Kidney, Lung, and Breast Cancer Diagnosed During the COVID-19 Pandemic Associated with Increased Mortality Risk

Team A: Kersten Bartelt, RN; Nicholas Volker
Team B: Tony Dunnigan, MD; Jacob Gasser
Last updated 5 November 2025 • Check for updates at EpicResearch.org

Key Findings

- Patients diagnosed with kidney cancer during the pandemic were 25% more likely to die in the three years following their diagnosis compared to those diagnosed before the pandemic.
- Diagnosis during the pandemic was also associated with an 11% increased likelihood of all-cause mortality in the three years following lung cancer diagnosis and a 7% increase in likelihood of all-cause mortality in the three years following breast cancer diagnosis compared to these diagnoses prior to the pandemic.

The COVID-19 pandemic disrupted many aspects of medical care, including cancer detection and treatment.[1,2] While prior studies have documented declines in routine screening volume,[3] less is known about the long-term survival of patients diagnosed with cancer during this period.

We studied 640,286 patients who were newly diagnosed with cancer between January 2015 and June 2022. We grouped patients as diagnosed during pre-pandemic (between January 1, 2015, and March 31, 2017) or during the COVID-19 pandemic (between March 11, 2020, and June 30, 2022) periods. Patients diagnosed before the COVID-19 pandemic were matched 4:1 with patients diagnosed during the pandemic period by sex, race, ethnicity, and age. We also accounted for social vulnerability, evidence of metastasis, and other comorbidities in our analysis.

Patients diagnosed with kidney cancer during the COVID-19 pandemic were 25% more likely to die from any cause within three years compared to those diagnosed before the pandemic, as seen in Figure 1. Pandemic-period lung cancer diagnoses were associated with an 11% increase in three-year all-cause mortality for patients diagnosed with lung cancer during the pandemic, while there was a 7% increase in three-year all-cause mortality for those diagnosed with breast cancer during the pandemic compared to those diagnosed prior to the pandemic.

Three-Year All-Cause Mortality Likelihood Following Cancer Diagnosis

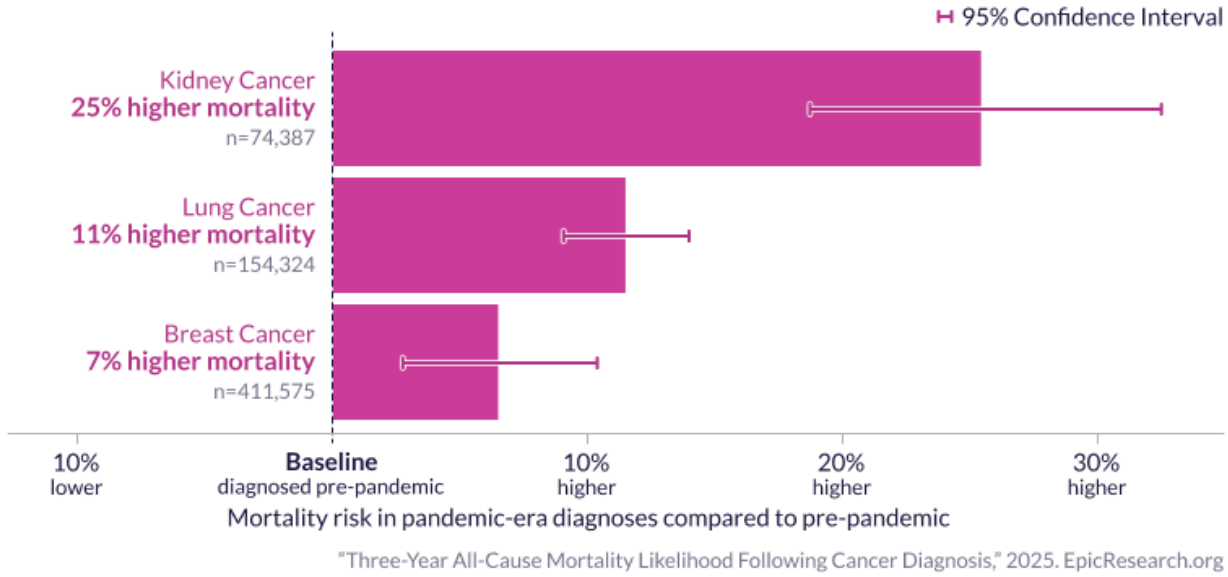

Figure 1. The likelihood of three-year all-cause mortality for patients following a cancer diagnosis by whether it occurred before or during the COVID-19 pandemic.

These findings suggest that disruptions in care during the pandemic had measurable adverse effects on outcomes across multiple cancer types.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 300 million patient records from 1,800 hospitals and more than 41,000 clinics from all 50 U.S. states, Canada, Lebanon, and Saudi Arabia. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

References

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2. Jabbal IS, Sabbagh S, Dominguez B, et al. Impact of COVID-19 on Cancer-Related Care in the United States: An Overview. Curr Oncol. 2023;30(1):681-687. Published 2023 Jan 4. doi:10.3390/curroncol30010053
3. Epic Research. Delayed Cancer Screenings. Epic Research. https://epicresearch.org/articles/delays-in-preventive-cancer-screenings-during-covid-19-pandemic. Accessed on October 31, 2025.

Data Definitions

Term	Definition
Study period	Patients newly diagnosed with **cancer** between 1/1/2015 and 3/31/2017 or 3/11/2020 and 6/30/2022
Study population: inclusion	Patients who had an **outpatient face-to-face encounter** in the two years before their inclusion **cancer** diagnosis
Study population: exclusion	Patients with evidence of **primary cancer** or **metastatic cancer** in billing, encounter, or problem list diagnosis before or on the same day as their inclusion **cancer** diagnosis
Primary cancer	An encounter diagnosis of **breast cancer**, **lung cancer**, or **kidney cancer**
Metastatic cancer	ICD-10-CM code C77*, C78*, C79*, C80.0, C80.2, or C7B*
Breast cancer	ICD-10-CM code C50*
Lung cancer	ICD-10-CM code C34*
Kidney cancer	ICD-10-CM code C64*
Censoring	Three years after initial diagnosis, last face-to-face encounter, or a documented death
Outcomes	Three-year survival rate
Matching	4:1 pre-pandemic period to during COVID-19 pandemic • Evaluated sex • Race and ethnicity: Asian, Black, Hispanic, other or multiracial, unknown, White • 5-year age bands based on age at time of diagnosis
Confounders	Race and ethnicity Age Social Vulnerability Index quintile **Development of metastatic cancer** after primary diagnosis Other comorbid diagnoses from Charlson Comorbidity Index (billing, encounter, or problem list diagnosis) • CHF: ICD-10-CM code I11.0, I13.0, I13.2, I25.5, I42.0, I42.5, I42.6, I42.7, I42.8, I42.9, I43*, I50*, P29.0 • Myocardial infarction: ICD-10-CM code I21*, I22*, or I25.2 • Peripheral vascular disease: ICD-10-CM code I70*, I71*, I73.1, I73.8, I73.9, I77.1, I79.0, I79.1, I79.8, K55.1, K55.8, K55.9, Z95.8, Z95.9 • CVA: ICD-10-CM code G45*, G46*, H34.0*, H34.1*, H34.2*, I60*, I62*, I63*, I64*, I65*, I66*, I67*, I68* • Dementia: ICD-10-CM code F01*, F02*, F03*, F04, F05, F06.1, F06.8, G13.2, G13.8, G30*, G31.0*, G31.1, G31.2, G91.4, G94, R41.81, R54 • Chronic pulmonary disease: ICD-10-CM code J40*, J41*, J42*, J43*, J44*, J45*, J46*, J47*, J60*, J61*, J62*, J63*, J64*, J65*, J66*, J67*, J68.4, J70.1, J70.3 • Rheumatic disease: ICD-10-CM code M05*, M06*, M31.5, M32*, M33*, M34*, M35.1, M35.3, M36.0 • Peptic ulcer disease: ICD-10-CM code K25*, K26*, K27*, K28* • Liver disease: ICD-10-CM code B18*, K70*, K71*, K72.1*, K72.9*, K73*, K74*, K76*, Z94.4, I85.0*, I86.4

	• Diabetes: ICD-10-CM code E08*-E13* • Kidney disease: ICD-10-CM code I12.0, I12.9, I13.0, I13.10, I13.11, I13.2, N03*, N05*, N18*, N25.0, Z94.0, Z49*, Z99.2 • Hemiplegia or paraplegia: ICD-10-CM code G04.1, G11.4, G80.0, G80.1, G80.2, G81*, G82*, G83* • HIV/AIDS: ICD-10-CM code B20
Race and ethnicity	Standard classification based on self-reported race into categories of Asian, Black, other or multiracial, unknown, or White
Model specifications	Survival analysis using a Cox proportional hazards model on the 1:4 matched exposure/control population generating hazard ratios for the exposure and confounders
Limitations	• The analysis could not distinguish between delays in screening versus treatment • Cause of death was not studied • Staging and severity of diagnosis was not possible for most cancer cases

Table 1: Population Characteristics

Category	Subcategory	Patients	% of Total
Total	Total	1,178,854	100.0%
Sex	Male	542,887	46.1%
	Female	630,033	53.4%
	Other	5,934	0.5%
Race/Ethnicity	Unknown	17,112	1.5%
	White	869,022	73.7%
	Hispanic	54,298	4.6%
	Other	85,634	7.3%
	Asian	24,861	2.1%
	Black	127,927	10.9%
Age	[<50]	120,536	10.2%
	[50,64]	386,898	32.8%
	[65,79]	504,203	42.8%
	[80+]	167,217	14.2%
SVI	<.2	172,666	14.6%
	>=.8	281,679	23.9%
	[.2,.4)	230,967	19.6%
	[.4,.6)	217,166	18.4%
	[.6,.8)	251,736	21.4%
	Other	24,640	2.1%
Three-Year Survival	Yes	1,047,518	88.9%
	No	131,336	11.1%

Table 2: Three-Year All-Cause Mortality Likelihood Following Cancer Diagnosis

	Likelihood of All-Cause Three-Year Mortality	95% CI Low	95% CI High
Kidney Cancer	1.25	1.19	1.32
Lung Cancer	1.11	1.09	1.14
Breast Cancer	1.07	1.03	1.10