

THE LANCET

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: COVID-19 National Preparedness Collaborators. Pandemic preparedness and COVID-19: an exploratory analysis of infection and fatality rates, and contextual factors associated with preparedness in 177 countries, from Jan 1, 2020, to Sept 30, 2021. *Lancet* 2022; published online Feb 1. [https://doi.org/10.1016/S0140-6736\(22\)00172-6](https://doi.org/10.1016/S0140-6736(22)00172-6).

Appendix 1: Supplemental methods and results for “**Pandemic preparedness and COVID-19: an exploratory analysis of infection and fatality rates and contextual factors associated with preparedness in 177 countries, from January 1, 2020, to September 30, 2021**”

This appendix provides further methodological and supplementary results for “**Pandemic preparedness and COVID-19: an exploratory analysis of infection and fatality rates and contextual factors associated with preparedness in 177 countries, from January 1, 2020, to September 30, 2021.**”

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103 Section 1: Abbreviations

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105 BMI: body-mass index

106 COVID-19: coronavirus disease 2019

107 JEE: Joint External Evaluation

108 GBD: Global Burden of Diseases, Injuries, and Risk Factors Study

109 GHS Index: Global Health Security Index

110 HAQ Index: Healthcare Access and Quality Index

111 IFR: infection-fatality ratio

112 IHR: infection-hospitalisation ratio

113 IDR: infection-detection ratio

114 IHME: Institute for Health Metrics and Evaluation

115 PCA: principal component analysis

116 SARS-CoV2: severe acute respiratory syndrome coronavirus 2

117 WHO: World Health Organization

118 UHC effective coverage index: universal health coverage effective coverage index

119 UI: uncertainty interval

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Checklist of information that should be included in new reports of global health estimates

Item #	Checklist item	Reported on page #
Objectives and funding		
1	Define the indicator(s), populations (including age, sex, and geographic entities), and time period(s) for which estimates were made.	Summary. Main Text: Introduction, Methods (Overview).
2	List the funding sources for the work.	Summary. Main Text: Acknowledgements and declarations.
Data Inputs		
<i>For all data inputs from multiple sources that are synthesized as part of the study:</i>		
3	Describe how the data were identified and how the data were accessed.	Main Text: Methods. Supplementary Appendix, Section 3.
4	Specify the inclusion and exclusion criteria. Identify all ad-hoc exclusions.	Main Text: Methods.
5	Provide information on all included data sources and their main characteristics. For each data source used, report reference information or contact name/institution, population represented, data collection method, year(s) of data collection, sex and age range, diagnostic criteria or measurement method, and sample size, as relevant.	Supplementary Appendix: Section 2.0, Table 2. Main characteristics of data, metadata, and/or NIDs available through: http://ghdx.healthdata.org/ (upon publication)
6	Identify and describe any categories of input data that have potentially important biases (e.g., based on characteristics listed in item 5).	Main text: Limitations

		section. Supplementa ry appendix (biases for input data in each modelling step identified in each section)
<i>For data inputs that contribute to the analysis but were not synthesized as part of the study:</i>		
7	Describe and give sources for any other data inputs.	N/A
<i>For all data inputs:</i>		
8	Provide all data inputs in a file format from which data can be efficiently extracted (e.g., a spreadsheet rather than a PDF), including all relevant meta-data listed in item 5. For any data inputs that cannot be shared because of ethical or legal reasons, such as third-party ownership, provide a contact name or the name of the institution that retains the right to the data.	Available through: http://ghdx. healthdata.o rg/ (upon publication)
Data analysis		
9	Provide a conceptual overview of the data analysis method. A diagram may be helpful.	Main text: Methods
10	Provide a detailed description of all steps of the analysis, including mathematical formulae. This description should cover, as relevant, data cleaning, data pre-processing, data adjustments and weighting of data sources, and mathematical or statistical model(s).	Main text: Methods
11	Describe how candidate models were evaluated and how the final model(s) were selected.	Supplementa ry Appendix: Section 3
12	Provide the results of an evaluation of model performance, if done, as well as the results of any relevant sensitivity analysis.	Supplementa ry Appendix: Sections 3.0 & 4.0
13	Describe methods for calculating uncertainty of the estimates. State which sources of uncertainty were, and were not, accounted for in the uncertainty analysis.	Main Text: Methods; Supplementa ry Appendix
14	State how analytic or statistical source code used to generate estimates can be accessed.	Available through: http://ghdx. healthdata.o rg/ (upon publication)
Results and Discussion		
15	Provide published estimates in a file format from which data can be efficiently extracted.	Available through: http://ghdx. healthdata.o rg/ (upon publication)

		healthdata.org/ (upon publication)
16	Report a quantitative measure of the uncertainty of the estimates (e.g. uncertainty intervals).	Available through: http://ghdx.healthdata.org/ (upon publication)
17	Interpret results in light of existing evidence. If updating a previous set of estimates, describe the reasons for changes in estimates.	Main Text: Discussion
18	Discuss limitations of the estimates. Include a discussion of any modelling assumptions or data limitations that affect interpretation of the estimates.	Main Text: Limitations

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126 2.2 Covariate name, spatiotemporal coverage, data source, notes, assessment of missingness, and summary statistics

Short name	Covariate name	Temporal coverage	Spatial coverage	Data source	Notes	N (%) missing	Median (IQR)	Range
Pneumonia RR	Relative risk of death from pneumonia divided by the average risk of death from pneumonia	2013-2019	National and subnational	Modelling COVID-19 scenarios for the United States ¹	Varies weekly	0 (0%)	0.93 (0.91 – 0.95)	0.76 – 1.22
Age	Age structure of the population (5-year age bins)	2020	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	-	-
Altitude	% of population living below 100 m	2015	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	30.4 (1.5 – 63.9)	0.0 – 100.0
Population density	% of population living above 1000 people/km ²	2020	National and subnational	Modelling COVID-19 scenarios for the United States ¹		0 (0%)	51.9 (36.2 – 69.6)	0.0 – 100.0
Air pollution	PM _{2.5} air pollution concentration (mg/m ³)	2019	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	18.5 (10.2 – 34.2)	3.5 – 217.5
Smoking prevalence	Age-standardised tobacco smoking prevalence	2019	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	0.17 (0.12 – 0.22)	0.04 – 0.44
GDP	Gross domestic product per capita	2019	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	15,722.8 (7345.9 – 39772.2)	131.8 – 102,793.9
BMI	Population-adjusted body-mass index	2019	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	26.5 (24.5 – 28.2)	20.5 – 30.8
UHC	Universal health coverage	2019	Nationals	Global Burden of Disease Study 2019, Measuring Universal Health Coverage ^{2,3}	Included 2 subcomponents – communicable and non-communicable, maternal, and neonatal	0 (0%)	61.2 (49.6 – 72.7)	22.3 – 96.3
Mobility	Largest % change from a January 2020 baseline	2020-2021	National and subnational	Modelling COVID-19 scenarios for the United States ¹		0 (0%)	61.3 (51.2 – 72.9)	20.0 – 93.2
Mandates	Mean fraction of mandates on over period	2020-2021	National and subnational	Modelling COVID-19 scenarios for the United States ¹	Locations measured at the subnational level had a mandate in place if 2/3 of locations or more had it in place on a given date	1/361 (0.3%)	44.0 (33.3 – 49.5)	0.0 – 85.5

Testing	Mean testing per capita over the time period	2020-2021	National and subnational	Modeling COVID-19 scenarios for the United States ¹		0 (0%)	71.4 / 100,000 (21.5 / 100,000 – 200.7 / 100,000)	0.3 / 100,000 – 1713.3 / 100,000
Vaccine coverage	Maximum vaccine coverage over the time period	2021	National and subnational	Modeling COVID-19 scenarios for the United States ¹		0 (0%)	50.9 (27.4 – 65.0)	0.0 – 94.3
COPD	Age-standardised COPD prevalence	2019	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	2.3 (2.0 - 3.2)	0.7-4.4
Cancer	Age-standardised cancer prevalence	2019	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	5.6 (4.3- 8.1)	2.1 – 20.8
Interpersonal trust	Trust in other people	2017-2021	National only	WORLD VALUES SURVEY WAVE 7 ⁴	Trust coded as those who answered “most people can be trusted” on Q57	102/177 (57.6%)	20.7 (11.9 – 32.9)	2.1 – 77.4
Trust in science	Trust in science	2018	National only	Wellcome Global Monitor Survey ⁵	Those that answered “A lot” to trusting science	40/177 (22.6%)	29.8 (23.0 – 39.4)	6.7 – 76.0
Trust in government - WVS	Trust in one’s government	2017-2021	National only	WORLD VALUES SURVEY WAVE 7 ⁴	Coded as “A great deal” or “Quite a lot” on Q71 asking about confidence in government	102/177 (57.6%)	40.1 (37.3 – 51.7)	0.0 – 95.2
Trust in government - Gallup	Trust in one’s government		National only	Gallup World Poll ⁶		46/177 (26%)	53.7 (39.1 – 68.9)	15.7 – 99.3
Governmental Corruption - CPI	Perceived governmental corruption	2020	National only	Transparency International ⁷		10/177 (5.6%)	40.0 (29.0 – 56.5)	12.0 – 88.0
JEE	Joint External Evaluation Components and Prevent Epidemics’ Preparedness overall score	2016-2021	National only	WHO and Prevent Epidemics ⁸	Only places that have completed a JEE; overall score is a summary variable of JEE components created by Prevent Epidemics	89/177 (50.3%)	Overall score: 50.0 (38.0 -69.3)	Overall score: 26.0 – 93.0

GHSI	Global Health Security Index components and overall score	2019	National only	Global Health Security Index 2019 ⁹	Weighted average of the other components	7/177 (4.0%)	Overall score: 39.3 (31.9-51.6)	Overall score: 16.2 – 83.5
GINI	Gini Index		National only	SWIID v8.2 ¹⁰ & Bosancinau ¹¹		27/177 (15.3%)	38.38 (33.10 – 44.05)	23.68 – 65.11
HAQ Index	Healthcare Access and Quality Index	2019	National only	Global Burden of Disease Study 2019 ²		0 (0%)	63.3 (42.4 -79.5)	12.8 – 96.8
Electoral populism	Populism-based campaign run		National only	Populism in Power ¹² & Bosancinau ¹¹	Whether a democratically elected head of government ran a populist campaign	0 (0%)	0 (0 – 0)	0 -1
Government effectiveness			National only	World Bank Indicators ¹³ & Bosancinau ¹¹	Perceived quality of public services, its provision and providers	1/177 (0.6%)	-0.09 (-0.66 – 0.57)	-2.45 – 2.23
State fragility	State Fragility Index		National only	State Fragility Index ¹⁴ & Bosancinau ¹¹	Incapacity to provide essential public goods and services and cope with shocks	19/177 (10.7%)	7.0 (3.0 – 12.0)	0.0 – 24.0
Index of federalism		2017	National only	Database of Political Institutions ¹⁵	Extent to which power and decision-making processes are decentralised	54/177 (30.5%)	-0.07 (-0.59 – 0.68)	-1.03 – 1.51
Bureaucracy corruption	Public sector corruption		National only	Varieties of Democracy Institute, Version 10 ^{16,17}	Pervasiveness of bureaucratic corruption in the public sector	13/177 (7.3%)	0.48 (0.19 – 0.72)	0 – 0.97
EDI	Electoral Democracy Index	2020	National only	Varieties of Democracy Institute, Version 11 ^{18,19}	Aggregate indicator combining free and fair elections, free association, freedom of expression, and access to alternative information, suffrage, and elected officials	13/177 (7.3%)	0.32 (0.05 – 0.63)	0.00 – 0.86

Beds per capita	Number of hospital beds per capita before start of the pandemic	2019	National and subnational	Global Burden of Disease Study 2019 ²		0 (0%)	206.0 / 100,000 (102.7 / 100,000 – 328.3 / 100,000)	18.4 / 100,000 – 1185.9 / 100,000
Health spending per capita	Total health expenditure per capita	2020	National only	Global Burden of Disease Health Financing Collaborator Network ²⁰	Mean value	0 (0%)	538.1 (87.1 – 1744.7)	5.0 – 6869.6
Government health spending per capita	Government health spending per capita	2020	National only	Global Burden of Disease Health Financing Collaborator Network ²⁰	Mean value	0 (0%)	932.7 (252.2– 2518.3)	23.5 – 12131.9
Bats	Average number of beta-coronavirus host bat species in a given location	2021 Bats & Ranges	National only	IUCN ²¹ & Verena Consortium ²²	See section 3.1 below	0 (0%)	11.5 (4.2 - 16.6)	0.0 – 42.0

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2.3 Analysis of multicollinearity between stage 1 variables

Covariates	Variance inflation factors	
	Cumulative infections per capita	IFR
GDP per capita	1.280	2.860
% of population living above 1000 people/km ²	1.242	1.181
Average number of beta-coronavirus host bat species	1.105	1.299
% of population living below 100 m	1.245	-
BMI	-	2.432
Smoking prevalence	-	1.486
PM _{2.5} air pollution concentration (mg/m ³)	-	1.455
COPD prevalence	-	1.703
Cancer prevalence	-	1.215

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2.4 Correlation between stage 1 variables

	GDP per capita	% of population living above 1000 people/km ²	% of population living below 100 m	Average number of beta-coronavirus host bat species	BMI	PM _{2.5} air pollution concentration (mg/m ³)	Smoking prevalence	COPD prevalence	Cancer prevalence
GDP per capita	1	0.343	0.135	-0.380	0.709	-0.594	0.417	0.336	0.449
% of population living above 1000 people/km ²	0.343	1	0.231	-0.122	0.287	-0.205	0.054	0.095	0.224
% of population living below 100 m	0.135	0.231	1	-0.063	-	-	-	-	-
Average number of beta-coronavirus host bat species	-0.380	-0.122	-0.063	1	-0.526	0.345	-0.077	-0.102	-0.087
BMI	0.709	0.287	-	-0.526	1	-0.584	0.193	0.117	0.446
PM _{2.5} air pollution concentration (mg/m ³)	-0.594	-0.205	-	0.345	-0.584	1	-0.198	-0.304	-0.268
Smoking prevalence	0.417	0.054	-	-0.077	0.193	-0.198	1	0.224	0.420
COPD prevalence	0.336	0.095	-	-0.102	0.117	-0.304	0.224	1	-0.166
Cancer prevalence	0.449	0.224	-	-0.087	0.446	-0.268	0.420	-0.166	1

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2.5 Correlation between stage 2 variables

First variable	Correlated variable	Correlation	P-value
Electoral democracy index	Electoral populism	0.004	0.9598
Electoral democracy index	Global health security index compliance with international norms score	0.404	<0.0001
Electoral democracy index	Global health security index detect score	0.481	<0.0001
Electoral democracy index	Global health security index health sector score	0.464	<0.0001
Electoral democracy index	Global health security index overall score	0.558	<0.0001
Electoral democracy index	Global health security index prevent score	0.476	<0.0001
Electoral democracy index	Global health security index respond score	0.417	<0.0001
Electoral democracy index	Global health security index risk environment score	0.635	<0.0001
Electoral democracy index	Government corruption - PCA	-0.721	<0.0001
Electoral democracy index	Government effectiveness	0.631	<0.0001
Electoral democracy index	Government health spending per capita	0.566	<0.0001
Electoral democracy index	Health spending per capita	0.568	<0.0001
Electoral democracy index	Healthcare Access and Quality Index	0.512	<0.0001
Electoral democracy index	Hospital beds per capita	0.382	<0.0001
Electoral democracy index	Income inequality	-0.342	<0.0001
Electoral democracy index	Interpersonal trust	0.416	0.0002
Electoral democracy index	Joint external evaluation detect score	0.359	0.0006
Electoral democracy index	Joint external evaluation other score	0.359	0.0006
Electoral democracy index	Joint external evaluation overall score	0.335	0.0014
Electoral democracy index	Joint external evaluation prevent score	0.343	0.0011
Electoral democracy index	Joint external evaluation respond score	0.259	0.0149
Electoral democracy index	State fragility	-0.630	<0.0001
Electoral democracy index	Trust in government - PCA	-0.317	0.0002
Electoral democracy index	Trust in science	0.273	0.0013
Electoral democracy index	Universal health coverage	0.544	<0.0001
Electoral democracy index	Universal health coverage - CMNNs	0.466	<0.0001

Electoral democracy index	Universal health coverage - NCDs	0.516	<0.0001
Electoral populism	Electoral democracy index	0.004	0.9598
Electoral populism	Global health security index compliance with international norms score	0.105	0.1738
Electoral populism	Global health security index detect score	0.136	0.0774
Electoral populism	Global health security index health sector score	0.261	0.0006
Electoral populism	Global health security index overall score	0.178	0.0201
Electoral populism	Global health security index prevent score	0.158	0.0395
Electoral populism	Global health security index respond score	0.136	0.0763
Electoral populism	Global health security index risk environment score	0.092	0.2309
Electoral populism	Government corruption - PCA	-0.015	0.8482
Electoral populism	Government effectiveness	0.055	0.4657
Electoral populism	Government health spending per capita	0.063	0.4033
Electoral populism	Health spending per capita	0.083	0.2712
Electoral populism	Healthcare Access and Quality Index	0.164	0.0288
Electoral populism	Hospital beds per capita	0.155	0.0392
Electoral populism	Income inequality	-0.066	0.4256
Electoral populism	Interpersonal trust	-0.133	0.2536
Electoral populism	Joint external evaluation detect score	0.109	0.3121
Electoral populism	Joint external evaluation other score	0.092	0.3930
Electoral populism	Joint external evaluation overall score	0.094	0.3861
Electoral populism	Joint external evaluation prevent score	0.070	0.5189
Electoral populism	Joint external evaluation respond score	0.098	0.3653
Electoral populism	State fragility	-0.116	0.1464
Electoral populism	Trust in government - PCA	-0.082	0.3447
Electoral populism	Trust in science	-0.026	0.7610
Electoral populism	Universal health coverage	0.114	0.1320
Electoral populism	Universal health coverage - CMNNs	0.181	0.0157
Electoral populism	Universal health coverage - NCDs	0.147	0.0506
Global health security index compliance with international norms score	Electoral democracy index	0.404	<0.0001

Global health security index compliance with international norms score	Electoral populism	0.105	0.1738
Global health security index compliance with international norms score	Global health security index detect score	0.598	<0.0001
Global health security index compliance with international norms score	Global health security index health sector score	0.563	<0.0001
Global health security index compliance with international norms score	Global health security index overall score	0.714	<0.0001
Global health security index compliance with international norms score	Global health security index prevent score	0.600	<0.0001
Global health security index compliance with international norms score	Global health security index respond score	0.579	<0.0001
Global health security index compliance with international norms score	Global health security index risk environment score	0.363	<0.0001
Global health security index compliance with international norms score	Government corruption - PCA	-0.396	<0.0001
Global health security index compliance with international norms score	Government effectiveness	0.432	<0.0001
Global health security index compliance with international norms score	Government health spending per capita	0.429	<0.0001
Global health security index compliance with international norms score	Health spending per capita	0.442	<0.0001
Global health security index compliance with international norms score	Healthcare Access and Quality Index	0.316	<0.0001
Global health security index compliance with international norms score	Hospital beds per capita	0.249	0.0011
Global health security index compliance with international norms score	Income inequality	-0.297	0.0003
Global health security index compliance with international norms score	Interpersonal trust	0.312	0.0073
Global health security index compliance with international norms score	Joint external evaluation detect score	0.517	<0.0001

Global health security index compliance with international norms score	Joint external evaluation other score	0.447	<0.0001
Global health security index compliance with international norms score	Joint external evaluation overall score	0.486	<0.0001
Global health security index compliance with international norms score	Joint external evaluation prevent score	0.495	<0.0001
Global health security index compliance with international norms score	Joint external evaluation respond score	0.416	0.0001
Global health security index compliance with international norms score	State fragility	-0.345	<0.0001
Global health security index compliance with international norms score	Trust in government - PCA	0.043	0.6209
Global health security index compliance with international norms score	Trust in science	0.245	0.0041
Global health security index compliance with international norms score	Universal health coverage	0.342	<0.0001
Global health security index compliance with international norms score	Universal health coverage - CMNNs	0.272	0.0003
Global health security index compliance with international norms score	Universal health coverage - NCDs	0.319	<0.0001
Global health security index detect score	Electoral democracy index	0.481	<0.0001
Global health security index detect score	Electoral populism	0.136	0.0774
Global health security index detect score	Global health security index compliance with international norms score	0.598	<0.0001
Global health security index detect score	Global health security index health sector score	0.727	<0.0001
Global health security index detect score	Global health security index overall score	0.883	<0.0001
Global health security index detect score	Global health security index prevent score	0.747	<0.0001
Global health security index detect score	Global health security index respond score	0.676	<0.0001
Global health security index detect score	Global health security index risk environment score	0.499	<0.0001
Global health security index detect score	Government corruption - PCA	-0.471	<0.0001
Global health security index detect score	Government effectiveness	0.560	<0.0001
Global health security index detect score	Government health spending per capita	0.522	<0.0001

Global health security index detect score	Health spending per capita	0.541	<0.0001
Global health security index detect score	Healthcare Access and Quality Index	0.510	<0.0001
Global health security index detect score	Hospital beds per capita	0.326	<0.0001
Global health security index detect score	Income inequality	-0.276	0.0007
Global health security index detect score	Interpersonal trust	0.279	0.0169
Global health security index detect score	Joint external evaluation detect score	0.702	<0.0001
Global health security index detect score	Joint external evaluation other score	0.663	<0.0001
Global health security index detect score	Joint external evaluation overall score	0.670	<0.0001
Global health security index detect score	Joint external evaluation prevent score	0.683	<0.0001
Global health security index detect score	Joint external evaluation respond score	0.555	<0.0001
Global health security index detect score	State fragility	-0.537	<0.0001
Global health security index detect score	Trust in government - PCA	-0.123	0.1576
Global health security index detect score	Trust in science	0.157	0.0697
Global health security index detect score	Universal health coverage	0.526	<0.0001
Global health security index detect score	Universal health coverage - CMNNs	0.460	<0.0001
Global health security index detect score	Universal health coverage - NCDs	0.510	<0.0001
Global health security index health sector score	Electoral democracy index	0.464	<0.0001
Global health security index health sector score	Electoral populism	0.261	0.0006
Global health security index health sector score	Global health security index compliance with international norms score	0.563	<0.0001
Global health security index health sector score	Global health security index detect score	0.727	<0.0001
Global health security index health sector score	Global health security index overall score	0.913	<0.0001
Global health security index health sector score	Global health security index prevent score	0.847	<0.0001
Global health security index health sector score	Global health security index respond score	0.780	<0.0001
Global health security index health sector score	Global health security index risk environment score	0.673	<0.0001
Global health security index health sector score	Government corruption - PCA	-0.603	<0.0001
Global health security index health sector score	Government effectiveness	0.695	<0.0001
Global health security index health sector score	Government health spending per capita	0.697	<0.0001
Global health security index health sector score	Health spending per capita	0.712	<0.0001
Global health security index health sector score	Healthcare Access and Quality Index	0.721	<0.0001
Global health security index health sector score	Hospital beds per capita	0.445	<0.0001

Global health security index health sector score	Income inequality	-0.463	<0.0001
Global health security index health sector score	Interpersonal trust	0.561	<0.0001
Global health security index health sector score	Joint external evaluation detect Score	0.796	<0.0001
Global health security index health sector score	Joint external evaluation other score	0.796	<0.0001
Global health security index health sector score	Joint external evaluation overall score	0.811	<0.0001
Global health security index health sector score	Joint external evaluation prevent score	0.790	<0.0001
Global health security index health sector score	Joint external evaluation respond score	0.749	<0.0001
Global health security index health sector score	State fragility	-0.653	<0.0001
Global health security index health sector score	Trust in government - PCA	-0.086	0.3206
Global health security index health sector score	Trust in science	0.343	<0.0001
Global health security index health sector score	Universal health coverage	0.731	<0.0001
Global health security index health sector score	Universal health coverage - CMNNs	0.668	<0.0001
Global health security index health sector score	Universal health coverage - NCDs	0.722	<0.0001
Global health security index overall score	Electoral democracy index	0.558	<0.0001
Global health security index overall score	Electoral populism	0.178	0.0201
Global health security index overall score	Global health security index compliance with international norms score	0.714	<0.0001
Global health security index overall score	Global health security index detect score	0.883	<0.0001
Global health security index overall score	Global health security index health sector score	0.913	<0.0001
Global health security index overall score	Global health security index prevent score	0.913	<0.0001
Global health security index overall score	Global health security index respond score	0.861	<0.0001
Global health security index overall score	Global health security index risk environment score	0.718	<0.0001
Global health security index overall score	Government corruption - PCA	-0.666	<0.0001
Global health security index overall score	Government effectiveness	0.758	<0.0001
Global health security index overall score	Government health spending per capita	0.705	<0.0001
Global health security index overall score	Health spending per capita	0.728	<0.0001
Global health security index overall score	Healthcare Access and Quality Index	0.705	<0.0001
Global health security index overall score	Hospital beds per capita	0.431	<0.0001
Global health security index overall score	Income inequality	-0.424	<0.0001
Global health security index overall score	Interpersonal trust	0.547	<0.0001
Global health security index overall score	Joint external evaluation detect score	0.849	<0.0001

Global health security index overall score	Joint external evaluation other score	0.815	<0.0001
Global health security index overall score	Joint external evaluation overall score	0.844	<0.0001
Global health security index overall score	Joint external evaluation prevent score	0.842	<0.0001
Global health security index overall score	Joint external evaluation respond score	0.751	<0.0001
Global health security index overall score	State fragility	-0.691	<0.0001
Global health security index overall score	Trust in government - PCA	-0.065	0.4568
Global health security index overall score	Trust in science	0.337	0.0001
Global health security index overall score	Universal health coverage	0.723	<0.0001
Global health security index overall score	Universal health coverage - CMNNs	0.654	<0.0001
Global health security index overall score	Universal health coverage - NCDs	0.703	<0.0001
Global health security index prevent score	Electoral democracy index	0.476	<0.0001
Global health security index prevent score	Electoral populism	0.158	0.0395
Global health security index prevent score	Global health security index compliance with international norms score	0.600	<0.0001
Global health security index prevent score	Global health security index detect score	0.747	<0.0001
Global health security index prevent score	Global health security index health sector score	0.847	<0.0001
Global health security index prevent score	Global health security index overall score	0.913	<0.0001
Global health security index prevent score	Global health security index respond score	0.739	<0.0001
Global health security index prevent score	Global health security index risk environment score	0.667	<0.0001
Global health security index prevent score	Government corruption - PCA	-0.609	<0.0001
Global health security index prevent score	Government effectiveness	0.700	<0.0001
Global health security index prevent score	Government health spending per capita	0.680	<0.0001
Global health security index prevent score	Health spending per capita	0.691	<0.0001
Global health security index prevent score	Healthcare Access and Quality Index	0.689	<0.0001
Global health security index prevent score	Hospital beds per capita	0.418	<0.0001
Global health security index prevent score	Income inequality	-0.438	<0.0001
Global health security index prevent score	Interpersonal trust	0.509	<0.0001
Global health security index prevent score	Joint external evaluation detect score	0.813	<0.0001
Global health security index prevent score	Joint external evaluation other score	0.775	<0.0001
Global health security index prevent score	Joint external evaluation overall score	0.818	<0.0001
Global health security index prevent score	Joint external evaluation prevent score	0.824	<0.0001

Global health security index prevent score	Joint external evaluation respond score	0.731	<0.0001
Global health security index prevent score	State fragility	-0.636	<0.0001
Global health security index prevent score	Trust in government - PCA	-0.062	0.4765
Global health security index prevent score	Trust in science	0.359	<0.0001
Global health security index prevent score	Universal health coverage	0.699	<0.0001
Global health security index prevent score	Universal health coverage - CMNNs	0.654	<0.0001
Global health security index prevent score	Universal health coverage - NCDs	0.679	<0.0001
Global health security index respond score	Electoral democracy index	0.417	<0.0001
Global health security index respond score	Electoral populism	0.136	0.0763
Global health security index respond score	Global health security index compliance with international norms score	0.579	<0.0001
Global health security index respond score	Global health security index detect score	0.676	<0.0001
Global health security index respond score	Global health security index health sector score	0.780	<0.0001
Global health security index respond score	Global health security index overall score	0.861	<0.0001
Global health security index respond score	Global health security index prevent score	0.739	<0.0001
Global health security index respond score	Global health security index risk environment score	0.543	<0.0001
Global health security index respond score	Government corruption - PCA	-0.536	<0.0001
Global health security index respond score	Government effectiveness	0.592	<0.0001
Global health security index respond score	Government health spending per capita	0.524	<0.0001
Global health security index respond score	Health spending per capita	0.570	<0.0001
Global health security index respond score	Healthcare Access and Quality Index	0.523	<0.0001
Global health security index respond score	Hospital beds per capita	0.253	0.0009
Global health security index respond score	Income inequality	-0.282	0.0005
Global health security index respond score	Interpersonal trust	0.473	<0.0001
Global health security index respond score	Joint external evaluation detect score	0.722	<0.0001
Global health security index respond score	Joint external evaluation other score	0.699	<0.0001
Global health security index respond score	Joint external evaluation overall score	0.737	<0.0001
Global health security index respond score	Joint external evaluation prevent score	0.717	<0.0001
Global health security index respond score	Joint external evaluation respond score	0.697	<0.0001
Global health security index respond score	State fragility	-0.526	<0.0001
Global health security index respond score	Trust in government - PCA	0.025	0.7721

Global health security index respond score	Trust in science	0.259	0.0024
Global health security index respond score	Universal health coverage	0.559	<0.0001
Global health security index respond score	Universal health coverage - CMNNs	0.469	<0.0001
Global health security index respond score	Universal health coverage - NCDs	0.531	<0.0001
Global health security index risk environment score	Electoral democracy index	0.635	<0.0001
Global health security index risk environment score	Electoral populism	0.092	0.2309
Global health security index risk environment score	Global health security index compliance with international norms score	0.363	<0.0001
Global health security index risk environment score	Global health security index detect score	0.499	<0.0001
Global health security index risk environment score	Global health security index health sector score	0.673	<0.0001
Global health security index risk environment score	Global health security index overall score	0.718	<0.0001
Global health security index risk environment score	Global health security index prevent score	0.667	<0.0001
Global health security index risk environment score	Global health security index respond score	0.543	<0.0001
Global health security index risk environment score	Government corruption - PCA	-0.870	<0.0001
Global health security index risk environment score	Government effectiveness	0.940	<0.0001
Global health security index risk environment score	Government health spending per capita	0.782	<0.0001
Global health security index risk environment score	Health spending per capita	0.786	<0.0001
Global health security index risk environment score	Healthcare Access and Quality Index	0.864	<0.0001
Global health security index risk environment score	Hospital beds per capita	0.542	<0.0001
Global health security index risk environment score	Income inequality	-0.449	<0.0001
Global health security index risk environment score	Interpersonal trust	0.702	<0.0001
Global health security index risk environment score	Joint external evaluation detect score	0.842	<0.0001
Global health security index risk environment score	Joint external evaluation other score	0.830	<0.0001
Global health security index risk environment score	Joint external evaluation overall score	0.851	<0.0001
Global health security index risk environment score	Joint external evaluation prevent score	0.852	<0.0001
Global health security index risk environment score	Joint external evaluation respond score	0.761	<0.0001
Global health security index risk environment score	State fragility	-0.892	<0.0001
Global health security index risk environment score	Trust in government - PCA	-0.068	0.4327
Global health security index risk environment score	Trust in science	0.430	<0.0001
Global health security index risk environment score	Universal health coverage	0.858	<0.0001
Global health security index risk environment score	Universal health coverage - CMNNs	0.852	<0.0001

Global health security index risk environment score	Universal health coverage - NCDs	0.849	<0.0001
Government corruption - PCA	Electoral democracy index	-0.721	<0.0001
Government corruption - PCA	Electoral populism	-0.015	0.8482
Government corruption - PCA	Global health security index compliance with international norms score	-0.396	<0.0001
Government corruption - PCA	Global health security index detect score	-0.471	<0.0001
Government corruption - PCA	Global health security index health sector score	-0.603	<0.0001
Government corruption - PCA	Global health security index overall score	-0.666	<0.0001
Government corruption - PCA	Global health security index prevent score	-0.609	<0.0001
Government corruption - PCA	Global health security index respond score	-0.536	<0.0001
Government corruption - PCA	Global health security index risk environment score	-0.87	<0.0001
Government corruption - PCA	Government corruption - PCA	1	<0.0001
Government corruption - PCA	Government effectiveness	-0.911	<0.0001
Government corruption - PCA	Government health spending per capita	-0.774	<0.0001
Government corruption - PCA	Health spending per capita	-0.773	<0.0001
Government corruption - PCA	Healthcare Access and Quality Index	-0.714	<0.0001
Government corruption - PCA	Hospital beds per capita	-0.464	<0.0001
Government corruption - PCA	Income inequality	0.424	<0.0001
Government corruption - PCA	Interpersonal trust	-0.727	<0.0001
Government corruption - PCA	Joint external evaluation detect score	-0.767	<0.0001
Government corruption - PCA	Joint external evaluation other score	-0.69	<0.0001
Government corruption - PCA	Joint external evaluation overall score	-0.749	<0.0001
Government corruption - PCA	Joint external evaluation prevent score	-0.755	<0.0001
Government corruption - PCA	Joint external evaluation respond score	-0.672	<0.0001
Government corruption - PCA	State fragility	0.747	<0.0001
Government corruption - PCA	Trust in government - PCA	-0.007	0.9323
Government corruption - PCA	Trust in science	-0.418	<0.0001
Government corruption - PCA	Universal health coverage	-0.757	<0.0001
Government corruption - PCA	Universal health coverage - CMNNs	-0.697	<0.0001
Government effectiveness	Electoral democracy index	0.631	<0.0001
Government effectiveness	Electoral populism	0.055	0.4657

Government effectiveness	Global health security index compliance with international norms score	0.432	<0.0001
Government effectiveness	Global health security index detect score	0.560	<0.0001
Government effectiveness	Global health security index health sector score	0.695	<0.0001
Government effectiveness	Global health security index overall score	0.758	<0.0001
Government effectiveness	Global health security index prevent score	0.700	<0.0001
Government effectiveness	Global health security index respond score	0.592	<0.0001
Government effectiveness	Global health security index risk environment score	0.940	<0.0001
Government effectiveness	Government corruption - PCA	-0.911	<0.0001
Government effectiveness	Government health spending per capita	0.784	<0.0001
Government effectiveness	Health spending per capita	0.798	<0.0001
Government effectiveness	Healthcare Access and Quality Index	0.808	<0.0001
Government effectiveness	Hospital beds per capita	0.506	<0.0001
Government effectiveness	Income inequality	-0.460	<0.0001
Government effectiveness	Interpersonal trust	0.745	<0.0001
Government effectiveness	Joint external evaluation detect score	0.858	<0.0001
Government effectiveness	Joint external evaluation other score	0.823	<0.0001
Government effectiveness	Joint external evaluation overall score	0.848	<0.0001
Government effectiveness	Joint external evaluation prevent score	0.848	<0.0001
Government effectiveness	Joint external evaluation respond score	0.750	<0.0001
Government effectiveness	State fragility	-0.825	<0.0001
Government effectiveness	Trust in government - PCA	0.057	0.5126
Government effectiveness	Trust in science	0.387	<0.0001
Government effectiveness	Universal health coverage	0.821	<0.0001
Government effectiveness	Universal health coverage - CMNNs	0.790	<0.0001
Government effectiveness	Universal health coverage - NCDs	0.794	<0.0001
Government health spending per capita	Electoral democracy index	0.566	<0.0001
Government health spending per capita	Electoral populism	0.063	0.4033
Government health spending per capita	Global health security index compliance with international norms score	0.429	<0.0001
Government health spending per capita	Global health security index detect score	0.522	<0.0001

Government health spending per capita	Global health security index health sector score	0.697	<0.0001
Government health spending per capita	Global health security index overall score	0.705	<0.0001
Government health spending per capita	Global health security index prevent score	0.680	<0.0001
Government health spending per capita	Global health security index respond score	0.524	<0.0001
Government health spending per capita	Global health security index risk environment score	0.782	<0.0001
Government health spending per capita	Government corruption - PCA	-0.774	<0.0001
Government health spending per capita	Government effectiveness	0.784	<0.0001
Government health spending per capita	Health spending per capita	0.964	<0.0001
Government health spending per capita	Healthcare Access and Quality Index	0.769	<0.0001
Government health spending per capita	Hospital beds per capita	0.486	<0.0001
Government health spending per capita	Income inequality	-0.542	<0.0001
Government health spending per capita	Interpersonal trust	0.765	<0.0001
Government health spending per capita	Joint external evaluation detect score	0.775	<0.0001
Government health spending per capita	Joint external evaluation other score	0.733	<0.0001
Government health spending per capita	Joint external evaluation overall score	0.768	<0.0001
Government health spending per capita	Joint external evaluation prevent score	0.759	<0.0001
Government health spending per capita	Joint external evaluation respond score	0.700	<0.0001
Government health spending per capita	State fragility	-0.652	<0.0001
Government health spending per capita	Trust in government - PCA	-0.028	0.7479
Government health spending per capita	Trust in science	0.564	<0.0001
Government health spending per capita	Universal health coverage	0.817	<0.0001
Government health spending per capita	Universal health coverage - CMNNs	0.686	<0.0001
Government health spending per capita	Universal health coverage - NCDs	0.777	<0.0001
Health spending per capita	Electoral democracy index	0.568	<0.0001
Health spending per capita	Electoral populism	0.083	0.2712
Health spending per capita	Global health security index compliance with international norms score	0.442	<0.0001
Health spending per capita	Global health security index detect score	0.541	<0.0001
Health spending per capita	Global health security index health sector score	0.712	<0.0001
Health spending per capita	Global health security index overall score	0.728	<0.0001
Health spending per capita	Global health security index prevent score	0.691	<0.0001

Health spending per capita	Global health security index respond score	0.570	<0.0001
Health spending per capita	Global health security index risk environment score	0.786	<0.0001
Health spending per capita	Government corruption - PCA	-0.773	<0.0001
Health spending per capita	Government effectiveness	0.798	<0.0001
Health spending per capita	Government health spending per capita	0.964	<0.0001
Health spending per capita	Healthcare Access and Quality Index	0.771	<0.0001
Health spending per capita	Hospital beds per capita	0.472	<0.0001
Health spending per capita	Income inequality	-0.515	<0.0001
Health spending per capita	Interpersonal trust	0.730	<0.0001
Health spending per capita	Joint external evaluation detect score	0.773	<0.0001
Health spending per capita	Joint external evaluation other score	0.721	<0.0001
Health spending per capita	Joint external evaluation overall score	0.759	<0.0001
Health spending per capita	Joint external evaluation prevent score	0.749	<0.0001
Health spending per capita	Joint external evaluation respond score	0.691	<0.0001
Health spending per capita	State fragility	-0.652	<0.0001
Health spending per capita	Trust in government - PCA	-0.023	0.7947
Health spending per capita	Trust in science	0.536	<0.0001
Health spending per capita	Universal health coverage	0.811	<0.0001
Health spending per capita	Universal health coverage - CMNNs	0.685	<0.0001
Health spending per capita	Universal health coverage - NCDs	0.779	<0.0001
Healthcare Access and Quality Index	Electoral democracy index	0.512	<0.0001
Healthcare Access and Quality Index	Electoral populism	0.164	0.0288
Healthcare Access and Quality Index	Global health security index compliance with international norms score	0.316	<0.0001
Healthcare Access and Quality Index	Global health security index detect score	0.510	<0.0001
Healthcare Access and Quality Index	Global health security index health sector score	0.721	<0.0001
Healthcare Access and Quality Index	Global health security index overall score	0.705	<0.0001
Healthcare Access and Quality Index	Global health security index prevent score	0.689	<0.0001
Healthcare Access and Quality Index	Global health security index respond score	0.523	<0.0001
Healthcare Access and Quality Index	Global health security index risk environment score	0.864	<0.0001
Healthcare Access and Quality Index	Government corruption - PCA	-0.714	<0.0001

Healthcare Access and Quality Index	Government effectiveness	0.808	<0.0001
Healthcare Access and Quality Index	Government health spending per capita	0.769	<0.0001
Healthcare Access and Quality Index	Health spending per capita	0.771	<0.0001
Healthcare Access and Quality Index	Hospital beds per capita	0.626	<0.0001
Healthcare Access and Quality Index	Income inequality	-0.612	<0.0001
Healthcare Access and Quality Index	Interpersonal trust	0.621	<0.0001
Healthcare Access and Quality Index	Joint external evaluation detect score	0.839	<0.0001
Healthcare Access and Quality Index	Joint external evaluation other score	0.856	<0.0001
Healthcare Access and Quality Index	Joint external evaluation overall score	0.871	<0.0001
Healthcare Access and Quality Index	Joint external evaluation prevent score	0.870	<0.0001
Healthcare Access and Quality Index	Joint external evaluation respond score	0.793	<0.0001
Healthcare Access and Quality Index	State fragility	-0.831	<0.0001
Healthcare Access and Quality Index	Trust in government - PCA	-0.193	0.0241
Healthcare Access and Quality Index	Trust in science	0.367	<0.0001
Healthcare Access and Quality Index	Universal health coverage	0.939	<0.0001
Healthcare Access and Quality Index	Universal health coverage - CMNNs	0.944	<0.0001
Healthcare Access and Quality Index	Universal health coverage - NCDs	0.987	<0.0001
Hospital beds per capita	Electoral democracy index	0.382	<0.0001
Hospital beds per capita	Electoral populism	0.155	0.0392
Hospital beds per capita	Global health security index compliance with international norms score	0.249	0.0011
Hospital beds per capita	Global health security index detect score	0.326	<0.0001
Hospital beds per capita	Global health security index health sector score	0.445	<0.0001
Hospital beds per capita	Global health security index overall score	0.431	<0.0001
Hospital beds per capita	Global health security index prevent score	0.418	<0.0001
Hospital beds per capita	Global health security index respond score	0.253	0.0009
Hospital beds per capita	Global health security index risk environment score	0.542	<0.0001
Hospital beds per capita	Government corruption - PCA	-0.464	<0.0001
Hospital beds per capita	Government effectiveness	0.506	<0.0001
Hospital beds per capita	Government health spending per capita	0.486	<0.0001
Hospital beds per capita	Health spending per capita	0.472	<0.0001

Hospital beds per capita	Healthcare Access and Quality Index	0.626	<0.0001
Hospital beds per capita	Income inequality	-0.567	<0.0001
Hospital beds per capita	Interpersonal trust	0.327	0.0042
Hospital beds per capita	Joint external evaluation detect score	0.571	<0.0001
Hospital beds per capita	Joint external evaluation other score	0.632	<0.0001
Hospital beds per capita	Joint external evaluation overall score	0.601	<0.0001
Hospital beds per capita	Joint external evaluation prevent score	0.630	<0.0001
Hospital beds per capita	Joint external evaluation respond score	0.497	<0.0001
Hospital beds per capita	State fragility	-0.568	<0.0001
Hospital beds per capita	Trust in government - PCA	-0.103	0.2306
Hospital beds per capita	Trust in science	0.087	0.3137
Hospital beds per capita	Universal health coverage	0.533	<0.0001
Hospital beds per capita	Universal health coverage - CMNNs	0.614	<0.0001
Hospital beds per capita	Universal health coverage - NCDs	0.609	<0.0001
Income inequality	Electoral democracy index	-0.342	<0.0001
Income inequality	Electoral populism	-0.066	0.4256
Income inequality	Global health security index compliance with international norms score	-0.297	0.0003
Income inequality	Global health security index detect score	-0.276	0.0007
Income inequality	Global health security index health sector score	-0.463	<0.0001
Income inequality	Global health security index overall score	-0.424	<0.0001
Income inequality	Global health security index prevent score	-0.438	<0.0001
Income inequality	Global health security index respond score	-0.282	0.0005
Income inequality	Global health security index risk environment score	-0.449	<0.0001
Income inequality	Government corruption - PCA	0.424	<0.0001
Income inequality	Government effectiveness	-0.460	<0.0001
Income inequality	Government health spending per capita	-0.542	<0.0001
Income inequality	Health spending per capita	-0.515	<0.0001
Income inequality	Healthcare Access and Quality Index	-0.612	<0.0001
Income inequality	Hospital beds per capita	-0.567	<0.0001
Income inequality	Interpersonal trust	-0.599	<0.0001

Income inequality	Joint external evaluation detect score	-0.375	0.0007
Income inequality	Joint external evaluation other score	-0.445	<0.0001
Income inequality	Joint external evaluation overall score	-0.428	0.0001
Income inequality	Joint external evaluation prevent score	-0.403	0.0002
Income inequality	Joint external evaluation respond score	-0.431	0.0001
Income inequality	State fragility	0.412	<0.0001
Income inequality	Trust in government - PCA	-0.005	0.9506
Income inequality	Trust in science	-0.304	0.0004
Income inequality	Universal health coverage	-0.539	<0.0001
Income inequality	Universal health coverage - CMNNs	-0.551	<0.0001
Income inequality	Universal health coverage - NCDs	-0.601	<0.0001
Interpersonal trust	Electoral democracy index	0.416	0.0002
Interpersonal trust	Electoral populism	-0.133	0.2536
Interpersonal trust	Global health security index compliance with international norms score	0.312	0.0073
Interpersonal trust	Global health security index detect score	0.279	0.0169
Interpersonal trust	Global health security index health sector score	0.561	<0.0001
Interpersonal trust	Global health security index overall score	0.547	<0.0001
Interpersonal trust	Global health security index prevent score	0.509	<0.0001
Interpersonal trust	Global health security index respond score	0.473	<0.0001
Interpersonal trust	Global health security index risk environment score	0.702	<0.0001
Interpersonal trust	Government corruption - PCA	-0.727	<0.0001
Interpersonal trust	Government effectiveness	0.745	<0.0001
Interpersonal trust	Government health spending per capita	0.765	<0.0001
Interpersonal trust	Health spending per capita	0.730	<0.0001
Interpersonal trust	Healthcare Access and Quality Index	0.621	<0.0001
Interpersonal trust	Hospital beds per capita	0.327	0.0042
Interpersonal trust	Income inequality	-0.599	<0.0001
Interpersonal trust	Joint external evaluation detect Score	0.732	<0.0001
Interpersonal trust	Joint external evaluation other score	0.706	<0.0001
Interpersonal trust	Joint external evaluation overall score	0.758	<0.0001

Interpersonal trust	Joint external evaluation prevent score	0.732	<0.0001
Interpersonal trust	Joint external evaluation respond score	0.703	<0.0001
Interpersonal trust	State fragility	-0.482	<0.0001
Interpersonal trust	Trust in government - PCA	0.355	0.0018
Interpersonal trust	Trust in science	0.549	<0.0001
Interpersonal trust	Universal health coverage	0.630	<0.0001
Interpersonal trust	Universal health coverage - CMNNs	0.544	<0.0001
Interpersonal trust	Universal health coverage - NCDs	0.596	<0.0001
Joint external evaluation detect Score	Electoral democracy index	0.359	0.0006
Joint external evaluation detect Score	Electoral populism	0.109	0.3121
Joint external evaluation detect Score	Global health security index compliance with international norms score	0.517	<0.0001
Joint external evaluation detect Score	Global health security index detect score	0.702	<0.0001
Joint external evaluation detect Score	Global health security index health sector score	0.796	<0.0001
Joint external evaluation detect Score	Global health security index overall score	0.849	<0.0001
Joint external evaluation detect Score	Global health security index prevent score	0.813	<0.0001
Joint external evaluation detect Score	Global health security index respond score	0.722	<0.0001
Joint external evaluation detect Score	Global health security index risk environment score	0.842	<0.0001
Joint external evaluation detect Score	Government corruption - PCA	-0.767	<0.0001
Joint external evaluation detect Score	Government effectiveness	0.858	<0.0001
Joint external evaluation detect Score	Government health spending per capita	0.775	<0.0001
Joint external evaluation detect Score	Health spending per capita	0.773	<0.0001
Joint external evaluation detect Score	Healthcare Access and Quality Index	0.839	<0.0001
Joint external evaluation detect Score	Hospital beds per capita	0.571	<0.0001
Joint external evaluation detect Score	Income inequality	-0.375	0.0007
Joint external evaluation detect Score	Interpersonal trust	0.732	<0.0001
Joint external evaluation detect Score	Joint external evaluation other score	0.873	<0.0001
Joint external evaluation detect Score	Joint external evaluation overall score	0.946	<0.0001
Joint external evaluation detect Score	Joint external evaluation prevent score	0.940	<0.0001
Joint external evaluation detect Score	Joint external evaluation respond score	0.847	<0.0001
Joint external evaluation detect Score	State fragility	-0.721	<0.0001

Joint external evaluation detect Score	Trust in government - PCA	-0.035	0.7767
Joint external evaluation detect Score	Trust in science	0.325	0.0053
Joint external evaluation detect Score	Universal health coverage	0.842	<0.0001
Joint external evaluation detect Score	Universal health coverage - CMNNs	0.806	<0.0001
Joint external evaluation detect Score	Universal health coverage - NCDs	0.831	<0.0001
Joint external evaluation other score	Electoral democracy index	0.359	0.0006
Joint external evaluation other score	Electoral populism	0.092	0.3930
Joint external evaluation other score	Global health security index compliance with international norms score	0.447	<0.0001
Joint external evaluation other score	Global health security index detect score	0.663	<0.0001
Joint external evaluation other score	Global health security index health sector score	0.796	<0.0001
Joint external evaluation other score	Global health security index overall score	0.815	<0.0001
Joint external evaluation other score	Global health security index prevent score	0.775	<0.0001
Joint external evaluation other score	Global health security index respond score	0.699	<0.0001
Joint external evaluation other score	Global health security index risk environment score	0.830	<0.0001
Joint external evaluation other score	Government corruption - PCA	-0.690	<0.0001
Joint external evaluation other score	Government effectiveness	0.823	<0.0001
Joint external evaluation other score	Government health spending per capita	0.733	<0.0001
Joint external evaluation other score	Health spending per capita	0.721	<0.0001
Joint external evaluation other score	Healthcare Access and Quality Index	0.856	<0.0001
Joint external evaluation other score	Hospital beds per capita	0.632	<0.0001
Joint external evaluation other score	Income inequality	-0.445	<0.0001
Joint external evaluation other score	Interpersonal trust	0.706	<0.0001
Joint external evaluation other score	Joint external evaluation detect score	0.873	<0.0001
Joint external evaluation other score	Joint external evaluation overall score	0.957	<0.0001
Joint external evaluation other score	Joint external evaluation prevent score	0.912	<0.0001
Joint external evaluation other score	Joint external evaluation respond score	0.913	<0.0001
Joint external evaluation other score	State fragility	-0.740	<0.0001
Joint external evaluation other score	Trust in government - PCA	-0.127	0.2937
Joint external evaluation other score	Trust in science	0.306	0.0089
Joint external evaluation other score	Universal health coverage	0.813	<0.0001

Joint external evaluation other score	Universal health coverage - CMNNs	0.807	<0.0001
Joint external evaluation other score	Universal health coverage - NCDs	0.837	<0.0001
Joint external evaluation overall score	Electoral democracy index	0.335	0.0014
Joint external evaluation overall score	Electoral populism	0.094	0.3861
Joint external evaluation overall score	Global health security index compliance with international norms score	0.486	<0.0001
Joint external evaluation overall score	Global health security index detect score	0.670	<0.0001
Joint external evaluation overall score	Global health security index health sector score	0.811	<0.0001
Joint external evaluation overall score	Global health security index overall score	0.844	<0.0001
Joint external evaluation overall score	Global health security index prevent score	0.818	<0.0001
Joint external evaluation overall score	Global health security index respond score	0.737	<0.0001
Joint external evaluation overall score	Global health security index risk environment score	0.851	<0.0001
Joint external evaluation overall score	Government corruption - PCA	-0.749	<0.0001
Joint external evaluation overall score	Government effectiveness	0.848	<0.0001
Joint external evaluation overall score	Government health spending per capita	0.768	<0.0001
Joint external evaluation overall score	Health spending per capita	0.759	<0.0001
Joint external evaluation overall score	Healthcare Access and Quality Index	0.871	<0.0001
Joint external evaluation overall score	Hospital beds per capita	0.601	<0.0001
Joint external evaluation overall score	Income inequality	-0.428	0.0001
Joint external evaluation overall score	Interpersonal trust	0.758	<0.0001
Joint external evaluation overall score	Joint external evaluation detect score	0.946	<0.0001
Joint external evaluation overall score	Joint external evaluation other score	0.957	<0.0001
Joint external evaluation overall score	Joint external evaluation prevent score	0.978	<0.0001
Joint external evaluation overall score	Joint external evaluation respond score	0.955	<0.0001
Joint external evaluation overall score	State fragility	-0.744	<0.0001
Joint external evaluation overall score	Trust in government - PCA	-0.079	0.5153
Joint external evaluation overall score	Trust in science	0.322	0.0058
Joint external evaluation overall score	Universal health coverage	0.851	<0.0001
Joint external evaluation overall score	Universal health coverage - CMNNs	0.837	<0.0001
Joint external evaluation overall score	Universal health coverage - NCDs	0.859	<0.0001
Joint external evaluation prevent score	Electoral democracy index	0.343	0.0011

Joint external evaluation prevent score	Electoral populism	0.070	0.5189
Joint external evaluation prevent score	Global health security index compliance with international norms score	0.495	<0.0001
Joint external evaluation prevent score	Global health security index detect score	0.683	<0.0001
Joint external evaluation prevent score	Global health security index health sector score	0.790	<0.0001
Joint external evaluation prevent score	Global health security index overall score	0.842	<0.0001
Joint external evaluation prevent score	Global health security index prevent score	0.824	<0.0001
Joint external evaluation prevent score	Global health security index respond score	0.717	<0.0001
Joint external evaluation prevent score	Global health security index risk environment score	0.852	<0.0001
Joint external evaluation prevent score	Government corruption - PCA	-0.755	<0.0001
Joint external evaluation prevent score	Government effectiveness	0.848	<0.0001
Joint external evaluation prevent score	Government health spending per capita	0.759	<0.0001
Joint external evaluation prevent score	Health spending per capita	0.749	<0.0001
Joint external evaluation prevent score	Healthcare Access and Quality Index	0.870	<0.0001
Joint external evaluation prevent score	Hospital beds per capita	0.630	<0.0001
Joint external evaluation prevent score	Income inequality	-0.403	0.0002
Joint external evaluation prevent score	Interpersonal trust	0.732	<0.0001
Joint external evaluation prevent score	Joint external evaluation detect score	0.940	<0.0001
Joint external evaluation prevent score	Joint external evaluation other score	0.912	<0.0001
Joint external evaluation prevent score	Joint external evaluation overall score	0.978	<0.0001
Joint external evaluation prevent score	Joint external evaluation respond score	0.887	<0.0001
Joint external evaluation prevent score	State fragility	-0.749	<0.0001
Joint external evaluation prevent score	Trust in government - PCA	-0.072	0.5553
Joint external evaluation prevent score	Trust in science	0.265	0.0242
Joint external evaluation prevent score	Universal health coverage	0.864	<0.0001
Joint external evaluation prevent score	Universal health coverage - CMNNs	0.846	<0.0001
Joint external evaluation prevent score	Universal health coverage - NCDs	0.860	<0.0001
Joint external evaluation respond score	Electoral democracy index	0.259	0.0149
Joint external evaluation respond score	Electoral populism	0.098	0.3653
Joint external evaluation respond score	Global health security index compliance with international norms score	0.416	0.0001

Joint external evaluation respond score	Global health security index detect score	0.555	<0.0001
Joint external evaluation respond score	Global health security index health sector score	0.749	<0.0001
Joint external evaluation respond score	Global health security index overall score	0.751	<0.0001
Joint external evaluation respond score	Global health security index prevent score	0.731	<0.0001
Joint external evaluation respond score	Global health security index respond score	0.697	<0.0001
Joint external evaluation respond score	Global health security index risk environment score	0.761	<0.0001
Joint external evaluation respond score	Government corruption - PCA	-0.672	<0.0001
Joint external evaluation respond score	Government effectiveness	0.750	<0.0001
Joint external evaluation respond score	Government health spending per capita	0.700	<0.0001
Joint external evaluation respond score	Health spending per capita	0.691	<0.0001
Joint external evaluation respond score	Healthcare Access and Quality Index	0.793	<0.0001
Joint external evaluation respond score	Hospital beds per capita	0.497	<0.0001
Joint external evaluation respond score	Income inequality	-0.431	0.0001
Joint external evaluation respond score	Interpersonal trust	0.703	<0.0001
Joint external evaluation respond score	Joint external evaluation detect score	0.847	<0.0001
Joint external evaluation respond score	Joint external evaluation other score	0.913	<0.0001
Joint external evaluation respond score	Joint external evaluation overall score	0.955	<0.0001
Joint external evaluation respond score	Joint external evaluation prevent score	0.887	<0.0001
Joint external evaluation respond score	State fragility	-0.664	<0.0001
Joint external evaluation respond score	Trust in government - PCA	-0.085	0.4824
Joint external evaluation respond score	Trust in science	0.369	0.0014
Joint external evaluation respond score	Universal health coverage	0.758	<0.0001
Joint external evaluation respond score	Universal health coverage - CMNNs	0.760	<0.0001
Joint external evaluation respond score	Universal health coverage - NCDs	0.781	<0.0001
State fragility	Electoral democracy index	-0.630	<0.0001
State fragility	Electoral populism	-0.116	0.1464
State fragility	Global health security index compliance with international norms score	-0.345	<0.0001
State fragility	Global health security index detect score	-0.537	<0.0001
State fragility	Global health security index health sector score	-0.653	<0.0001
State fragility	Global health security index overall score	-0.691	<0.0001

State fragility	Global health security index prevent score	-0.636	<0.0001
State fragility	Global health security index respond score	-0.526	<0.0001
State fragility	Global health security index risk environment score	-0.892	<0.0001
State fragility	Government corruption - PCA	0.747	<0.0001
State fragility	Government effectiveness	-0.825	<0.0001
State fragility	Government health spending per capita	-0.652	<0.0001
State fragility	Health spending per capita	-0.652	<0.0001
State fragility	Healthcare Access and Quality Index	-0.831	<0.0001
State fragility	Hospital beds per capita	-0.568	<0.0001
State fragility	Income inequality	0.412	<0.0001
State fragility	Interpersonal trust	-0.482	<0.0001
State fragility	Joint external evaluation detect score	-0.721	<0.0001
State fragility	Joint external evaluation other score	-0.740	<0.0001
State fragility	Joint external evaluation overall score	-0.744	<0.0001
State fragility	Joint external evaluation prevent score	-0.749	<0.0001
State fragility	Joint external evaluation respond score	-0.664	<0.0001
State fragility	Trust in government - PCA	0.228	0.0085
State fragility	Trust in science	-0.208	0.0158
State fragility	Universal health coverage	-0.785	<0.0001
State fragility	Universal health coverage - CMNNs	-0.841	<0.0001
State fragility	Universal health coverage - NCDs	-0.807	<0.0001
Trust in government - PCA	Electoral democracy index	-0.317	0.0002
Trust in government - PCA	Electoral populism	-0.082	0.3447
Trust in government - PCA	Global health security index compliance with international norms score	0.043	0.6209
Trust in government - PCA	Global health security index detect score	-0.123	0.1576
Trust in government - PCA	Global health security index health sector score	-0.086	0.3206
Trust in government - PCA	Global health security index overall score	-0.065	0.4568
Trust in government - PCA	Global health security index prevent score	-0.062	0.4765
Trust in government - PCA	Global health security index respond score	0.025	0.7721
Trust in government - PCA	Global health security index risk environment score	-0.068	0.4327

Trust in government - PCA	Government corruption - PCA	-0.007	0.9323
Trust in government - PCA	Government effectiveness	0.057	0.5126
Trust in government - PCA	Government health spending per capita	-0.028	0.7479
Trust in government - PCA	Health spending per capita	-0.023	0.7947
Trust in government - PCA	Healthcare Access and Quality Index	-0.193	0.0241
Trust in government - PCA	Hospital beds per capita	-0.103	0.2306
Trust in government - PCA	Income inequality	-0.005	0.9506
Trust in government - PCA	Interpersonal trust	0.355	0.0018
Trust in government - PCA	Joint external evaluation detect score	-0.035	0.7767
Trust in government - PCA	Joint external evaluation other score	-0.127	0.2937
Trust in government - PCA	Joint external evaluation overall score	-0.079	0.5153
Trust in government - PCA	Joint external evaluation prevent score	-0.072	0.5553
Trust in government - PCA	Joint external evaluation respond score	-0.085	0.4824
Trust in government - PCA	State fragility	0.228	0.0085
Trust in government - PCA	Trust in government - PCA	1	
Trust in government - PCA	Trust in science	0.205	0.0205
Trust in government - PCA	Universal health coverage	-0.168	0.0500
Trust in government - PCA	Universal health coverage - CMNNs	-0.193	0.0242
Trust in science	Electoral democracy index	0.273	0.0013
Trust in science	Electoral populism	-0.026	0.7610
Trust in science	Global health security index compliance with international norms score	0.245	0.0041
Trust in science	Global health security index detect score	0.157	0.0697
Trust in science	Global health security index health sector score	0.343	<0.0001
Trust in science	Global health security index overall score	0.337	0.0001
Trust in science	Global health security index prevent score	0.359	<0.0001
Trust in science	Global health security index respond score	0.259	0.0024
Trust in science	Global health security index risk environment score	0.430	<0.0001
Trust in science	Government corruption - PCA	-0.418	<0.0001
Trust in science	Government effectiveness	0.387	<0.0001
Trust in science	Government health spending per capita	0.564	<0.0001

Trust in science	Health spending per capita	0.536	<0.0001
Trust in science	Healthcare Access and Quality Index	0.367	<0.0001
Trust in science	Hospital beds per capita	0.087	0.3137
Trust in science	Income inequality	-0.304	0.0004
Trust in science	Interpersonal trust	0.549	<0.0001
Trust in science	Joint external evaluation detect score	0.325	0.0053
Trust in science	Joint external evaluation other score	0.306	0.0089
Trust in science	Joint external evaluation overall score	0.322	0.0058
Trust in science	Joint external evaluation prevent score	0.265	0.0242
Trust in science	Joint external evaluation respond score	0.369	0.0014
Trust in science	State fragility	0.205	0.0205
Trust in science	Trust in government - PCA	0.208	0.0147
Trust in science	Universal health coverage	0.392	<0.0001
Trust in science	Universal health coverage - CMNNs	0.294	0.0005
Trust in science	Universal health coverage - NCDs	0.350	<0.0001
Universal health coverage	Electoral democracy index	0.544	<0.0001
Universal health coverage	Electoral populism	0.114	0.1320
Universal health coverage	Global health security index compliance with international norms score	0.342	<0.0001
Universal health coverage	Global health security index detect score	0.526	<0.0001
Universal health coverage	Global health security index health sector score	0.731	<0.0001
Universal health coverage	Global health security index overall score	0.723	<0.0001
Universal health coverage	Global health security index prevent score	0.699	<0.0001
Universal health coverage	Global health security index respond score	0.559	<0.0001
Universal health coverage	Global health security index risk environment score	0.858	<0.0001
Universal health coverage	Government corruption - PCA	-0.757	<0.0001
Universal health coverage	Government effectiveness	0.821	<0.0001
Universal health coverage	Government health spending per capita	0.817	<0.0001
Universal health coverage	Health spending per capita	0.811	<0.0001
Universal health coverage	Healthcare Access and Quality Index	0.939	<0.0001
Universal health coverage	Hospital beds per capita	0.533	<0.0001

Universal health coverage	Income inequality	-0.539	<0.0001
Universal health coverage	Interpersonal trust	0.630	<0.0001
Universal health coverage	Joint external evaluation detect score	0.842	<0.0001
Universal health coverage	Joint external evaluation other score	0.813	<0.0001
Universal health coverage	Joint external evaluation overall score	0.851	<0.0001
Universal health coverage	Joint external evaluation prevent score	0.864	<0.0001
Universal health coverage	Joint external evaluation respond score	0.758	<0.0001
Universal health coverage	State fragility	-0.785	<0.0001
Universal health coverage	Trust in government - PCA	-0.168	0.0500
Universal health coverage	Trust in science	0.392	<0.0001
Universal health coverage	Universal health coverage - CMNNs	0.909	<0.0001
Universal health coverage	Universal health coverage - NCDs	0.958	<0.0001
Universal health coverage - CMNNs	Electoral democracy index	0.466	<0.0001
Universal health coverage - CMNNs	Electoral populism	0.181	0.0157
Universal health coverage - CMNNs	Global health security index compliance with international norms score	0.272	0.0003
Universal health coverage - CMNNs	Global health security index detect score	0.460	<0.0001
Universal health coverage - CMNNs	Global health security index health sector score	0.668	<0.0001
Universal health coverage - CMNNs	Global health security index overall score	0.654	<0.0001
Universal health coverage - CMNNs	Global health security index prevent score	0.654	<0.0001
Universal health coverage - CMNNs	Global health security index respond score	0.469	<0.0001
Universal health coverage - CMNNs	Global health security index risk environment score	0.852	<0.0001
Universal health coverage - CMNNs	Government corruption - PCA	-0.697	<0.0001
Universal health coverage - CMNNs	Government effectiveness	0.790	<0.0001
Universal health coverage - CMNNs	Government health spending per capita	0.686	<0.0001
Universal health coverage - CMNNs	Health spending per capita	0.685	<0.0001
Universal health coverage - CMNNs	Healthcare Access and Quality Index	0.944	<0.0001
Universal health coverage - CMNNs	Hospital beds per capita	0.614	<0.0001
Universal health coverage - CMNNs	Income inequality	-0.551	<0.0001
Universal health coverage - CMNNs	Interpersonal trust	0.544	<0.0001
Universal health coverage - CMNNs	Joint external evaluation detect score	0.806	<0.0001

Universal health coverage - CMNNs	Joint external evaluation other score	0.807	<0.0001
Universal health coverage - CMNNs	Joint external evaluation overall score	0.837	<0.0001
Universal health coverage - CMNNs	Joint external evaluation prevent score	0.846	<0.0001
Universal health coverage - CMNNs	Joint external evaluation respond score	0.760	<0.0001
Universal health coverage - CMNNs	State fragility	-0.841	<0.0001
Universal health coverage - CMNNs	Trust in government - PCA	-0.193	0.0242
Universal health coverage - CMNNs	Trust in science	0.294	0.0005
Universal health coverage - CMNNs	Universal health coverage	0.909	<0.0001
Universal health coverage - CMNNs	Universal health coverage - NCDs	0.923	<0.0001
Universal health coverage - NCDs	Electoral democracy index	0.516	<0.0001
Universal health coverage - NCDs	Electoral populism	0.147	0.0506
Universal health coverage - NCDs	Global health security index compliance with international norms score	0.319	<0.0001
Universal health coverage - NCDs	Global health security index detect score	0.510	<0.0001
Universal health coverage - NCDs	Global health security index health sector score	0.722	<0.0001
Universal health coverage - NCDs	Global health security index overall score	0.703	<0.0001
Universal health coverage - NCDs	Global health security index prevent score	0.679	<0.0001
Universal health coverage - NCDs	Global health security index respond score	0.531	<0.0001
Universal health coverage - NCDs	Global health security index risk environment score	0.849	<0.0001
Universal health coverage - NCDs	Government corruption - PCA	-0.707	<0.0001
Universal health coverage - NCDs	Government effectiveness	0.794	<0.0001
Universal health coverage - NCDs	Government health spending per capita	0.777	<0.0001
Universal health coverage - NCDs	Health spending per capita	0.779	<0.0001
Universal health coverage - NCDs	Healthcare Access and Quality Index	0.987	<0.0001
Universal health coverage - NCDs	Hospital beds per capita	0.609	<0.0001
Universal health coverage - NCDs	Income inequality	-0.601	<0.0001
Universal health coverage - NCDs	Interpersonal trust	0.596	<0.0001
Universal health coverage - NCDs	Joint external evaluation detect score	0.831	<0.0001
Universal health coverage - NCDs	Joint external evaluation other score	0.837	<0.0001
Universal health coverage - NCDs	Joint external evaluation overall score	0.859	<0.0001
Universal health coverage - NCDs	Joint external evaluation prevent score	0.860	<0.0001

Universal health coverage - NCDs	Joint external evaluation respond score	0.781	<0.0001
Universal health coverage - NCDs	State fragility	-0.807	<0.0001
Universal health coverage - NCDs	Trust in government - PCA	-0.219	0.0105
Universal health coverage - NCDs	Trust in science	0.350	<0.0001
Universal health coverage - NCDs	Universal health coverage	0.958	<0.0001
Universal health coverage - NCDs	Universal health coverage - CMNNs	0.923	<0.0001

2.6 Results of stage 1 and stage 2 regressions

2.6.1 Results of stage 1 multivariate regressions, January 1, 2020 – September 30, 2021

Covariates	Beta estimate (uncertainty interval)	
	Cumulative infections per capita	IFR
GDP per capita	-0.17 (-0.28 - -0.05)	-0.17 (-0.28 - -0.05)
% of population living above 1000 people/km ²	0.05 (-0.10 – 0.19)	-0.03 (-0.16-0.06)
Average number of beta-coronavirus host bat species	0.08 (-0.04 – 0.23)	0.07 (-0.01-0.18)
% of population living below 100 m	-0.15 (-0.25 - -0.06)	-
BMI	-	1.74 (0.65-3.2)
Smoking prevalence	-	0.01 (-0.16-0.19)
PM _{2.5} air pollution concentration (mg/m ³)	-	-0.03 (-0.16-0.06)
COPD prevalence	-	0.04 (-0.16-0.27)
Cancer prevalence	-	-0.16 (-0.4-0.01)

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2.6.2 Results of stage 2 bivariate regressions, January 1, 2020 – September 30, 2021

Covariates	Beta estimate (uncertainty interval)	
	Cumulative infections per capita	IFR
Hospital beds per capita	-0.07 (-0.21 - 0.06)	-0.03 (-0.11 - 0.04)
Government health spending per capita	-0.17 (-0.34 - 0)	-0.01 (-0.10 - 0.08)
Healthcare Access and Quality Index	-0.09 (-0.28 - 0.05)	-0.04 (-0.11 - 0.05)
Health spending per capita	-0.16 (-0.32 - -0.02)	-0.02 (-0.09 - 0.08)
Universal health coverage - CMNNs	-0.03 (-0.16 - 0.13)	0.00 (-0.07 - 0.09)
Electoral populism	0.12 (0.02 - 0.22)	-0.03 (-0.12 - 0.05)
Global health security index overall score	-0.10 (-0.26 - 0.07)	-0.03 (-0.10 - 0.04)
Global health security index prevent score	-0.08 (-0.24 - 0.04)	0.01 (-0.08 - 0.12)
Global health security index detect score	-0.03 (-0.17 - 0.12)	-0.02 (-0.11 - 0.07)
Global health security index respond score	-0.12 (-0.28 - 0.03)	-0.03 (-0.13 - 0.08)
Global health security index health sector score	-0.11 (-0.27 - 0.07)	0.00 (-0.11 - 0.11)
Global health security index compliance with international norms score	-0.08 (-0.2 - 0.08)	-0.02 (-0.12 - 0.05)
Global health security index risk environment score	-0.06 (-0.22 - 0.08)	-0.02 (-0.12 - 0.04)
Income inequality	0.17 (0.00 - 0.31)	0.01 (-0.09 - 0.09)
Government effectiveness	-0.16 (-0.34 - -0.01)	-0.02 (-0.12 - 0.06)
Government corruption - PCA	0.14 (0.05 - 0.27)	0.08 (0.02 - 0.19)
Trust in government - PCA	-0.25 (-0.36 - -0.11)	-0.03 (-0.12 - 0.06)
Interpersonal trust	-0.67 (-0.94 - -0.42)	0.01 (-0.03 - 0.07)
Joint external evaluation overall score	-0.15 (-0.35 - 0.07)	-0.02 (-0.17 - 0.08)
Joint external evaluation prevent score	-0.16 (-0.35 - 0.08)	0.00 (-0.07 - 0.06)
Joint external evaluation detect Score	-0.14 (-0.33 - 0.14)	-0.03 (-0.09 - 0.04)
Joint external evaluation respond score	-0.14 (-0.35 - 0.06)	-0.06 (-0.19 - 0.07)
Joint external evaluation other score	-0.08 (-0.28 - 0.11)	-0.05 (-0.19 - 0.07)
Universal health coverage - NCDs	-0.08 (-0.24 - 0.05)	-0.01 (-0.15 - 0.09)
State fragility	-0.01 (-0.15 - 0.14)	-0.01 (-0.13 - 0.12)
Trust in science	-0.11 (-0.27 - 0.05)	-0.02 (-0.12 - 0.09)
Universal health coverage	-0.14 (-0.29 - 0.07)	0.01 (-0.12 - 0.18)
Electoral democracy index	-0.08 (-0.25 - 0.07)	0.02 (-0.07 - 0.11)

2.6.3 Results of stage 1 multivariate regressions, January 1, 2020 – October 15, 2020

Covariates	Beta estimate (uncertainty interval)	
	Cumulative infections per capita	IFR
GDP per capita	-0.21 (-0.39 - -0.09)	-0.19 (-0.31 - 0.01)
% of population living above 1000 people/km ²	0.10 (-0.13 – 0.35)	-0.04 (-0.17 - 0.08)
Average number of beta-coronavirus host bat species	0.01 (-0.19 – 0.22)	0.04 (-0.09 - 0.14)
% of population living below 100 m	-0.24 (-0.37 - -0.09)	-
BMI	-	3.36 (1.72 - 4.88)
Smoking prevalence	-	-0.38 (-0.64 - -0.11)
PM _{2.5} air pollution concentration (mg/m ³)	-	-0.20 (-0.39 - 0.03)
COPD prevalence	-	0.51 (0.19 - 0.78)
Cancer prevalence	-	-0.13 (-0.42 - 0.1)

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2.6.4 Results of stage 2 bivariate regressions, January 1, 2020 – October 15, 2020

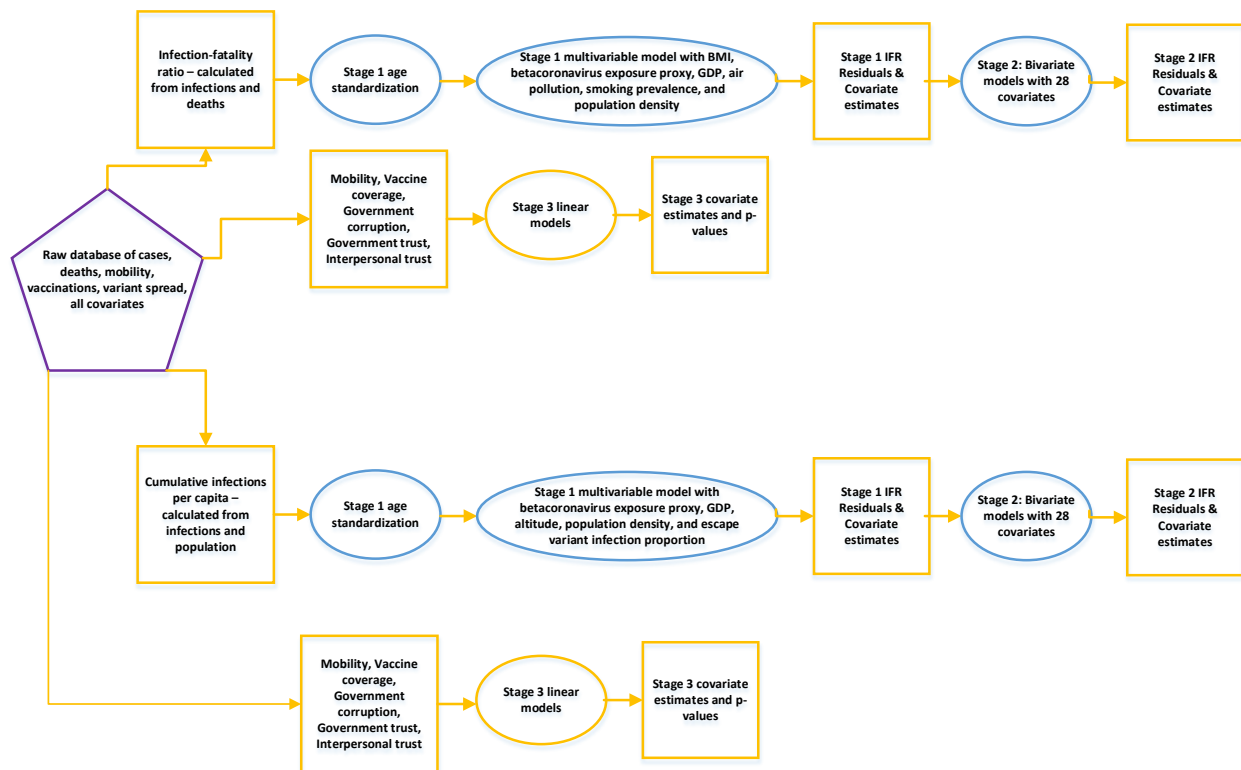
Covariates	Beta estimate (uncertainty interval)	
	Cumulative infections per capita	IFR
Hospital beds per capita	-0.21 (-0.41 - 0.02)	-0.03 (-0.11 - 0.04)
Government health spending per capita	-0.05 (-0.28 - 0.17)	-0.01 (-0.1 - 0.08)
Healthcare Access and Quality Index	-0.07 (-0.31 - 0.19)	-0.04 (-0.11 - 0.05)
Health spending per capita	-0.09 (-0.36 - 0.14)	-0.02 (-0.09 - 0.08)
Universal health coverage - CMNNs	-0.12 (-0.38 - 0.13)	0.00 (-0.07 - 0.09)
Electoral populism	0.15 (-0.09 - 0.37)	-0.03 (-0.12 - 0.05)
Global health security index overall score	-0.06 (-0.34 - 0.18)	-0.03 (-0.10 - 0.04)
Global health security index prevent score	-0.07 (-0.30 - 0.18)	0.01 (-0.08 - 0.12)
Global health security index detect score	-0.04 (-0.33 - 0.20)	-0.02 (-0.11 - 0.07)
Global health security index respond score	-0.01 (-0.28 - 0.27)	-0.03 (-0.13 - 0.08)
Global health security index health sector score	-0.04 (-0.25 - 0.22)	0.00 (-0.11 - 0.11)
Global health security index compliance with international norms score	-0.10 (-0.32 - 0.12)	-0.02 (-0.12 - 0.05)
Global health security index risk environment score	-0.20 (-0.44 - 0.04)	-0.02 (-0.12 - 0.04)
Income inequality	0.19 (-0.05 - 0.40)	0.01 (-0.09 - 0.09)
Government effectiveness	-0.24 (-0.55 - -0.05)	-0.02 (-0.12 - 0.06)
Government corruption - PCA	0.24 (0.07 - 0.43)	0.08 (0.02 - 0.19)
Trust in government - PCA	-0.31 (-0.51 - -0.13)	-0.03 (-0.12 - 0.06)
Interpersonal trust	-0.62 (-0.97 - -0.26)	0.01 (-0.03 - 0.07)
Joint external evaluation overall score	-0.17 (-0.42 - 0.19)	-0.02 (-0.17 - 0.08)
Joint external evaluation prevent score	-0.13 (-0.52 - 0.27)	0.00 (-0.07 - 0.06)
Joint external evaluation detect Score	-0.13 (-0.46 - 0.28)	-0.03 (-0.09 - 0.04)
Joint external evaluation respond score	-0.23 (-0.58 - 0.1)	-0.06 (-0.19 - 0.07)
Joint external evaluation other score	0.06 (-0.29 - 0.34)	-0.05 (-0.19 - 0.07)
Universal health coverage - NCDs	-0.04 (-0.30 - 0.16)	-0.01 (-0.15 - 0.09)
State fragility	0.19 (-0.02 - 0.47)	-0.01 (-0.13 - 0.12)
Trust in science	0.16 (-0.08 - 0.43)	-0.02 (-0.12 - 0.09)
Universal health coverage	-0.10 (-0.41 - 0.13)	0.01 (-0.12 - 0.18)
Electoral democracy index	-0.11 (-0.36 - 0.11)	0.02 (-0.07 - 0.11)

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Section 3: Additional methods

For our final analysis, we included all variables that we had access to, there was previous literature connecting, and there was theoretical perspective on how they could be included. In general, we opted for an inclusive modelling strategy and included rather than excluded variables in this exploratory analysis. A diagram of our analytic pathway follows.

Figure 3.1.1: Modelling pathway for Stages 1-3 for IFR and infections



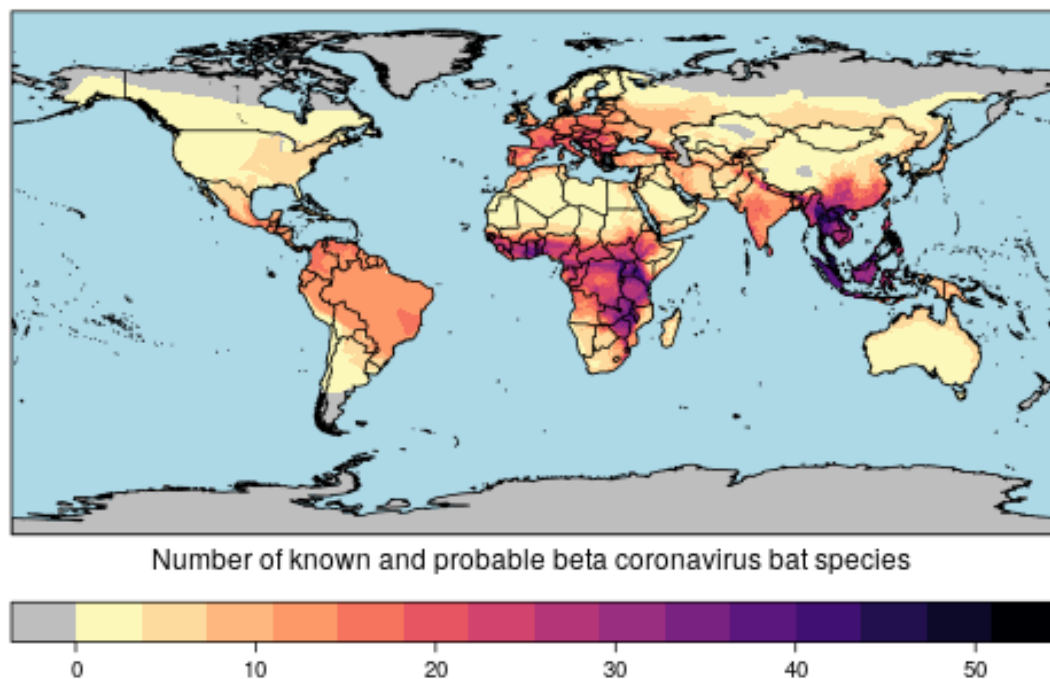
3.2 Proxy for previous exposure to beta coronaviruses

Literature suggests that possible previous exposure to SARS, MERS, or other beta coronaviruses may provide cross-immunity to SARS-CoV2.²³⁻²⁵ In order to capture previous exposure to other beta coronaviruses, we obtained a list of possible bat hosts of beta coronaviruses produced by authors at the Verena Consortium.¹⁸ These authors used an ensemble model of seven other statistical models (network- and trait-based models) to predict possible bat beta coronavirus hosts in addition to known bat hosts. This list of 300+ species was then compared against known species ranges, determined by experts, using the IUCN Red List of Threatened Species.²¹ Of the 448 known and probable species extracted from the publication by Becker et al,²² 441 were able to be

retrieved from the IUCN red list, allowing for possible changes in species naming convention.

Following the extraction of a geographical range for each species, each range was converted to a 1-km by 1-km raster in R using the raster package. Ranges were then layered one on top of the other, interpolated to a 5-km by 5-km grid cell range for processing times using the average of all cells in that grid. All ranges were then summed together to get the estimated number of bat species per grid cell, as seen in Figure 1 below.

Figure 3.2.1: Number of known and probable beta coronavirus bat species per grid cell



The number of species per grid cell were then averaged over the first and second administrative region in agreement with our COVID-19 units of analysis. Number of bat species per location ranged from 0 to 42, with a median exposure of 11.5 (IQR: 4.2–16.6).

3.3 PCA analysis for trust in government and corruption

We used principal component analysis (PCA) to create summary metrics that combine information about trust in government and/or corruption. The input variables were governmental corruption, bureaucracy corruption, trust in government (WVS), and trust in government (Gallup). The first summary metric combined the two trust covariates, and the second combined the two corruption covariates. Using centered and scaled versions of the covariates, the summary metrics consist of the first principal component from each PCA analysis. The first component (of four) explained 92.6% of the variation

for the trust variable and 94.4% of the corruption variable. PCA requires that all variables have complete data, but some of the variables had missing data. We used the `imputePCA` function from the `missMDA` R package to impute missing values, but only used observations that had at least one of the two original observations. The package implements the iterative PCA method described in Josse and Husson (2010).²⁶ To propagate uncertainty from the imputation process, we created 100 datasets with random realisations of the imputation.

Section 4: Sensitivity analyses

4.1 Using a correction of 1% of median for log transformations

Figure 2: Standardised infections per capita and standardised infection fatality ratios

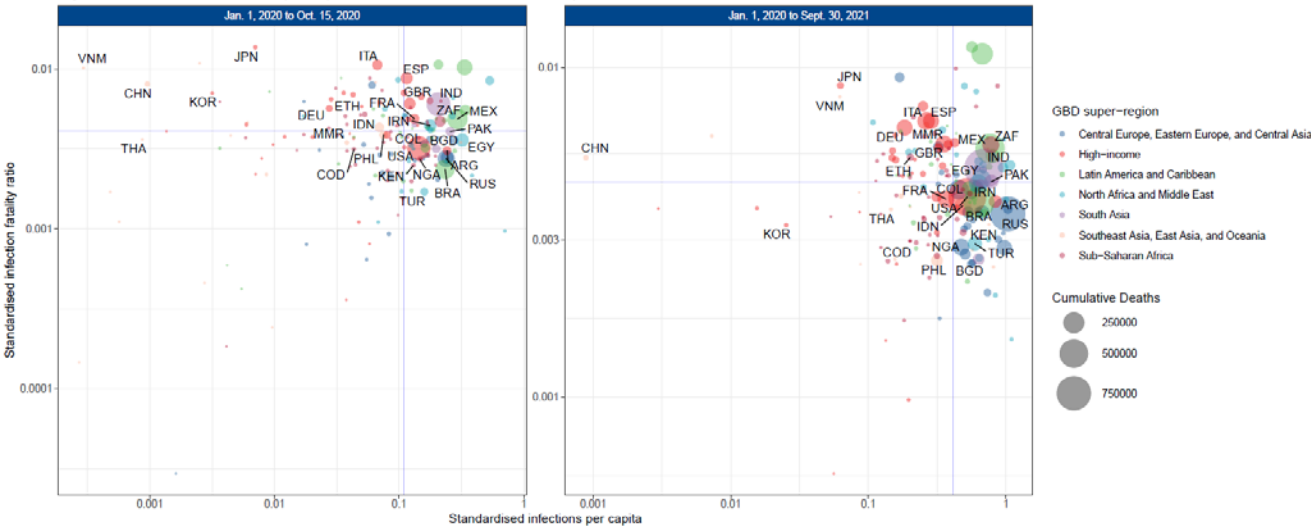
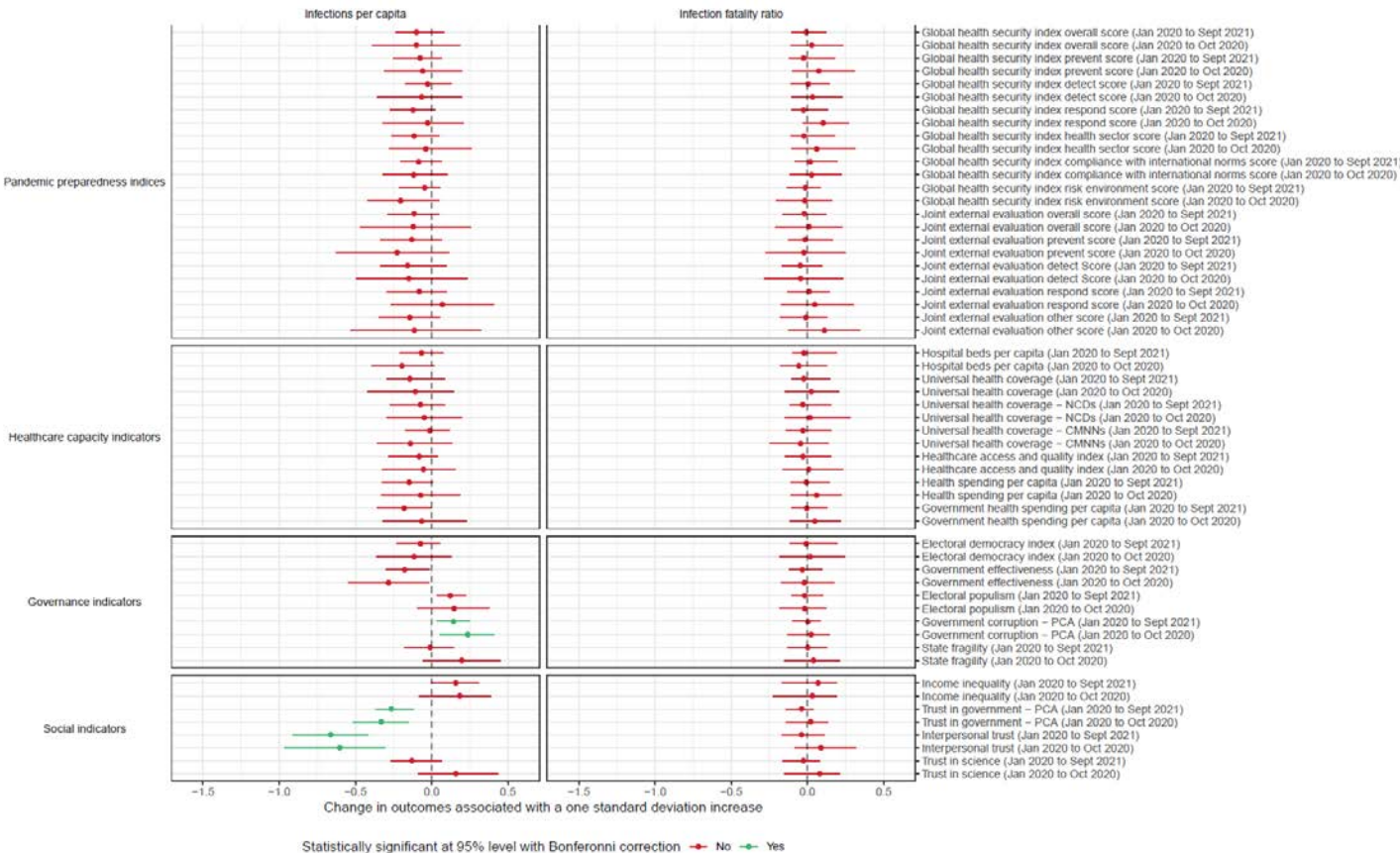


Figure 4.1.1: Infections vs. IFR

Figure 4.1.2: Bivariate results



4.2 Using centred and scaled variables

Figure 4.2.1: Infections vs. IFR

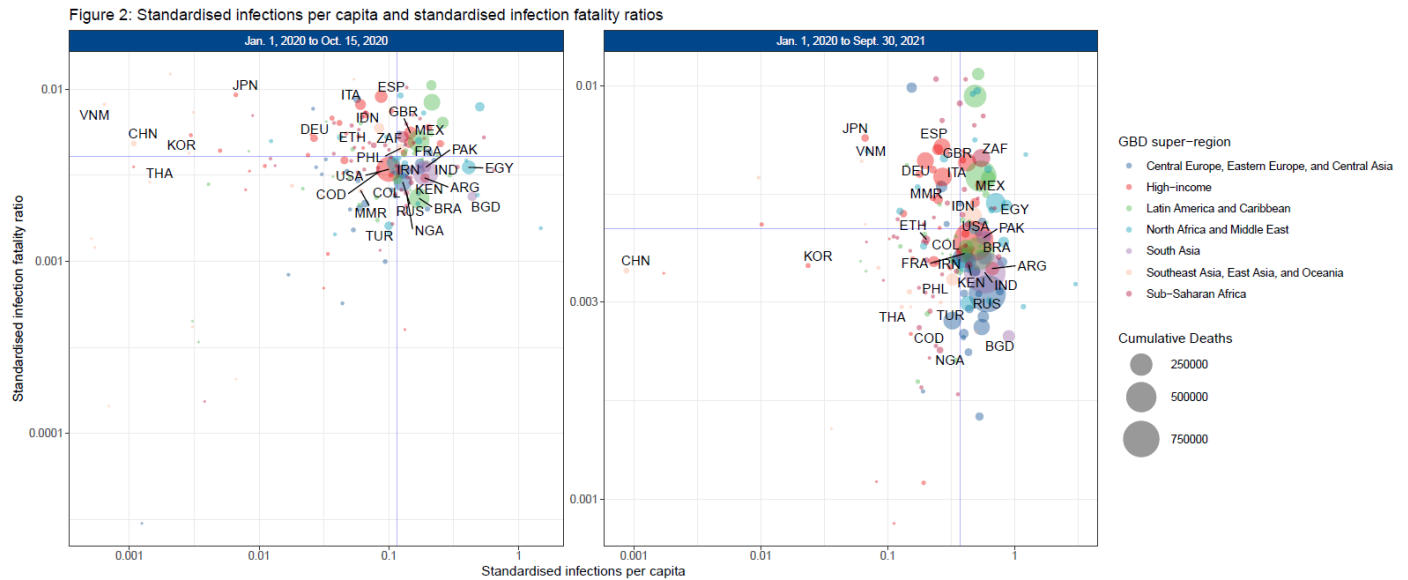
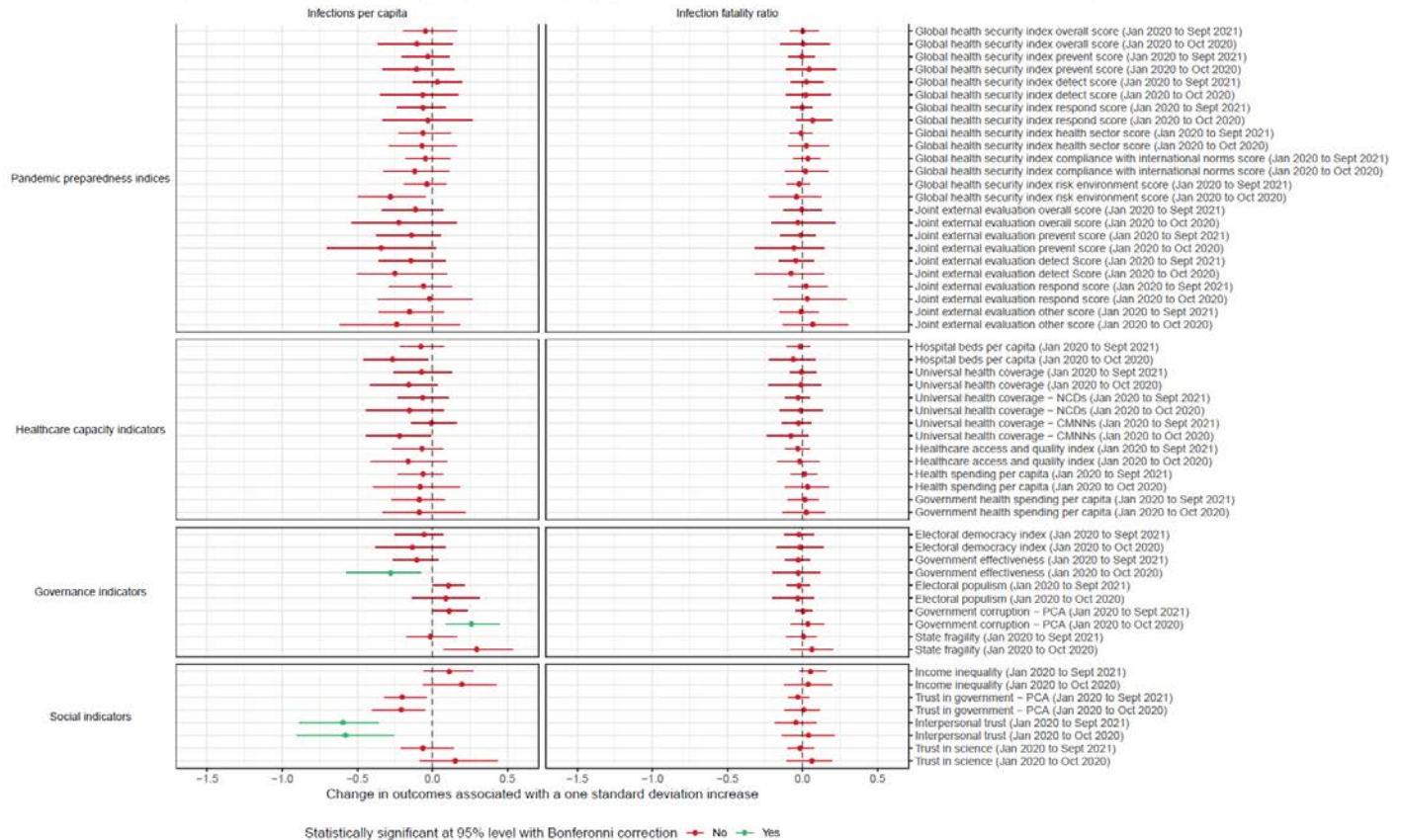


Figure 4.2.2 Bivariate results

Figure 3: Associations between key preparedness, capacity, governance, and social indicators and infections and infection fatality ratio



4.3 Including variant spread in stage 1

Figure 4.3.1: Infections vs. IFR

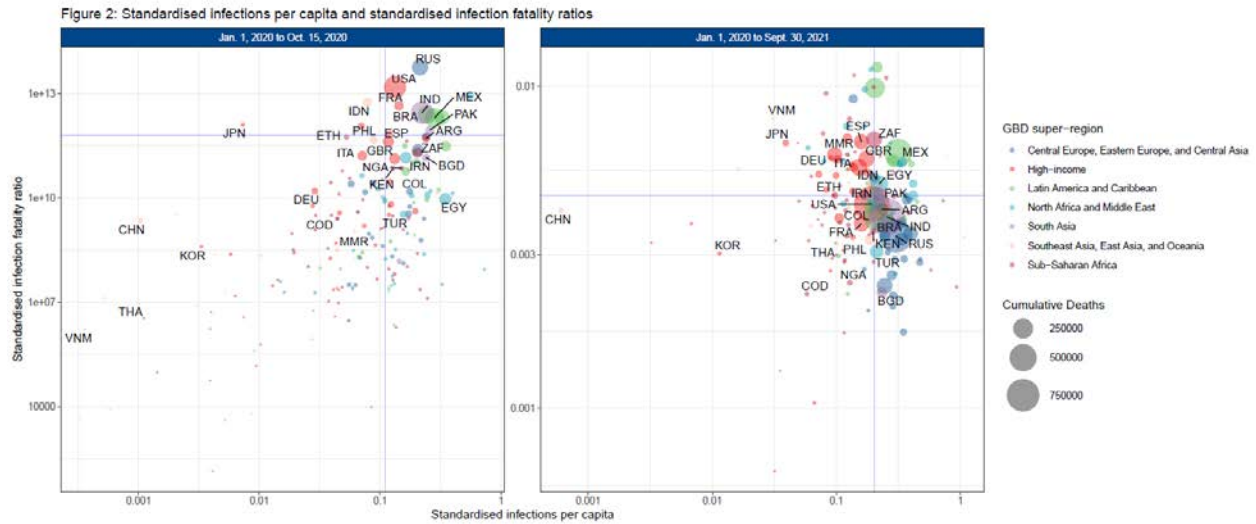
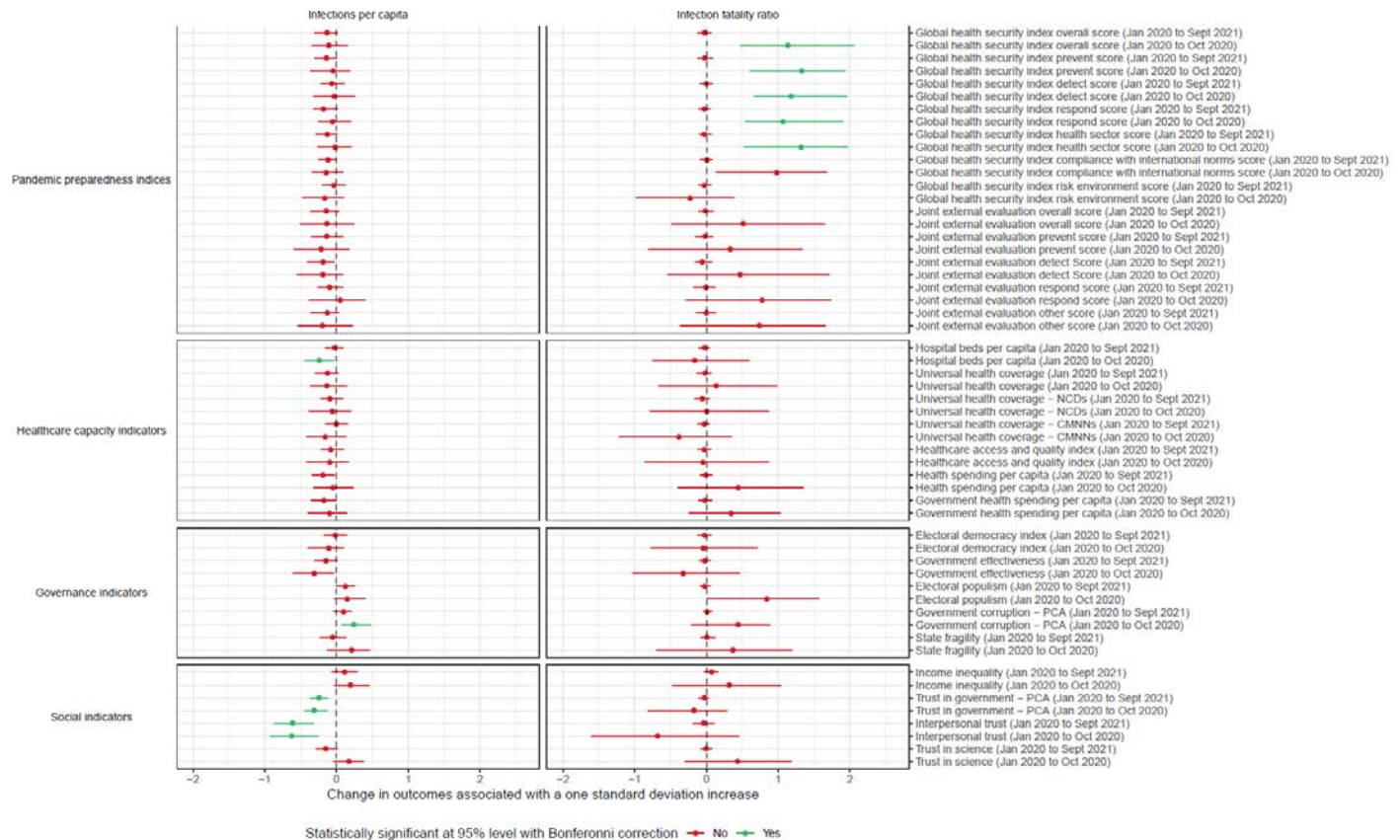
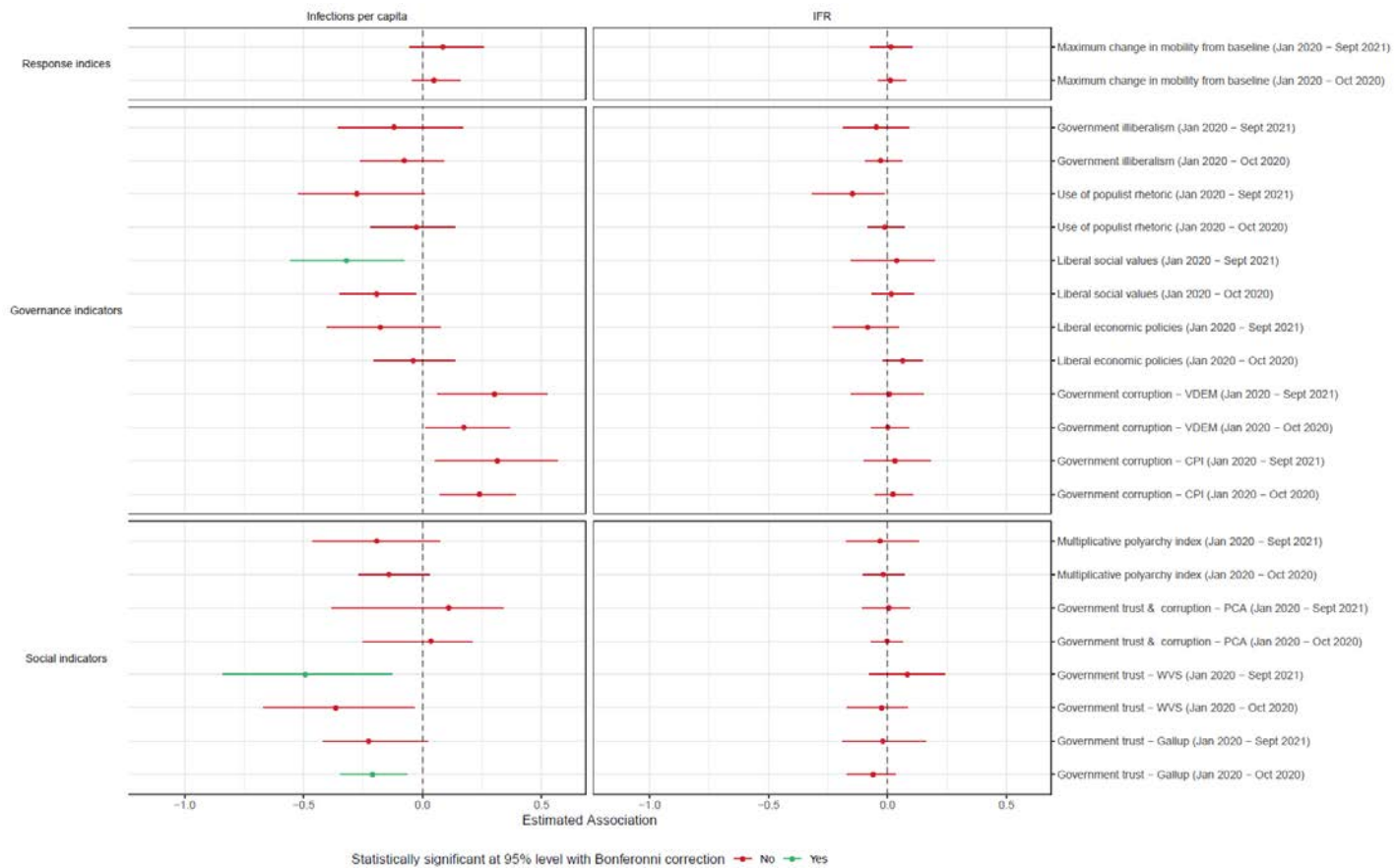


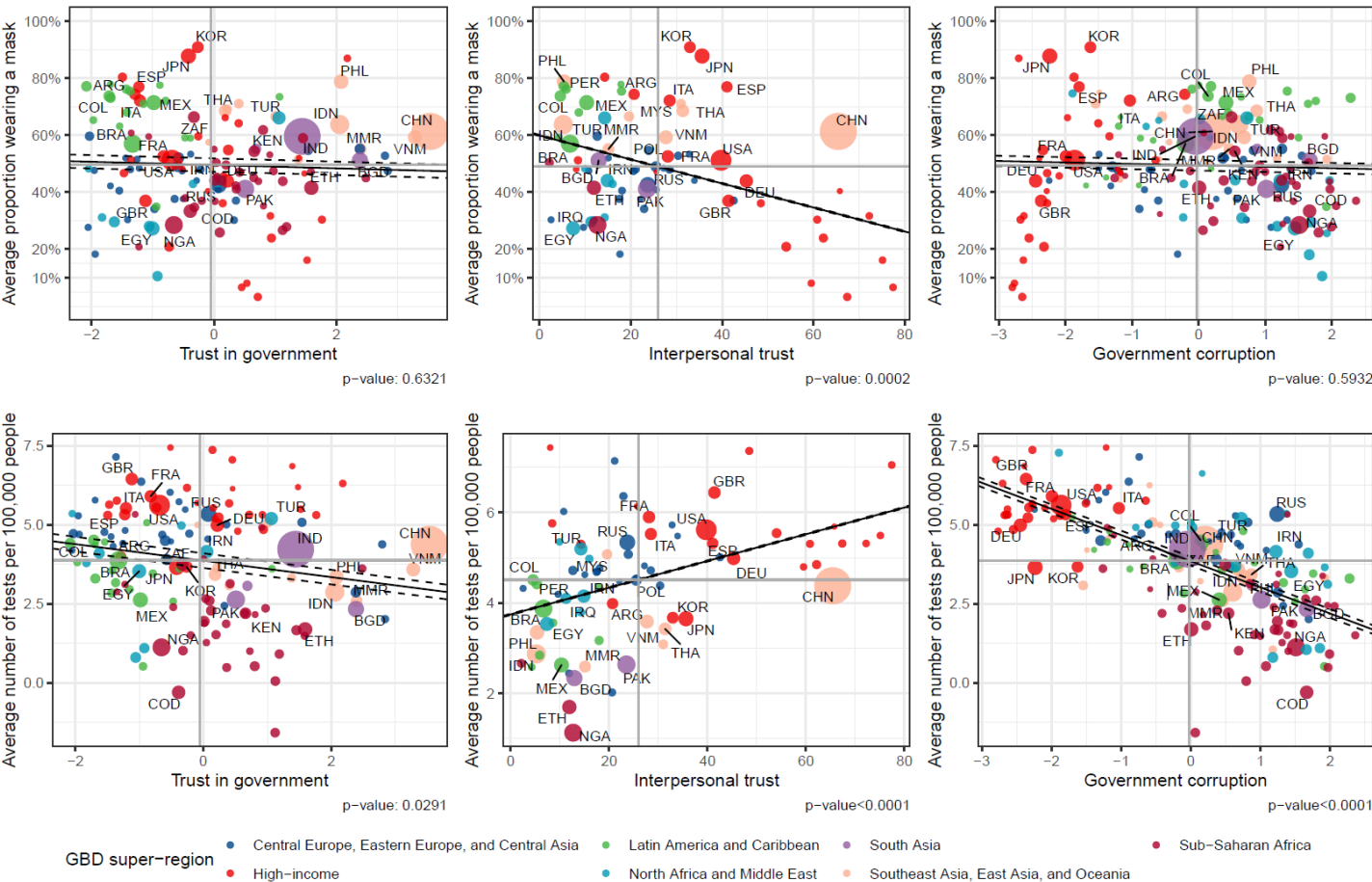
Figure 4.3.2: Bivariate results



Section 5: Supplemental results

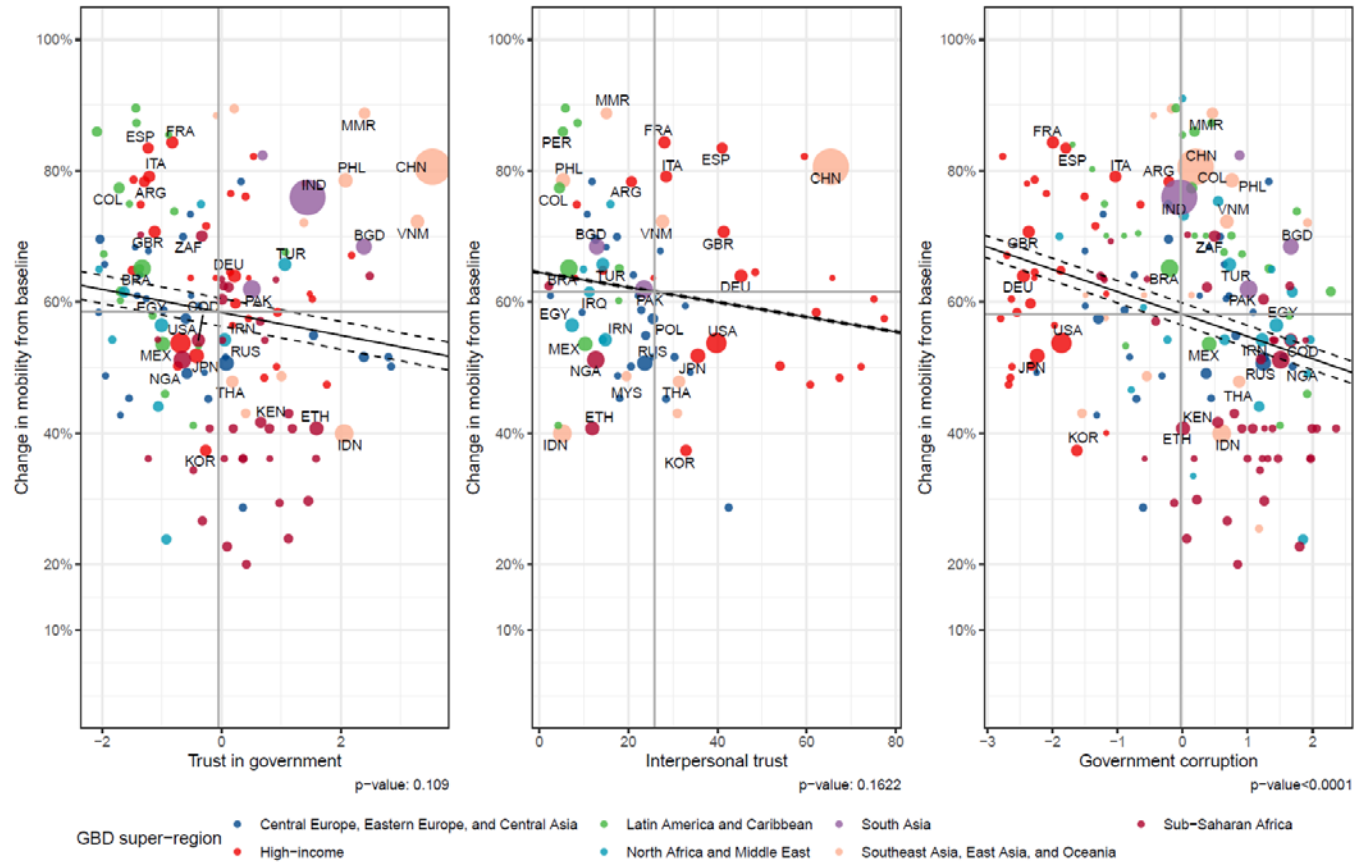
5.1 Additional bivariate analyses



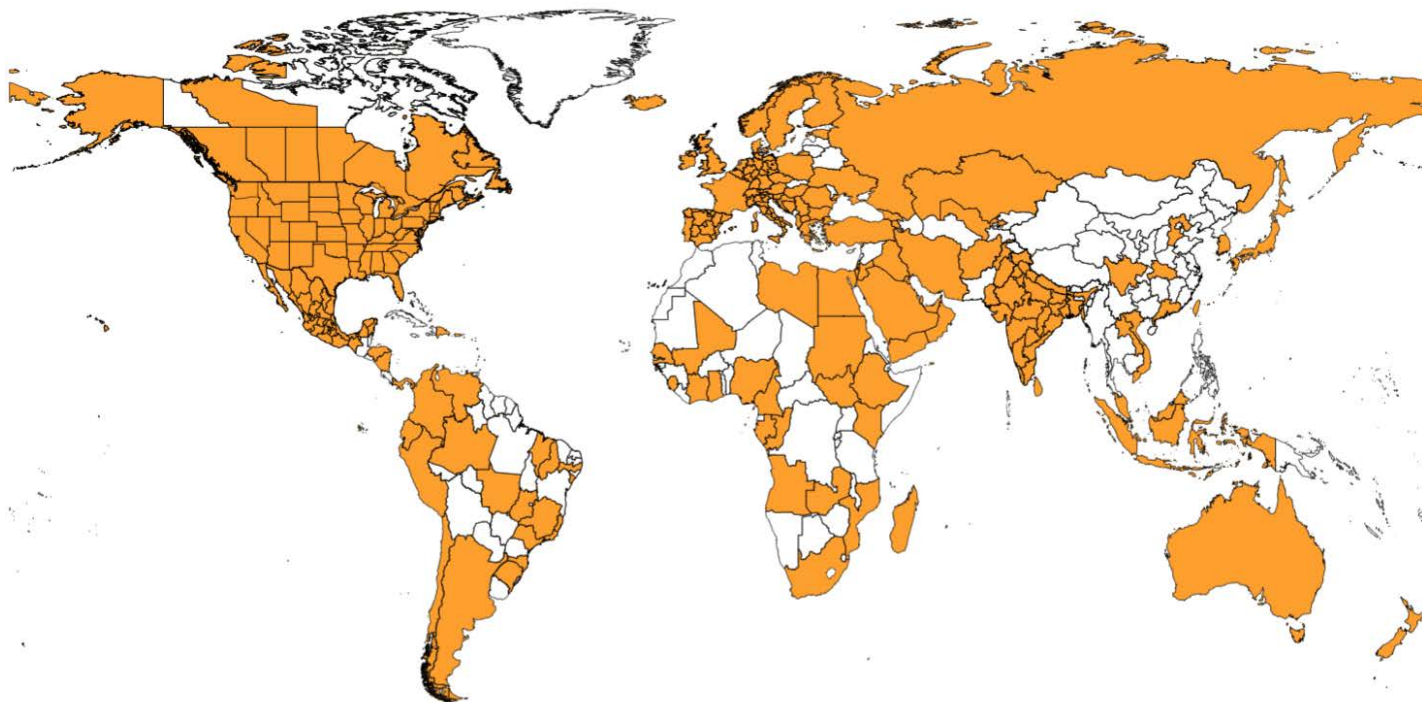


5.3 Additional analyses for the first phase of the pandemic (pre-variants and vaccines, January 1, 2020 – October 15, 2020)

Figure 5.3.1: Intermediate mobility pathways



247 5.4 Analyses for seroprevalence study locations (n=303 nationals and
248 subnationals, n=101 nationals only)
249 Figure 5.4.1: Seroprevalence study locations



250

Standardised infection fatality ratio

Jan. 1, 2020 to Oct. 15, 2020

Jan. 1, 2020 to Sept. 30, 2021

Standardised infections per capita

GBD super-region

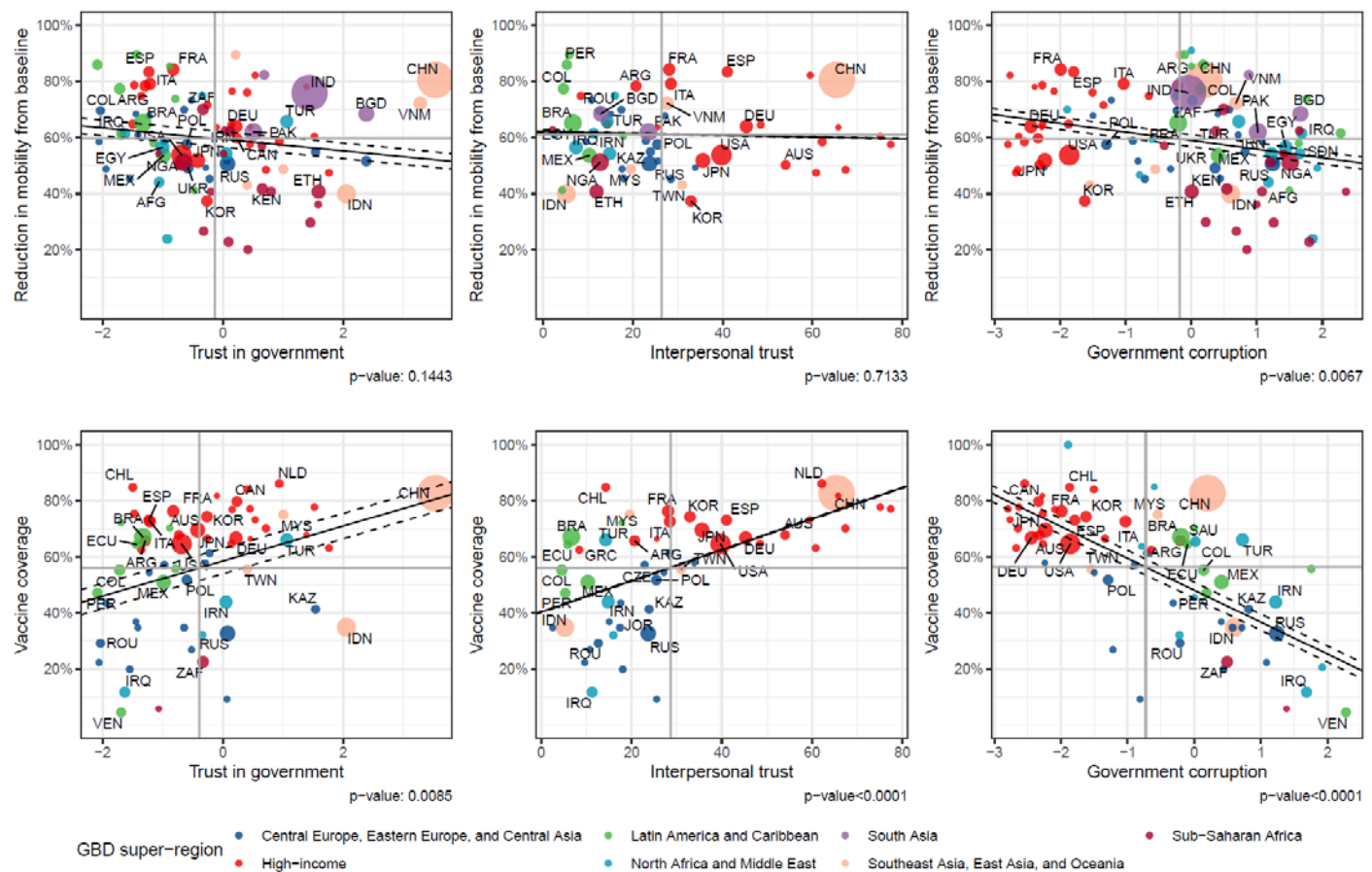
- Central Europe, Eastern Europe, and Central Asia
- High-income
- Latin America and Caribbean
- North Africa and Middle East
- South Asia
- Southeast Asia, East Asia, and Oceania
- Sub-Saharan Africa

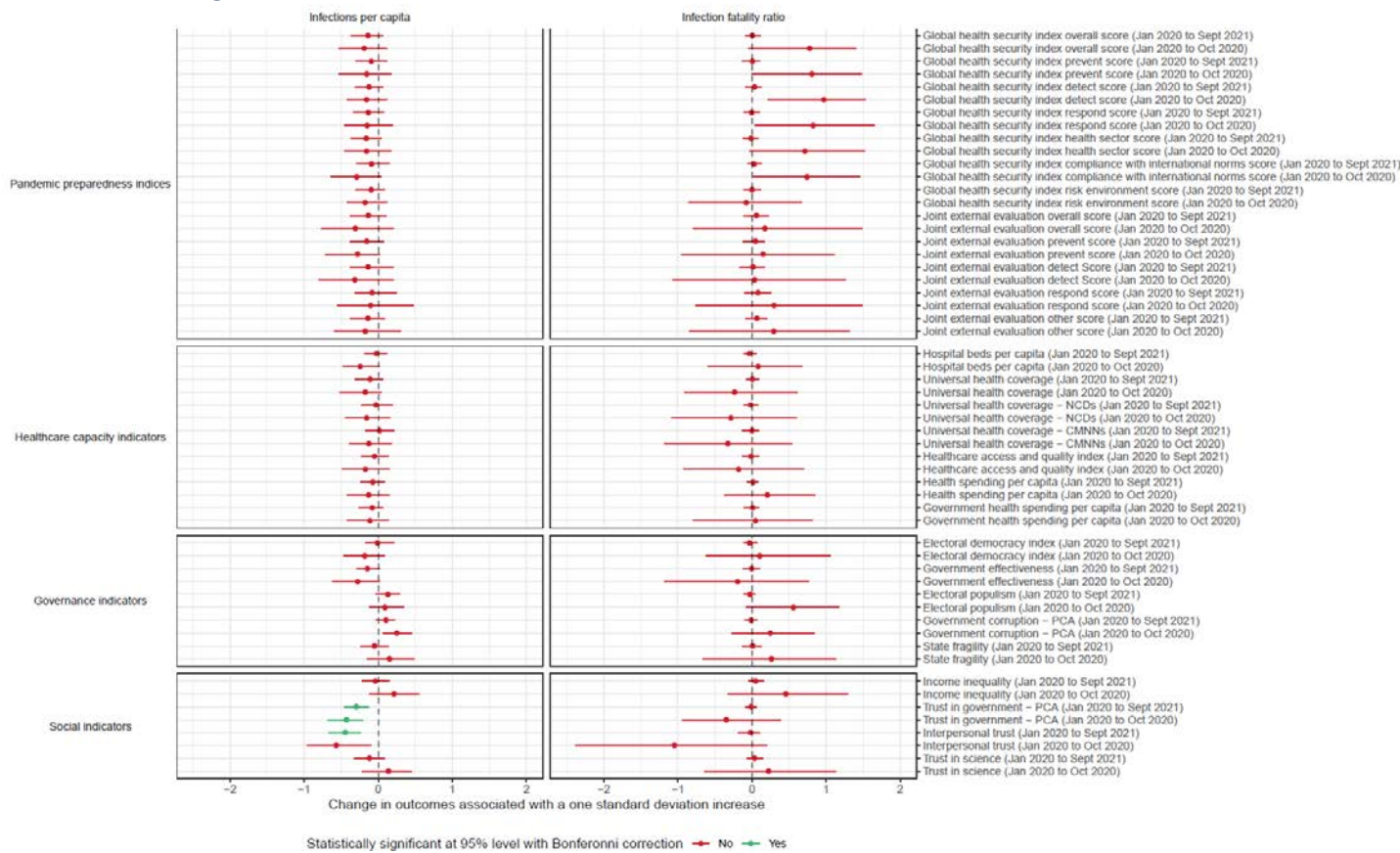
Cumulative Deaths

- 250000
- 500000
- 750000

Figure 5.4.2: Infections vs. IFR

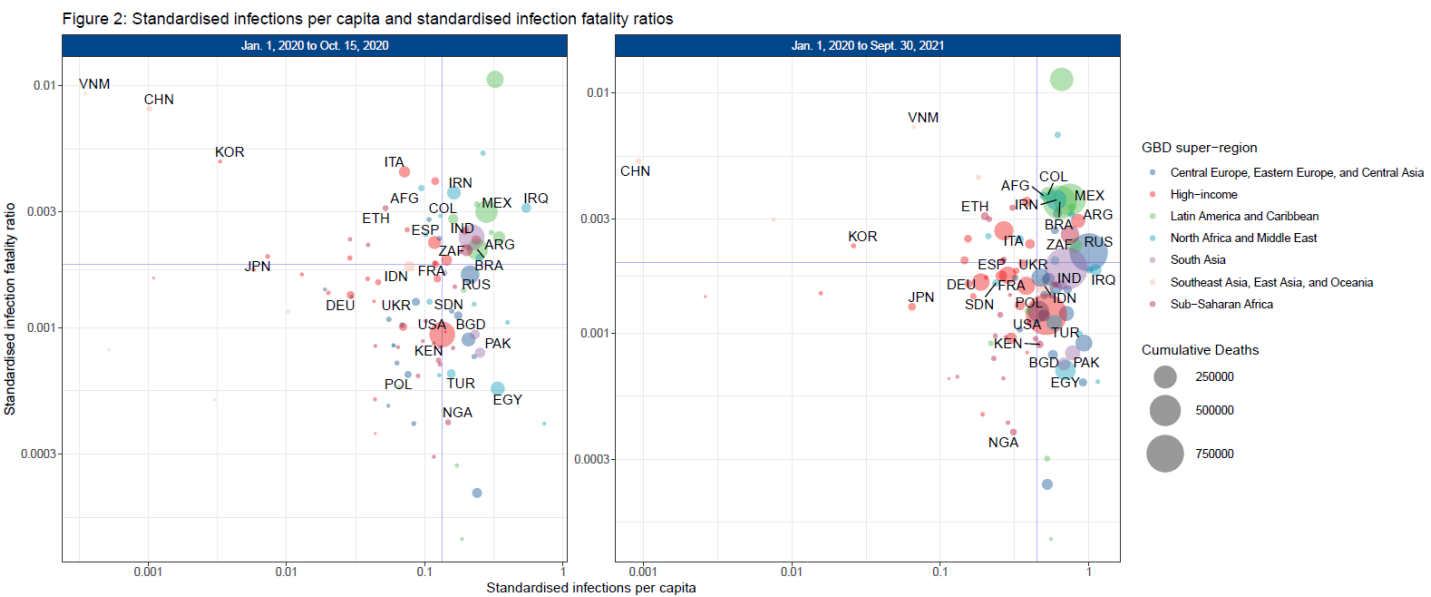
Figure 5.4.3: Intermediate pathways, vaccine coverage, and mobility change, January 1, 2020 – September 30, 2021





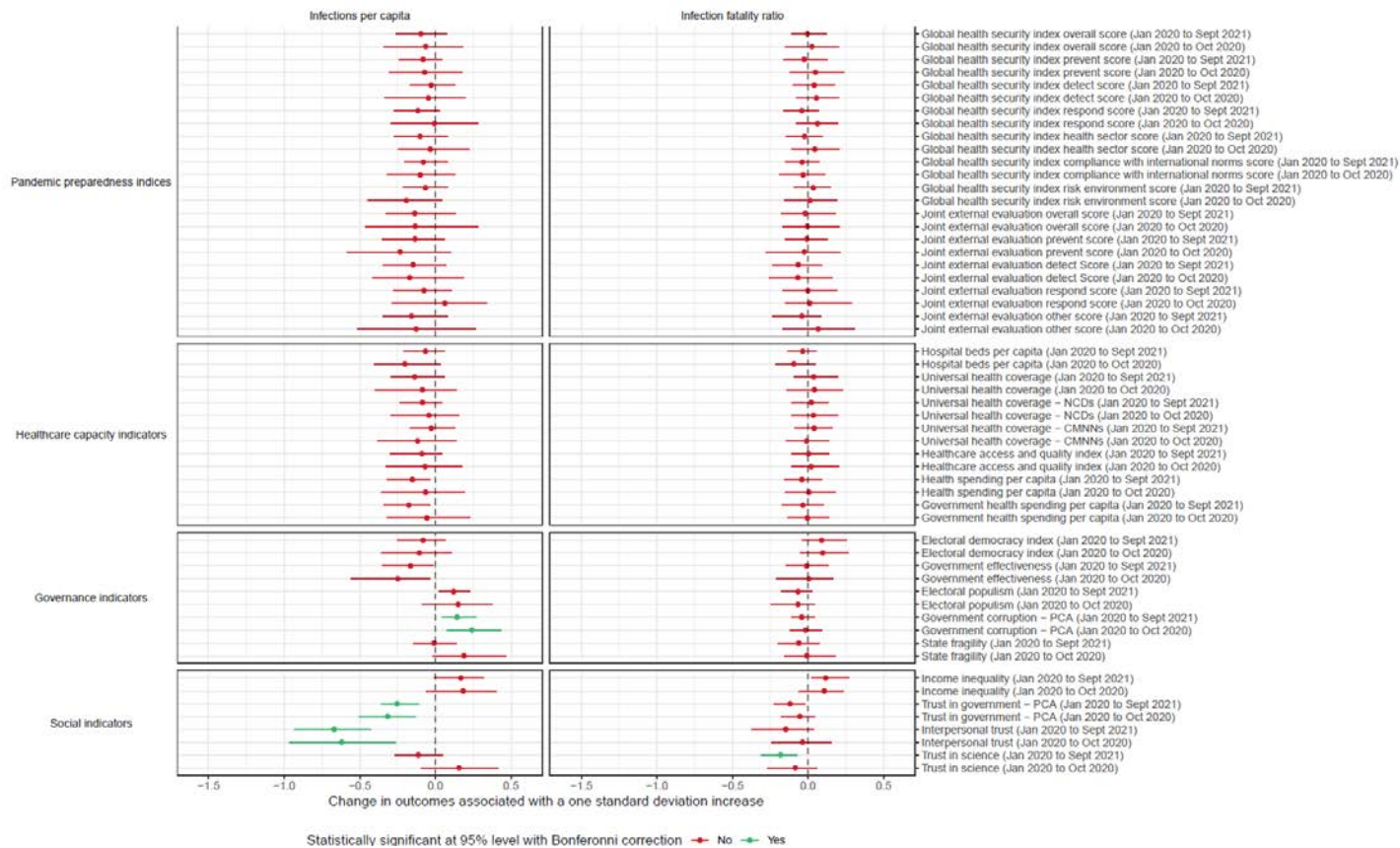
257
258 5.5 Analyses using only reported COVID deaths
259

Figure 5.5.1: Infections vs. IFR



261

Figure 5.5.2 Bivariate plots
Figure 3: Associations between key preparedness, capacity, governance, and social indicators and infections and infection fatality ratio



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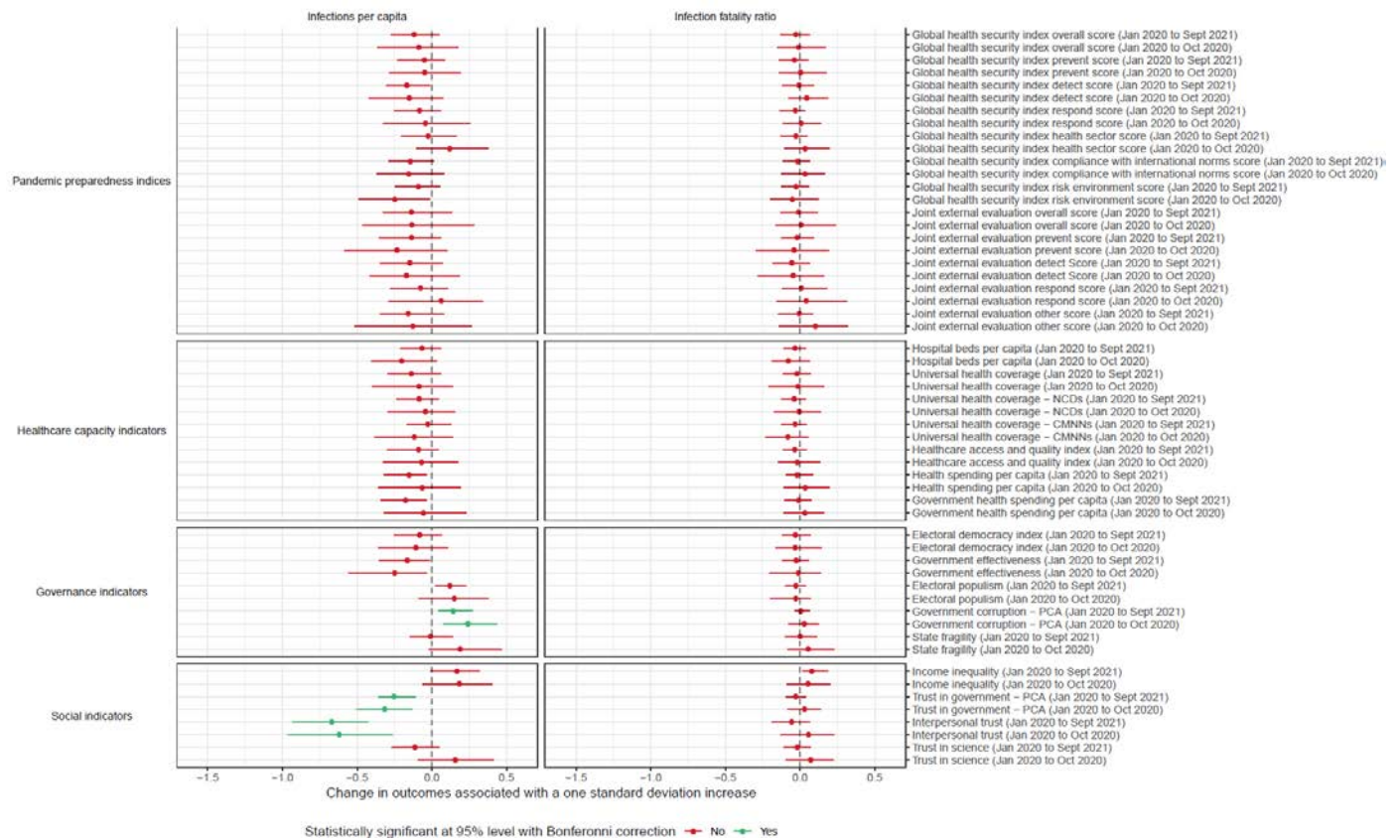
5.6 Scatter of raw data versus adjusted for stage 1 variables – IFR and cumulative infections



265

5.7 Using 2021 Global Health Security Index metrics in lieu of 2019 metrics, bivariate results

Figure 3: Associations between key preparedness, capacity, governance, and social indicators and infections and infection fatality ratio



Section 6: Author Contributions

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Erin N Hulland, Reed J D Sorenson, and Mark Moses

Primary responsibility for seeking, cataloguing, extracting, or cleaning data; designing or coding figures and tables

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 300 Fedosseeva, Abraham D Flaxman, John R Giles, Gaorui Guo, Jiawei He, Erin N Hulland, Emily
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 307 Christopher J L Murray, Latera Tesfaye Olana, Samuel M Ostroff, Maja Pasovic, David M Pigott,
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 318 Emma Spurlock.

319

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