Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

eAppendix 1. Alphabetical List of Participants by Institution That Contributed at Least 1 Record to the Analysis

Bolded = site PI/co-PIs; site co-investigators are listed alphabetically by last name.

1. **Balazs Halmos, MD; Amit Verma, MBBS**; Benjamin A. Gartrell, MD; Sanjay Goel, MBBS; Nitin Ohri, MD; R. Alejandro Sica, MD; Astha Thakkar, MD (Albert Einstein College of Medicine, Montefiore Medical Center, Bronx, NY, USA)
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3. **Michael A. Thompson, MD, PhD, FASCO**; Pamela Bohachek, RN; Daniel Mundt, MD; Mitrianna Streckfuss, MPH; Eyob Tadesse, MD (Aurora Cancer Care, Advocate Aurora Health, Milwaukee, WI, USA)
4. **Philip E. Lammers, MD, MSCI** (Baptist Cancer Center, Memphis, TN, USA)
5. **Orestis A. Panagiotou, MD, PhD**; Pamela C. Egan, MD; Dimitrios Farmakiotis, MD, FACP, FIDSA; Hina Khan, MD; Adam J. Olszewski, MD (Brown University and Lifespan Cancer Institute, Providence, RI, USA)
6. **Arturo Loaiza-Bonilla, MD, MSEd, FACP** (Cancer Treatment Centers of America, AZ/GA/IL/OK/PA, USA)
7. **Salvatore A. Del Prete, MD**; Michael H. Bar, MD, FACP; Anthony P. Gulati, MD; K. M. Steve Lo, MD; Suzanne J. Rose, MS, PhD, CCRC, FACRP; Jamie Stratton, MD; Paul L. Weinstein, MD (Carl & Dorothy Bennett Cancer Center at Stamford Hospital, Stamford, CT, USA)
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9. **Shilpa Gupta, MD**; Nathan A. Pennell, MD, PhD, FASCO; Manmeet S. Ahluwalia, MD, FACP; Scott J. Dawsey, MD; Christopher A. Lemmon, MD; Amanda Nizam, MD (Cleveland Clinic, Cleveland, OH, USA)
10. **Claire Hoppenot, MD; Ang Li, MD, MS** (Dan L Duncan Comprehensive Cancer Center at Baylor College of Medicine, Houston, TX, USA)
11. **Toni K. Choueiri, MD**; Ziad Bakouny, MD, MSc; Gabrielle Bouchard, BS; Fiona J. Busser, BA; Jean M. Connors, MD; Catherine R. Curran, BA; George D. Demetri, MD, FASCO; Antonio Giordano, MD, PhD; Kaitlin Kelleher, BA; Anju Nohria, MD; Andrew Schmidt, MD; Grace Shaw, BA; Eli Van Allen, MD; Pier Vitale Vincent Xu, MD; Rebecca L. Zon, MD (Dana-Farber Cancer Institute, Boston, MA, USA)
12. **Tian Zhang, MD, MHS**; Susan Halabi, PhD, FASCO (Duke Cancer Institute at Duke University Medical Center, Durham, NC, USA)
13. **John C. Leighton Jr, MD, FACP** (Einstein Healthcare Network, Philadelphia, PA, USA)
14. **Gary H. Lyman, MD, MPH, FASCO, FRCP**; Jerome J. Graber MD, MPH; Petros Grivas, MD, PhD; Ali Raza Khaki, MD; Elizabeth T. Loggers, MD, PhD; Ryan C. Lynch, MD; Elizabeth S. Nakasone, MD, PhD; Michael T. Schweizer, MD; Lisa Tachiki, MD; Shaveta Vinayak, MD,

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16. **Sharad Goyal, MD; Minh-Phuong Huynh-Le, MD, MAS** (George Washington University, Washington, DC, USA)
17. **Lori J. Rosenstein, MD** (Gundersen Health System, WI, USA)
18. **Peter Paul Yu, MD, FACP, FASCO**; Jessica M. Clement, MD; Ahmad Daher, MD; Mark Dailey, MD; Rawad Elias, MD; Asha Jayaraj, MD; Emily Hsu, MD; Alvaro G. Menendez, MD; Joerg Rathmann, MD; Oscar Serrano, MD (Hartford HealthCare Cancer Institute, Hartford, CT, USA)
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22. **Eric H. Bernicker, MD** (Houston Methodist Cancer Center, Houston, TX, USA)
23. **John Deeken, MD**; Danielle Shafer, DO (Inova Schar Cancer Institute, Fairfax, VA, USA)
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42. **Salma K. Jabbour, MD**; Christian F. Misdary, MD; Mansi R. Shah, MD (Rutgers Cancer Institute of New Jersey at Rutgers Biomedical and Health Sciences, New Brunswick, NJ, USA)
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65. **Jeremy L. Warner, MD, MS, FAMIA, FASCO**; Alex Cheng, PhD; Elizabeth J. Davis, MD; Stephany N. Duda, PhD, MS; Kyle T. Enriquez, MSc BS; Benjamin French, PhD; Erin A. Gillaspie, MD, MPH; Cassandra Hennessy, MS; Daniel Hausrath, MD; Chih-Yuan Hsu, PhD; Douglas B. Johnson, MD, MSCI; Xuanyi Li, BA; Sanjay Mishra, MS, PhD; Sonya A. Reid, MD, MPH; Brian I. Rini, MD, FACP, FASCO; David A. Slosky, MD; Yu Shyr, PhD; Carmen C. Solorzano, MD, FACS; Tianyi Sun, MS; Matthew D. Tucker, MD; Karen Vega-Luna, MA; Lucy L. Wang, BA (Vanderbilt-Ingram Cancer Center at Vanderbilt University Medical Center, Nashville, TN, USA)
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67. **Matthew Puc, MD**; Theresa M. Carducci, MSN, RN, CCRP; Karen J. Goldsmith, BSN, RN; Susan Van Loon, RN, CTR, CCRP (Virtua Health, Marlton, NJ, USA)
68. **Umit Topaloglu, PhD, FAMIA**; Saif I. Alimohamed, MD (Wake Forest Baptist Comprehensive Cancer Center, Winston-Salem, NC, USA)

69. **Robert L. Rice, MD, PhD** (WellSpan Health, York, PA, USA)
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72. **Mehmet A. Bilen, MD**; Deepak Ravindranathan, MD, MS (Winship Cancer Institute of Emory University, Atlanta, GA, USA)
73. **Navid Hafez, MD, MPH**; Roy Herbst, MD, PhD; Patricia LoRusso, DO, PhD; Tyler Masters, MS; Catherine Stratton, BA (Yale Cancer Center at Yale University School of Medicine, New Haven, CT, USA)

eAppendix 2. Statistical Analysis Plan

Approved Project Title	Regional Variability and Urban-Rural Health Disparities in Outcomes of Patients with Cancer and COVID-19
Approved Project PIs	Jessica Hawley and Clara Hwang
1 (a) Manuscript title	Assessment of US Regional Variability in COVID-19 Outcomes Among Patients With Cancer
3 Objectives State specific objectives, including any prespecified hypotheses	H0: Clinical outcomes and US census region are independent in patients with cancer and COVID-19 in adjusted models (no difference in death (30-day all-cause mortality) or composite endpoint (death, rate of ICU admission, rate of mechanical ventilation). HA: Clinical outcomes and US census region are associated in patients with cancer and COVID-19.
4 Study design	Retrospective, multi-center cohort study
5 Setting	Cohort study of patients with current or past history of cancer and lab-confirmed SARS-CoV-2 infection from >120 participating CCC19 sites. Data analyzed from March 15, 2020 – November 30, 2020. Registry built and maintained as electronic REDCap database at VUMC.
6 Participants	
(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	Subjects included in this analysis were those with laboratory-confirmed SARS-CoV-2 infection and past or current history of invasive malignancy, from the U.S., and entered into the CCC19 database between 3/17/2020 and 11/30/2020 with follow-up data reported through 12/31/2020. We excluded records of presumptive COVID-19 cases, patients < 18 years of age, patients with incomplete follow-up data, cases of non-invasive cancers and premalignant conditions or non-melanoma non-invasive skin cancers, cases from outside the U.S., and records with quality score >4.
(b) For matched studies, give matching criteria and number of exposed and unexposed	Not a matched study.
7 Variables	
(a) Outcomes	Primary outcomes: 30-day all-cause mortality (binary) Secondary outcomes: composite binary outcome (death at any time, ICU admission, or mechanical ventilation), and individual components of composite outcome to assess overall medical burden by U.S. Census subregion. Analysis of outcomes conducted overall (all time periods) and by three prespecified time periods.
(b) Exposures	9 US Census Subregions (Defined as per list below)
(c) Potential confounders	**Census Region Level:**

	• Average daily new COVID-19 case rate per 1,000,000 people (continuous) • Population density for region (continuous) **Center-level:** • SVI (continuous) • RUCC code (ordinal) • Type of Center – academic vs. community (binary) **Individual-level:** • Age • sex • race/ethnicity • smoking • obesity • specific comorbidities (CV, pulmonary, renal, DM) • type of malignancy (solid vs. heme) • cancer status • ECOG status • type of cancer-directed therapy or surgery • COVID-19 treatments **Time intervals** (use every 3 months = 3 time periods) • March, April, May • June, July, August • Sept, Oct, Nov
(d) Effect modifiers	None
(e) Diagnostic criteria (if applicable)	Laboratory-confirmed positive for SARS-CoV-2
8 Data sources/measurement For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Variables of interest are defined by the CCC19 database registry and entered by each local site's data abstractor. -race/ethnicity self-reported (5 categories) -smoking (never v. ever v. missing) -obesity (y/n/missing) -specific comorbidities (CV, pulm, renal, DM, missing) -cancer status (active and responding, active and stable, active and progressing vs. remission/NED, unknown, missing) -ECOG (0, 1, ≥ 2, unknown, missing) -type of malignancy (solid vs. heme) -modality of active anti-cancer therapy (categorical: none, cytotoxic chemo, immunotherapy, targeted, endocrine, locoregional, other, missing/unknown)

	-COVID-19 tx (categorical: use JCO paper groupings) -Rural-urban status (center-level: ordinal – 1, 2, 3) -Neighborhood (cont: use center-level SVI) -Population density by US census subregion (continuous) -New COVID19 ave daily case over 3 time intervals by region (continuous)
9 Bias Describe any efforts to address potential sources of bias	Adjustment for covariates in multivariable models.
10 Study size Explain how the study size was arrived at	Case volume dependent on data abstracters at each site.
11 Quantitative variables Explain how quantitative variables will be handled in the analyses. If applicable, describe which groupings will be chosen and why	As per above
12 Statistical methods	
(a) Describe all statistical methods, including those to be used to control for confounding	Covariates (listed above under potential confounders) and binary outcomes will be summarized across 9 census subregions using standard descriptive statistics. Multivariable generalized linear mixed-effects models (with a logit link for binary outcomes and center-level random effects) will be used to (1) estimate adjusted covariate-outcome associations and (2) estimate adjusted subregion-level outcome rates overall and at 3-month time intervals. For secondary outcomes, the model will include an offset for (log) follow-up time. A list of potential tables and figures is provided below.
(b) Describe any methods that will be used to examine subgroups and interactions	None
(c) Explain how missing data will be addressed	Multiple imputation will be used to impute missing and unknown data for all variables included in the analysis, with some exceptions: unknown ECOG performance score and unknown cancer status will not be imputed and treated as a separate category in analyses. Imputation will be performed on the largest dataset possible (that is, after removing test cases and other manual exclusions, but before applying specific exclusion criteria). At least 10 imputations will be generated.

(d) If applicable, explain how loss to follow-up will be addressed	Excluded if no data on 30-day follow-up form. We will extend follow-up time (through 12/31/2020) to ensure that follow-up for the primary outcome, 30-day mortality, is complete to the best of our ability.
(e) Describe any sensitivity analyses	None
Date approved	January 22, 2021

US Census Regions / Division:

- Region I: Northeast
  - New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
  - Middle Atlantic: New Jersey, New York, Pennsylvania
- Region II: Midwest
  - East North Central: Indiana, Illinois, Michigan, Ohio, Wisconsin
  - West North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
- Region III: South
  - South Atlantic: Delaware, DC, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia
  - East South Central: Alabama, Kentucky, Mississippi, Tennessee
  - West South Central: Arkansas, Louisiana, Oklahoma, Texas
- Region IV: West
  - Mountain: Arizona, Colorado, Idaho, New Mexico, Montana, Utah, Nevada, Wyoming
  - Pacific: Alaska, California, Hawaii, Oregon, Washington

The COVID-19 & Cancer Consortium

Approved Project Variables

Once the project design and SAP have been approved for your project, this document will be used to specify the exact outcomes and variables to be used in your analysis. Please provide as much information as you can, including the existing variable name if you know it. Use of existing variables will decrease the amount of time that it takes to get your project to the analysis phase, but we will endeavor to add any needed derived variables based on your project needs. Existing variables can be found in two places within the GitHub repo: the **Data Dictionary** ("`CCC19_DataDictionary.csv`"), which includes the native variables found in the survey, and the list of **Derived Variables** ("`CCC19_Derived_Variables_Spreadsheet.xlsx`").

Please fill out and return this form to Jeremy Warner (jeremy.warner@vumc.org), Sanjay Mishra (sanjay.mishra.1@vumc.org) and your assigned biostatistics lead.

If you need extra rows just hit Tab when your cursor is in the bottom right cell.

Outcome description	Outcome variable name	Outcome values	Additional Details
Derived variable indicating whether patient has died within 30 days of COVID-19 diagnosis (default = No)	der_dead30	0 = No; 1 = Yes; 99 = Unknown	
Derived dead/alive variable	*der_deadbinary*	0 = No; 1 = Yes; 99 = Unknown	
Derived variable indicating whether patients required mechanical ventilation	der_mv	0 = No; 1 = Yes; 99 = Unknown	
Derived variable indicating time in ICU	der_ICU	0 = No; 1 = Yes; 99 = Unknown	
Derived variable of composite outcome	der_composite_ICU_mv_death (der_composite.3.v2 is the variable name in R script)	0 = No; 1 = Yes; 99 = Unknown	Derived with: *der_deadbinary, der_mv, der_ICU*
Median F/U in days	der_days_fu *(der_median_fu is the variable name in R script)*		

Covariate description	Variable name	Covariate values	Additional Details
Patient-level covariates			

Region of patient residence with ex-US collapsed	der_region_v2	Non-US; Other; Undesignated US; US Midwest; US Northeast; US South; US West	
Region of patient residence with US and ex-US collapsed	der_region_v3	Non-US; Other; US	
US Census Division	der_division	East North Central; East South Central; Middle Atlantic; Mountain; New England; Pacific; South Atlantic; West North Central; West South Central	
Age with imputation for categoricals	*der_age_trunc (der_age is the variable name in the R script)*	Years (continuous 18-89; patients noted to be greater than 89 are set to be age = 90)	
***Sex* (Recode other/prefer not to say gender --> missing)**	*der_sex*	*Male, Female*	
Derived variable for race/ethnicity	der_race	Non-Hispanic White; Hispanic; Non-Hispanic Black; Other	
Derived variable for smoking status collapsing the current/former smoker variables	der_smoking2	Never; Current or Former; Unknown	
Binary obesity (BMI >= 30 or checkbox checked) indicator	der_obesity	0 = No; 1 = Yes; 99 = Unknown	
Cardiovascular comorbidity (CAD, CHF, Afib, arrhythmia NOS, PVD, CVA, cardiac disease NOS)	der_card	0 = No; 1 = Yes; 99 = Unknown	
Derived variable indicating whether patient has pulmonary comorbidities	der_pulm	0 = No; 1 = Yes; 99 = Unknown	
Renal comorbidities	der_renal	0 = No; 1 = Yes; 99 = Unknown	
Derived variable indicating whether patient has diabetes mellitus	der_dm2	0 = No; 1 = Yes; 99 = Unknown	

Solid tumor indicator	der_solid	0 = No; 1 = Yes;	
Hematologic malignancy indicator	der_heme	0 = No; 1 = Yes	
Derived variable indicating cancer status	der_cancer_status	0 - Remission/NED; 1 - Active, stable/responding; 2 - Active, progressing; 99 - Unknown	
Timing of cancer treatment relative to COVID-19, collapsed	der_cancer_tx_timing_v3	0 = more than 3 months; 1 = 0-3 months; 88 = never or after COVID-19 diagnosis; 99 = unknown	
Performance Status	der_ecogcat2	ECOG 0, 1, or 2+	
No cancer treatment in the 3 months prior to COVID-19	der_cancertr_none	0=No; 1=Yes; 99=Unknown	Derived with the following covariates: der_any_cyto, der_any_targeted, der_any_endo, der_any_immuno, der_any_local, der_any_other Coded as 1 if all these variables are 0; coded as 0 if any of these variables is 1; coded as 99 if any of these variables is 99; otherwise, NA
Any cytotoxic cancer treatment in the 3 months prior to COVID-19	der_any_cyto	0 = No; 1 = Yes; 99 = Unknown	
Any targeted therapy in the 3 months prior to COVID-19	der_any_targeted	0 = No; 1 = Yes; 99 = Unknown	
Any endocrine therapy in the 3 months prior to COVID-19	der_any_endo	0 = No; 1 = Yes; 99 = Unknown	
Any immunotherapy in the 3 months prior to COVID-19	der_any_immuno	0 = No; 1 = Yes; 99 = Unknown	
Any local therapy (surgery or RT) within 3 months	der_any_local	0 = No; 1 = Yes; 99 = Unknown	
Any other cancer therapy in the 3 months prior to COVID-19	der_any_other	0 = No; 1 = Yes; 99 = Unknown	
No COVID-19 treatment ever	der_covidtr_none	0 = No; 1 = Yes; 99 = Unknown	Derived with the following covariates: der_rem, der_hcq, der_steroids_c19,

			der_other_tx_c19_v2 Coded as 1 if all these variables are 0; coded as 0 if any of these variables is 1; coded as 99 if any of these variables is 99; otherwise, NA
Remdesivir as treatment for COVID-19 ever	der_rem	0 = No; 1 = Yes; 99 = Unknown	
Hydroxychloroquine as COVID-19 treatment ever	der_hcq	0 = No; 1 = Yes; 99 = Unknown	
Steroids as COVID-19 treatment ever	der_steroids_c19	0 = No; 1 = Yes; 99 = Unknown	
COVID-19 treatments other than HCQ, steroids, remdesivir	der_other_tx_c19_v2	0 = No; 1 = Yes; 99 = Unknown	
Trimester and year of diagnosis, using the most recent side of the interval as anchor	der_tri_rt_dx	T1 2020; T2 2020; T3 2020; T1 2021	
Derived variable indicating cancer type	der_ttype	Solid, Heme, Multiple	Derived with: der_solid, der_heme, cancer_type_2 Coded as Solid if der_solid is 1 and cancer_type_2=" "; coded as Heme if der_heme is 1 and cancer_type_2=" " Otherwise, coded as Multiple
No cancer therapy, ever	cancer_tx_never	0 = No; 1 = Yes;	Derived with der_cancer_tx_timing_v3 No recent cancer therapy; directly mapped from cancer_tx_timing_v3 = 88
participating institution ID	ccc19_institution[1]		
Derived hospitalized/not hospitalized variable	der_hosp	0 = No; 1 = Yes; 99 = Unknown	Used for imputation only
Center-level covariates			
Social Vulnerability Index	svi	Continuous	
Rural-Urban Continuum Codes	rucc	1, Metro – 1 million population or more; 2, Metro – 250,000 to 1 million population; 3, Metro – fewer than 250,000 population	
Type of center	hosp_type	Academic; Community	
Number of patients at each center	volume	Integer (Patients)	Count the number of patients at each center within final dataset (with selected cohort), then link it to center-level data (using ccc19_institution from ccc19x and Center_ID from CCC19_center_level_covariates.v3_3.4.2021.xlsx)

Derived variable using state	region	US Northeast; US Midwest; US South; US West	Derived with State
Census-level covariates			
Average rate of SARS-CoV-2 diagnosis, per 100 cases per million population	reg_daily_avg_newCOVID_v2	Continuous	Derived with reg_T1_daily_avg_newCOVID_per_1mil, reg_T2_daily_avg_newCOVID_per_1mil, reg_T3_daily_avg_newCOVID_per_1mil der_tri_rt_dx Derived after der_tri_rt_dx imputed

[1]Raw variable

Once this form has been finalized, it will be signed by:

Approved:_____ Date: 11/17/2021

Core Lead, Informatics

Approved:_____ Date: 11/17/2021

Biostatistics Analyst

eMethods. Details on Social Vulnerability Index and Rural-Urban Continuum Code

The Centers for Disease Control and Prevention's Social Vulnerability Index (SVI) indicates the relative vulnerability of every U.S. Census tract (or county) according to ranks on 15 social factors in four domains: socioeconomic status, household composition and disability, minority status and language, and housing and transportation. An overall percentile rank (0-1) for the county where each center is located was used in this analysis. A SVI ranking of 0.85 indicates that 85% of tracts (or counties) in the state or nation are less vulnerable than the tract of interest and that 15% of tracts (or counties) in the state or nation are more vulnerable.

The U.S. Department of Agriculture's Economic Research Service's 2013 Rural-Urban Continuum Code (RUCC) classifies all counties in the U.S. by their official metro-nonmetro status, as defined by the Office of Management and Budget, with further breakdown by population resulting in nine RUCC codes (1-9). In this coding scheme, 1 represents counties in metropolitan areas with populations of 1 million, and 9 represents counties that are completely rural with populations of <2500, not adjacent to a metro area.

eTable 1. Average Rate of SARS-CoV-2 Diagnosis in United States Census Divisions (Cases per Million Population), Stratified by Calendar Time

	Mar–May, 2020	Jun–Aug, 2020	Sep–Nov, 2020
New England	88	30	116
Middle Atlantic	182	134	302
East North Central	65	87	385
West North Central	33	81	351
South Atlantic	24	64	90
East South Central	40	198	312
West South Central	33	207	229
Mountain	13	58	169
Pacific	29	140	140

eTable 2. Patients' Severity of COVID-19 at Presentation by the Rural-Urban Continuum Code of the Center From Which Patients Were Reported

	RUCC 1[a]	RUCC 2[b]	RUCC 3[c]
	n = 3820	n = 666	n = 263
COVID-19 severity at presentation, n (%)			
Mild – no hospitalization indicated[d]	1965 (51.4)	330 (49.5)	208 (79.1)
Moderate – hospitalization indicated[d]	1407 (36.8)	254 (38.1)	47 (17.9)
Severe – ICU admission indicated[d]	443 (11.6)	80 (12.0)	7 (2.7)
Missing/unknown, n (%)	5 (0.1)	2 (0.3)	1 (0.4)

ICU, intensive care unit; RUCC, rural-urban continuum code.

[a] Metro – 1 million population or more.

[b] Metro – 250,000 to 1 million population.

[c] Metro – fewer than 250,000 population.

[d] Whether or not it occurred.

eTable 3. Associations of Census Division With 30-Day All-Cause Mortality (Primary Outcome) and the Composite Outcome (Secondary), Adjusted for Patient-Level Characteristics Only

	30-day mortality	Composite outcome[a]
	OR[b] (95% CI)	OR[c] (95% CI)
Census division[d]		
New England	1.55 (0.89-2.70)	1.56 (0.74-3.28)
Middle Atlantic	1.64 (0.97-2.77)	1.32 (0.67-2.62)
East North Central	Reference	Reference
West North Central	1.16 (0.57-2.39)	1.31 (0.58-2.92)
South Atlantic	1.31 (0.73-2.35)	1.41 (0.73-2.73)
East South Central	1.58 (0.79-3.17)	1.56 (0.68-3.58)
West South Central	1.99 (0.94-4.23)	1.89 (0.72-4.92)
Mountain	1.10 (0.43-2.80)	1.35 (0.48-3.82)
Pacific	0.87 (0.43-1.76)	0.76 (0.33-1.76)

CI, confidence interval; OR, odds ratio.

[a] The composite outcome reflected the occurrence of any of the following: admission to an intensive care unit, receipt of mechanical ventilation, and total all-cause mortality. Analyses of the composite outcome were limited to 4,561 patients within non-missing data.

[b] Odds ratios greater than 1 indicate higher odds of 30-day all-cause mortality.

[c] Odds ratios greater than 1 indicate higher odds of admission to an intensive care unit, receipt of mechanical ventilation, or total all-cause mortality.

[d] Adjusted for age, sex, race and ethnicity, smoking status, obesity, cardiovascular comorbidities, pulmonary comorbidities, renal disease, diabetes mellitus, type of malignancy, cancer status, Eastern Cooperative Oncology Group performance status, anti-COVID-19 treatments, and month of COVID-19 diagnosis. P values for evaluating the null hypothesis of equality in odds ratios across census divisions (8 degrees of freedom): 30-day mortality, 0.42; composite outcome, 0.73.

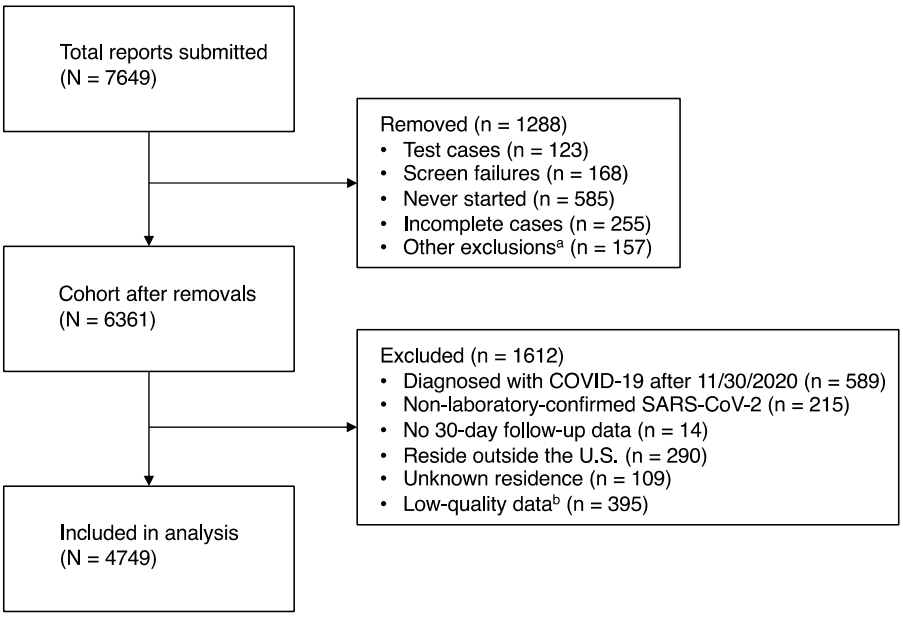
eTable 4. Adjusted Odds Ratios Comparing the Odds of 30-Day All-Cause Mortality Between the West North Central and Mountain Census Divisions Combined vs All Other Census Divisions Combined, Stratified by Month of COVID-19 Diagnosis

	OR[a] (95% CI)
March–May, 2020	1.12 (0.55-2.27)
June–August, 2020	0.65 (0.25-1.73)
September–November, 2020	2.62 (0.86-8.01)

CI, confidence interval, OR, odds ratio.

[a] P value for evaluating the null hypothesis of equality in odds ratios across month of COVID-19 diagnosis: 0.13 (2 degrees of freedom).

eFigure. Inclusion and Exclusion Criteria



[a] Includes duplicate records, in situ solid malignancy, non-invasive non-melanoma skin cancer, precursor hematologic condition, benign hematologic condition, false-positive SARS-CoV-2 test, and non-CCC19 site.

[b] Quality score ≥5. Exclusions for low-quality data by census region: Northeast, 170/1734 (9.8%); Midwest, 101/1739 (5.8%); South, 80/974 (8.2%); West, 44/697 (6.3%).