

Stepwise Regression on COVID Risks and Social Determinants of Health

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Risk of all cause deaths in 2020

I have modeled risk of dying in 2020 regardless of cause. Here I have analyzed all cause deaths in 2020, Covid or no Covid. Copied is the SAS code below the results.

Dataset: Research Consortium Database - Common profile

Number of observations used: 9,446,214 (Everyone active in 2020 in the linked data)

Number died in 2020: 135,067 (1.43%)

Reference racial group is whites

Test of global null hypotheses $BETA=0$ for all the models below: Likelihood ratio, Score and Wald p-values are all < .0001

*Education: Less than high school=1, High school=2, Bachelor degree=3, and Graduate degree=4

*Income: Under \$24,999=1, \$25,000 to \$49,999=2, \$50,000 to \$74,999=3, \$75,000 to \$99,999=4, \$100,000 to \$124,999=5, \$125,000 to \$149,999=6, and Over \$150,000=7

*Race: White=0, Unknown=1, African American=2, Hispanic=3, Native American and Pacific islander=4, and Asian=5

*Gender: Female=1, Male=2

*Senior: Age 65 or above=1, Otherwise 0

*UMC_30: Count of underlying medical conditions out of total 30 chronic conditions that are risk factor for severe outcomes given Covid

Results

Topline finding: *Odds of death were statistically similar for black and white populations in 2020; other racial groups had lesser odds in comparison.*

Higher odds of mortality in whites could be explained in part by deaths of despair Case and Deaton had chronicled in <https://www.pnas.org/content/pnas/112/49/15078.full.pdf>

Risk	Controlling for	Race	Odds Ratio	95% Wald Confidence Limits		p-value
Death in 2020	Nothing	Other	0.549	0.534	0.563	<.0001
		Black	1.19	1.168	1.212	<.0001
		Hispanic	0.728	0.717	0.739	<.0001
		Native	0.78	0.723	0.841	<.0001
		Asian	0.316	0.288	0.345	<.0001
Death in 2020	Education	Other	0.585	0.569	0.6	<.0001
		Black	1.078	1.058	1.098	<.0001
		Hispanic	0.605	0.596	0.614	<.0001
		Native	0.76	0.705	0.819	<.0001
		Asian	0.336	0.307	0.367	<.0001
Death in 2020	Education, Income	Other	0.65	0.633	0.667	<.0001
		Black	0.831	0.815	0.847	<.0001
		Hispanic	0.603	0.594	0.612	<.0001
		Native	0.857	0.795	0.924	<.0001
		Asian	0.41	0.375	0.449	<.0001
Death in 2020	Education, Income, Senior	Other	0.655	0.638	0.672	<.0001
		Black	1.075	1.055	1.096	<.0001
		Hispanic	0.757	0.745	0.769	<.0001
		Native	0.859	0.797	0.927	<.0001
		Asian	0.461	0.421	0.504	<.0001
Death in 2020	Education, Income, Senior, Gender	Other	0.646	0.63	0.664	<.0001
		Black	1.086	1.065	1.107	<.0001
		Hispanic	0.756	0.744	0.767	<.0001
		Native	0.859	0.796	0.927	<.0001
		Asian	0.438	0.4	0.479	<.0001
Death in 2020	Education, Income, Senior, Gender, Underlying medical conditions (30)	Other	0.573	0.558	0.588	<.0001
		Black	0.991	0.972	1.01	0.3387
		Hispanic	0.613	0.603	0.623	<.0001
		Native	0.714	0.662	0.771	<.0001
		Asian	0.373	0.341	0.409	<.0001

Risk of Covid infection and risk of death given Covid

Risk of Covid infection

Dataset: Research Consortium Database - Common profile

Number of observations used: 9,446,214 (Everyone active in 2020 in the linked data)

Number contracted Covid in 2020: 258,814 (2.74%)

Reference racial group is whites

Test of global null hypotheses BETA=0 for all the models below: Likelihood ratio, Score and Wald p-values are all < .0001

*Education: Less than high school=1, High school=2, Bachelor degree=3, and Graduate degree=4

*Income: Under \$24,999=1, \$25,000 to \$49,999=2, \$50,000 to \$74,999=3, \$75,000 to \$99,999=4, \$100,000 to \$124,999=5, \$125,000 to \$149,999=6, and Over \$150,000=7

*Race: White=0, Unknown=1, African American=2, Hispanic=3, Native American and Pacific islander=4, and Asian=5

*Gender: Female=1, Male=2

*Senior: Age 65 or above=1, Otherwise 0

*UMC_30: Count of underlying medical conditions out of total 30 chronic conditions that are risk factor for severe outcomes given Covid

Results

Topline finding: *All racial groups had higher odds of contracting Covid than whites.*

Risk	Controlling for	Race	Odds Ratio	95% Wald Confidence Limits		p-value
Covid infection in 2020	Nothing	Other	1.226	1.205	1.247	<.0001
		Black	1.462	1.44	1.485	<.0001
		Hispanic	3.05	3.024	3.076	<.0001
		Native	2.166	2.075	2.261	<.0001
		Asian	1.966	1.899	2.035	<.0001
Covid infection in 2020	Education	Other	1.243	1.222	1.264	<.0001
		Black	1.418	1.396	1.441	<.0001
		Hispanic	2.849	2.824	2.875	<.0001
		Native	2.135	2.046	2.229	<.0001
		Asian	1.995	1.927	2.065	<.0001
Covid infection in 2020	Education, Income	Other	1.242	1.221	1.263	<.0001
		Black	1.395	1.373	1.417	<.0001
		Hispanic	2.852	2.827	2.878	<.0001
		Native	2.137	2.047	2.231	<.0001
		Asian	1.996	1.928	2.066	<.0001
Covid infection in 2020	Education, Income, Senior	Other	1.244	1.223	1.265	<.0001
		Black	1.43	1.408	1.453	<.0001
		Hispanic	2.918	2.892	2.945	<.0001
		Native	2.138	2.048	2.232	<.0001
		Asian	2.017	1.949	2.088	<.0001
Covid infection in 2020	Education, Income, Senior, Gender	Other	1.238	1.217	1.259	<.0001
		Black	1.438	1.416	1.461	<.0001
		Hispanic	2.919	2.893	2.946	<.0001
		Native	2.139	2.049	2.233	<.0001
		Asian	1.98	1.913	2.05	<.0001
Covid infection in 2020	Education, Income, Senior, Gender, Underlying medical conditions (30)	Other	1.101	1.082	1.12	<.0001
		Black	1.285	1.264	1.305	<.0001
		Hispanic	2.363	2.341	2.385	<.0001
		Native	1.756	1.682	1.833	<.0001
		Asian	1.691	1.633	1.751	<.0001

Risk of death given Covid

Dataset: Research Consortium Database - Common profile

Number of observations used: 258,814 (Everyone who had contracted Covid in 2020 in the linked data)

Of these, number died: 9,807 (3.79%)

Reference racial group is whites

Test of global null hypotheses $BETA=0$ for all the models below: Likelihood ratio, Score and Wald p-values are all < .0001

Results

Topline finding: *All other racial groups had lesser odds of dying in the face of Covid in 2020 when compared to whites.*

Risk	Controlling for	Race	Odds Ratio	95% Wald Confidence Limits		p-value
Died in the face of Covid in 2020	Nothing	Other	0.535	0.485	0.591	<.0001
		Black	0.925	0.86	0.995	0.0351
		Hispanic	0.528	0.505	0.553	<.0001
		Native	0.61	0.479	0.776	<.0001
		Asian	0.253	0.188	0.339	<.0001
Died in the face of Covid in 2020	Education	Other	0.562	0.509	0.621	<.0001
		Black	0.855	0.795	0.919	<.0001
		Hispanic	0.448	0.427	0.47	<.0001
		Native	0.587	0.461	0.747	<.0001
		Asian	0.266	0.198	0.357	<.0001
Died in the face of Covid in 2020	Education, Income	Other	0.622	0.563	0.687	<.0001
		Black	0.678	0.629	0.73	<.0001
		Hispanic	0.448	0.426	0.47	<.0001
		Native	0.679	0.533	0.865	0.0018
		Asian	0.334	0.249	0.45	<.0001
Died in the face of Covid in 2020	Education, Income, Senior	Other	0.677	0.612	0.749	<.0001
		Black	0.908	0.842	0.979	0.012
		Hispanic	0.675	0.642	0.709	<.0001
		Native	0.765	0.599	0.978	0.0328
		Asian	0.408	0.303	0.55	<.0001
Died in the face of Covid in 2020	Education, Income, Senior, Gender	Other	0.661	0.597	0.731	<.0001
		Black	0.913	0.847	0.985	0.0188
		Hispanic	0.671	0.638	0.705	<.0001
		Native	0.758	0.593	0.969	0.0271
		Asian	0.383	0.284	0.516	<.0001
Died in the face of Covid in 2020	Education, Income, Senior, Gender, Underlying medical conditions (30)	Other	0.644	0.582	0.712	<.0001
		Black	0.896	0.83	0.966	0.0044
		Hispanic	0.644	0.612	0.678	<.0001
		Native	0.726	0.568	0.929	0.0108
		Asian	0.371	0.275	0.5	<.0001

Gender

Risk of Covid infection and risk of death given Covid

Risk of Covid infection

Dataset: Research Consortium Database - Common profile

Number of observations used: 9,446,214 (Everyone active in 2020 in the linked data)

Number contracted Covid in 2020: 258,814 (2.74%)

Reference gender group is female

Test of global null hypotheses BETA=0 for all the models below: Likelihood ratio, Score and Wald p-values are all < .0001

*Education: Less than high school=1, High school=2, Bachelor degree=3, and Graduate degree=4

*Income: Under \$24,999=1, \$25,000 to \$49,999=2, \$50,000 to \$74,999=3, \$75,000 to \$99,999=4, \$100,000 to \$124,999=5, \$125,000 to \$149,999=6, and Over \$150,000=7

*Race: White=0, Unknown=1, African American=2, Hispanic=3, Native American and Pacific islander=4, and Asian=5

*Gender: Female=1, Male=2

*Senior: Age 65 or above=1, Otherwise 0

*UMC_30: Count of underlying medical conditions out of total 30 chronic conditions that are risk factor for severe outcomes given Covid

Results

Topline finding: *Males had higher odds of contracting Covid than females.*

Risk	Controlling for	Race	Odds Ratio	95% Wald Confidence Limits		p-value
Covid infection in 2020	Nothing	Other	1.155	1.146	1.164	<.0001
Covid infection in 2020	Education	Other	1.162	1.153	1.171	<.0001
Covid infection in 2020	Education, Income	Other	1.163	1.154	1.173	<.0001
Covid infection in 2020	Education, Income, Senior	Other	1.159	1.15	1.169	<.0001
Covid infection in 2020	Education, Income, Senior, Race	Other	1.159	1.15	1.168	<.0001
Covid infection in 2020	Education, Income, Senior, Race, Underlying medical conditions (30)	Other	1.092	1.083	1.101	<.0001

Risk of death given Covid

Dataset: Research Consortium Database - Common profile

Number of observations used: 258,814 (Everyone who had contracted Covid in 2020 in the linked data)

Of these, number died: 9,807 (3.79%)

Reference gender group is female

Test of global null hypotheses BETA=0 for all the models below: Likelihood ratio, Score and Wald p-values are all < .0001

Results

Topline finding: *Males had greater odds of dying in the face of Covid in 2020 when compared to females.*

Risk	Controlling for	Race	Odds Ratio	95% Wald Confidence Limits		p-value
Died in the face of Covid in 2020	Nothing	Other	1.369	1.315	1.426	<.0001
Died in the face of Covid in 2020	Education	Other	1.382	1.327	1.439	<.0001
Died in the face of Covid in 2020	Education, Income	Other	1.426	1.369	1.485	<.0001
Died in the face of Covid in 2020	Education, Income, Senior	Other	1.354	1.299	1.411	<.0001
Died in the face of Covid in 2020	Education, Income, Senior, Race	Other	1.373	1.318	1.431	<.0001
Died in the face of Covid in 2020	Education, Income, Senior, Race, Underlying medical conditions (30)	Other	1.369	1.313	1.426	<.0001

Risk of Covid infection

Dataset: COVID 19 Research Consortium Database

Number of observations used: 14,725,975 (Everyone active in Q2, Q3, Q4 of 2020 and Q1 of 2021 in the linked data)

Number contracted Covid in 2020: 387,998 (2.63%)

Reference racial group is whites

Test of global null hypotheses BETA=0 for all the models below: Likelihood ratio, Score and Wald p-values are all < .0001

*Education: Less than high school=1, High school=2, Bachelor degree=3, and Graduate degree=4

*Income: Income in 100,00 USD

*Homevalue= Home value in 100,00 USD

*Race: White=0, Unknown=1, African American=2, Hispanic=3, Native American and Pacific islander=4, and Asian=5

*Gender: Female=1, Male=2

*Age: Age in years

*Job: Blue collar=1, Rest are different shades of white or homemaker

*Politics: Republican=1, Democrat=2, Remainder=3

*Religion: Catholic=1, Jewish=2, Non-Christian=3, Protestant=4, Not Religious=5, Else=0

*UMC_30: Count of underlying medical conditions out of total 30 chronic conditions that are risk factor for severe outcomes given Covid

Topline finding: All racial groups had higher odds of contracting Covid than whites.

Risk	Controlling for	Race	Odds Ratio	95% Wald Confidence Limits		p-value
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Nothing	Other	1.123	1.098	1.149	<.0001
		Black	1.403	1.386	1.419	<.0001
		Hispanic	2.927	2.906	2.948	<.0001
		Native	2.093	2.019	2.17	<.0001
		Asian	1.401	1.381	1.422	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30)	Other	1.117	1.091	1.142	<.0001
		Black	1.394	1.318	1.35	<.0001
		Hispanic	2.484	2.466	2.502	<.0001
		Native	1.787	1.724	1.853	<.0001
		Asian	1.23	1.212	1.248	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income	Other	1.117	1.092	1.143	<.0001
		Black	1.33	1.315	1.347	<.0001
		Hispanic	2.481	2.464	2.499	<.0001
		Native	1.79	1.726	1.856	<.0001
		Asian	1.233	1.214	1.251	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income, Job	Other	1.116	1.091	1.142	<.0001
		Black	1.318	1.302	1.334	<.0001
		Hispanic	2.461	2.443	2.479	<.0001
		Native	1.775	1.712	1.841	<.0001
		Asian	1.227	1.208	1.245	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income, Job, Education	Other	1.116	1.09	1.141	<.0001
		Black	1.307	1.291	1.323	<.0001
		Hispanic	2.37	2.352	2.388	<.0001
		Native	1.756	1.693	1.821	<.0001
		Asian	1.234	1.215	1.252	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income, Job, Education, Homevalue	Other	1.116	1.09	1.141	<.0001
		Black	1.307	1.291	1.323	<.0001
		Hispanic	2.37	2.352	2.388	<.0001
		Native	1.756	1.693	1.821	<.0001
		Asian	1.234	1.215	1.252	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income, Job, Education, Homevalue, Politics	Other	1.116	1.091	1.142	<.0001
		Black	1.298	1.281	1.315	<.0001
		Hispanic	2.359	2.339	2.38	<.0001
		Native	1.759	1.696	1.824	<.0001
		Asian	1.236	1.217	1.254	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income, Job, Education, Homevalue, Religion	Other	1.112	1.087	1.138	<.0001
		Black	1.37	1.352	1.389	<.0001
		Hispanic	2.217	2.196	2.239	<.0001
		Native	1.745	1.683	1.809	<.0001
		Asian	1.288	1.265	1.311	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income, Job, Education, Homevalue, Religion, Age	Other	1.114	1.088	1.14	<.0001
		Black	1.381	1.362	1.4	<.0001
		Hispanic	2.23	2.208	2.251	<.0001
		Native	1.754	1.691	1.82	<.0001
		Asian	1.286	1.263	1.31	<.0001
Covid infection in Q2,Q3,Q4 2020 and Q1 2021	Underlying medical conditions (30), Income, Job, Education, Homevalue, Religion, Age, Gender	Other	1.106	1.08	1.131	<.0001
		Black	1.302	1.285	1.321	<.0001
		Hispanic	2.137	2.116	2.158	<.0001
		Native	1.736	1.674	1.801	<.0001
		Asian	1.249	1.226	1.272	<.0001