Supplemental Online Content

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eTable 1. Detailed Study Summary Characteristics of All 68 Included Studies

Summary characteristics for each of the 68 studies included in this systematic review and meta-analysis, including but not limited to the following variables: ADI, county median income, measures of clinical care quality, and urban core opportunity index.

Study First Author	Study Type	Quality Score	Geographic Region	Number of patients (total)	African-American	White	Asian-American	Pacific Islander	Hispanic/Latino	American Indian/Alaskan Natives	multiracial	Mean Age	Median Age	Study Setting	ADI	Congressional County	County Median Income	Percent Uninsured	Primary Care Physicians (X:1)	Mental Health Providers (X:1)	Preventable Hospital Stays	UOI	Percent of Individuals Over Age 60	Percent of Individuals Over Age 65	Percent Male
David P. Bui et al, 2020	Cohort	75%	USA	1305130	4086	3337	236	378	4086	322	0	N/A	0	Community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di Xiong et al, 2020	Cross-Sectional	82%	California	848166	0	104140	33342	0	366314	0	0	N/A	N/A	Community	21.56	N/A	80440	8	1250	270	3358	N/A	15.67	10.66	N/A
Erin K. Stokes et al, 2020	Cross-Sectional	88%	USA	599636	131920	215869	23985	5996	197880	7795	23985	N/A	N/A	Community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	48.9
Ishaan Pathak et al, 2020	Cross-Sectional	82%	USA	577117	53495	103554	19637	0	179997	0	220434	N/A	N/A	Community	47.637	N/A	69423	8	1263.3	353.33	4390.7	N/A	N/A	8.27	N/A
Mary L. Adams et al, 2020	Cross-Sectional	88%	USA	398865	31939	307282	9108	0	26837	0	0	N/A	N/A	Community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36.6	N/A	56.3
Michael Poulson et al, 2020	Cross-Sectional	100%	USA	124780	48334	76426	0	0	0	0	0	N/A	N/A	Community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sara J. Cromer et al, 2020	Cohort	100%	Mass Gen Brigham - Massachusetts	57865	5528	34398	2077	0	12358	0	0	N/A	N/A	Hospital	18	MA-8	100690	3.66	1423	165	5353.3	1.387	N/A	29.29	44.22
Jon Zelner et al, 2020	Cross-Sectional	82%	Michigan	49719	19662	23301	1364	0	3657	123	1612	N/A	N/A	Community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
Diego A. Martinez et al, 2020	Cohort	75%	Baltimore – Washington and DC	37727	11639	17113	0	0	4169	0	0	N/A	N/A	Hospital	35.5	N/A	77674	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Yelena Rozenfeld et al, 2020	Cross-Sectional	75%	Providence Health System - 5 US States	34503	1649	24799	1713	356	3565	465	1956	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	33.8	N/A	40.4
Jacob McPadden et al, 2020	Cohort	82%	Yale New Haven Health - New Haven	28605	5093	16825	721	79	5468	60	4464	N/A	N/A	Hospital	N/A	CT-3	70574	7	1140	256.67	4021	4.574	N/A	22.6	39.9
Samuel B Reichberg et al, 2020	Cohort	100%	Northwell Health Laboratories - New York	26730	4534	11463	1572	*	*	*	*	N/A	N/A	Hospital	32.7	N/A	72108	5	700	320	3422	2.676866 8	N/A	N/A	N/A
Farhaan S Vahidy et al, 2020	Cross-Sectional	88%	Houston	20228	4369	16648	1861	0	3600	0	263	51	N/A	Community	15	TX-9	49147	N/A	N/A	N/A	N/A	N/A	N/A	N/A	38
Sharia M Ahmed et al, 2020	Cross-Sectional	88%	University of Utah Health Clinics	20088	361	13151	446	223	2804	152	0	N/A	N/A	Hospital	N/A	UT-2	80119	12	2280	566.43	3103.8	1.391	16.3	N/A	44
Kristen M. J. Azar et al, 2020	Cohort	73%	Sutter Health - Northern California	14036	940	6779	1432	98	2681	0	0	50.7	N/A	Hospital	21.56	N/A	80440	N/A	N/A	N/A	N/A	N/A	32	N/A	39.3
Alan Pan et al, 2020	Cross-Sectional	100%	Houston Methodist Hospital	12084	3049	3346	0	0	4372	0	0	N/A	N/A	Hospital	15	N/A	52540	0	0	0	0	0	N/A	N/A	N/A
Lara Jehi et al, 2020	Cohort	100%	Cleveland Clinic - Ohio and Florida	11672	2345	7848	183	0	553	0	1296	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Baligh R Yehia et al, 2020	Cross-Sectional	75%	92 Hospitals across 12 US States	11210	4180	4606	0	0	0	0	2424	N/A	61	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	49.8
George N. Ioannou et al, 2020	Cohort	100%	USA	10131	4215	5022	80	0	944	140	0	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	51	91
Gbenga Ogedegbe et al, 2020	Cohort	73%	Health System in New York	9722	1353	4187	831	0	2087	0	1264	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.154723 2	N/A	21.6	41.2
Rafi Kabarriti et al, 2020	Cohort	82%	Montefiore Medical Center - New York	9268	2823	960	283	0	2919	0	2283	N/A	N/A	Hospital	21	NY-13	46298	7.5	1185	460	4210	2.644	43	N/A	46.9
Michael Gottlieb et al, 2020	Cross-Sectional	100%	Rush University Medical Center - Chicago, Illinois	8673	2301	1797	119	0	4281	0	4456	N/A	41	Hospital	33.66	N/A	69429	8	1400	540	5350	2.72	N/A	10	46.6

Brian E. Dixon et al, 2020	Cohort	82%	Indiana	8214	0	6596	0	0	649	0	0	N/A	N/A	Community	69	N/A	57603	10	1500	590	4795	N/A	34.1	N/A	44.4
Haotian Chen et al, 2020	Cross-Sectional	82%	Chicago	8208	2702	2238	140	14	4772	15	0	N/A	40	Community	33.66	N/A	69429	8	1400	540	5350	2.72	N/A	N/A	46.45
Fatima Rodriguez et al, 2020	Cross-Sectional	75%	USA	7868	2009	2768	498	0	2593	0	0	N/A	63	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	55
Ahmad Khan et al, 2020	Cohort	82%	USA	7082	3329	2620	0	0	0	0	0	54.1	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22.83	38.42
Sara Y. Tartof et al, 2020	Cross-Sectional	100%	Kaiser Permanente Health - Southern California	6916	584	1210	1036	0	3751	0	335	49.1	49	Hospital	N/A	N/A	N/A	9	1565.7	354.28	3589.42	N/A	24.8987	N/A	44.98
Michelle A Waltenburg et al, 2020	Cross-Sectional	100%	28 US States	5721	362	963	0	232	4164	0	0	N/A	N/A	Community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tian Gu et al, 2020	Cohort	100%	University of Michigan Hospital	5698	1058	3740	0	0	0	0	900	53	53	Hospital	15	MI-12	62253	6	570	180	3289	2.846531 6	N/A	28.2	46.6
Nicholas E. Ingraham et al, 2020	Cohort	82%	Midwest	5577	172	381	161	0	102	0	0	N/A	60.9	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	49.1
S.B. Chan et al, 2020	Cohort	82%	Amita Health Center - Chicago, Illinois	5489	1098	2080	0	0	1839	0	472	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kengo Inagaki et al, 2020	Cohort	75%	Mississippi Medical Center	4802	2975	1257	0	0	203	0	0	N/A	N/A	Hospital	37	MS-03	49863	13	1230	310	5433	N/A	0	0	49.4
Ayodeji Adegunsoye et al, 2020	Cohort	75%	Chicago	4413	2543	1071	184	6	254	5	0	52	N/A	Hospital	44	IL-01	56680	10	1050	340	5144	2.248011 4	N/A	N/A	20.1
Nir Menachemi et al, 2020	Cohort	75%	Indiana	3658	0	3373	0	0	80	0	281	N/A	N/A	Community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36	N/A	2.13
Eboni G Price-Haywood et al, 2020	Cross-Sectional	83%	Ochsner Health Facility - Louisiana	3481	2451	1030	0	0	0	0	0	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	40
Heather E. Hsu et al, 2020	Cross-Sectional	100%	Urban Safety-Net Medical Center - Boston, Massachusetts	2729	1218	369	0	0	821	0	0	N/A	N/A	Hospital	4	MA-7	75461	4	670	120	5131	3.071747 8	34	N/A	48.1
Amy K Feehan et al, 2020	Cohort	75%	New Orleans, Louisiana	2640	0	1631	0	0	0	0	0	50.6	N/A	Community	51.5	N/A	27915	11	1025	275	4848.5	N/A	N/A	N/A	36.5
L. Silvia Muñoz-Price et al, 2020	Cross-Sectional	88%	Froedtert & MCW Hospital - Wisconsin	2595	785	0	0	0	0	0	1810	54.5	N/A	Hospital	N/A	N/A	N/A	8	1360	330	5196	1.013395 7	40.1	N/A	46.1
Rolando G. Valenzuela et al, 2020	Cross-Sectional	100%	Stony Brook Hospital - NYC	2039	0	1079	0	0	960	0	0	N/A	N/A	Hospital	N/A	N/A	N/A	5	1380	360	4251	2.230289 5	30.22	N/A	46.27
Naima T. Joseph et al, 2020	Cohort	75%	Atlanta	1882	1353	226	164	0	139	0	0	N/A	N/A	Hospital	N/A	N/A	60247	14	900	410	4273	2.058932 55	N/A	N/A	N/A
Olga Grechukhina et al, 2020	Cross-Sectional	82%	3 Hospitals in New Haven	1567	0	0	0	0	61	0	0	0	0	Hospital	32	CT-03	70574	0	0	0	0	0	0	0	0
Ana A. Weil et al, 2020	Cross-Sectional	75%	16 Skilled Nursing Homes across Washington	1289	360	360	392	34	109	3	111	50	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23
Jennifer Woo Baidal et al, 2020	Cross-Sectional	82%	14 Midwest hospitals	1022	0	437	0	0	0	0	0	N/A	62.1	Community	20	N/A	46298	N/A	N/A	N/A	N/A	N/A	N/A	N/A	48.6
Beth L. Pineles et al, 2020	Cohort	75%	Houston, Texas	935	125	27	84	0	527	0	0	N/A	N/A	Hospital	N/A	N/A	80922	21	5790	4590	4843	N/A	N/A	N/A	0
Ingrid V Bassett et al, 2020	Cross-Sectional	88%	Massachusetts General Hospital - Massachusetts, USA	866	98	346	0	0	305	0	117	N/A	60.4	Hospital	18	MA-8	100690	3.66	1423	165	5353.3	1.387	0	42	56.6
Brian T. Garibaldi et al, 2020	Cohort	91%	Five hospitals in the Maryland and Washington and DC areas	832	336	264	48	0	134	2	42	N/A	63	Hospital	35.5	N/A	77674	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53

Benjamin D. Renelus et al, 2020	Cohort	100%	New York-Presbyterian Brooklyn Methodist Hospital	734	372	214	0	0	92	0	56	N/A	N/A	Hospital	1	N/A	66891	N/A	N/A	N/A	N/A	N/A	N/A	N/A	41
Angelico Mendy et al, 2020	Cross-Sectional	75%	University of Cincinnati Health System	689	176	201	0	0	224	0	88	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nana-Yaa Misa et al, 2020	Cohort	100%	Alameda Health System - California	526	214	83	41	0	139	0	0	N/A	N/A	Hospital	17	CA-13	91514	N/A	770	150	3000	1.565	N/A	N/A	N/A
Priyank Shah et al, 2020	Cohort	75%	Phoebe Putney Health System - Southwest Georgia	522	454	59	0	0	0	0	9	N/A	63	Hospital	52	GA-2	39728	17	4208.6	3162	4800	N/A	N/A	N/A	42
Wesley H Self et al, 2020	Cross-Sectional	100%	34 hospitals in USA	479	112	0	0	0	178	0	0	N/A	N/A	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	55.7
Sindhura Bandi et al, 2020	Cohort	75%	Rush University Medical Center - Illinois	474	205	117	7	0	0	0	0	N/A	N/A	Hospital	N/A	IL-07	64312	8	1400	540	5350	2.72	N/A	N/A	N/A
Ashish Bhargava et al, 2020	Cohort	82%	Tertiary Care Academic Health Center, Detroit	419	419	0	0	0	0	0	0	N/A	N/A	Hospital	95	MI-14	50438	6.5	1045	527.14	4584.6	N/A0.82	58.4	47.9	50.35
Vijay Gayam et al, 2020	Cross-Sectional	75%	Teaching Community Hospitals - NYC	408	408	0	0	0	0	0	0	N/A	N/A	Hospital	N/A	NY-9	69754	8	1480	430	4561	3.140101 9	0	N/A	N/A
Samina Bhumbra et al, 2020	Cohort	82%	Riley Hospital - Indianapolis	407	7	4	1	0	7	0	0	N/A	5	Hospital	28	IN-7	46118	12	1210	330	4873	2.150258 2	0	0	74
Sridhar Chilimuri et al, 2020	Cohort	91%	Safety Net Hospital - Bronx, New York	375	93	0	0	0	246	0	36	N/A	63	Hospital	24	NY-13	46298	7.5	1185	460	4210	1.5	N/A	N/A	63
Mark W. Tenforde et al, 2020	Cross-Sectional	100%	11 Academic Medical Centers in 9 states	350	73	116	0	0	116	0	42	N/A	43	Hospital	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	47
Jeremy A W Gold et al, 2020	Cross-Sectional	75%	8 Hospitals in Georgia	297	247	50	0	0	0	0	0	N/A	N/A	Hospital	27	GA-5	60247	16.6	1873.3	2210	7500	0.5	N/A	38	N/A
Fahad Marmarchi et al, 2020	Cohort	82%	Teaching Hospital in Atlanta - Georgia	288	209	0	0	0	0	0	79	63	N/A	Hospital	N/A	N/A	N/A	14	900	410	4273	2.079961 7	N/A	N/A	55

eTable 2: Study Summary Characteristics for Comorbidities

Summary characteristics for each of the 68 studies included in this systematic review and meta-analysis, including but not limited to the following variables: percent of ever smokers, median BMI, BMI over 40, cardiovascular disease, hypertension, COPD, diabetes, and malignancy/cancer.

Study First Author	Percent of Ever Smokers	Median BMI	Percent BMI Over 40	Percent Cardiovascular Disease	Percent Hypertension	Percent COPD	Percent Diabetes	Percent Malignancy/Cancer
David P. Bui et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Di Xiong et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Erin K. Stokes et al, 2020	N/A	N/A	N/A	32.2	N/A	N/A	30.2	N/A
Ishaan Pathak et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mary L. Adams et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Michael Poulson et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sara J. Cromer et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Jon Zelner et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Diego A. Martinez et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Yelena Rozenfeld et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	14.3	N/A

Jacob McPadden et al, 2020	N/A	N/A	N/A	N/A	53	N/A	32.5	5.4
Samuel B Reichberg et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Farhaan S Vahidy et al, 2020	N/A	N/A	N/A	N/A	47.2	N/A	24.2	N/A
Sharia M Ahmed et al, 2020	N/A	N/A	N/A	N/A	14.53	N/A	N/A	N/A
Kristen M. J. Azar et al, 2020	27.4	N/A	N/A	10.2	29.8	9.2	N/A	6.8
Alan Pan et al, 2020	17.511	N/A	N/A	N/A	N/A	12.5	0	0
Lara Jehi et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Baligh R Yehia et al, 2020	N/A	N/A	N/A	19.99	23.2	8.47	2585	2.71
George N. Ioannou et al, 2020	N/A	N/A	N/A	N/A	62.1	18.8	38.1	22.7
Gbenga Ogedegbe et al, 2020	24.7	28.2	51.4	N/A	N/A	N/A	N/A	N/A
Rafi Kabarriti et al, 2020	N/A	N/A	N/A	22.1	44.7	N/A	32.9	5.6
Michael Gottlieb et al, 2020	14	27.2	264	N/A	22.1	1.3	14.6	6.2
Brian E. Dixon et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Haotian Chen et al, 2020	22	N/A	N/A	N/A	21.99	N/A	N/A	N/A
Fatima Rodriguez et al, 2020	6.6	N/A	N/A	9.5	60.1	18.7	37	11.2
Ahmad Khan et al, 2020	N/A	N/A	N/A	N/A	36.057	21.5	19.1	N/A
Sara Y. Tartof et al, 2020	21.24	N/A	9.16	3.26	24.47	12.56	20.12	2.22
Michelle A Waltenburg et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tian Gu et al, 2020	33.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nicholas E. Ingraham et al, 2020	N/A	N/A	N/A	N/A	66.3	14.2	N/A	N/A
S.B. Chan et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kengo Inagaki et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ayodeji Adegunsoye et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nir Menachemi et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Eboni G Price-Haywood et al, 2020	N/A	N/A	N/A	3.99	30.8	2.26	16.25	4.5

Heather E. Hsu et al, 2020	N/A	N/A	N/A	14.9	45.7	5.3	25.9	7.1
Amy K Feehan et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
L. Silvia Muñoz-Price et al, 2020	33.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rolando G. Valenzuela et al, 2020	N/A	N/A	N/A	8.3	27.5	4.7	14.38	N/A
Naima T. Joseph et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Olga Grechukhina et al, 2020	0	0	0	0	0	0	0	0
Ana A. Weil et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Jennifer Woo Baidal et al, 2020	6.94	N/A	N/A	71.6	N/A	N/A	N/A	11.5
Beth L. Pineles et al, 2020	N/A	N/A	N/A	N/A	23	N/A	10	N/A
Ingrid V Bassett et al, 2020	38	29.1	N/A	79	52	31	N/A	N/A
Brian T. Garibaldi et al, 2020	33	29	N/A	15	47	19	30	10
Benjamin D. Renelus et al, 2020	N/A	N/A	N/A	N/A	67.3	N/A	43.46	3.67

Angelico Mendy et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nana-Yaa Misa et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Priyank Shah et al, 2020	17	N/A	N/A	N/A	79.7	9	42.3	9.2
Wesley H Self et al, 2020	N/A	N/A	N/A	N/A	52.8	8.14	34.6	N/A
Sindhura Bandi et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ashish Bhargava et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	40.3	5.4
Vijay Gayam et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Samina Bhumbra et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sridhar Chilimuri et al, 2020	N/A	N/A	N/A	17	60	N/A	N/A	N/A
Mark W. Tenforde et al, 2020	31	N/A	N/A	30	29	5	15	N/A
Jeremy A W Gold et al, 2020	N/A	N/A	12.7	25.6	67.5	5.2	39.7	3.9
Fahad Marmarchi et al, 2020	N/A	32	N/A	14	74	7	45	N/A

Victoria Silver et al, 2020	38	N/A	23	32	80	13	52	12
Cian P. McCarthy et al, 2020	32.8	28.5	N/A	49	51.8	8.9	27.5	27.5
James Andrew McCracken et al, 2020	9.5	29	N/A	24.5	84.5	8.5	57.5	6
Ilona Telefus Goldfarb et al, 2020	N/A	N/A	N/A	N/A	N/A	N/A	8.19	N/A
Christopher S. King et al, 2020	N/A	30	N/A	6.7	52	N/A	34.1	N/A
Vikramjit Mukherjee et al, 2020	28.5	N/A	9.7	13.9	51.1	2.9	37.2	2.9
Mark P. Abrams et al, 2020	N/A	27.2	N/A	77.4	82.7	16.5	52.6	N/A
Stephen Capone et al, 2020	N/A	N/A	N/A	N/A	59.8	N/A	49	N/A
Anthony M. Valeri et al, 2020	32	25.2	N/A	46	98	17	69	N/A

eTable 3. Adjustment of Relative Risk Ratios (RRs) for Additional Variables

The following variables were adjusted for RR for each racial/ethnic group by COVID-19 outcome: age, ADI, county median income, a combined measure of clinical care quality, urban core opportunity index, and a combined measure of medical comorbidities.

		Age-Adjusted		ADI-Adjusted		Income-Adjusted		Clinical Care-Adjusted (combined)			UOI		Comorbidities		
	# of studies	**RR (95% CI)**	**RR *p*-value**	**RR (95% CI)**	**RR *p*-value**	**RR (95% CI)**	**RR *p*-value**	**RR (95% CI)**	**RR *p*-value**	***alpha***	**RR (95% CI)**	**RR *p*-value**	**RR (95% CI)**	**RR *p*-value**	***alpha***
Cohort															
(1) Positive															
White	13	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A		Reference	N/A	Reference	N/A	
African American	20	1.34 (.91, 1.97)	0.137	2.01 (1.04, 3.88)	0.037	1.92 (1.00, 3.66)	0.048	1.79 (1.11, 3.17)	0.029	0.902	6.12 (0.11, 337.85)	0.383	3.34 (0.50, 23.59)	0.212	0.958
Hispanic and Latino	10	6.98 (2.06, 23.58)	0.002	2.09 (1.13, 3.88)	0.019	3.26 (1.50, 7.07)	0.003	N/A	N/A	0.088	2.15 (0.98, 4.74)	0.056	1.98 (1.30, 3.02)	0.002	N/A
Asian-American	7	N/A	N/A	1.12 (1.04, 1.21)	0.003	1.14 (1.05, 1.25)	0.003	1.116 (1.03, 1.31)	0.015	0.890	1.13 (1.07, 1.19)	<.001	N/A	N/A	N/A
(2) Hospitalization															
White	4	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A	N/A	Reference	N/A	Reference	N/A	
African American	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hispanic and Latino	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asian-American	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(3) ICU															
White	4	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A	N/A	Reference	N/A	Reference	N/A	
African American	4	N/A	N/A	N/A	N/A	1.07 (0.63, 1.84)	0.816	N/A	N/A	N/A	1.11 (0.66, 1.87)	0.707	N/A	N/A	N/A
Hispanic and Latino	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.29 (0.66, 2.52)	0.465	N/A	N/A	N/A
Asian-American	3	.33 (0.07, 1.58)	0.164	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(4) Mortality															
White	6	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A	N/A	Reference	N/A	Reference	N/A	
African American	7	N/A	N/A	0.84 (0.62, 1.13)	0.258	0.85 (0.82, 0.88)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hispanic and Latino	5	N/A	N/A	N/A	N/A	0.59 (0.26, 1.34)	0.209	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asian-American	4	N/A	N/A	1.18 (0.99, 1.41)	0.066	1.18 (0.69, 2.00)	0.553	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cross-Sectional															

(4) Mortality															
White	5	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A		Reference	N/A	Reference	N/A	N/A
African American	6	0.92 (0.70, 1.20)	0.555	0.88 (0.63, 1.22)	0.457	0.91 (0.68, 1.23)	0.554	0.99 (0.91, 1.07)	0.819	0.779	N/A	N/A	0.86 (0.62, 1.19)	0.370	0.866
Hispanic and Latino	4	N/A	N/A	0.44 (0.31, 0.61)	<0.001	0.43 (0.41, 0.46)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asian-American	4	N/A	N/A	0.73 (0.32, 1.68)	0.465	0.44 (0.36, 0.54)	<0.001	0.74 (0.59, 0.94)	0.011	0.874	N/A	N/A	N/A	N/A	N/A

eTable 4. Adjustment of Odds Ratios (ORs) for Additional Variables

The following variables were adjusted for OR for each racial/ethnic group by COVID-19 outcome: age, ADI, county median income, a combined measure of clinical care quality, urban core opportunity index, and a combined measure of medical comorbidities.

		Age-Adjusted		ADI-Adjusted		Income-Adjusted		Clinical Care-Adjusted (combined)			UOI		Comorbidites		
	# of studies	**OR (95% CI)**	**OR p-value**	**OR (95% CI)**	**OR p-value**	**OR (95% CI)**	**OR p-value**	**OR (95% CI)**	**OR p-value**	***alpha***	**OR (95% CI)**	**OR p-value**	**OR (95% CI)**	**OR p-value**	***alpha***
Cohort															
(1) Positive															
White	13	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A		Reference	N/A	Reference	N/A	
African American	20	5.02 (1.57, 16.06)	0.007	2.69 (0.99, 7.32)	0.052	2.55 (0.92, 7.04)	0.071	2.45 (1.67, 3.58)	<0.001	0.902	N/A	N/A	6.20 (0.34, 114.5)	0.220	0.958
Hispanic and Latino	10	4.38 (1.22, 15.73)	0.233	2.52 (1.20, 5.28)	0.014	4.15 (1.70, 10.13)	0.002	N/A	N/A	0.089	2.71 (1.37, 5.35)	0.004	2.33 (1.56, 3.47)	<0.001	N/A
Asian-American	7	N/A	N/A	1.31 (1.12, 1.53)	0.221	1.34 (1.13, 1.61)	0.001	1.35 (1.06, 1.72)	0.015	0.890	1.31 (1.19, 1.45)	<0.001	N/A	N/A	N/A
(2) Hospitalization															
White	4	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A	N/A	Reference	N/A	Reference	N/A	
African American	4	N/A	N/A	1.94 (0.07, 53.28)	0.713	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hispanic and Latino	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asian-American	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(3) ICU															
White	4	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A	N/A	Reference	N/A	Reference	N/A	
African American	4	N/A	N/A	N/A	N/A	1.11 (0.54, 2.25)	0.787	N/A	N/A	N/A	1.16 (0.59, 2.27)	0.679	N/A	N/A	N/A
Hispanic and Latino	4	N/A	N/A	N/A	N/A	1.41 (0.58, 3.41)	0.455	N/A	N/A	N/A	1.43 (0.57, 3.59))	0.454	N/A	N/A	N/A
Asian-American	3	2.09 (1.59, 2.76)	<0.001	N/A	N/A	0.87 (0.63, 1.18)	0.391	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(4) Mortality															
White	6	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A	N/A	Reference	N/A	Reference	N/A	
African American	7	N/A	N/A	0.82 (0.56, 1.19)	0.306	0.84 (0.81, 0.87)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hispanic and Latino	5	N/A	N/A	0.88 (0.50, 1.53)	0.667	0.58 (0.24, 1.39)	0.226	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asian-American	4	N/A	N/A	1.35 (0.96, 1.89)	0.082	1.3 (0.30, 2.77)	0.656	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Cross-Sectional															
(4) Mortality															
White	5	Reference	N/A	Reference	N/A	Reference	N/A	Reference	N/A		Reference	N/A	Reference	N/A	N/A
African American	6	0.73 (0.39, 1.35)	0.325	0.86 (0.60, 1.25)	0.428	0.91 (0.67, 1.23)	0.055	0.98 (0.89, 1.08)	0.695	0.779	N/A	N/A	0.84 (0.56, 1.24)	0.859	0.866
Hispanic and Latino	4	N/A	N/A	0.42 (0.29, 0.61)	<0.001	0.42 (0.39, 0.44)	<0.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asian-American	4	N/A	N/A	0.58 (0.16, 2.04)	0.409	0.39 (0.31, 0.48)	<0.001	0.62 (0.29, 1.33)	0.220	0.874	N/A	N/A	N/A	N/A	N/A

eTable 5. Combined Prevalence of Cohort and Cross-sectional Studies

Combined prevalence of COVID-19 positivity, mortality, ICU admission, and hospitalization in cohort and cross-sectional studies.

	# of studies	Prevalence (per 1000 people)	I^2 (%)
Cohort			
(1) Positive			
White	13	296.58	100
African American	20	306.04	100
Hispanic and Latino	10	370.67	99
Asian-American	7	49.42	98
(2) Hospitalization			
White	4	98.69	100
African American	4	151.37	100
Hispanic and Latino	3	100.88	100
Asian-American	0	N/A	N/A
(3) ICU			
White	4	235.75	92
African American	4	243.52	97
Hispanic and Latino	4	288.65	98
Asian-American	3	409.26	85
(4) Mortality			
White	6	161.12	99
African American	7	143.99	99
Hispanic and Latino	5	130.51	100
Asian-American	4	42.99	98
Cross-Sectional			
(4) Mortality			
White	5	83.78	100
African American	6	89.37	99
Hispanic and Latino	4	26.73	88
Asian-American	4	63.54	93

eTable 6. Summary of Q and I^2 Statistics for Study Variables

Q and I^2 statistics for correlations between proportions of individuals from each racial/ethnic group by COVID-19 outcome and the following variables: ADI, county median income, and measures of clinical care quality.

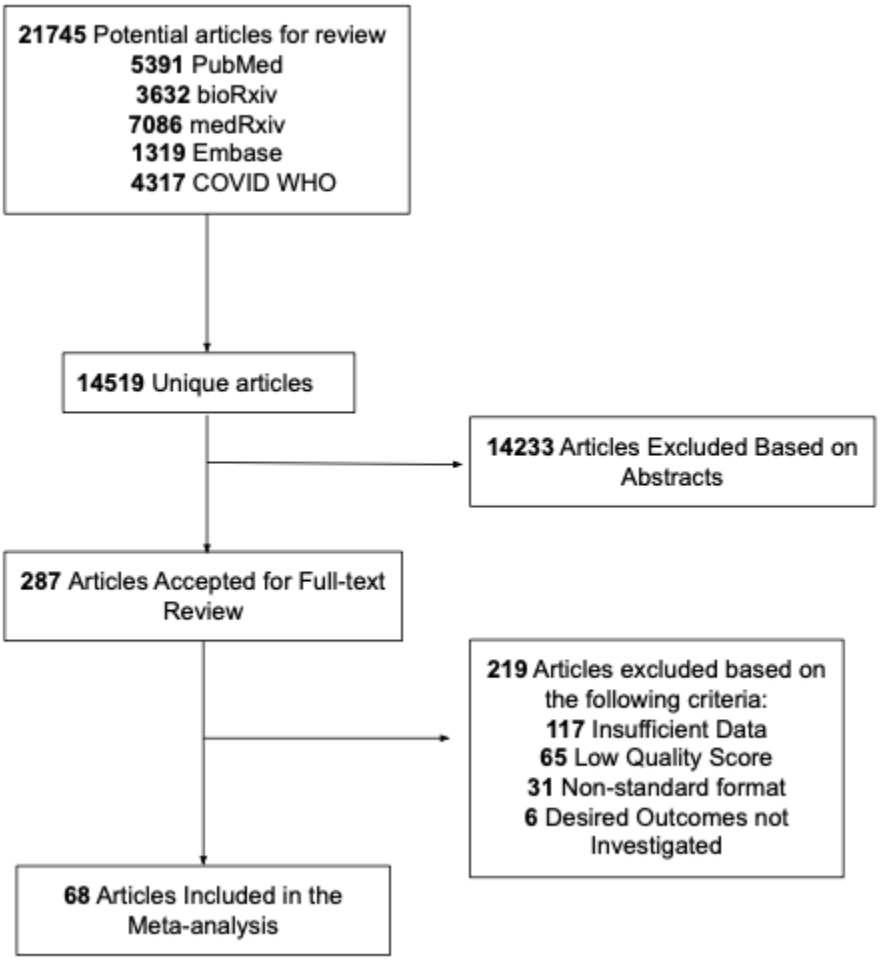
Variable Studied	No. of Studies	Q Statistic	I² Statistic, %
(1) Cohort Studies			
Proportion of Deceased Whites with ADI	6/69	101.24	97.36
Proportion of Deceased African Americans with ADI	6/69	943.43	99.62
Proportion of Deceased Hispanics/Latinos with ADI	4/69	115.03	97.4
Proportion of Deceased Asian-Americans with ADI	4/69	111.85	98.59
Proportion of Deceased Whites with county median income	6/69	250.99	98.68
Proportion of Deceased African Americans with county median income	6/69	324.41	99.2
Proportion of Deceased Hispanics/Latinos with county median income	4/69	204.09	98.55
Proportion of Deceased Asian-Americans with county median income	4/69	13.43	85.3
Proportion of Deceased African Americans with Preventable Hospital Stay	3/69	124.91	99.2
Proportion of Deceased African Americans with Primary Care Availability	3/69	127.84	99.22
Proportion of Deceased African Americans with Uninsured	3/69	119.2	99.16
Proportion of ICU Admitted Whites with county median income	3/69	1.33	25.06
Proportion of ICU Admitted African Americans with county median income	3/69	13.61	92.66
Proportion of ICU Admitted Hispanics/Latinos with county median income	3/69	57.62	98.26
Proportion of COVID-19 Positive Whites with ADI	6/69	402.13	99.07

Proportion of COVID-19 Positive African Americans with ADI	13/69	14005.48	99.91
Proportion of COVID-19 Positive Hispanics/Latinos with ADI	6/69	238.09	99.72
Proportion of COVID-19 Positive Asian-Americans with ADI	4/69	197.72	98.63
Proportion of COVID-19 Positive Whites with county median income	9/69	2657.67	99.77
Proportion of COVID-19 Positive African Americans with county median income	15/69	4956.89	99.87
Proportion of COVID-19 Positive Hispanics/Latinos with county median income	9/69	497.21	99.06
Proportion of COVID-19 Positive Asian-Americans with county median income	5/69	395.16	99.25
Proportion of COVID-19 Positive Whites with Preventable Hospital Stay	7/69	2212.72	99.71
Proportion of COVID-19 Positive African Americans with Preventable Hospital Stay	9/69	2897.78	99.87
Proportion of COVID-19 Positive Hispanics/Latinos with Preventable Hospital Stay	5/69	201.58	99.69
Proportion of COVID-19 Positive Asian-Americans with Preventable Hospital Stay	4/69	34.15	93.3
Proportion of COVID-19 Positive Whites with Primary Care Availability	7/69	1999.8	99.73
Proportion of COVID-19 Positive African Americans with Primary Care Availability	9/69	3281.45	99.87
Proportion of COVID-19 Positive Hispanics/Latinos with Primary Care Availability	5/69	23.81	97.48
Proportion of COVID-19 Positive Asian-Americans with Primary Care Availability	4/69	12.22	81.45

Proportion of COVID-19 Positive Whites with Uninsured	7/69	2028.71	99.67
Proportion of COVID-19 Positive African Americans with Uninsured	9/69	1561.64	99.74
Proportion of COVID-19 Positive Hispanics/Latinos with Uninsured	5/69	494.7	99.78
Proportion of COVID-19 Positive Asian-Americans with Uninsured	7/69	48.96	96.44
(2) Cross-sectional			
Proportion of Deceased Whites with ADI	6/69	101.24	97.36
Proportion of Deceased African Americans with ADI	6/69	943.43	99.62
Proportion of Deceased Hispanics/Latinos with ADI	4/69	115.03	97.4
Proportion of Deceased Asian-Americans with ADI	4/69	111.85	98.59
Proportion of Deceased Whites with county median income	6/69	250.99	98.68
Proportion of Deceased African Americans with county median income	6/69	324.41	99.2
Proportion of Deceased Hispanics/Latinos with county median income	4/69	204.09	98.55
Proportion of Deceased Asian-Americans with county median income	4/69	13.43	85.3
Proportion of Deceased African Americans with Preventable Hospital Stay	3/69	124.91	99.2
Proportion of Deceased African Americans with Primary Care Availability	3/69	127.84	99.22
Proportion of Deceased African Americans with Uninsured	3/69	119.2	99.16
Proportion of ICU Admitted Whites with county median income	3/69	1.33	25.06
Proportion of ICU Admitted African Americans with county median income	3/69	13.61	92.66

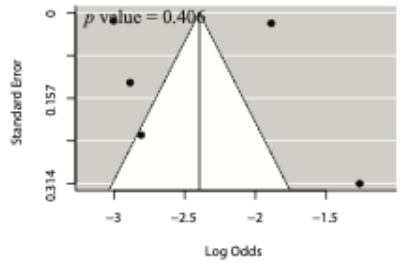
Proportion of ICU Admitted Hispanics/Latinos with county median income	3/69	57.62	98.26

eFigure 1. PRISMA Workflow for Studies Included in Analysis

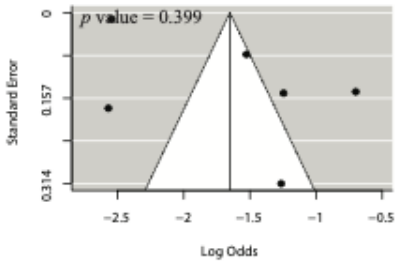


eFigure 2. Funnel Plots for Deceased Individuals in Cohort and Cross-sectional Studies

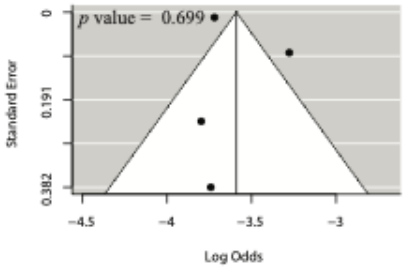
White, Deceased (Cross-sectional Studies)



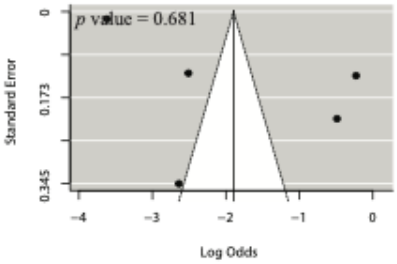
White, Deceased (Cohort Studies)



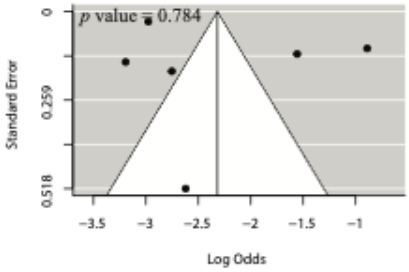
Hispanics, Deceased (Cross-sectional Studies)



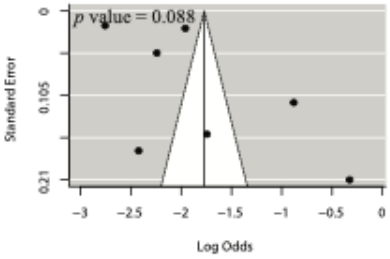
Hispanics, Deceased (Cohort Studies)



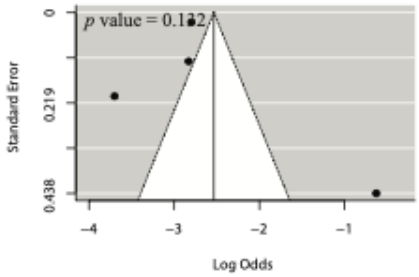
African-American, Deceased (Cross-sectional Studies)



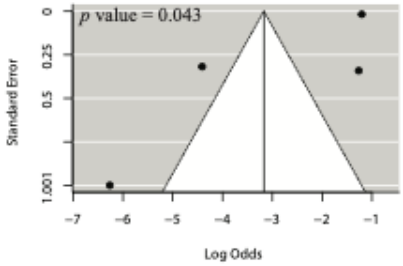
African-American, Deceased (Cohort Studies)



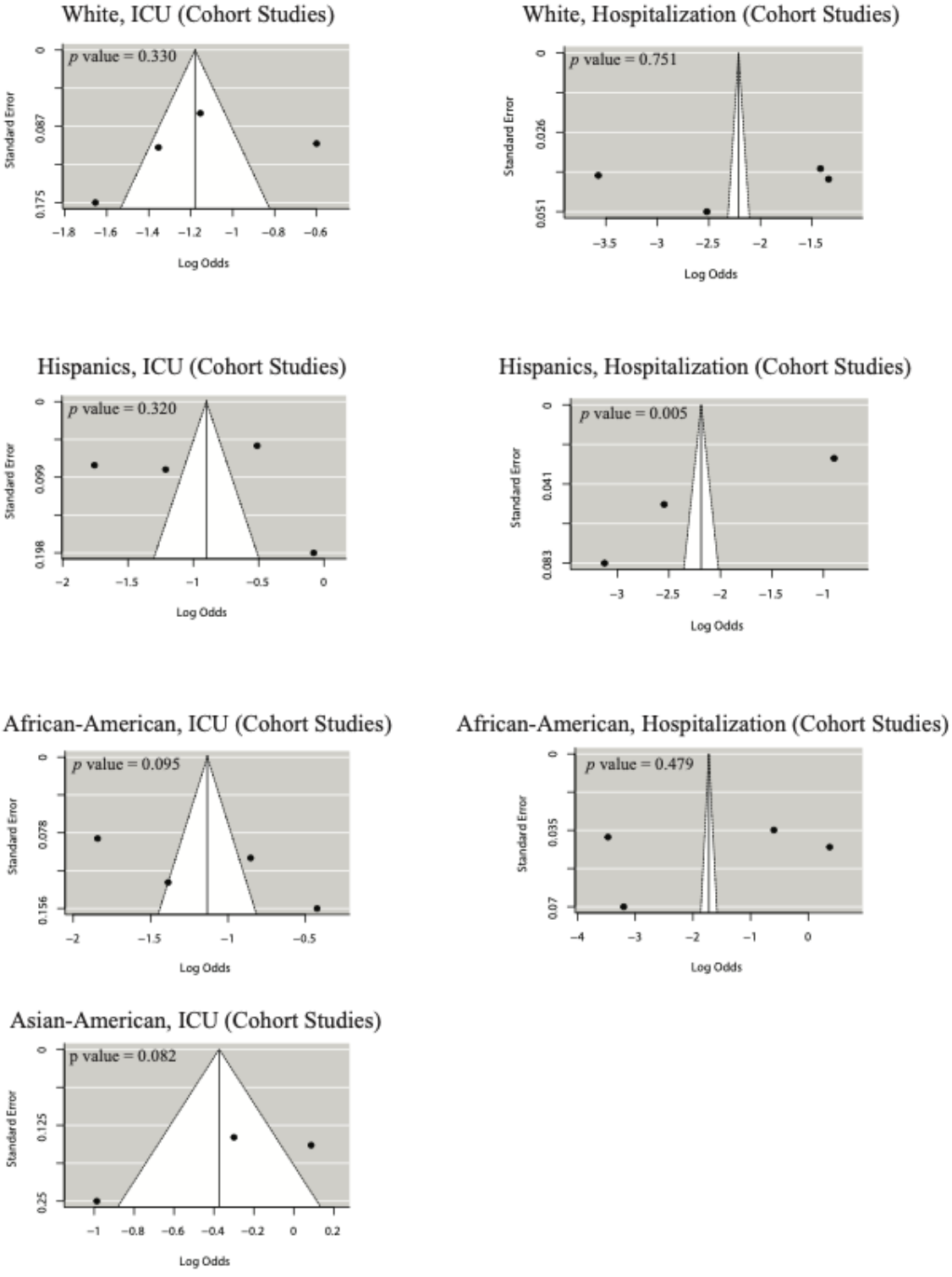
Asian-American, Deceased (Cross-sectional Studies)



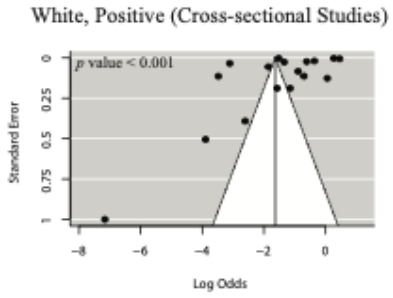
Asian-American, Deceased (Cohort Studies)

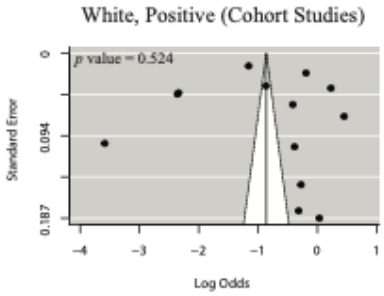


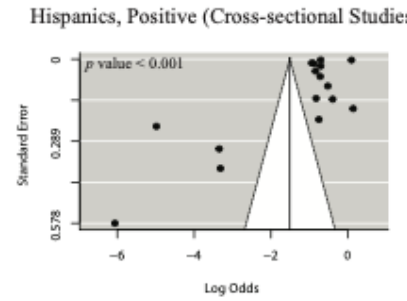
eFigure 3. Funnel Plots for Patients Admitted to ICU or Hospitalized in Cohort Studies

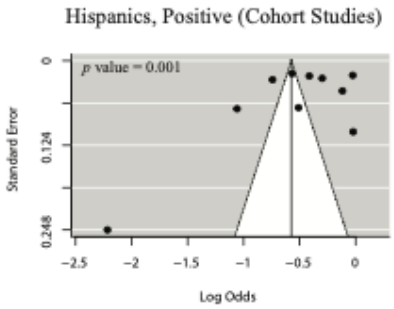


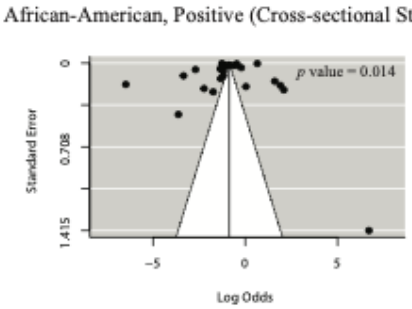
eFigure 4. Funnel Plots for COVID-19 Positive Patients in Cohort and Cross-sectional Studies

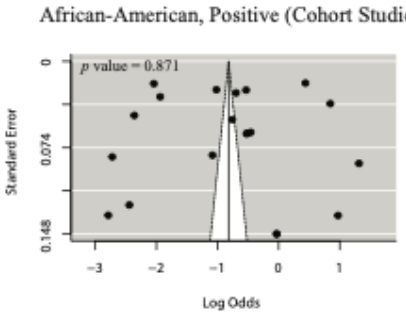


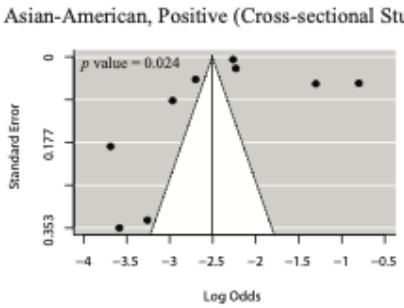


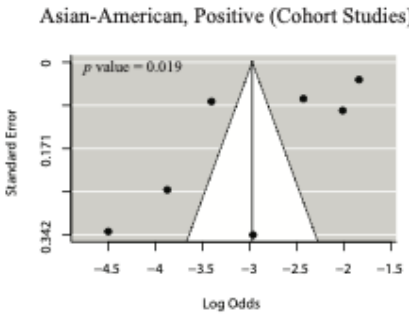




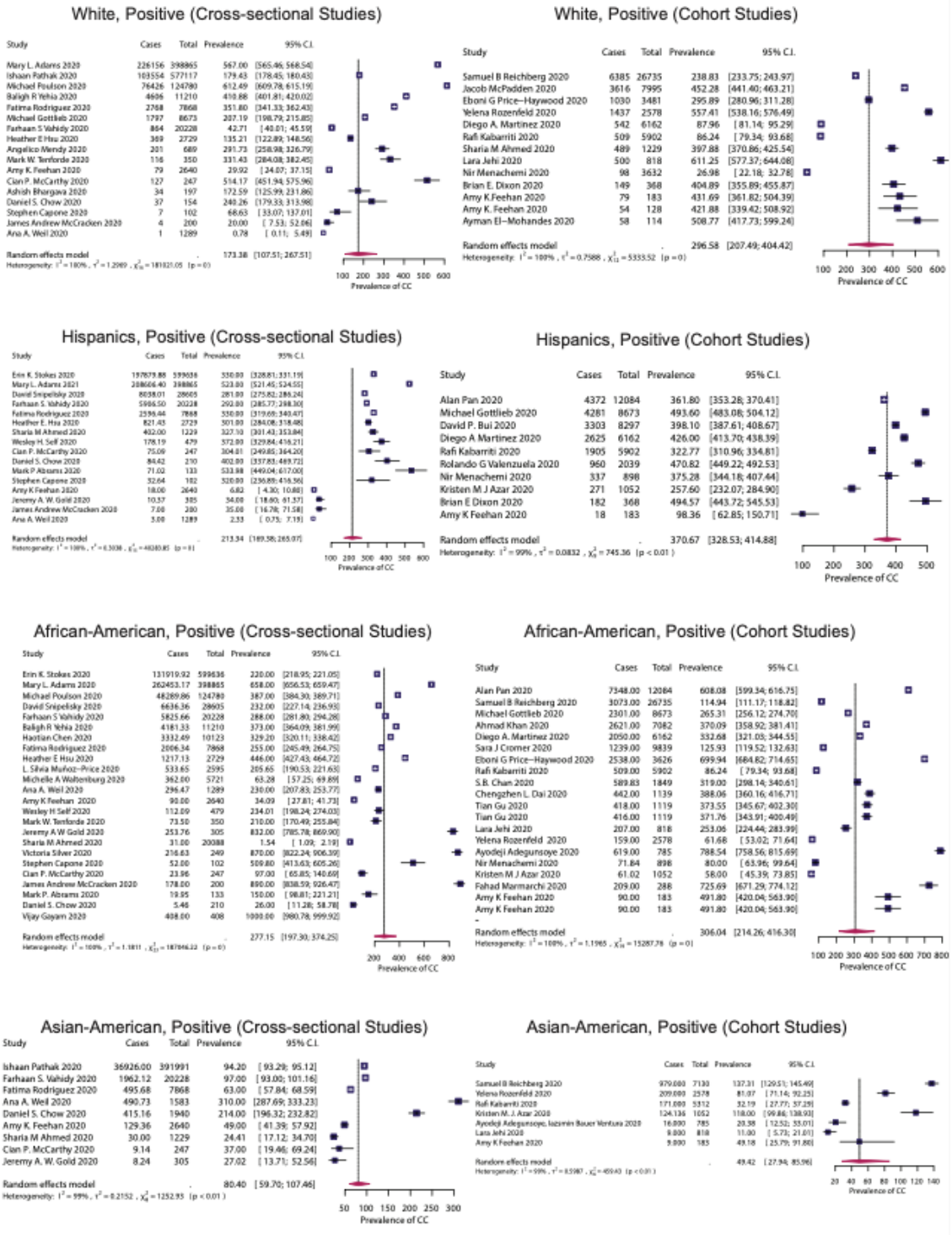




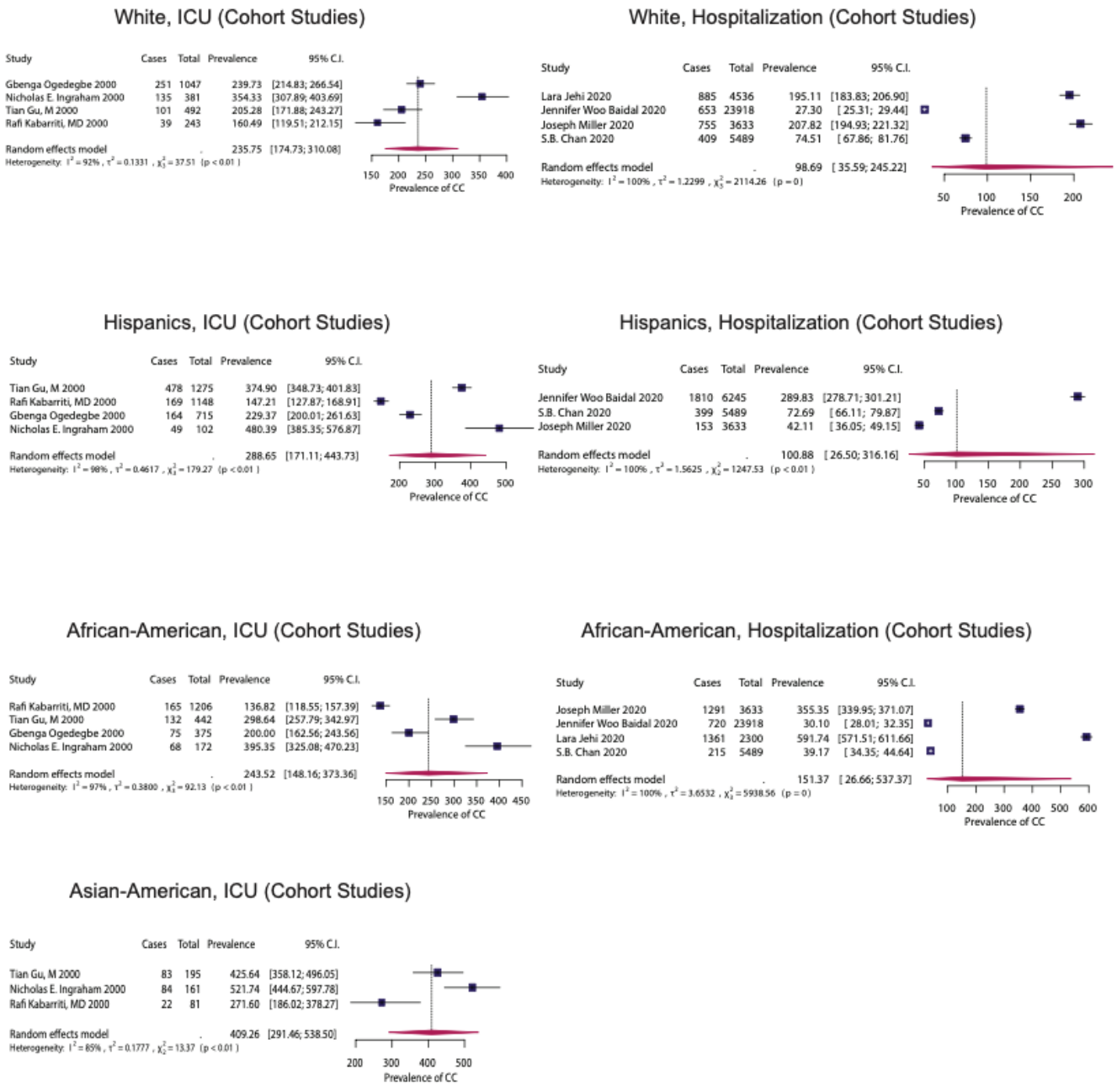




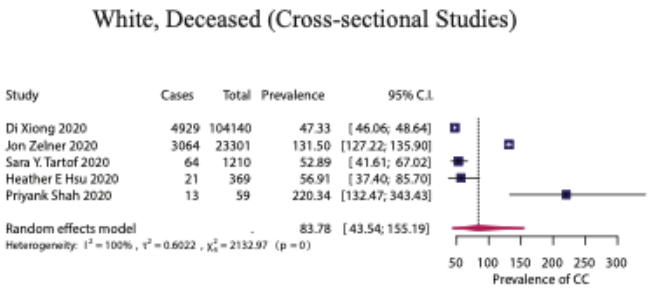
eFigure 5. Forest Plot for COVID-19 Positivity in Cohort and Cross-sectional Studies

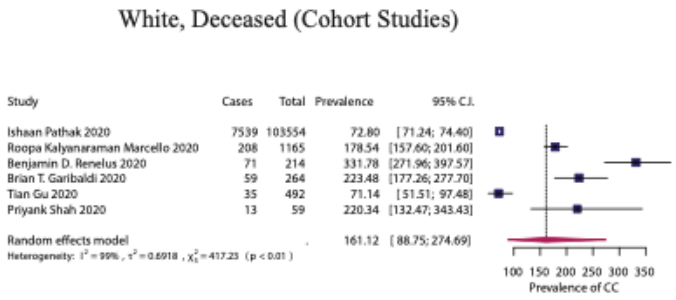


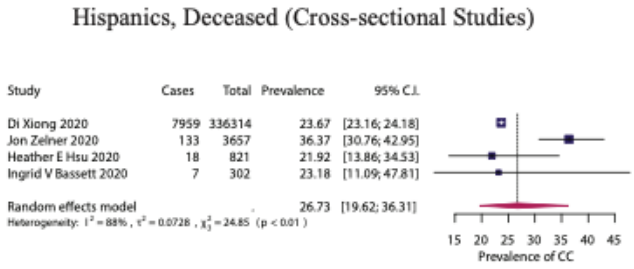
eFigure 6. Forest Plot for Patients Admitted to ICU or Hospitalized in Cohort Studies

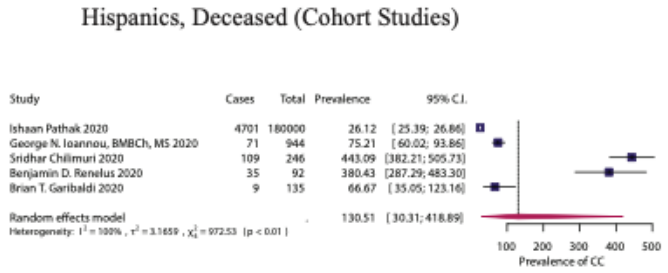


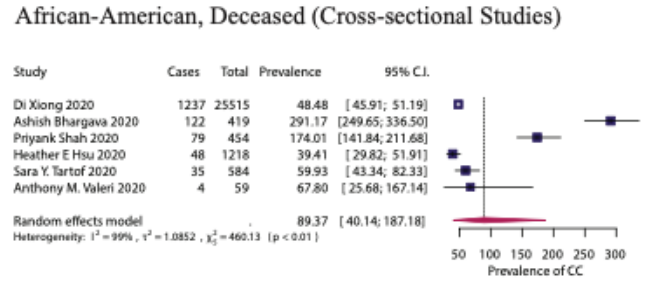
eFigure 7. Forest Plot for Deceased Individuals in Cohort and Cross-sectional Studies

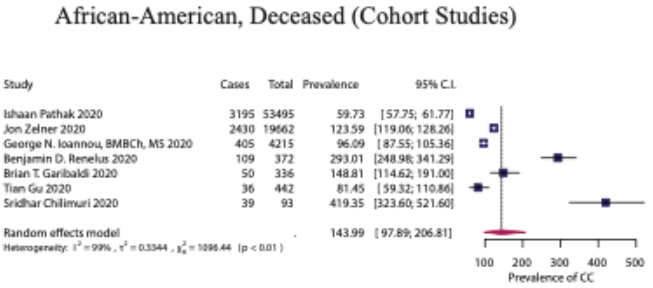


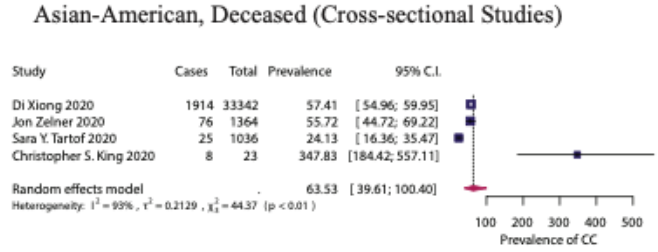


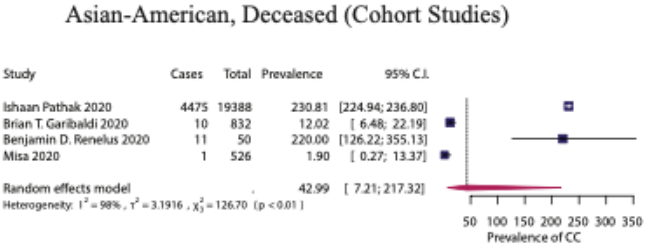






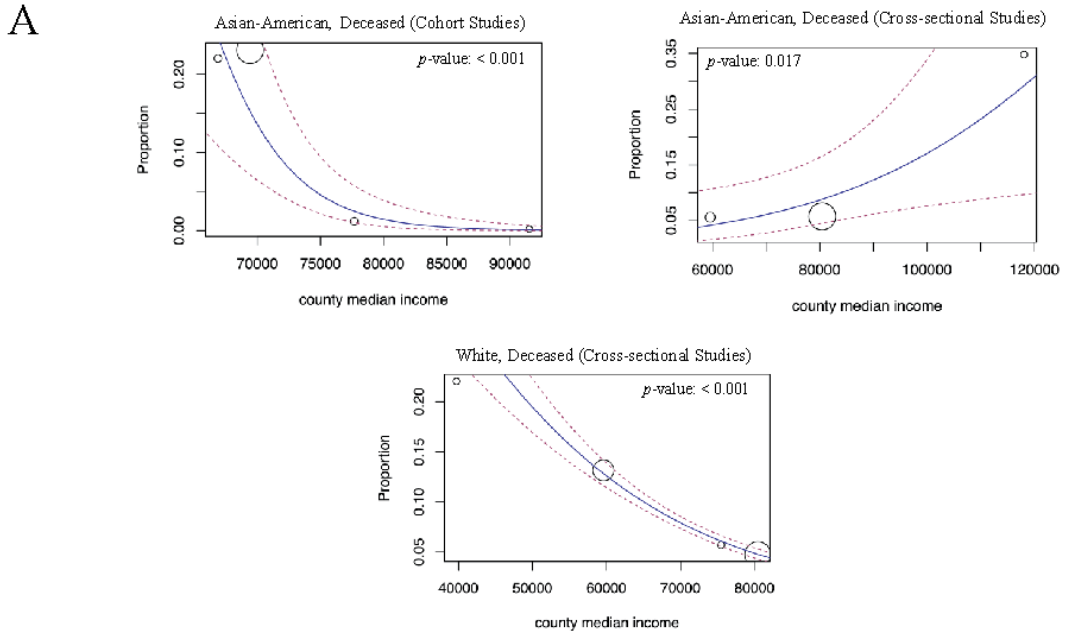


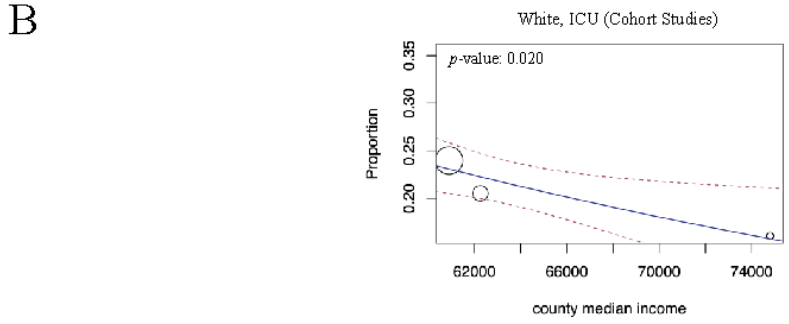




eFigure 8. Metaregression for County Median Income

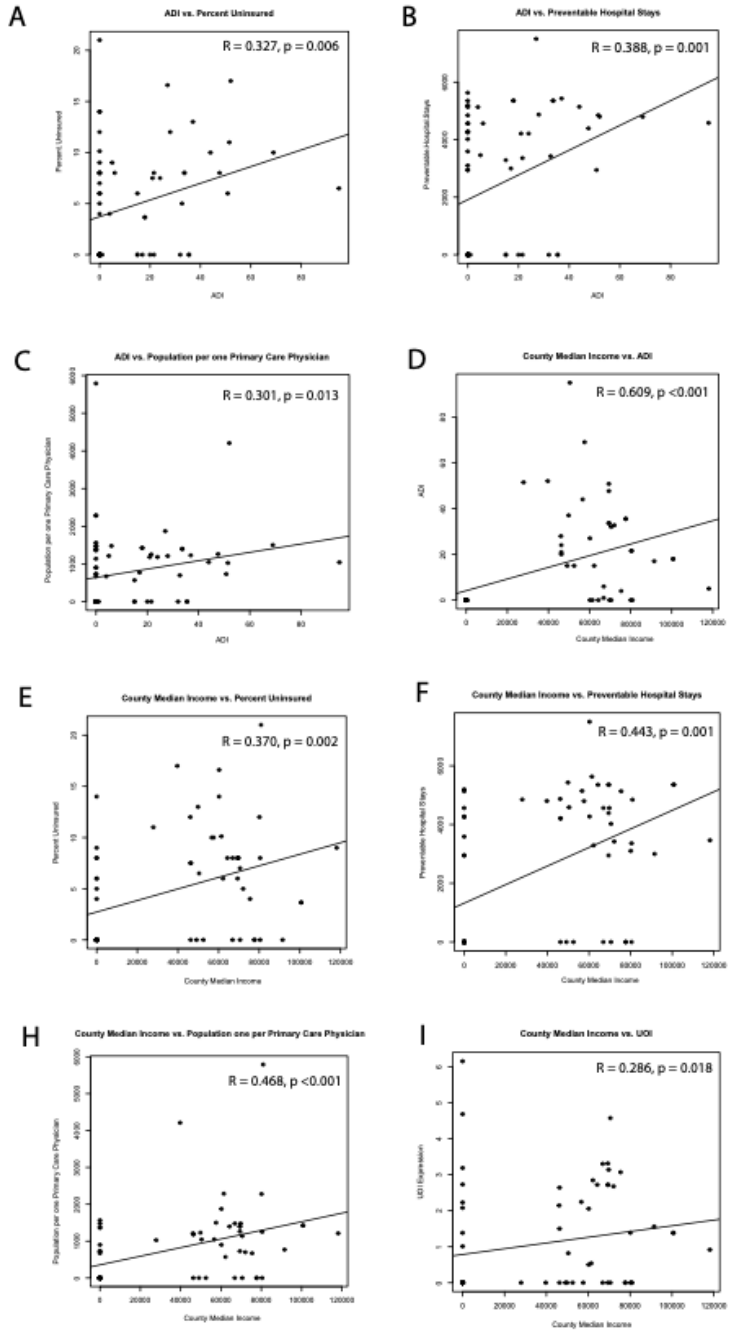
Meta-regression for county median income in (A) Asian Americans and Whites who are deceased (cohort and cross-sectional studies) and (B) Whites who were admitted to the ICU (cohort studies).





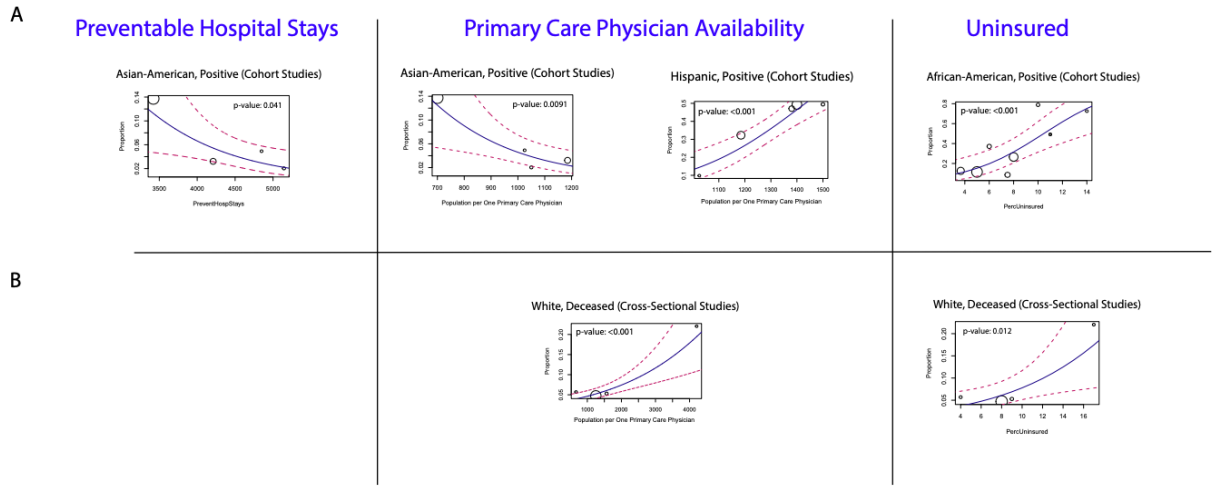
eFigure 9. Spearman Correlations for Measures of Clinical Care Quality

Spearman Correlations for ADI and county median income in respect to the following variables: urban core opportunity index, population per one primary care physician, preventable hospital stays, and amount of uninsured individuals.

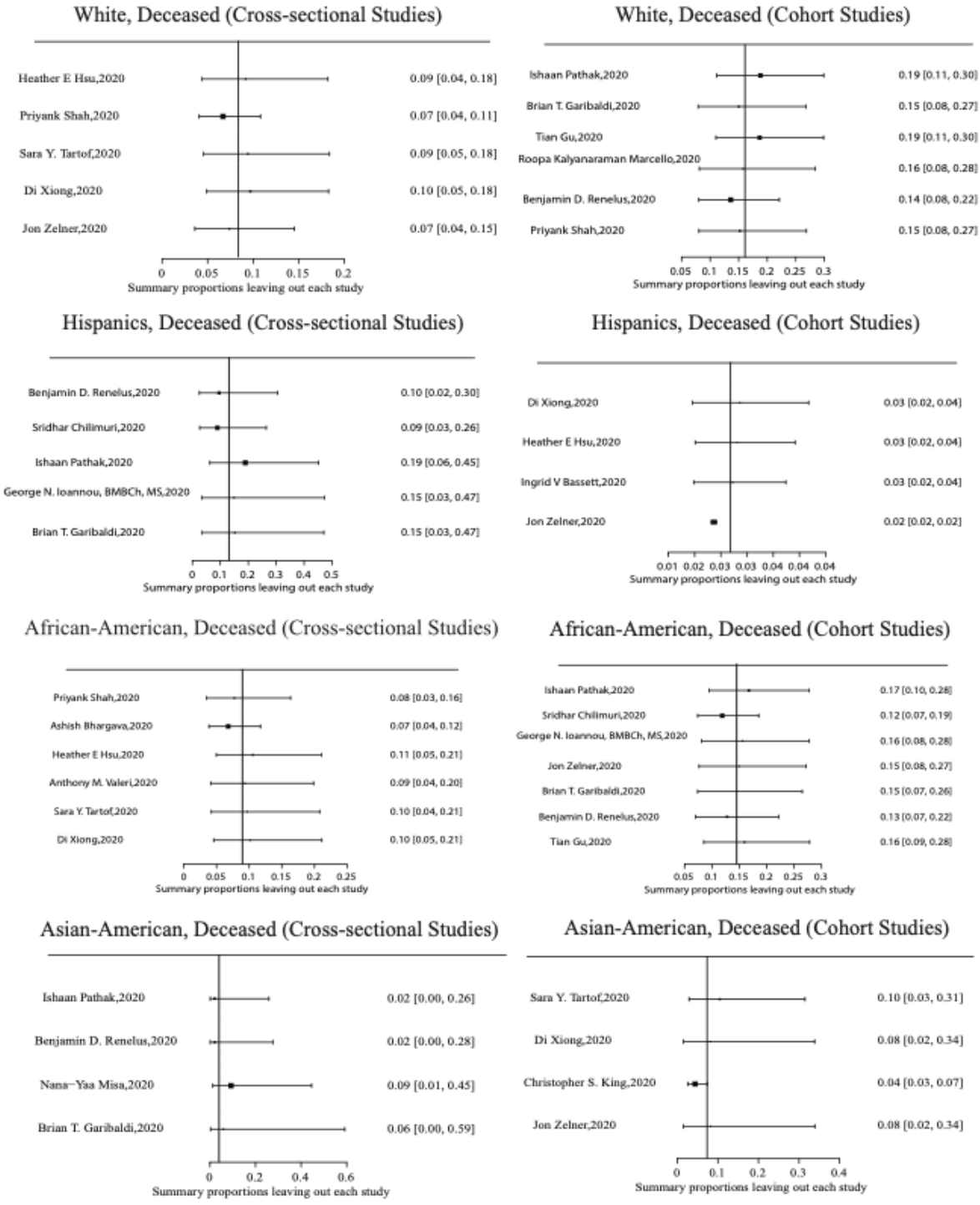


eFigure 10. Metaregression for Clinical Care Measures

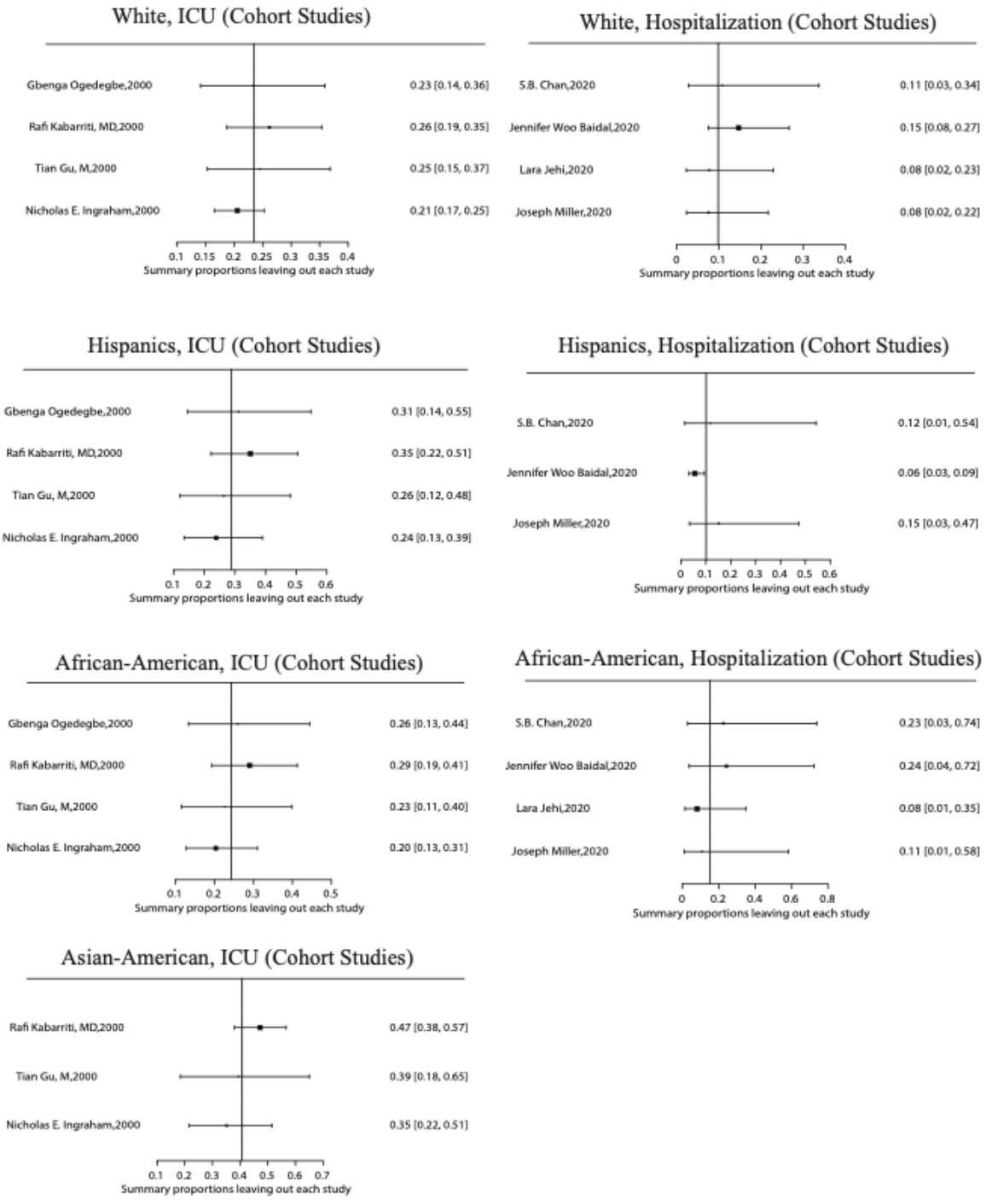
Meta-regression for measures of clinical care quality in the following cohorts: meta-regression for preventable hospital stays in correlation with Asian Americans who tested positive for COVID-19 in cohort studies; meta-regression for primary care physician availability in correlation with Asian Americans and Hispanics who tested positive for COVID-19 (cohort studies) and Whites who are deceased (cross-sectional studies); and meta-regression for the amount of uninsured individuals in correlation with African Americans who tested positive for COVID-19 (cohort studies) and Whites who are deceased (cross sectional studies).



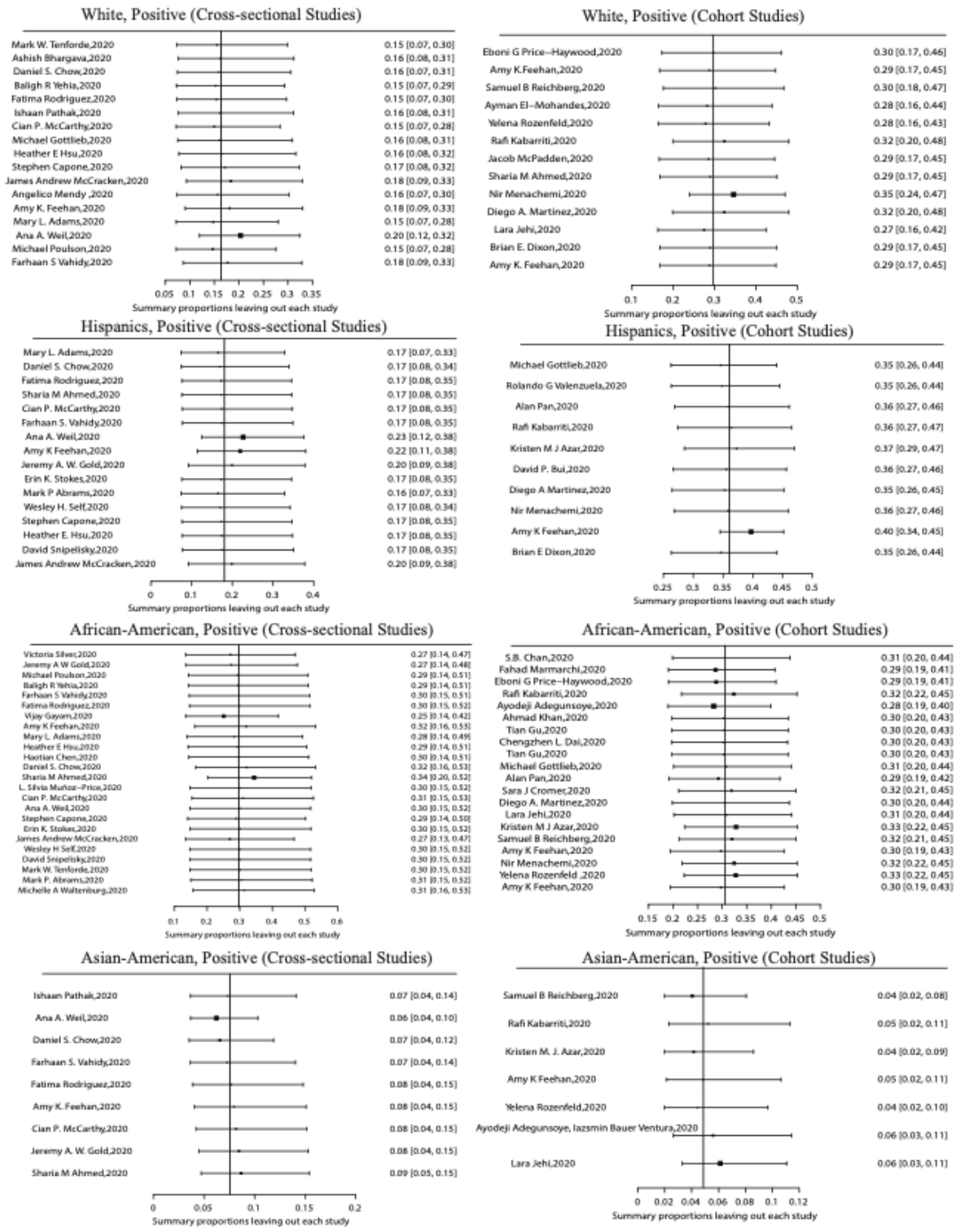
eFigure 11. Leave-One-Out Sensitivity Analysis for Deceased Individuals in Cohort and Cross-sectional Studies



eFigure 12. Leave-One-Out Sensitivity Analysis for Patients Admitted to ICU or Hospitalized in Cohort Studies

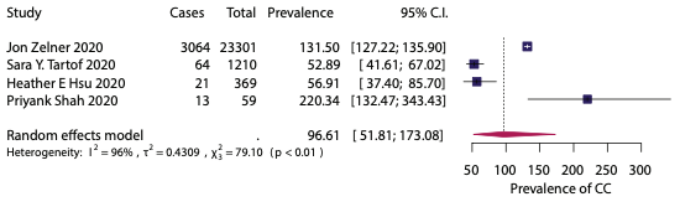


eFigure 13. Leave-One-Out Sensitivity Analysis for COVID-19 Positive Patients in Cohort and Cross-sectional Studies

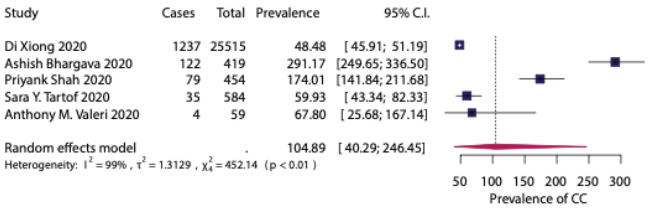


eFigure 14. Forest Plots for Deceased Patients After Removing Dominating Studies
Adjusted forest plots for deceased patients following removal of outlier studies identified in leave-one-out sensitivity analysis.

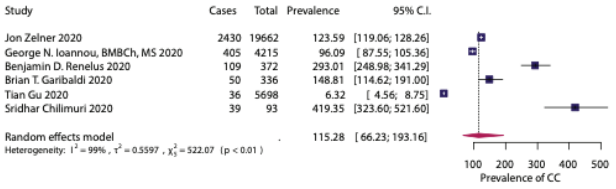
White, Deceased (Cross-sectional Studies)



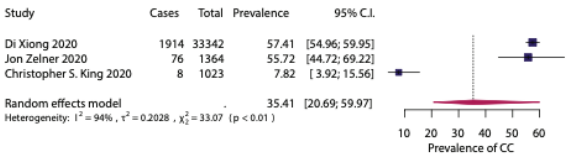
African-American, Deceased (Cross-sectional Studies)



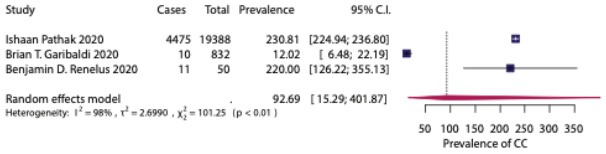
African-American, Deceased (Cohort Studies)



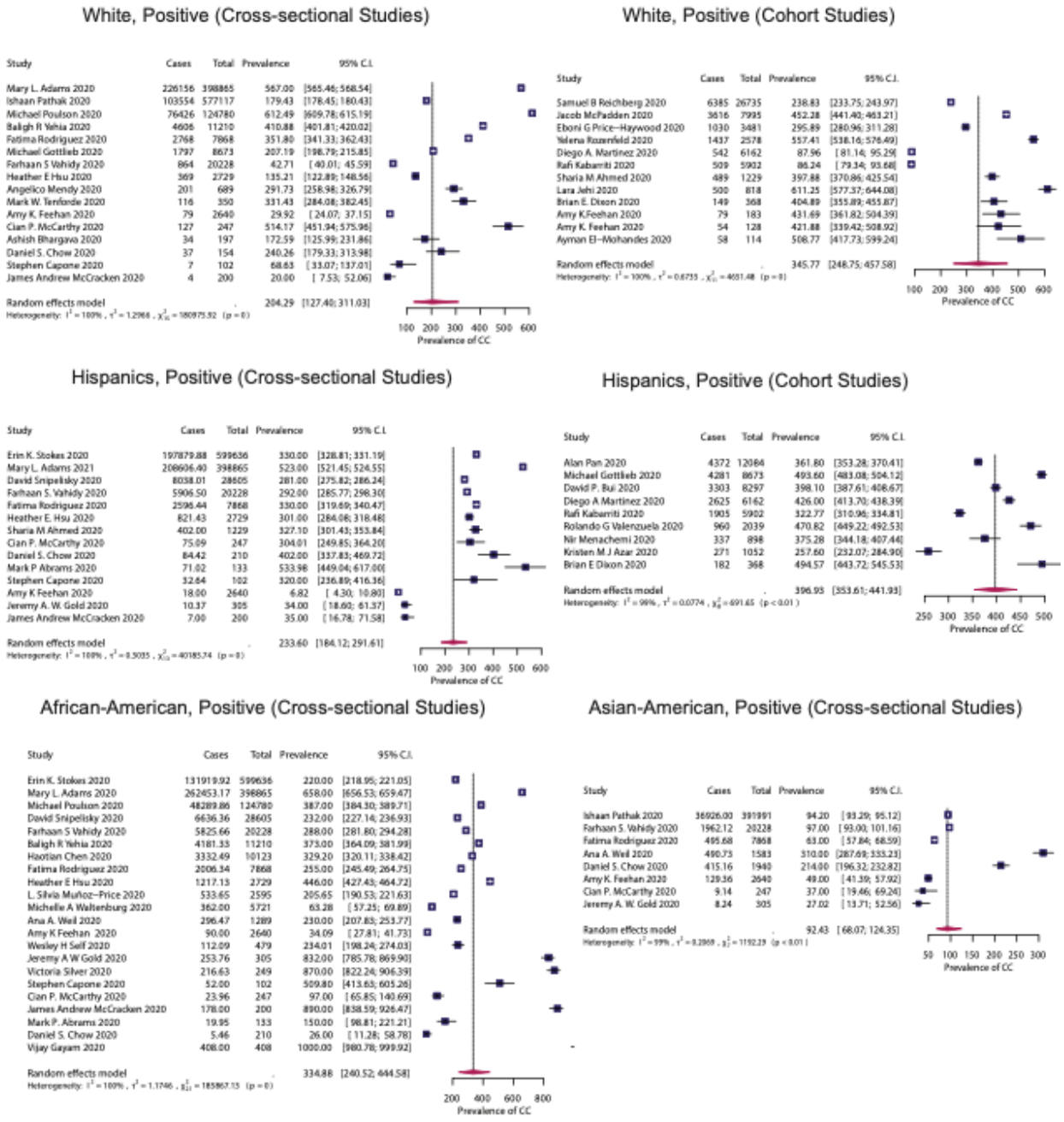
Asian-American, Deceased (Cross-sectional Studies)



Asian-American, Deceased (Cohort Studies)



eFigure 15. Forest Plots for Positive Individuals After Removing Dominating Studies
Adjusted forest plots for COVID-19 positive patients following removal of outlier studies identified in leave-one-out sensitivity analysis.



eMethods 1. Methods Pertaining to Search Criteria and Data Collection

The following keywords were used to search by all fields, which includes full text, author name, journal name, and phrase, in each database: “COVID-19 AND race”, “COVID-19 AND ethnicity”, “COVID-19 AND Asian patients”, “COVID-19 AND Black patients”, “COVID-19 AND White patients”, “COVID-19 AND Hispanic/Latino patients”, “COVID-19 AND American Indian/Alaska Natives patients”, “COVID-19 AND Pacific Islander patients”, “COVID-19 AND multiracial patients”, “income AND COVID-19”; “socioeconomic status AND COVID-19”, and “employment AND COVID-19.”

We used both the keyword and Medical Subject Heading (MeSH) term for the following keywords to increase the scope of our systematic review and meta-analysis: “COVID-19 AND ethnicity (MeSH term: COVID-19 AND ethnic groups)”, “COVID-19 AND race (MeSH term: COVID-19 AND race factors)”, “socioeconomic status AND COVID-19 (MeSH term: COVID-19 AND social class)”. MeSH terms provide controlled vocabulary for searches in databases, such as Pubmed. We chose to use both the MeSH term and the non-MeSH term for these particular keywords, as the non-MeSH term yielded significantly more results than the MeSH term. MeSH terms could not be used for the following keywords, as they were not available on the database: “COVID-19 AND Asian patients”, “COVID-19 AND Black patients”, “COVID-19 AND White patients”, “COVID-19 AND Hispanic/Latino patients”, “COVID-19 AND American Indian/Alaska Natives patients”, “COVID-19 AND Pacific Islander patients”, and “COVID-19 AND multiracial patients”. MeSH terms were solely used for the following keywords: “income AND COVID-19” and “employment AND COVID-19”.

Our original keyword searches yielded 21,745 total results. Of these articles, 14,519 were unique (eFigure 1). We excluded studies based on Abstract if they met one of the following criteria: (1) The article is irrelevant for the study question or has insufficient data, (2) The article does not discuss an outcome that is of interest, (3) The article is published in a non-standard format and/or in a foreign language. Only studies with original clinical data were included. Following the Abstract review, we screened the full text of the remaining 287 articles. After subsequent full-text screening using the same 3 exclusion criteria, a total of 68 studies were included for data analysis.

Study and patient characteristics were collected, including the study type, location, mean and median age, total number of patients in the study, and medical comorbidities. Specifically, we extracted data for the following medical comorbidities and conditions which we observed to be commonly reported across various studies: smoking status (both former and current smokers), median body mass index (BMI), BMI over 40, cardiovascular disease (including other heart conditions such as coronary artery disease), hypertension, chronic obstructive pulmonary disease (COPD), diabetes mellitus or diabetes, and occurence of malignancy or cancer. For the purposes of this analysis, we considered Hispanics and Latinos as a single cohort. The studies included did

not differentiate between various Asian populations, so many Asian populations were considered as a single cohort.

Following initial data review, we extracted the zip code, geographic location and/or congressional district from each study included in our meta-analysis in order to identify socioeconomic variables for subsequent analyses. In instances where congressional district information was not provided, we determined this information based on the zip code or geographic location of the study. From this extracted information, we obtained the following data for various measures of socioeconomic disparity from external websites for each study: (1) County median income and the percentage of each race in the district where the study was conducted was taken from the US Census Bureau’s website at the congressional district level. (2) Area Deprivation Index (ADI) was evaluated with The University of Wisconsin's Neighborhood Atlas tool and was constructed based on geographic location. (3) Measures of social determinants of health, including the percent of the population under age 65 that are uninsured, ratio of population to primary care physicians, and rate of hospital stays for ambulatory-care sensitive conditions per 100,000 Medicare enrollees (preventable hospital stays), were evaluated with the County Health Rankings and Roadmaps tool at the congressional district level. Geographic variation and population density were assessed with the Urban Core Opportunity Index as reported in the Social Determinants of Health Atlas. Area unit of analysis was limited to specific location and address level for this particular tool. For county-wide studies, a broader measure of each of these social determinants was calculated, using averages of data from each of the locations indicated in the study.

eMethods 2. Citations of Articles that Appeared to Meet Inclusion Criteria but Were Excluded

Excluded for non-standard format:

1. Bassett, M. T., Chen, J. T., & Krieger, N. (2020). Variation in racial/ethnic disparities in COVID-19 mortality by age in the United States: A cross-sectional study. PLoS medicine, 17(10), e1003402.
2. Hawkins, R. B., Charles, E. J., & Mehaffey, J. H. (2020). Socio-economic status and COVID-19–related cases and fatalities. Public health, 189, 129-134.
3. Egede, L. E., Walker, R. J., Garacci, E., & Raymond Sr, J. R. (2020). Racial/Ethnic Differences In COVID-19 Screening, Hospitalization, And Mortality In Southeast Wisconsin: Study examines racial/ethnic differences in COVID-19 screening, symptom presentation, hospitalization, and mortality among 31,549 adults tested for COVID-19 in Wisconsin. Health Affairs, 39(11), 1926-1934.
4. Abedi, V., Olulana, O., Avula, V., Chaudhary, D., Khan, A., Shahjouei, S., ... & Zand, R. (2020). Racial, economic, and health inequality and COVID-19 infection in the United States. Journal of racial and ethnic health disparities, 1-11.
5. Alnababteh, M., Drescher, G., Jayaram, L., Kohli, A., Hashmi, M., Hayat, F., ... & Zaaqoq, A. (2020). INVESTIGATING THE RELATIONSHIP BETWEEN RACE/ETHNICITY AND CLINICAL OUTCOMES IN COVID-19. Chest, 158(4), A2477.
6. Aleman, V. D., Fernandez, E. G., Varon, D., Surani, S., Gathe, J., & Varon, J. (2020). SOCIOECONOMIC DISPARITIES AS A DETERMINANT RISK FACTOR IN THE INCIDENCE OF COVID-19. Chest, 158(4), A1039.
7. El-Mohandes, A., Ratzan, S. C., Rauh, L., Ngo, V., Rabin, K., Kimball, S., ... & Freudenberg, N. (2020). COVID-19: A Barometer for Social Justice in New York City.
8. Xie, J., Zu, Y., Alkhatib, A., Pham, T. T., Gill, F., Jang, A., ... & Denson, J. L. (2021). Metabolic syndrome and COVID-19 mortality among adult black patients in New Orleans. Diabetes Care, 44(1), 188-193.
9. Clift, A. K., Coupland, C. A., Keogh, R. H., Diaz-Ordaz, K., Williamson, E., Harrison, E. M., ... & Hippisley-Cox, J. (2020). Living risk prediction algorithm (QCOVID) for risk of hospital admission and mortality from coronavirus 19 in adults: national derivation and validation cohort study. bmj, 371.
10. Sepulchre, E., Pittie, G., Stojkovic, V., Haesbroek, G., Crama, Y., Schyns, M., ... & Minon, J. M. (2020). Covid-19: contribution of clinical characteristics and laboratory features for early detection of patients with high risk of severe evolution. Acta Clinica Belgica, 1-7.
11. Baquero, B., Gonzalez, C., Ramirez, M., Chavez Santos, E., & Ornelas, I. J. (2020). Understanding and Addressing Latinx COVID-19 Disparities in Washington State. Health Education & Behavior, 47(6), 845-849.
12. Le, T. K., Cha, L., Han, H. R., & Tseng, W. (2020). Anti-Asian Xenophobia and Asian American COVID-19 Disparities.

13. Kim, H. N., Lan, K. F., Nkyekyer, E., Neme, S., Pierre-Louis, M., Chew, L., & Duber, H. C. (2020). Assessment of disparities in COVID-19 testing and infection across language groups in Seattle, Washington. JAMA network open, 3(9), e2021213-e2021213.
14. Hamidi, S., Ewing, R., & Sabouri, S. (2020). Longitudinal analyses of the relationship between development density and the COVID-19 morbidity and mortality rates: Early evidence from 1,165 metropolitan counties in the United States. Health & place, 64, 102378.
15. Rader, B., Astley, C. M., Sy, K. T. L., Sewalk, K., Hswen, Y., Brownstein, J. S., & Kraemer, M. U. (2020). Geographic access to United States SARS-CoV-2 testing sites highlights healthcare disparities and may bias transmission estimates.
16. He, J., He, L., Zhou, W., Nie, X., & He, M. (2020). Discrimination and social exclusion in the outbreak of COVID-19. International Journal of Environmental Research and Public Health, 17(8), 2933.
17. Do, D. P., & Frank, R. (2021). Unequal burdens: assessing the determinants of elevated COVID-19 case and death rates in New York City's racial/ethnic minority neighbourhoods. J Epidemiol Community Health, 75(4), 321-326.
18. Dasgupta, S., Bowen, V. B., Leidner, A., Fletcher, K., Musial, T., Rose, C., ... & Oster, A. M. (2020). Association Between Social Vulnerability and a County's Risk for Becoming a COVID-19 Hotspot—United States, June 1–July 25, 2020. Morbidity and Mortality Weekly Report, 69(42), 1535.
19. Barasa, S. (2020). The major predictors of testing positive for COVID-19 among symptomatic hospitalized patients. medRxiv.
20. Benussi, A., Pilotto, A., Premi, E., Libri, I., Giunta, M., Agosti, C., ... & Padovani, A. (2020). Clinical characteristics and outcomes of inpatients with neurologic disease and COVID-19 in Brescia, Lombardy, Italy. Neurology, 95(7), e910-e920.
21. Bertsimas, D., Lukin, G., Mingardi, L., Nohadani, O., Orfanoudaki, A., Stellato, B., ... & Hellenic COVID-19 Study Group. (2020). COVID-19 mortality risk assessment: An international multi-center study. PloS one, 15(12), e0243262.
22. Bhowmik, T., Tirtha, S. D., Iraganaboina, N. C., & Eluru, N. (2021). A comprehensive analysis of COVID-19 transmission and mortality rates at the county level in the United States considering socio-demographics, health indicators, mobility trends and health care infrastructure attributes. Plos one, 16(4), e0249133.
23. Bilal, U., Barber, S., Tabb, L., & Diez-Roux, A. V. (2020). Spatial Inequities in COVID-19 Testing, Positivity, Incidence and Mortality in 3 US Cities: a Longitudinal Ecological Study. medRxiv.
24. Burden, S. J., Rademaker, J., Weedon, B. D., Whaymand, L., Dawes, H., & Jones, A. (2020). Associations of Global Country Profiles and Modifiable Risk Factors with COVID-19 Cases and Deaths. Available at SSRN 3627258.

25. Cao, Y., Hiyoshi, A., & Montgomery, S. (2020). COVID-19 case-fatality rate and demographic and socioeconomic influencers: worldwide spatial regression analysis based on country-level data. BMJ open, 10(11), e043560.
26. Incerti, D., Rizzo, S., Li, X., Lindsay, L., Yau, V., Keebler, D., ... & Tsai, L. (2020). Risk factors for mortality among hospitalized patients with COVID-19. medRxiv.
27. Kiaghadi, A., Rifai, H. S., & Liaw, W. (2020). Assessing COVID-19 risk, vulnerability and infection prevalence in communities. Plos one, 15(10), e0241166.
28. Kranjac, A. W., & Kranjac, D. (2020). County-level factors influence the trajectory of Covid-19 incidence. medRxiv.
29. Robertson, L. S. (2020). COVID-19 Confirmed Cases and Fatalities in 883 US Counties with a Population of 50,000 or More: Predictions Based on Social, Economic, Demographic Factors and Shutdown Days. medRxiv.
30. Lieberman-Cribbin, W., Tuminello, S., Flores, R. M., & Taioli, E. (2020). Disparities in COVID-19 testing and positivity in New York City. American journal of preventive medicine, 59(3), 326-332.
31. Center, K. E., Da Silva, J., Hernandez, A. L., Vang, K., Martin, D. W., Mazurek, J., ... & James, A. E. (2020). Multidisciplinary community-based investigation of a COVID-19 outbreak among Marshallese and Hispanic/Latino communities—Benton and Washington Counties, Arkansas, March–June 2020. Morbidity and Mortality Weekly Report, 69(48), 1807.

Excluded because desired outcomes were not measured:

1. Gross, C. P., Essien, U. R., Pasha, S., Gross, J. R., Wang, S. Y., & Nunez-Smith, M. (2020). Racial and ethnic disparities in population-level Covid-19 mortality. Journal of general internal medicine, 35(10), 3097-3099.
2. Richmond, H. L., Tome, J., Rochani, H., Fung, I. C. H., Shah, G. H., & Schwind, J. S. (2020). The Use of Penalized Regression Analysis to Identify County-Level Demographic and Socioeconomic Variables Predictive of Increased COVID-19 Cumulative Case Rates in the State of Georgia. International journal of environmental research and public health, 17(21), 8036.
3. Oronce, C. I. A., Scannell, C. A., Kawachi, I., & Tsugawa, Y. (2020). Association between state-level income inequality and COVID-19 cases and mortality in the USA. Journal of General Internal Medicine, 35(9), 2791-2793.
4. El Chaar, M., King, K., & Lima, A. G. (2020). Are black and Hispanic persons disproportionately affected by COVID-19 because of higher obesity rates?. Surgery for Obesity and Related Diseases, 16(8), 1096-1099.
5. Maroko, A. R., Nash, D., & Pavilonis, B. T. (2020). Covid-19 and Inequity: A comparative spatial analysis of New York City and Chicago hot spots. Journal of Urban Health, 97(4), 461-470.

6. Kaushik, S., Aydin, S. I., Derespina, K. R., Bansal, P. B., Kowalsky, S., Trachtman, R., ... & Medar, S. S. (2020). Multisystem inflammatory syndrome in children (MIS-C) associated with SARS-CoV-2 infection: a multi-institutional study from New York City. The Journal of Pediatrics.

Excluded due to insufficient data:

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eMethods 3. Description of Statistical Methods Used in Analyses

All calculations for prevalence, relative risk ratio (RR), odds ratio (OR), and adjustment analysis were conducted using the "meta," "metafor," and "multicon" R packages.

The studies were separated into cohort and cross-sectional studies for all data analysis. Cohort studies include a population that is defined prior to the pandemic, while cross-sectional studies only include patients with COVID-19 at a given place/time.

A random-effects model was used to calculate all measures in this study. Random effects models were used to assess summary proportions and account for study heterogeneity, as studies included in the meta-analysis contained diverse patient populations (eFigures 5-7).

Random-effects models do not condition on the true outcomes, but instead the studies in the meta-analysis are assumed to be a random sample of the large population of studies. This is ideal for the purposes of this study, as our study population is a hypothetical population of an infinitely possible subset of study populations that may have been sampled or will be sampled in the future. In a random-effects model, the true outcomes in the studied population are assumed to be normally distributed, with μ representing the average true outcome, and $\boldsymbol{\tau}$ representing the variance of the true outcomes: $\theta \sim N(\mu, \tau^2)$. The random-effects model may also be represented as a linear combination of the average true outcome and uniformly distributed variables: $y_i = \mu + \mu_i + \varepsilon_i$, where $\mu_i \sim N(0, \tau^2)$and $\varepsilon_i \sim N(0, v_i)$ ($v_i$is the sampling variance associated with the observed outcomes).

Logit transformations were applied to all proportional data, and the Cochran's Q test and the I^2 index were used to quantify study heterogeneity (eTable 6). Meta-regression analysis was conducted to assess correlations between study effect size and socioeconomic variables. These models were used to further examine the correlations between race/ethnicity and COVID-19 outcomes. Publication bias was assessed using the Egger's test for publication bias. Leave-one-sensitivity analysis was conducted to examine the impact of dominating studies or outliers on results.

The relative risk ratio (RR) (with 95% confidence interval) and the odds ratio (OR) (with 95% confidence interval) describe the risk (or odds) of COVID-19 severity in different racial and ethnic groups relative to Whites. RR/OR measures were adjusted by fitting a mixed-effects model with Restricted Maximum Likelihood (REML) estimation. 8 different models were used to test for the effect of confounding variables on risk outcomes: Sex-Adjusted (Figure 1, Figure 2); Age-Adjusted (eTable 3, eTable 4); Sex & Age-adjusted (Figure 1, Figure 2); ADI-adjusted (eTable 3, eTable 4); Income-adjusted (eTable 3, eTable 4); Clinical Care-adjusted (eTable 3, eTable 4); Urban Oppurtunity Index (UOI)-adjusted (eTable 3, eTable 4); Comorbidities-

adjusted (eTable 3, eTable 4). Studies in the unadjusted model that did not include information for one of these variables were excluded from the adjustment analysis of that particular variable. Methods to estimate missing data, such as multiple imputation, were not used as the studies were conducted separately (not a randomized trial) and the number of known outcomes would not be sufficient for accurate imputation. No more than two individual measures were adjusted at once in order to minimize the effects of overfitting (see the composite measures mentioned below).

Additionally, fitting was only calculated if the predictor variable(s) had at least 2 more outcomes than the variables being adjusted for. The mixed-effects models were fitted to the median value(s) of the variable(s) being adjusted for in order to reduce the effects of outliers. We calculated a combined measure for both Comorbidities and Clinical Care using a unit-weighted composite function, as several variables were required to appropriately adjust for these factors. The Comorbidity measure was composed using the following comorbidities that were available in the study group: ever smoker, BMI, cardiovascular disease, hypertension, COPD, diabetes, and cancer. The following variables were used to compose an estimate for the quality of Clinical care: Percent of the population under 65 that are uninsured, ratio of the population to primary care physicians, and the rate of hospital stays for ambulatory-care sensitive conditions per 100,000 Medicare enrollees (preventable hospital stays). In order to test for the similarity of variables used for the combined measures, only composed variables with a Chronbach's alpha score > 0.7 were used for adjustment (eTable 3, eTable 4). The clinical-care measure for Hispanic/Latino COVID-19 positive RR/OR was the only unit-weighted composite variable which yielded an alpha score < 0.7. Thus, RR/OR adjustment was not implemented for this cohort.