

## **Supplementary Material**

### **Supplementary Methods**

#### **Delay-adjustment**

Reporting delay refers to the time it takes for a new cancer diagnosis, to be reported and included in the database. Cancer cases reported in the most recent diagnosis years in SEER data submissions are slightly underreported. To correct for this underreporting in the November 2022 data submission, we utilized delay adjustment factors estimated from the November 2021 data submission using statistical regression methods (1, 2). The methods combine data from different submissions to estimate the amount of reporting delay for the most recent years at diagnosis by various factors that may influence the reporting delay, such as cancer site, registry, age group, gender, and race. The largest reporting delay occurs in the last year of data. On average we estimated that the number of cancers cases reported in 2020 year is about 4% lower than the final number of cancer cases that will eventually be reported for 2020 in future data submissions.

Once the reporting delay is estimated, we apply (multiply) adjustments to all cases based on these same factors to account for the expected number of cases that have not yet been reported. For example, if there are 100 cases reported in 2020 with a specific cancer site, registry, age group, gender, race, and we estimate an underreporting of 5% for cases with these factors, we would multiply each case by 1.05 and would obtain a delay-adjusted count of 105 cases. Note that rates in diagnosis years prior to 2020, e.g. 2019, 2018... are also adjusted, but to a much smaller extent. We then use these adjusted counts to estimate age-adjusted incidence rates that are adjusted for reporting delay. These delay-adjusted age-adjusted rates can then be used for further analysis, such as inputs into Joinpoint models or in the calculation of the percent change measure. By adjusting for underreporting, we obtain cancer incidence rates that can more accurately describe the decline in the rates due to COVID eliminating any potential decline due to reporting delay.

#### **Percent change estimate and confidence interval**

To measure the sudden decline in 2020 cancer incidence rates relative to 2019 rates we used the percent change of the rates in 2020 compared to 2019. Let us denote incidence rates in 2020 and 2019 respectively as Rate(2020) and Rate(2019). The percent change of the rates in 2020 compared to 2019 is defined as

$$PC = [\text{Rate}(2020) - \text{Rate}(2019)] / \text{Rate}(2019).$$

We used SEER\*Stat estimates of Ratio=[Rate (2020)/Rate (2019)] and respective confidence intervals based on Tiwari et al (2006) method (3), respectively LCI and UCI. We can calculate the percent change estimate and its confidence interval

as:

$$PC = (\text{Ratio} - 1) \times 100,$$

$$\text{Lower limit for PC: } (\text{UCI} - 1) \times 100$$

$$\text{Upper limit for PC: } (\text{LCI} - 1) \times 100$$

## References

1. Clegg LX, Feuer EJ, Midthune DN, Fay MP, Hankey BF. Impact of reporting delay and reporting error on cancer incidence rates and trends. JNCI Journal of the National Cancer Institute. 2002;94(20):1537-45.
2. Midthune DN, Fay MP, Clegg LX, Feuer EJ. Modeling reporting delays and reporting corrections in cancer registry data. Journal of the American Statistical Association. 2005;100(469):61-70.
3. Tiwari RC, Clegg LX, Zou Z. Efficient interval estimation for age-adjusted cancer rates. Stat Methods Med Res. 2006;15(6):547-69.
4. The 2022 Release of Delay Adjustment Factors and Rates (<https://surveillance.cancer.gov/delay/model.html>).

Supplementary Table 1. Joinpoint trends in age-standardized, delay-adjusted incidence rates by cancer sites, using the November 2022 data submission excluding and including the 2020 incidence rates. Trends were characterized by using the annual percent change (APC).

	Nov 2022 Data Excluding 2020 Rates				Nov 2022 Data Including 2020 Rates			
	Segment	APC	95% C.I.	Trend	Segment	APC	95% C.I.	Trend
All Sites	(2000-2008)	-0.10	(-0.35, 0.39)	n.s.	(2000-2020)	-0.60	(-0.78, -0.42)	↑
All Sites	(2008-2013)	-1.37	(-2.44, -0.85)	↓	-	-	-	-
All Sites	(2013-2019)	0.13	(-0.28, 1.39)	n.s.	-	-	-	-
Breast (Female)	(2000-2004)	-2.41	(-5.20, -1.03)	↓	(2000-2004)	-2.17	(-5.64, -0.18)	↓
Breast (Female)	(2004-2019)	0.47	(0.28, 0.74)	↑	(2004-2020)	0.32	(0.05, 1.14)	↑
Prostate	(2000-2009)	-1.58	(-2.39, -0.44)	↓	(2000-2008)	-1.28	(-2.45, 1.56)	n.s.
Prostate	(2009-2014)	-7.43	(-11.61, -5.37)	↓	(2008-2014)	-6.29	(-11.55, -4.20)	↓
Prostate	(2014-2019)	3.80	(1.67, 7.14)	↑	(2014-2020)	2.06	(-0.23, 7.15)	n.s.
Lung and Bronchus	(2000-2008)	-0.81	(-0.96, -0.63)	↓	(2000-2007)	-0.85	(-1.31, 0.67)	n.s.
Lung and Bronchus	(2008-2011)	-2.83	(-3.12, -2.15)	↓	(2007-2018)	-2.00	(-2.45, -1.64)	↓
Lung and Bronchus	(2011-2019)	-1.83	(-1.98, -1.39)	↓	(2018-2020)	-5.95	(-7.40, -3.33)	↓
Colon and Rectum	(2000-2007)	-2.43	(-2.64, -1.99)	↓	(2000-2013)	-2.77	(-3.15, -2.47)	↓
Colon and Rectum	(2007-2012)	-3.36	(-4.21, -2.94)	↓	(2013-2018)	-0.71	(-2.88, 1.11)	n.s.
Colon and Rectum	(2012-2019)	-0.92	(-1.19, -0.53)	↓	(2018-2020)	-5.04	(-7.37, -1.72)	↓
Melanoma	(2000-2005)	3.27	(2.17, 5.84)	↑	(2000-2018)	1.56	(1.28, 2.07)	↑
Melanoma	(2005-2019)	1.16	(0.82, 1.40)	↑	(2018-2020)	-5.95	(-9.97, -0.16)	↓
Urinary Bladder	(2000-2004)	0.75	(-0.01, 1.93)	n.s.	(2000-2004)	0.62	(-0.15, 2.41)	n.s.
Urinary Bladder	(2004-2019)	-1.14	(-1.27, -1.02)	↓	(2004-2017)	-1.05	(-1.22, -0.86)	↓
Urinary Bladder	-	-	-	-	(2017-2020)	-2.98	(-5.04, -1.95)	↓
Non-Hodgkin Lymphoma	(2000-2005)	1.10	(0.61, 1.88)	↑	(2000-2005)	1.07	(0.36, 2.91)	↑
Non-Hodgkin Lymphoma	(2005-2019)	-0.41	(-0.54, -0.30)	↓	(2005-2018)	-0.38	(-0.61, -0.13)	↓
Non-Hodgkin Lymphoma	-	-	-	-	(2018-2020)	-3.44	(-4.84, -1.32)	↓
Kidney and Renal Pelvis	(2000-2007)	3.45	(3.05, 3.92)	↑	(2000-2006)	3.44	(2.38, 6.23)	↑
Kidney and Renal Pelvis	(2007-2011)	-0.11	(-0.92, 0.74)	n.s.	(2006-2018)	1.01	(0.61, 2.09)	↑
Kidney and Renal Pelvis	(2011-2019)	1.38	(1.13, 2.02)	↑	(2018-2020)	-2.53	(-4.44, 0.66)	n.s.
Corpus and Uterus	(2000-2003)	-0.80	(-2.67, 0.51)	n.s.	(2000-2004)	-0.32	(-2.66, 0.89)	n.s.
Corpus and Uterus	(2003-2019)	1.29	(1.18, 1.45)	↑	(2004-2018)	1.38	(1.23, 2.19)	↑
Corpus and Uterus	-	-	-	-	(2018-2020)	-3.07	(-4.68, -0.47)	↓
Leukemia	(2000-2007)	0.02	(-1.30, 0.46)	n.s.	(2000-2007)	0.05	(-1.30, 0.53)	n.s.
Leukemia	(2007-2013)	1.63	(1.09, 3.00)	↑	(2007-2014)	1.53	(1.05, 2.96)	↑
Leukemia	(2013-2019)	-0.20	(-0.97, 0.24)	n.s.	(2014-2020)	-0.82	(-1.57, -0.27)	↓

Incidence rates were delay-adjusted using the November 2021 delay adjustment factors (4). The upward arrows indicate statistically significant increasing trends, downward arrow indicate statistically significant decreasing trend and n.s. indicates non significant.