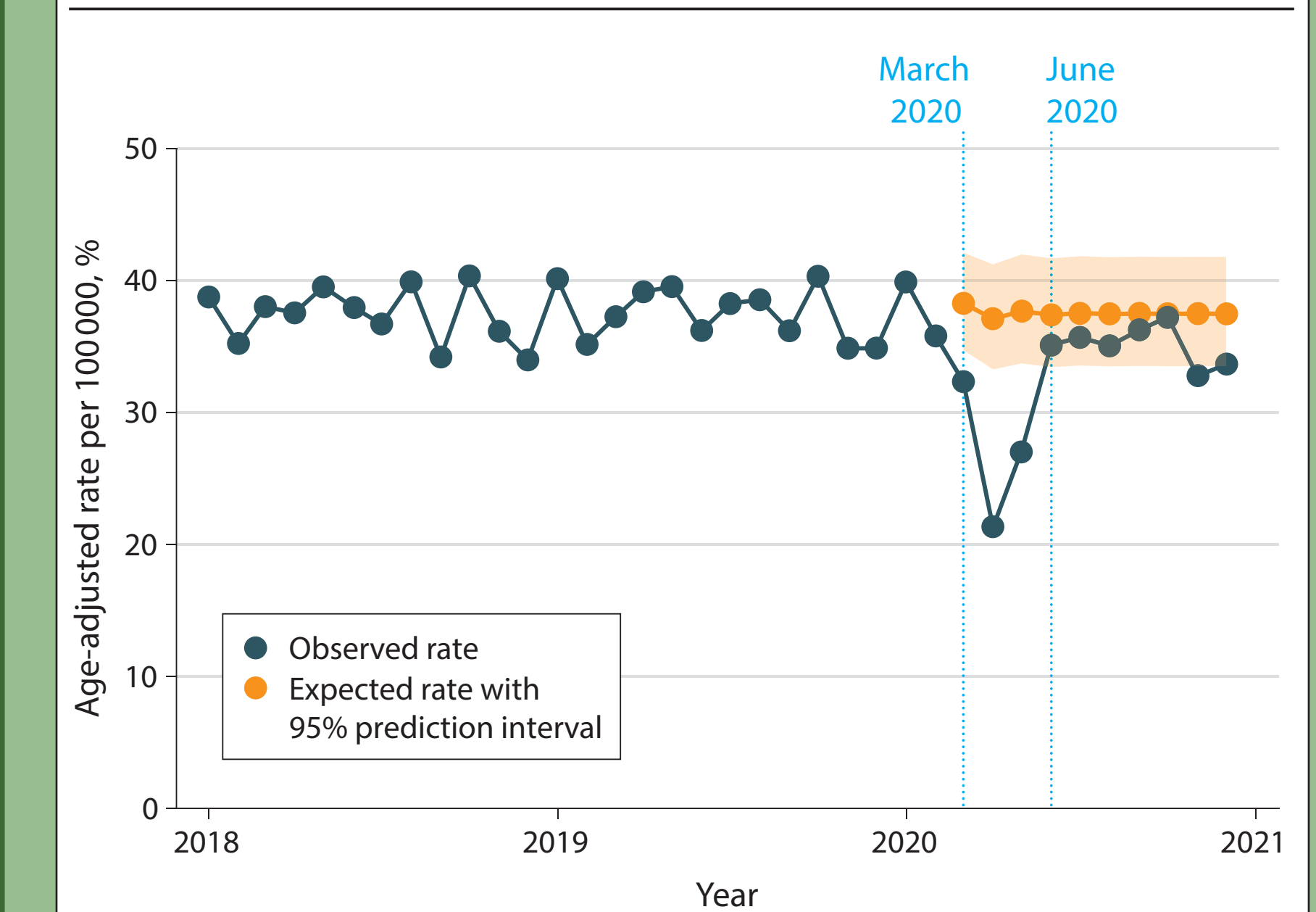


Percentage difference in observed vs expected rates for each site and time period (March-May 2020, June-December 2020, and March-December 2020) according to early (left) or late (right) stage at cancer diagnosis. Error bars indicate 95% PI (prediction interval).

^a Indicates statistically significant disruption based on 95% PI not containing 0.

Model Illustration

Figure 1. All-Sites Cancer Incidence Rates in the US for January 1, 2018, Through December 31, 2020



Monthly observed all-sites cancer incidence rates. Expected rates in the absence of the COVID-19 pandemic displayed starting in March 2020. The beginnings of the 2 pandemic periods considered (March-May 2020 and June-December 2020) are noted.

Limitations

- Actual observed incidence rates may be higher due to case reporting delays.
- Monthly rates based on annual rather than monthly population estimates.
- ARIMA models fit according to postulated interruptions. Postulating different interruptions could produce different results.

Conclusions

The US experienced a substantial deficit in diagnosed cancer cases between March and December 2020, with variations by site and patient demographics. These findings offer crucial information for current cancer prevention and control, and emphasize the need to consider how future disaster planning could affect cancer detection.