

Supplementary Materials

Abbreviations used in the supplementary materials:

AFR = African Region
AMR = American Region
C-C = case-control
COSMOS-E = Conducting Systematic Reviews and Meta-Analyses of Observational Studies of Etiology
C-S = cross-sectional
DM = diabetes mellitus
EHR = electronic health (medical) record
EMR = East Mediterranean Region
ES = effect size
EUR = European Region
GHSI = Global Health Security Index
HI = high income
HR = hazard ratio
HTN = hypertension
LMI = lower middle income
MOOSE = meta-analyses Of Observational Studies in Epidemiology
NOS = Newcastle-Ottawa Scale
Ob = obesity
OR = odds ratio
PRR = pooled risk ratio
PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RR = relative risk or risk ratio
ARS = administrative/registry/surveillance or (case) reporting system
SEAR = Southeast Asian Region
UK = United Kingdom
UMI = upper middle income
USA = United States of America
WB = World Bank
WHO = World Health Organization
WPR = West Pacific Region

Supplementary Text 1**Search Strategy**

Time period: December 1st, 2019, through December 31st, 2020.

Key words or terms:

1. (COVID-19 and all possible variations) AND
2. (Diabetes, obesity, hypertension, and all relevant terms) OR
3. (Comorbidity, comorbid disease or illness or condition, underlying disease or illness or condition, chronic disease or illness or condition, noncommunicable disease or NCD, predictor, risk or risk factor, determinant, cardiovascular, and metabolic).

No restrictions in language, gender, age, publication types.

Databases: all 16 databases.

Database	Strategy	Records 08/17/2020	Update 09/16/2020	Update 01/15/2021
Medline (OVID) 1946-	novel coronavirus* OR novel corona virus* OR 2019 coronavirus OR coronavirus disease OR coronavirus 2019 OR betacoronavirus* OR covid19 OR covid 19 OR nCoV OR novel CoV OR CoV 2 OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR wuhan virus* OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)) AND outbreak* AND (201912*.dt OR 2020*.dt) OR ((coronavirus OR pandemic).mp AND (201912*.dt OR 2020*.dt)) AND Diabetes OR diabetic OR blood glucose OR glyc?emic control OR glucose control OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR waist circumference OR BMI OR body mass index OR hypertension OR hypertensive OR high blood pressure OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR chronic disease* OR chronic illness* OR chronic condition* OR noncommunicable disease* OR cardiovascular disease* OR predictor* OR determinant* OR risk factor* OR metabolic	5856	1586	7932
Embase (OVID) 1988-	(novel coronavirus* OR novel corona virus* OR 2019 coronavirus OR coronavirus disease OR coronavirus 2019 OR betacoronavirus* OR covid19 OR covid 19 OR nCoV OR novel CoV OR CoV 2 OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)) AND outbreak*) OR ((coronavirus OR pandemic).mp AND 2020*.dc) AND Diabetes OR diabetic OR blood glucose OR glyc?emic control OR glucose control OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR waist circumference OR BMI OR body mass index OR hypertension OR hypertensive OR high blood pressure OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR chronic disease* OR chronic illness* OR chronic condition* OR noncommunicable disease* OR cardiovascular disease* OR predictor* OR determinant* OR risk factor* OR metabolic Not pubmed/medline	6461 -4050 duplicates =2411 unique items	2816 -1677 duplicates =1139 unique items	11477 -5134 duplicates =6343 unique items
Global Health (OVID)	(novel coronavirus* OR novel corona virus* OR 2019 coronavirus OR coronavirus disease OR coronavirus 2019 OR betacoronavirus* OR covid19 OR covid 19 OR nCoV OR novel CoV OR CoV 2 OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR wuhan virus*) OR (((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)) AND outbreak*) AND 2020*.up) OR ((coronavirus OR pandemic).mp AND 2020*.up) AND Diabetes OR diabetic OR blood glucose OR glyc?emic control OR glucose control OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR waist circumference OR BMI OR body mass index OR hypertension OR hypertensive OR high blood pressure OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR chronic disease* OR chronic illness*	1102 -744 duplicates =358 unique items	273 -107 duplicates =166 unique items	3225 -1597 duplicates =1628 unique items

	OR chronic condition* OR noncommunicable disease* OR cardiovascular disease* OR predictor* OR determinant* OR risk factor* OR metabolic			
CAB Abstracts (OVID)	(novel coronavirus* OR novel corona virus* OR 2019 coronavirus OR coronavirus disease OR coronavirus 2019 OR betacoronavirus* OR covid19 OR covid 19 OR nCoV OR novel CoV OR CoV 2 OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*) AND outbreak*) OR ((coronavirus OR pandemic).mp AND 2020*.up) AND Diabetes OR diabetic OR blood glucose OR glyc?emic control OR glucose control OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR waist circumference OR BMI OR body mass index OR hypertension OR hypertensive OR high blood pressure OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR chronic disease* OR chronic illness* OR chronic condition* OR noncommunicable disease* OR cardiovascular disease* OR predictor* OR determinant* OR risk factor* OR metabolic	501 -463 duplicates =38 unique items	125 -121 duplicates =4 unique items	685 -669 duplicates =16 unique items
PsycInfo (OVID) 1987-	(novel coronavirus* OR novel corona virus* OR 2019 coronavirus OR coronavirus disease OR coronavirus 2019 OR betacoronavirus* OR covid19 OR covid 19 OR nCoV OR novel CoV OR CoV 2 OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR wuhan virus*) OR (((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*) AND outbreak*) AND 2020*.up) OR ((coronavirus OR pandemic).mp AND 2020*.up) AND Diabetes OR diabetic OR blood glucose OR glyc?emic control OR glucose control OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR waist circumference OR BMI OR body mass index OR hypertension OR hypertensive OR high blood pressure OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR chronic disease* OR chronic illness* OR chronic condition* OR noncommunicable disease* OR cardiovascular disease* OR predictor* OR determinant* OR risk factor* OR metabolic	159 -106 duplicates =53 unique items	74 -47 duplicates =27 unique items	609 -254 duplicates =355 unique items
CINAHL (EbscoHost)	("novel coronavirus*" OR "novel corona virus*" OR "2019 coronavirus" OR betacoronavirus* OR covid19 OR "covid 19" OR nCoV OR "novel CoV" OR "CoV 2" OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR "wuhan virus*") OR (((wuhan OR hubei OR huanan) AND ("severe acute respiratory" OR pneumonia*) AND outbreak*) AND PY 2020) OR ((coronavirus OR pandemic) AND PY 2020) AND Diabetes OR diabetic OR "blood glucose" OR "glyc?emic control" OR "glucose control" OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR "waist circumference" OR BMI OR "body mass index" OR hypertension OR hypertensive OR "high blood pressure" OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR "chronic disease*" OR "chronic illness*" OR "chronic condition*" OR "noncommunicable disease*" OR "cardiovascular disease*" OR predictor* OR determinant* OR "risk factor*" OR metabolic Exclude Medline records	1668 -602 duplicates =766 unique items	264 -105 duplicates =259 unique items	1225 -569 duplicates =656 unique items
Academic Research Complete	("novel coronavirus*" OR "novel corona virus*" OR "2019 coronavirus" OR betacoronavirus* OR covid19 OR "covid 19" OR nCoV OR "novel CoV" OR "CoV 2" OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR "wuhan virus*") OR (((wuhan OR hubei OR huanan) AND ("severe acute respiratory" OR pneumonia*) AND outbreak*) AND PY 2020) OR ((coronavirus OR pandemic) AND PY 2020) AND Diabetes OR diabetic OR "blood glucose" OR "glyc?emic control" OR "glucose control" OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR "waist circumference" OR BMI OR "body mass index" OR hypertension OR hypertensive OR "high blood pressure" OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR "chronic disease*" OR "chronic illness*" OR "chronic condition*" OR "noncommunicable disease*" OR "cardiovascular disease*" OR predictor* OR determinant* OR "risk factor*" OR metabolic	1644 -1096 duplicates =548 unique items	647 -448 duplicates =199 unique items	2585 -1979 duplicates =606 unique items
Africa Wide Information	("novel coronavirus*" OR "novel corona virus*" OR "2019 coronavirus" OR betacoronavirus* OR covid19 OR "covid 19" OR nCoV OR "novel CoV" OR "CoV 2" OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV OR "wuhan virus*") OR (((wuhan OR hubei OR huanan) AND ("severe acute respiratory" OR pneumonia*) AND outbreak*) AND PY 2020) OR ((coronavirus OR pandemic) AND PY 2020) AND	6 -1 duplicates =5 unique items	0	15 -3 duplicates =11 unique items

	Diabetes OR diabetic OR "blood glucose" OR "glyc?emic control" OR "glucose control" OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR "waist circumference" OR BMI OR "body mass index" OR hypertension OR hypertensive OR "high blood pressure" OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR "chronic disease*" OR "chronic illness*" OR "chronic condition*" OR "noncommunicable disease*" OR "cardiovascular disease*" OR predictor* OR determinant* OR "risk factor*" OR metabolic			
Scopus	TITLE-ABS("novel coronavir*" OR "novel corona virus*" OR "2019 coronavirus" OR betacoronavir* OR covid19 OR "covid 19" OR nCoV OR "CoV 2" OR cov2 OR sarscov2 OR sars-cov OR sarscov OR 2019ncov OR 2019-nCoV OR "novel CoV" OR "wuhan virus") AND TITLE-ABS(Diabetes OR diabetic OR "blood glucose" OR "glyc?emic control" OR "glucose control" OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR "waist circumference" OR BMI OR "body mass index" OR hypertension OR hypertensive OR "high blood pressure" OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR "chronic disease*" OR "chronic illness*" OR "chronic condition*" OR "noncommunicable disease*" OR "cardiovascular disease*" OR predictor* OR determinant* OR "risk factor*" OR metabolic)	4021 -3551 duplicates =470 unique items	94 -73 duplicates =21 unique items	1038 -702 duplicates =336 unique items
PMC	("novel coronavir*" [Title/Abstract] OR "novel corona virus*" [Title/Abstract] OR "2019 coronavirus" [Title/Abstract] OR "betacoronavir*" [Title/Abstract] OR "covid19" [Title/Abstract] OR "covid 19" [Title/Abstract] OR "nCoV" [Title/Abstract] OR "CoV 2" [Title/Abstract] OR "cov2" [Title/Abstract] OR "sarscov2" [Title/Abstract] OR "sars-cov" [Title/Abstract] OR "sarscov" [Title/Abstract] OR "2019ncov" [Title/Abstract] OR "2019-nCoV" [Title/Abstract] OR "novel CoV" [Title/Abstract] OR "wuhan virus" [All Fields]) AND Diabetes [Title/Abstract] OR diabetic [Title/Abstract] OR "blood glucose" [Title/Abstract] OR "glyc?emic control" [Title/Abstract] OR "glucose control" [Title/Abstract] OR hyperglyc?emia [Title/Abstract] OR hypoglyc?emia [Title/Abstract] OR obesity [Title/Abstract] OR obese [Title/Abstract] OR overweight [Title/Abstract] OR adipos* [Title/Abstract] OR "waist circumference" [Title/Abstract] OR BMI [Title/Abstract] OR "body mass index" [Title/Abstract] OR hypertension [Title/Abstract] OR hypertensive [Title/Abstract] OR "high blood pressure" [Title/Abstract] OR comorbid* [Title/Abstract] OR co-morbid* [Title/Abstract] OR pre-existing [Title/Abstract] OR preexisting [Title/Abstract] OR underlying [Title/Abstract] OR "chronic disease*" [Title/Abstract] OR "chronic illness*" [Title/Abstract] OR "chronic condition*" [Title/Abstract] OR "noncommunicable disease*" [Title/Abstract] OR "cardiovascular disease*" [Title/Abstract] OR predictor* [Title/Abstract] OR determinant* [Title/Abstract] OR "risk factor*" [Title/Abstract] OR metabolic [Title/Abstract]	918 -676 duplicates =242 unique items	243 -172 duplicates =71 unique items	791 -727 duplicates =64 unique items
ProQuest Central	TI,AB("novel coronavir*" OR "novel corona virus*" OR "2019 coronavirus" OR betacoronavir* OR covid19 OR "covid 19" OR nCoV OR "novel CoV" OR "CoV 2" OR CoV2 OR sarscov2 OR sars-cov OR sarscov OR 2019nCoV OR 2019-nCoV) AND TI,AB(Diabetes OR diabetic OR "blood glucose" OR "glyc?emic control" OR "glucose control" OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR "waist circumference" OR BMI OR "body mass index" OR hypertension OR hypertensive OR "high blood pressure" OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR "chronic disease*" OR "chronic illness*" OR "chronic condition*" OR "noncommunicable disease*" OR "cardiovascular disease*" OR predictor* OR determinant* OR "risk factor*" OR metabolic)	1238 -844 duplicates =394 unique items	483 -339 duplicates =144 unique items	1256 -760 duplicates =496 unique items
SBT COVID-19 Library This library covers (PrePrints - Medrxiv, BIORxiv, Chemrxiv, SSRN, Scielo -, WHO COVID-19 database, Homeland	Diabetes OR diabetic OR "blood glucose" OR "glyc?emic control" OR "glucose control" OR hyperglyc?emia OR hypoglyc?emia OR obesity OR obese OR overweight OR adipos* OR "waist circumference" OR BMI OR "body mass index" OR hypertension OR hypertensive OR "high blood pressure" OR comorbid* OR co-morbid* OR pre-existing OR preexisting OR underlying OR "chronic disease*" OR "chronic illness*" OR "chronic condition*" OR "noncommunicable disease*" OR "cardiovascular disease*" OR predictor* OR determinant* OR "risk factor*" OR metabolic	Preprints = 1602 WHO = 913 HLSC = 25 SciFinder = 82	Preprints = 26 WHO = 0 HLSC = 0 SciFinder = 0 Clinicaltrials = 384	No longer being updated

Security COVID-19 collection, SciFinder, Clinicaltrials)		Clinicaltrials = 326		
Total		13646	3467	18443

Notes: Duplicates were identified using the Endnote automated "find duplicates" function with preference set to match on title, author, and year, and removed from your Endnote library. There will likely be additional duplicates found that Endnote was unable to detect.

Total records before removing duplicates = 35,556; total records after removing duplicates via Endnote 20 = 34,830; total records after further removing duplicates via Covidence = 30,586.

Supplementary Text 2

Adapted Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses

A. CASE-CONTROL STUDIES

Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Exposure components. A maximum of two stars can be given for the Comparability component.

Selection (Maximum 4 stars)

- 1) Is the case definition adequate?
 - a) yes, with independent validation*
 - b) yes, e.g., record linkage or based on self-reports
 - c) no description
- 2) Representativeness of the cases
 - a) consecutive or obviously representative series of cases*
 - b) potential for selection biases or not stated
- 3) Selection of Controls
 - a) community controls*
 - b) hospital controls
 - c) no description
- 4) Definition of Controls
 - a) no history of disease (endpoint)*
 - b) no description of source

Comparability (Maximum 2 stars)

- 1) Comparability of cases and controls on the basis of the design or analysis
 - a) study controls for age (the most important factor)*
 - b) study controls for age plus any additional factor** (This criterion could be modified to indicate specific control for a second important factor)
 - c) study does not control for any confounders or no information provided

Exposure (Maximum 3 stars)

- 1) Ascertainment of exposure
 - a) secure record (e.g., surgical records)*
 - b) structured interview where blind to case/control status*
 - c) interview not blinded to case/control status
 - d) written self-report or medical record only
 - e) no description
- 2) Same method of ascertainment for cases and controls
 - a) Yes*
 - b) no
- 3) Non-Response rate
 - a) same rate for both groups*

- b) non respondents described
- c) rate different and no designation

B. COHORT STUDIES

Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Outcome components. A maximum of two stars can be given for the Comparability component.

Selection (Maximum 4 stars)

- 1) Representativeness of the exposed cohort
 - a) truly representative of the average (describe) in the community*
 - b) somewhat representative of the average _____ in the community*
 - c) selected group of users (e.g., nurses, volunteers)
 - d) no description of the derivation of the cohort
- 2) Selection of the non-exposed cohort
 - a) drawn from the same community as the exposed cohort*
 - b) drawn from a different source
 - c) no description of the derivation of the non-exposed cohort
- 3) Ascertainment of exposure
 - a) secure record (e.g., surgical records)*
 - b) structured interview*
 - c) written self-report
 - d) no description
- 4) Demonstration that outcome of interest was not present at start of study
 - a) Yes*
 - b) no

Comparability (Maximum 2 stars)

- 1) Comparability of cohorts on the basis of the design or analysis
 - a) study controls for _____ (select the most important factor)*
 - b) study controls for the most important factor plus any additional factor** (This criterion could be modified to indicate specific control for a second important factor)
 - c) study does not adjust for any relevant confounders/risk factors or no information provided

Outcome (Maximum 3 stars)

- 1) Assessment of outcome
 - a) independent blind assessment*
 - b) record linkage*
 - c) self-report
 - d) no description
- 2) Was follow-up long enough for outcomes to occur
 - a) yes (select an adequate follow up period for outcome of interest)*
 - b) no
- 3) Adequacy of follow up of cohorts
 - a) complete follow up - all subjects accounted for*

- b) subjects lost to follow up unlikely to introduce bias - small number lost - > ____ % (select an adequate %) follow up, or description provided of those lost)*
- c) follow up rate < ____% (select an adequate %) and no description of those lost
- d) no statement

C. CROSS-SECTIONAL STUDIES

Note: This scale has been adapted from the Newcastle-Ottawa Quality Assessment Scale for case-control studies and cohort studies to provide quality assessment of cross-sectional studies. A study can be awarded a maximum of one star for each numbered item within the Selection component. A maximum of two stars can be given for the Comparability and Outcome components.

Selection (Maximum 4 stars)

- 1) Representativeness of the sample
 - a) truly representative of the average in the target population* (all subjects or random sampling)
 - b) somewhat representative of the average in the target group* (non-random sampling)
 - c) selected group of users/convenience sample.
 - d) no description of the derivation of the included subjects
- 2) Sample size
 - a) justified and satisfactory (including sample size calculation)*
 - b) not justified
 - c) no information provided
- 3) Ascertainment of the exposure (risk factor)
 - a) Secure record (e.g., surgical record)*
 - b) structured interview*
 - c) written self-report
 - d) no description
- 4) Non-respondents
 - a) proportion of target sample recruited attains pre-specified target or basic summary of non-respondent characteristics in sampling frame recorded*
 - b) unsatisfactory recruitment rate, no summary data on non-respondents
 - c) no description of the response rate or the characteristics of the responders and the non-responders

Comparability (Maximum 2 stars)

- 1) Comparability of cohorts on the basis of the design or analysis
 - a) study controls for _____ (select the most important factor)*
 - b) study controls for the most important factor plus any additional factor** (This criterion could be modified to indicate specific control for a second important factor)
 - c) study does not adjust for any relevant confounders/risk factors or no information provided

Outcome (Maximum 3 stars)

- 1) Assessment of outcome

- a) independent blind assessment**
 - b) record linkage*
 - c) self-report
 - d) no description
- 2) Statistical test
- a) statistical test used to analyse the data clearly described, appropriate and measures of association presented including confidence intervals and probability level (p-value)*
 - b) statistical test is not appropriate, not described, or incomplete

Total NOS scores: 8-9 stars: high quality or low risk of bias
5-7 stars: moderate quality or moderate risk of bias
<5 stars: low quality or high risk of bias.

Supplementary Figures

Fig. S1.1 – Forest Plots for the Association of Diabetes with COVID-19 Mortality

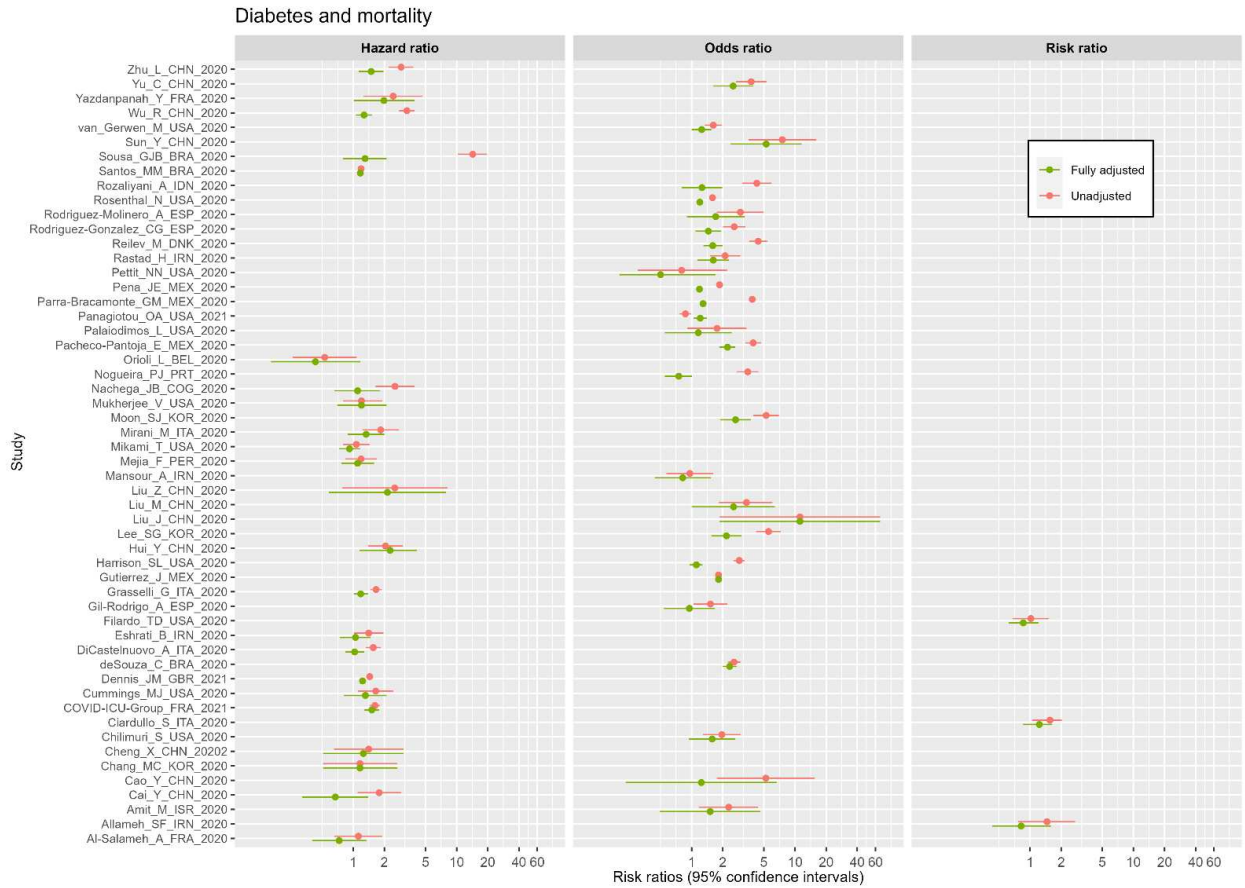


Fig. S1.2 – Forest Plots for the Association of Hypertension with COVID-19 Mortality

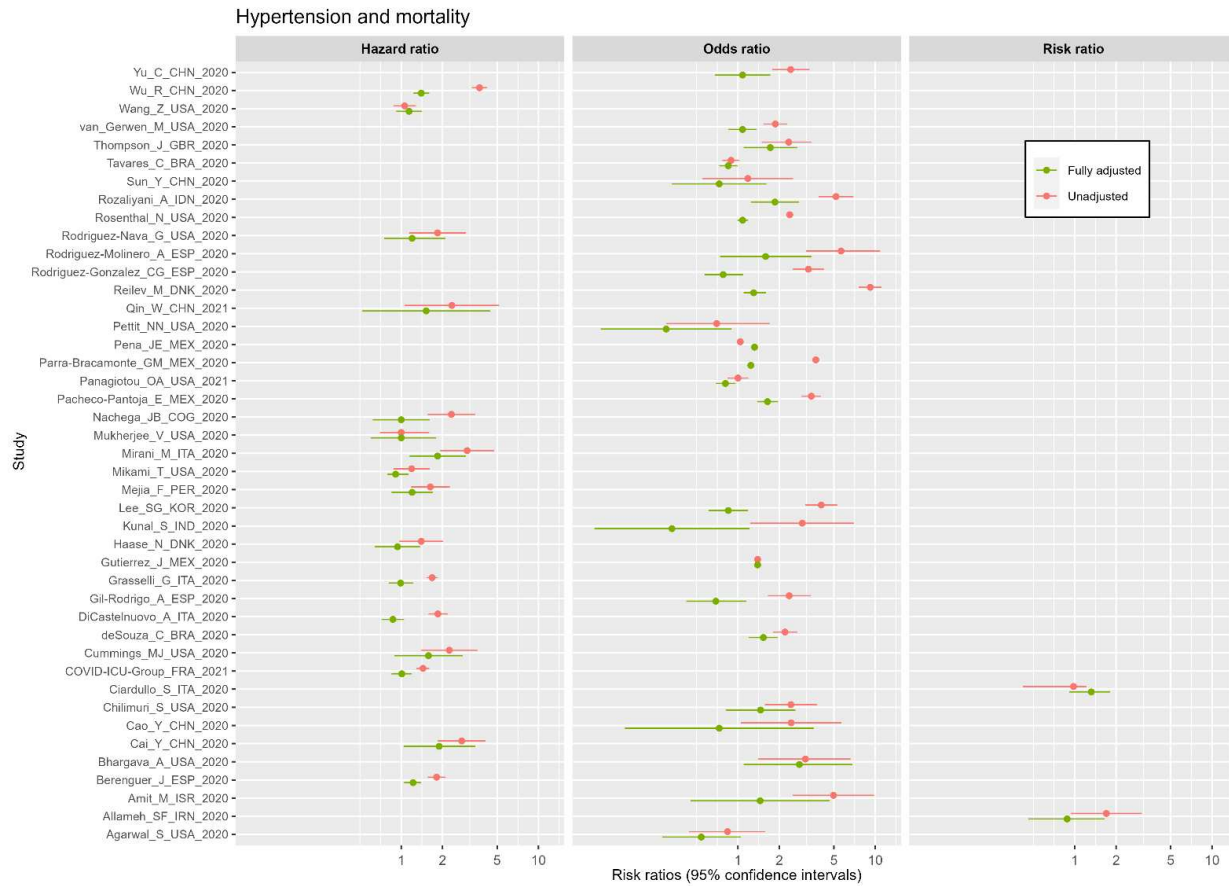


Fig. S1.3 – Forest Plots for the Association of Obesity with COVID-19 Mortality

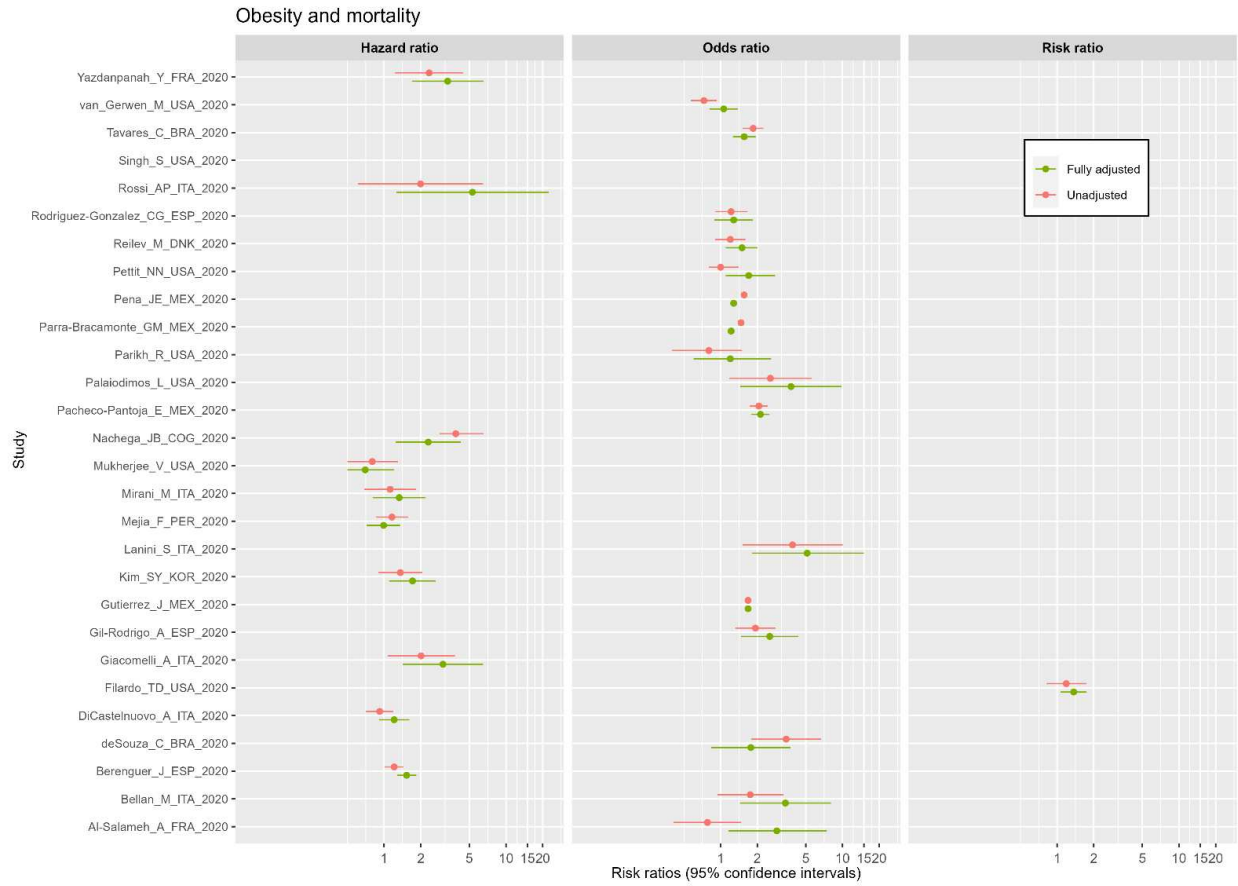


Fig. S2.1 – Influence Plot for the Association of Diabetes with COVID-19 Mortality

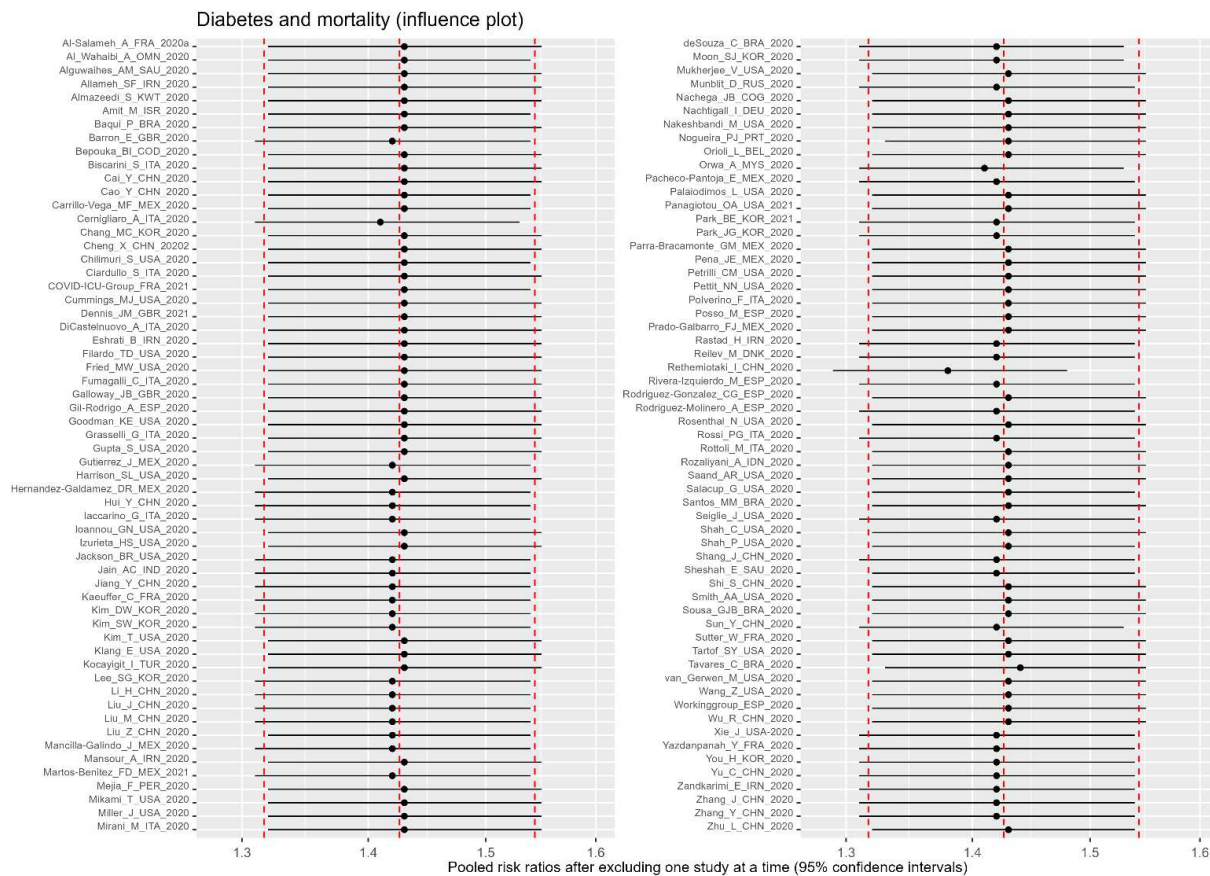


Fig. S2.2 – Influence Plot for the Association of Hypertension with COVID-19 Mortality

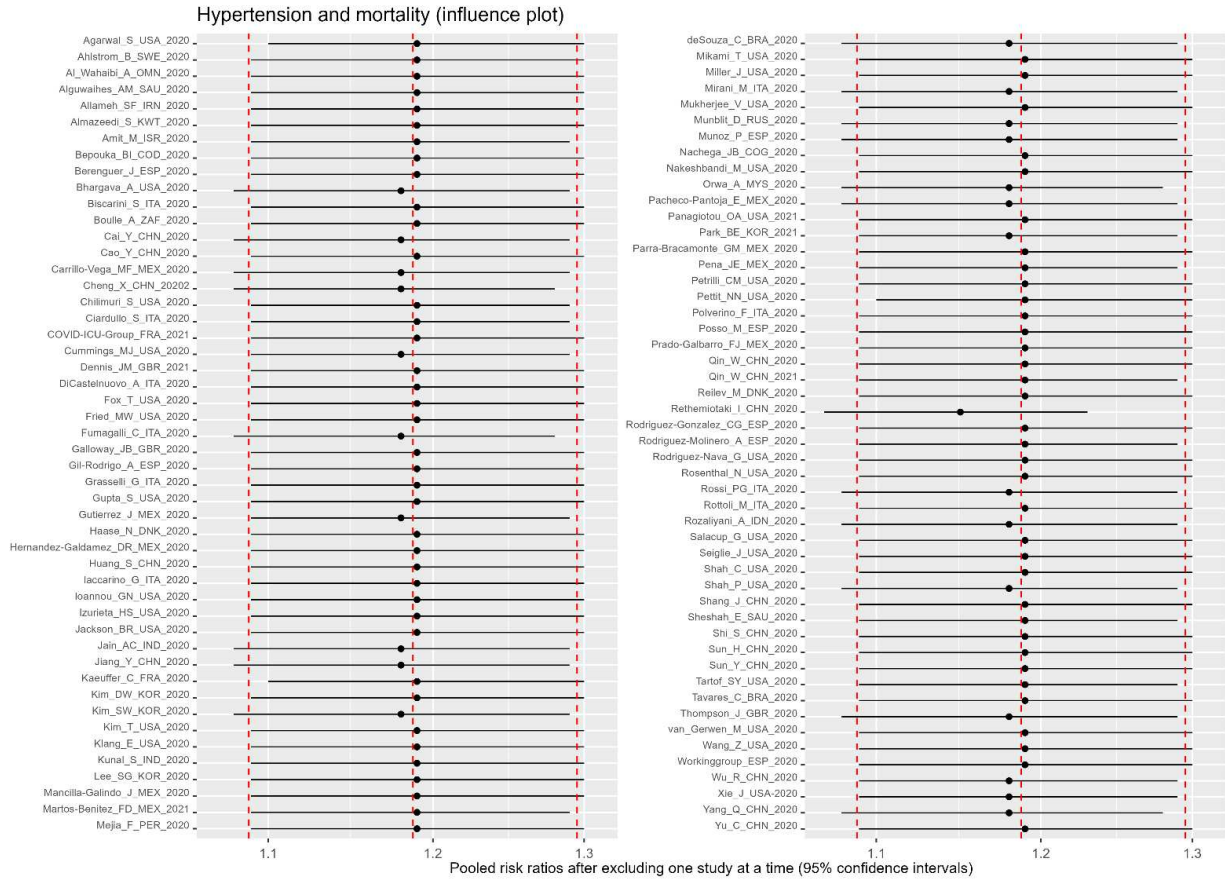
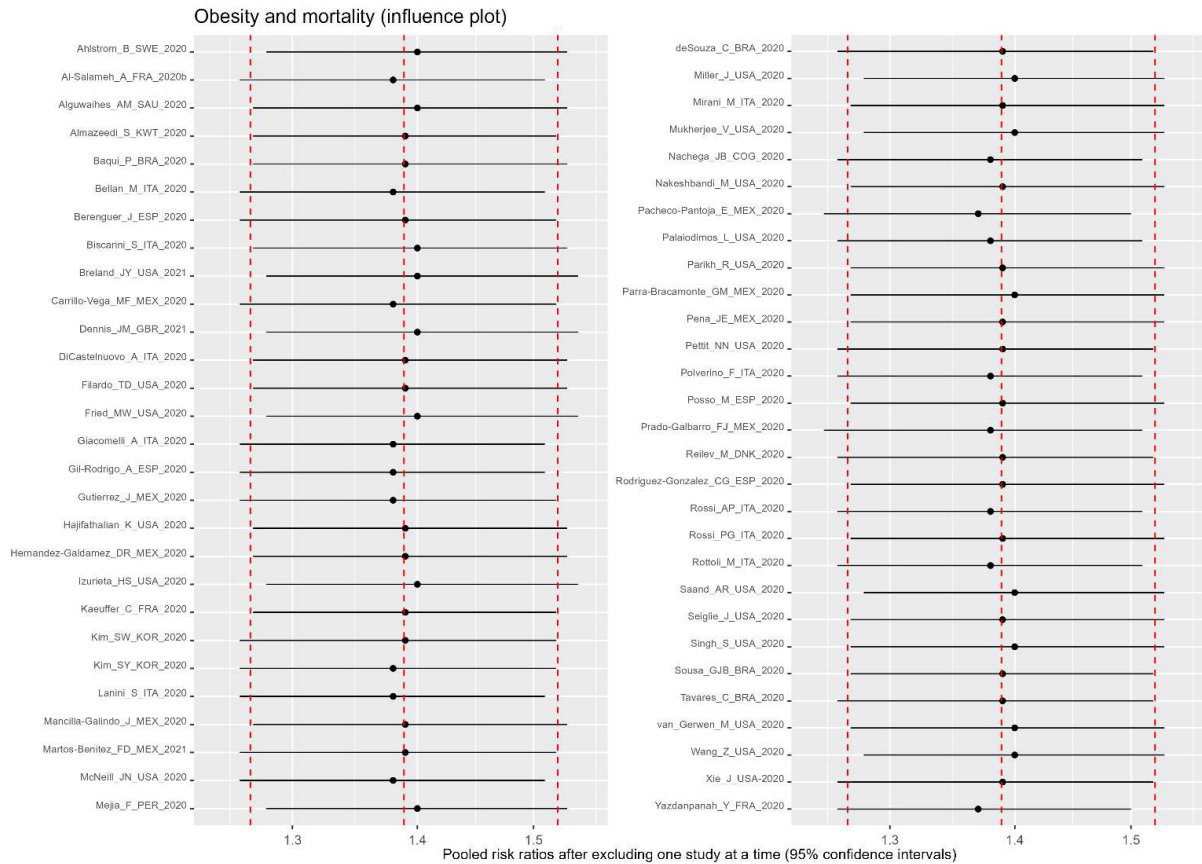


Fig. S2.3 – Influence Plot for the Association of Obesity with COVID-19 Mortality



Supplementary Tables

Table S1 – Overall Pooled Effect Estimates for the Association of Diabetes, Hypertension, and Obesity with COVID-19 Mortality

Exposure	Effect Estimate	N	PRR* (95% CI)	τ^2 (95% CI)	I^2 (95% CI)
Diabetes	Unadjusted	54	2.13 (1.80, 2.52)	0.31 (0.21, 0.53)	0.99 (0.99, 0.99)
Diabetes	Adjusted (overall)	118	1.43 (1.32, 1.54)	0.12 (0.10, 0.21)	0.94 (0.93, 0.95)
Diabetes	Adjusted (OR)	63	1.59 (1.40, 1.81)	0.17 (0.12, 0.34)	0.96 (0.95, 0.96)
Diabetes	Adjusted (HR/RR)	55	1.24 (1.15, 1.32)	0.02 (0.01, 0.11)	0.79 (0.73, 0.84)
Hypertension	Unadjusted	43	2.07 (1.74, 2.47)	0.28 (0.18, 0.47)	0.99 (0.99, 0.99)
Hypertension	Adjusted (overall)	99	1.19 (1.09, 1.30)	0.12 (0.09, 0.21)	0.91 (0.89, 0.92)
Hypertension	Adjusted (OR)	60	1.19 (1.04, 1.35)	0.17 (0.11, 0.33)	0.91 (0.89, 0.92)
Hypertension	Adjusted (HR/RR)	39	1.18 (1.06, 1.30)	0.06 (0.03, 0.16)	0.91 (0.89, 0.93)
Obesity	Unadjusted	28	1.45 (1.22, 1.71)	0.12 (0.07, 0.32)	0.85 (0.80, 0.89)
Obesity	Adjusted (overall)	57	1.39 (1.27, 1.52)	0.06 (0.04, 0.18)	0.96 (0.96, 0.97)
Obesity	Adjusted (OR)	30	1.46 (1.29, 1.65)	0.06 (0.03, 0.24)	0.98 (0.97, 0.98)
Obesity	Adjusted (HR/RR)	27	1.31 (1.14, 1.51)	0.06 (0.03, 0.24)	0.77 (0.66, 0.84)

Note: * PRR = pooled risk ratio. τ^2 = a measure of between-study variance; I^2 = a statistic of the proportion of total variability explained by between-study variance. Estimates are from random-effects meta-analysis using restricted maximum likelihood method and Hartung-Knapp-Sidik-Jonkman adjusting for the standard errors.

HR = hazard ratio; OR = odds ratio; RR = relative risk.

Table S2.1 – Pooled Effect Estimates for the Association between Diabetes and COVID-19 Mortality by Subgroups

Study- or Country-Level Variable	Subgroups	N	PRR* (95% CI)	τ^2 (95% CI)	I^2 (95% CI)
Type of risk ratio	OR	63	1.59 (1.40, 1.81)	0.17 (0.12, 0.34)	0.96 (0.95, 0.96)
	HR	48	1.26 (1.17, 1.36)	0.02 (0.01, 0.13)	0.73 (0.64, 0.79)
	RR	7	1.08 (0.94, 1.24)	0.01 (0.00, 0.15)	0.36 (0.00, 0.73)
Study period	May 2020 - November 2020	48	1.38 (1.26, 1.51)	0.07 (0.05, 0.15)	0.97 (0.96, 0.97)
	December 2019 - April 2020	70	1.48 (1.31, 1.68)	0.17 (0.12, 0.35)	0.82 (0.78, 0.86)
Study design	Cohort	90	1.37 (1.28, 1.46)	0.05 (0.04, 0.13)	0.79 (0.75, 0.83)
	Other	28	1.53 (1.20, 1.96)	0.31 (0.20, 0.76)	0.98 (0.97, 0.98)
Study quality	Low	8	1.56 (0.70, 3.49)	0.71 (0.26, 4.23)	0.87 (0.76, 0.93)
	Medium	54	1.50 (1.32, 1.70)	0.16 (0.11, 0.31)	0.96 (0.96, 0.97)
	High	56	1.30 (1.21, 1.40)	0.02 (0.01, 0.11)	0.79 (0.73, 0.84)
WHO region	EMR	9	1.31 (0.99, 1.72)	0.05 (0.00, 0.35)	0.38 (0.00, 0.72)
	EUR	32	1.35 (1.19, 1.53)	0.07 (0.04, 0.21)	0.93 (0.91, 0.94)
	AMR	46	1.27 (1.17, 1.37)	0.05 (0.03, 0.08)	0.95 (0.95, 0.96)
	AFR/SEAR	4	1.32 (0.81, 2.15)	0.00 (0.00, 2.11)	0.06 (0.00, 0.86)
	WPR	26	2.26 (1.76, 2.89)	0.24 (0.10, 0.57)	0.85 (0.80, 0.89)
	WPR -China	18	2.42 (1.64, 3.56)	0.41 (0.15, 1.05)	0.90 (0.85, 0.93)
WB income level	-South Korea	8	2.15 (1.79, 2.60)	0.00 (0.00, 0.15)	0.00 (0.00, 0.68)
	High	72	1.30 (1.21, 1.40)	0.05 (0.03, 0.11)	0.93 (0.92, 0.94)
	Upper middle	41	1.65 (1.38, 1.97)	0.22 (0.14, 0.49)	0.95 (0.94, 0.96)
Health index score tertile	Lower middle	3	1.44 (0.47, 4.38)	0.07 (0.00, 8.80)	0.36 (0.00, 0.79)
	1 st	39	1.29 (1.18, 1.41)	0.06 (0.03, 0.11)	0.96 (0.95, 0.97)
	2 nd	39	1.28 (1.17, 1.42)	0.04 (0.02, 0.12)	0.93 (0.91, 0.94)
GHSI score tertile	3 rd	38	1.87 (1.55, 2.27)	0.24 (0.13, 0.47)	0.86 (0.82, 0.89)
	1 st	39	1.66 (1.35, 2.04)	0.27 (0.15, 0.54)	0.89 (0.86, 0.92)
	2 nd	39	1.44 (1.29, 1.60)	0.07 (0.04, 0.18)	0.93 (0.91, 0.94)
	3 rd	38	1.24 (1.15, 1.35)	0.03 (0.02, 0.08)	0.96 (0.95, 0.97)

Note: * PRR = pooled risk ratio. τ^2 = a measure of between-study variance; I^2 = a statistic of the proportion of total variability explained by between-study variance. Estimates are from random-effects meta-analysis using restricted maximum likelihood method and Hartung-Knapp-Sidik-Jonkman adjusting for the standard errors.

HR = hazard ratio; OR = odds ratio; RR = relative risk; GHSI = Global Health Security Index.

Table S2.2 – Pooled Effect Estimates for the Association between Hypertension and COVID-19 Mortality by Subgroups

Study- or Country-Level Variable	Subgroups	N	PRR* (95% CI)	τ^2 (95% CI)	I^2 (95% CI)
Type of risk ratio	OR	60	1.19 (1.04, 1.35)	0.17 (0.11, 0.33)	0.91 (0.89, 0.92)
	HR	35	1.19 (1.06, 1.33)	0.06 (0.03, 0.18)	0.92 (0.89, 0.93)
	RR	4	1.06 (0.65, 1.73)	0.06 (0.00, 1.00)	0.67 (0.03, 0.89)
Study period	May 2020 - November 2020	46	1.12 (1.04, 1.21)	0.03 (0.02, 0.13)	0.86 (0.82, 0.89)
	December 2019 - April 2020	53	1.24 (1.07, 1.44)	0.21 (0.13, 0.36)	0.93 (0.91, 0.94)
Study design	Cohort	78	1.17 (1.07, 1.27)	0.07 (0.05, 0.18)	0.87 (0.84, 0.89)
	Other	21	1.22 (0.95, 1.56)	0.25 (0.13, 0.58)	0.96 (0.95, 0.97)
Study quality	Low	8	1.07 (0.60, 1.91)	0.29 (0.07, 2.25)	0.71 (0.40, 0.86)
	Medium	40	1.30 (1.10, 1.53)	0.20 (0.13, 0.40)	0.95 (0.94, 0.96)
	High	51	1.09 (1.01, 1.18)	0.02 (0.01, 0.10)	0.62 (0.49, 0.72)
WHO region	AMR	41	1.11 (1.02, 1.21)	0.04 (0.02, 0.13)	0.89 (0.85, 0.91)
	EUR	27	1.13 (0.99, 1.30)	0.07 (0.04, 0.21)	0.94 (0.92, 0.95)
	EMR	5	0.92 (0.58, 1.47)	0.00 (0.00, 0.54)	0.00 (0.00, 0.79)
	AFR/SEAR	6	1.20 (0.74, 1.92)	0.07 (0.00, 2.28)	0.59 (0.00, 0.83)
	WPR	19	1.52 (1.08, 2.15)	0.39 (0.17, 0.90)	0.92 (0.88, 0.94)
	WPR -China	15	1.57 (1.01, 2.45)	0.49 (0.20, 1.27)	0.93 (0.89, 0.95)
WB income level	-South Korea	4	1.30 (0.71, 2.37)	0.09 (0.00, 1.99)	0.64 (0.00, 0.88)
	High	62	1.07 (0.99, 1.16)	0.05 (0.03, 0.14)	0.90 (0.88, 0.92)
	Upper middle	31	1.42 (1.17, 1.71)	0.20 (0.11, 0.42)	0.91 (0.88, 0.93)
Health index score tertile	Lower middle	4	1.06 (0.43, 2.60)	0.05 (0.00, 7.90)	0.47 (0.00, 0.82)
	1 st	33	1.16 (1.05, 1.28)	0.04 (0.03, 0.15)	0.89 (0.86, 0.92)
	2 nd	32	1.02 (0.92, 1.13)	0.02 (0.01, 0.22)	0.60 (0.40, 0.73)
GHSI score tertile	3 rd	32	1.38 (1.12, 1.69)	0.24 (0.13, 0.46)	0.92 (0.89, 0.94)
	1 st	33	1.29 (1.03, 1.61)	0.28 (0.14, 0.52)	0.90 (0.87, 0.92)
	2 nd	32	1.22 (1.10, 1.36)	0.05 (0.03, 0.16)	0.92 (0.90, 0.94)
	3 rd	32	1.01 (0.93, 1.10)	0.02 (0.01, 0.19)	0.62 (0.44, 0.74)

Note: * PRR = pooled risk ratio. τ^2 = a measure of between-study variance; I^2 = a statistic of the proportion of total variability explained by between-study variance. Estimates are from random-effects meta-analysis using restricted maximum likelihood method and Hartung-Knapp-Sidik-Jonkman adjusting for the standard errors.

HR = hazard ratio; OR = odds ratio; RR = relative risk; GHSI = Global Health Security Index.

Table S2.3 – Pooled Effect Estimates for the Association between Obesity and COVID-19 Mortality by Subgroups

Study- or Country-Level Variable	Subgroups	N	PRR* (95% CI)	τ^2 (95% CI)	I^2 (95% CI)
Type of risk ratio	HR	23	1.34 (1.13, 1.59)	0.09 (0.04, 0.33)	0.80 (0.71, 0.86)
	OR	30	1.46 (1.29, 1.65)	0.06 (0.03, 0.24)	0.98 (0.97, 0.98)
	RR	4	1.23 (1.03, 1.48)	0.00 (0.00, 0.07)	0.00 (0.00, 0.85)
Study period	May 2020 - November 2020	26	1.25 (1.14, 1.37)	0.03 (0.01, 0.11)	0.98 (0.98, 0.98)
	December 2019 - April 2020	31	1.61 (1.38, 1.87)	0.08 (0.04, 0.31)	0.72 (0.60, 0.80)
Study design	Cohort	44	1.43 (1.27, 1.62)	0.08 (0.05, 0.26)	0.91 (0.89, 0.93)
	Other	13	1.34 (1.18, 1.51)	0.03 (0.01, 0.12)	0.95 (0.93, 0.97)
Study quality	High	28	1.46 (1.21, 1.77)	0.12 (0.07, 0.51)	0.78 (0.69, 0.85)
	Medium	27	1.36 (1.24, 1.50)	0.04 (0.02, 0.08)	0.98 (0.98, 0.98)
	Low	2	-	-	-
WHO region	EUR	20	1.63 (1.32, 2.01)	0.10 (0.04, 0.44)	0.75 (0.61, 0.84)
	EMR	2	-	-	-
	AMR	32	1.31 (1.19, 1.45)	0.05 (0.03, 0.12)	0.98 (0.97, 0.98)
	WPR	2	-	-	-
	AFR/SEAR	1	-	-	-
	WPR	China	0	-	-
WB income group	South Korea	2	-	-	-
	High	42	1.34 (1.18, 1.52)	0.07 (0.05, 0.28)	0.75 (0.66, 0.81)
	Upper middle	14	1.49 (1.33, 1.67)	0.03 (0.01, 0.09)	0.94 (0.91, 0.96)
Health index score tertile	Lower middle	1	-	-	-
	1 st	19	1.42 (1.27, 1.58)	0.04 (0.02, 0.09)	0.99 (0.98, 0.99)
	2 nd	19	1.17 (0.99, 1.38)	0.04 (0.02, 0.41)	0.64 (0.41, 0.78)
	3 rd	19	1.67 (1.36, 2.06)	0.07 (0.02, 0.41)	0.53 (0.20, 0.72)
GHSI score tertile	1 st	19	1.55 (1.26, 1.92)	0.06 (0.02, 0.60)	0.58 (0.31, 0.75)
	2 nd	19	1.54 (1.38, 1.72)	0.03 (0.01, 0.14)	0.91 (0.88, 0.94)
	3 rd	19	1.09 (1.01, 1.17)	0.00 (0.00, 0.19)	0.63 (0.40, 0.78)

Note: * PRR = pooled risk ratio. τ^2 = a measure of between-study variance; I^2 = a statistic of the proportion of total variability explained by between-study variance. Estimates are from random-effects meta-analysis using restricted maximum likelihood method and Hartung-Knapp-Sidik-Jonkman adjusting for the standard errors.

HR = hazard ratio; OR = odds ratio; RR = relative risk; GHSI = Global Health Security Index.

Table S3 – Characteristics of Studies Included in the Meta-Analysis on the Associations of Diabetes, Hypertension, and Obesity with COVID-19 Mortality, December 2019 – December, 2020 (n=145)

Study ID	Country	WHO region	WB income level	Health index score	GHSI score	Start date	End date	Data source	Study design	Exposure			Sample size	Mean age, y	Men, %	Effect estimate type	Funding source	NOS score
										DM	HTN	OB						
										Agarwal_S_USA_2020 ¹	USA	AMR						
Ahlstrom_B_SWE_2020 ²	Sweden	EUR	HI	82.1	66.4	1/31/2020	5/27/2020	ARS	Cohort	No	Yes	Yes	9,905	61.0	74.0	HR	Independent	9
Al_Wahaibi_A_OMN_2020 ³	Oman	EMR	HI	75.2	40.9	2/24/2020	7/19/2020	ARS	C-S	Yes	Yes	No	68,967	40.0	74.9	OR	None or NA	4
Alguwaihes_AM_SAU_2020 ⁴	Saudi Arabia	EMR	HI	74.5	45.0	5/15/2020	7/15/2020	EHR	C-S	Yes	Yes	Yes	439	55.0	68.3	HR	Independent	7
Allameh_SF_IRN_2020 ⁵	Iran	EMR	UMI	74.8	39.5	2/20/2020	3/19/2020	EHR	Cohort	Yes	Yes	No	396	56.9	61.8	RR	Not reported	8
Almazeedi_S_KWT_2020 ⁶	Kuwait	EMR	HI	76.9	40.1	2/24/2020	4/20/2020	EHR	Cohort	Yes	Yes	Yes	1,096	41.0	81.0	OR	Independent	9
Al-Salameh_A_FRA_2020a ⁷	France	EUR	HI	80.5	62.6	10/1/2020	4/21/2020	EHR	Cohort	Yes	No	No	432	73.0	55.1	HR	None or NA	9
Al-Salameh_A_FRA_2020b ⁸	France	EUR	HI	80.5	62.6	1/24/2020	5/1/2020	EHR	Cohort	No	No	Yes	329	81.0	59.6	OR	Not reported	9
Amit_M_ISR_2020 ⁹	Israel	EUR	HI	82.8	50.7	3/5/2020	4/27/2020	EHR	Cohort	Yes	Yes	No	156	72.0	69.0	OR	None or NA	9
Baqui_P_BRA_2020 ¹⁰	Brazil	AMR	UMI	72.0	51.0	2/27/2020	5/4/2020	ARS	C-S	Yes	No	Yes	7,371	55.2	45.5	HR	None or NA	8
Barron_E_GBR_2020 ¹¹	UK	EUR	HI	78.8	68.3	3/1/2020	5/11/2020	ARS	C-S	Yes	No	No	61,414,470*	40.9	49.9	OR	None or NA	8
Bellan_M_ITA_2020 ¹²	Italy	EUR	HI	81.1	51.9	3/1/2020	4/28/2020	EHR	Cohort	No	No	Yes	407	71.0	59.0	OR	None or NA	9
Bepouka_BI_COD_2020 ¹³	D.R. Congo	AFR	LMI	48.6	26.0	3/23/2020	6/15/2020	EHR	Cohort	Yes	Yes	No	141	49.6	67.4	HR	Not reported	9
Berenguer_J_ESP_2020 ¹⁴	Spain	EUR	HI	80.5	60.4	1/31/2020	3/17/2020	EHR	Cohort	No	Yes	Yes	4,035	70.0	61.0	HR	Independent	9
Bhargava_A_USA_2020 ¹⁵	USA	AMR	HI	73.9	76.2	3/8/2020	6/14/2020	EHR	Cohort	No	Yes	No	265	50.4	52.8	OR	None or NA	4
Biscarini_S_ITA_2020 ¹⁶	Italy	EUR	HI	81.1	51.9	2/21/2020	3/31/2020	ARS	Cohort	Yes	Yes	Yes	427	67.0	68.1	HR	Independent	9
Boulle_A_ZAF_2020 ¹⁷	South Africa	AFR	UMI	56.6	47.5	3/1/2020	6/9/2020	ARS	Cohort	No	Yes	No	2,978	53.4	37.9	HR	Independent	9
Breland_JY_USA_2021 ¹⁸	USA	AMR	HI	73.9	76.2	3/2/2020	5/20/2020	EHR	Cohort	No	No	Yes	9,347	65.0	91.0	OR	Independent	8
Cai_Y_CHN_2020 ¹⁹	China	WPR	UMI	82.8	49.0	1/20/2020	3/3/2020	EHR	Cohort	Yes	Yes	No	941	57.0	48.0	HR	Independent	9
Cao_Y_CHN_2020 ²⁰	China	WPR	UMI	82.8	49.0	1/5/2020	2/22/2020	EHR	C-S	Yes	Yes	No	101	56.6	66.3	OR	Independent	8
Carrillo-Vega_MF_MEX_2020 ²¹	Mexico	AMR	UMI	72.1	55.1	2/28/2020	4/23/2020	ARS	C-S	Yes	Yes	Yes	9,946	48.2	57.8	OR	Independent	7
Cernigliaro_A_ITA_2020 ²²	Italy	EUR	HI	81.1	51.9	1/3/2020	6/26/2020	ARS	C-S	Yes	No	No	2,847	50.0	49.5	OR	Not reported	5
Chang_MC_KOR_2020 ²³	South Korea	WPR	HI	84.1	65.9	2/1/2020	4/10/2020	EHR	Cohort	Yes	No	No	106	67.6	50.1	HR	Independent	9
Cheng_X_CHN_2020 ²⁴	China	WPR	UMI	82.8	49.0	1/11/2020	2/20/2020	ARS	Cohort	Yes	Yes	No	220	59.5	48.2	HR	Independent	8
Chilimuri_S_USA_2020 ²⁵	USA	AMR	HI	73.9	76.2	3/9/2020	4/9/2020	EHR	Cohort	Yes	Yes	No	375	63.0	63.0	OR	None or NA	9
Ciardullo_S_ITA_2020 ²⁶	Italy	EUR	HI	81.1	51.9	2/22/2020	5/15/2020	EHR	Cohort	Yes	Yes	No	373	72.0	65.4	RR	None or NA	9
COVID-ICU-Group_FRA_2021 ²⁷	France, Switzerland, and Belgium	EUR				2/25/2020	5/4/2020	EHR	Cohort	Yes	Yes	No	4,244	63.0	74.0	HR	Independent	9

Cummings_MJ_USA_2020 ²⁸	USA	AMR	HI	73.9	76.2	3/2/2020	4/1/2020	EHR	Cohort	Yes	Yes	No	257	62.0	67.0	HR	Independent	9
Dennis_JM_GBR_2021 ²⁹	UK	EUR	HI	78.8	68.3	3/1/2020	7/27/2020	ARS	Cohort	Yes	Yes	Yes	19,256	67.0	60.1	HR	Independent	9
deSouza_C_BRA_2020 ³⁰	Brazil	AMR	UMI	72.0	51.0	7/26/2020	8/1/2020	ARS	Cohort	Yes	Yes	Yes	9,807	70.2	47.5	OR	Not reported	8
DiCastellnuovo_A_ITA_2020 ³¹	Italy	EUR	HI	81.1	51.9	2/19/2020	5/23/2020	EHR	Cohort	Yes	Yes	Yes	3,894	67.0	61.7	HR	None or NA	9
Eshrati_B_IRN_2020 ³²	Iran	EMR	UM	74.8	39.5	2/22/2020	3/25/2020	ARS	Cohort	Yes	No	No	3,188	55.1	60.4	HR	Independent	9
Filardo_TD_USA_2020 ³³	USA	AMR	HI	73.9	76.2	3/9/2020	4/8/2020	EHR	Cohort	Yes	No	Yes	270	58.0	67.4	RR	None or NA	8
Fox_T_USA_2020 ³⁴	USA	AMR	HI	73.9	76.2	3/1/2020	4/24/2020	EHR	C-S	No	Yes	No	355	66.2	51.0	OR	None or NA	8
Fried_MW_USA_2020 ³⁵	USA	AMR	HI	73.9	76.2	2/15/2020	4/20/2020	ARS	C-S	Yes	Yes	Yes	11,721	65.0	53.4	OR	Industry	7
Fumagalli_C_ITA_2020 ³⁶	Italy	EUR	HI	81.1	51.9	2/22/2020	4/10/2020	EHR	Cohort	Yes	Yes	No	516	67.0	66.9	HR	None or NA	8
Galloway_JB_GBR_2020 ³⁷	UK	EUR	HI	78.8	68.3	3/1/2020	4/17/2020	EHR	Cohort	Yes	Yes	No	1,157	71.0	57.6	HR	None or NA	9
Giacomelli_A_ITA_2020 ³⁸	Italy	EUR	HI	81.1	51.9	2/21/2020	4/20/2020	EHR	Cohort	No	No	Yes	233	61.0	69.1	HR	None or NA	9
Gil-Rodrigo_A_ESP_2020 ³⁹	Spain	EUR	HI	80.5	60.4	3/1/2020	4/30/2020	EHR	Cohort	Yes	Yes	Yes	1,000	62.3	56.2	OR	None or NA	6
Goodman_KE_USA_2020 ⁴⁰	USA	AMR	HI	73.9	76.2	4/15/2020	6/15/2020	ARS	Cohort	Yes	No	No	66,646	62.8	52.9	RR	Independent	9
Grasselli_G_ITA_2020 ⁴¹	Italy	EUR	HI	81.1	51.9	2/20/2020	5/30/2020	EHR	Cohort	Yes	Yes	No	3,988	63.0	80.0	HR	Independent	9
Gupta_S_USA_2020 ⁴²	USA	AMR	HI	73.9	76.2	3/4/2020	4/4/2020	EHR	Cohort	Yes	Yes	No	2,215	60.5	64.8	OR	Independent	8
Gutierrez_J_MEX_2020 ⁴³	Mexico	AMR	UMI	72.1	55.1	2/28/2020	9/16/2020	ARS	C-S	Yes	Yes	Yes	654,858	46.1	52.2	OR	None or NA	8
Haase_N_DNK_2020 ⁴⁴	Denmark	EUR	HI	80.6	67.3	3/10/2020	6/16/2020	EHR	Cohort	No	Yes	No	323	68.0	74.0	HR	Industry	9
Hajifathalian_K_USA_2020 ⁴⁵	USA	AMR	HI	73.9	76.2	3/4/2020	4/9/2020	EHR	Cohort	No	No	Yes	770	63.5	60.8	RR	Not reported	9
Harrison_SL_USA_2020 ⁴⁶	USA	AMR	HI	73.9	76.2	1/20/2020	5/26/2020	EHR	Cohort	Yes	No	No	31,461	50.0	45.5	OR	Independent	8
Hernandez-Galdamez_DR_MEX_2020 ⁴⁷	Mexico	AMR	UMI	72.1	55.1	2/15/2020	6/27/2020	ARS	C-S	Yes	Yes	Yes	211,003	45.7	54.7	OR	Not reported	8
Huang_S_CHN_2020 ⁴⁸	China	WPR	UMI	82.8	49.0	12/30/2019	4/19/2020	EHR	Cohort	No	Yes	No	310	62.0	56.0	OR	Not reported	9
Hui_Y_CHN_2020 ⁴⁹	China	WPR	UMI	82.8	49.0	1/28/2020	3/10/2020	EHR	Cohort	Yes	No	No	167	65.0	65.3	HR	Independent	9
Iaccarino_G_ITA_2020 ⁵⁰	Italy	EUR	HI	81.1	51.9	3/9/2020	4/9/2020	ARS	C-S	Yes	Yes	No	1,591	66.5	64.0	OR	Independent	7
Ioannou_GN_USA_2020 ⁵¹	USA	AMR	HI	73.9	76.2	2/28/2020	5/14/2020	EHR	Cohort	Yes	Yes	No	10,131	63.6	91.0	HR	Independent	9
Izurieta_HS_USA_2020 ⁵²	USA	AMR	HI	73.9	76.2	4/1/2020	5/8/2020	ARS	C-S	Yes	Yes	Yes	25,333,329+	73.0	44.0	OR	Independent	8
Jackson_BR_USA_2020 ⁵³	USA	AMR	HI	73.9	76.2	3/1/2020	3/31/2020	EHR	Cohort	Yes	Yes	No	297	60.0	50.0	OR	Independent	9
Jain_AC_IND_2020 ⁵⁴	INDIA	SEAR	LMI	67.1	43.6	4/15/2020	6/15/2020	EHR	Cohort	Yes	Yes	No	425	49.0	73.4	OR	None or NA	7
Jiang_Y_CHN_2020 ⁵⁵	China	WPR	UMI	82.8	49.0	1/30/2020	4/10/2020	EHR	Cohort	Yes	Yes	No	281	70.0	50.9	OR	Independent	9
Kaeuffer_C_FRA_2020 ⁵⁶	France	EUR	HI	80.5	62.6	3/20/2020	3/20/2020	EHR	Cohort	Yes	Yes	Yes	1,045	66.0	59.0	OR	Independent	7
Kim_DW_KOR_2020 ⁵⁷	South Korea	WPR	HI	84.1	65.9	1/20/2020	3/26/2020	ARS	C-S	Yes	Yes	No	9,148	46.0	39.0	OR	Independent	7
Kim_SW_KOR_2020 ⁵⁸	South Korea	WPR	HI	84.1	65.9	2/18/2020	7/10/2020	EHR	Cohort	Yes	Yes	Yes	2,254	57.0	35.8	HR	Independent	8
Kim_SY_KOR_2020 ⁵⁹	South Korea	WPR	HI	84.1	65.9	1/20/2020	4/30/2020	ARS	Cohort	No	No	Yes	4,057	50.0	42.5	HR	Independent	8
Kim_T_USA_2020 ⁶⁰	USA	AMR	HI	73.9	76.2	3/1/2020	5/12/2020	EHR	Cohort	Yes	Yes	No	10,861	65.0	59.6	OR	Independent	9
Klang_E_USA_2020 ⁶¹	USA	AMR	HI	73.9	76.2	3/1/2020	5/17/2020	EHR	Cohort	Yes	Yes	No	572	60.0	69.4	OR	Not reported	9

Kocayigit_I_TUR_2020 ⁶²	Turkey	EUR	UMI	75.1	49.8	3/20/2020	4/10/2020	EHR	Cohort	Yes	No	No	169	65.8	46.7	OR	Not reported	7
Kunal_S_IND_2020 ⁶³	India	SEAR	LMI	67.1	43.6	1/30/2020	5/7/2020	EHR	Cohort	No	Yes	No	108	51.2	64.8	OR	None or NA	5
Lanini_S_ITA_2020 ⁶⁴	Italy	EUR	HI	81.1	51.9	1/29/2020	3/28/2020	EHR	Cohort	No	No	Yes	379	61.7	72.0	OR	Independent	9
Lee_SG_KOR_2020 ⁶⁵	South Korea	WPR	HI	84.1	65.9	3/26/2020	5/15/2020	ARS	C-S	Yes	Yes	No	7,339	47.1	40.1	OR	None or NA	7
Li_H_CHN_2020 ⁶⁶	China	WPR	UMI	82.8	49.0	1/22/2020	3/17/2020	EHR	Cohort	Yes	No	No	453	61.0	52.0	HR	Independent	8
Liu_J_CHN_2020 ⁶⁷	China	WPR	UMI	82.8	49.0	12/29/2019	2/28/2020	EHR	Cohort	Yes	No	No	1,190	57.0	53.4	OR	None or NA	7
Liu_M_CHN_2020 ⁶⁸	China	WPR	UMI	82.8	49.0	1/1/2020	3/4/2020	EHR	Cohort	Yes	No	No	665	58.0	47.8	OR	Independent	9
Liu_Z_CHN_2020 ⁶⁹	China	WPR	UMI	82.8	49.0	2/8/2020	4/15/2020	EHR	Cohort	Yes	No	No	934	62.0	48.6	HR	None or NA	9
Mancilla-Galindo_J_MEX_2020 ⁷⁰	Mexico	AMR	UMI	72.1	55.1	2/28/2020	5/30/2020	ARS	Cohort	Yes	Yes	Yes	83,779	46.3	56.6	HR	None or NA	9
Mansour_A_IRN_2020 ⁷¹	Iran	EMR	UMI	74.8	39.5	2/25/2020	4/21/2020	EHR	C-S	Yes	No	No	353	61.7	57.5	OR	None or NA	7
Martos-Benitez_FD_MEX_2021 ⁷²	Mexico	AMR	UMI	72.1	55.1	1/1/2020	5/13/2020	ARS	C-S	Yes	Yes	Yes	38,324	46.9	58.3	OR	None or NA	7
McNeill_JN_USA_2020 ⁷³	USA	AMR	HI	73.9	76.2	2/28/2020	4/27/2020	EHR	Cohort	No	No	Yes	781	61.0	58.0	OR	Independent	7
Mejia_F_PER_2020 ⁷⁴	Peru	AMR	UMI	76.4	53.8	3/29/2020	6/11/2020	OTH	Cohort	Yes	Yes	Yes	369	59.0	65.3	HR	None or NA	6
Mikami_T_USA_2020 ⁷⁵	USA	AMR	HI	73.9	76.2	3/12/2020	4/17/2020	EHR	Cohort	Yes	Yes	No	3,708	66.0	57.0	HR	Not reported	6
Miller_J_USA_2020 ⁷⁶	USA	AMR	HI	73.9	76.2	3/7/2020	4/30/2020	EHR	Cohort	Yes	Yes	Yes	2,316	64.5	51.8	OR	Independent	7
Mirani_M_ITA_2020 ⁷⁷	Italy	EUR	HI	81.1	51.9	2/20/2020	4/9/2020	EHR	Cohort	Yes	Yes	Yes	387	66.0	66.7	HR	Not reported	8
Moon_SJ_KOR_2020 ⁷⁸	South Korea	WPR	HI	84.1	65.9	1/20/2020	5/15/2020	ARS	C-S	Yes	No	No	5,307	56.0	39.0	OR	Independent	7
Munoz_P_ESP_2020 ⁷⁹	Spain	EUR	HI	80.5	60.4	3/1/2020	5/10/2020	OTH	Cohort	No	Yes	No	100	61.5	52.0	OR	Independent	9
Mukherjee_V_USA_2020 ⁸⁰	USA	AMR	HI	73.9	76.2	3/10/2020	5/18/2020	EHR	Cohort	Yes	Yes	Yes	137	59.0	72.3	HR	Not reported	9
Munblit_D_RUS_2020 ⁸¹	Russia	EUR	UMI	71.6	47.1	4/8/2020	5/28/2020	EHR	Cohort	Yes	Yes	No	3,480	56.0	50.5	OR	Independent	7
Nachega_IB_COG_2020 ⁸²	D.R. Congo	AFR	LMI	48.6	26.0	3/10/2020	7/31/2020	ARS	Cohort	Yes	Yes	Yes	766	46.0	65.3	HR	Independent	9
Nachtigall_I_DEU_2020 ⁸³	Germany	EUR	HI	81.1	65.7	2/12/2020	6/12/2020	OTH	Cohort	Yes	No	No	1,904	73.0	51.5	HR	Independent	9
Nakeshbandi_M_USA_2020 ⁸⁴	USA	AMR	HI	73.9	76.2	3/10/2020	4/13/2020	EHR	Cohort	Yes	Yes	Yes	504	68.0	53.0	RR	Not reported	9
Nogueira_PJ_PRT_2020 ⁸⁵	Portugal	EUR	HI	77.6	58.7	1/1/2020	4/21/2020	ARS	C-S	Yes	No	No	20,293	52.1	41.3	OR	None or NA	7
Orioli_L_BEL_2020 ⁸⁶	Belgium	EUR	HI	80.6	61.9	3/1/2020	5/6/2020	ARS	C-S	Yes	No	No	192	67.0	50.0	HR	None or NA	4
Orwa_A_MYS_2020 ⁸⁷	Worldwide	World				12/30/2019	4/21/2020	ARS	C-S	Yes	Yes	No	828	49.4	59.1	OR	None or NA	6
Pacheco-Pantoja_E_MEX_2020 ⁸⁸	Mexico	AMR	UMI	72.1	55.1	2/28/2020	4/30/2020	ARS	Cohort	Yes	Yes	Yes	19,224	46.6	58.2	OR	Not reported	7
Palaiodimos_L_USA_2020 ⁸⁹	USA	AMR	HI	73.9	76.2	3/9/2020	4/12/2020	EHR	Cohort	Yes	No	Yes	200	64.0	49.0	OR	None or NA	9
Panagiotou_OA_USA_2021 ⁹⁰	USA	AMR	HI	73.9	76.2	3/16/2020	9/15/2020	EHR	Cohort	Yes	Yes	No	5,256	79.0	39.0	OR	Independent	9
Parikh_R_USA_2020 ⁹¹	USA	AMR	HI	73.9	76.2	3/1/2020	5/1/2020	EHR	Cohort	No	No	Yes	160	60.4	65.6	OR	None or NA	9
Park_BE_KOR_2021 ⁹²	South Korea	WPR	HI	84.1	65.9	2/15/2020	4/24/2020	ARS	Cohort	Yes	Yes	No	2,269	55.5	36.0	OR	Independent	9
Park_JG_KOR_2020 ⁹³	South Korea	WPR	HI	84.1	65.9	2/20/2020	4/14/2020	EHR	Cohort	Yes	No	No	289	72.0	46.0	HR	Independent	8
Parra-Bracamonte_GM_MEX_2020 ⁹⁴	Mexico	AMR	UMI	72.1	55.1	1/13/2020	7/17/2020	ARS	Cohort	Yes	Yes	Yes	331,298	44.0	53.8	OR	Not reported	8
Pena_JE_MEX_2020 ⁹⁵	Mexico	AMR	UMI	72.1	55.1	2/28/2020	11/13/2020	ARS	C-S	Yes	Yes	Yes	121,225	50.0	59.8	OR	Not reported	7

Petrilli_CM_USA_2020 ⁹⁶	USA	AMR	HI	73.9	76.2	3/1/2020	4/8/2020	EHR	Cohort	Yes	Yes	No	5,279	54.0	49.5	HR	Independent	9
Pettit_NN_USA_2020 ⁹⁷	USA	AMR	HI	73.9	76.2	3/1/2020	4/18/2020	EHR	Cohort	Yes	Yes	Yes	238	58.5	47.5	OR	Not reported	9
Polverino_F_ITA_2020 ⁹⁸	Italy	EUR	HI	81.1	51.9	3/25/2020	4/22/2020	OTH	C-S	Yes	Yes	Yes	3,179	69.0	68.3	OR	Independent	8
Posso_M_ESP_2020 ⁹⁹	Spain	EUR	HI	80.5	60.4	2/23/2020	5/12/2020	EHR	Cohort	Yes	Yes	Yes	834	78.2	46.5	OR	None or NA	8
Prado-Galbarro_FJ_MEX_2020 ¹⁰⁰	Mexico	AMR	UMI	72.1	55.1	2/27/2020	4/27/2020	ARS	Cohort	Yes	Yes	Yes	15,529	55.0	57.8	HR	None or NA	9
Qin_W_CHN_2020 ¹⁰¹	China	WPR	UMI	82.8	49.0	12/19/2019	2/20/2020	EHR	Cohort	No	Yes	No	582	64.0	50.3	OR	Independent	6
Qin_W_CHN_2021 ¹⁰²	China	WPR	UMI	82.8	49.0	1/31/2020	3/6/2020	EHR	Cohort	No	Yes	No	262	63.5	46.9	HR	Independent	9
Rastad_H_IRN_2020 ¹⁰³	Iran	EMR	UMI	74.8	39.5	2/20/2020	3/25/2020	EHR	Cohort	Yes	No	No	2,957	54.8	53.7	OR	Independent	8
Reilev_M_DNK_2020 ¹⁰⁴	Denmark	EUR	HI	80.6	67.3	2/27/2020	5/19/2020	ARS	Cohort	Yes	Yes	Yes	11,122	48.0	42.0	OR	Independent	7
Rethemiotaki_I_CHN_2020 ¹⁰⁵	China	WPR	UMI	82.8	49.0	12/19/2019	2/20/2020	ARS	C-S	Yes	Yes	No	44,672	55.0	64.0	OR	Not reported	7
Rivera-Izquierdo_M_ESP_2020 ¹⁰⁶	Spain	EUR	HI	80.5	60.4	3/16/2020	4/10/2020	OTH	Cohort	Yes	No	No	238	64.7	55.0	HR	Independent	9
Rodriguez-Gonzalez_CG_ESP_2020 ¹⁰⁷	Spain	EUR	HI	80.5	60.4	3/1/2020	3/24/2020	OTH	Cohort	Yes	Yes	Yes	1,208	65.0	58.0	OR	Independent	9
Rodriguez-Molinero_A_ESP_2020 ¹⁰⁸	Spain	EUR	HI	80.5	60.4	3/12/2020	5/2/2020	EHR	Cohort	Yes	Yes	No	418	65.4	57.0	OR	None or NA	9
Rodriguez-Nava_G_USA_2020 ¹⁰⁹	USA	AMR	HI	73.9	76.2	3/1/2020	5/25/2020	OTH	Cohort	No	Yes	No	313	68.0	58.0	HR	Not reported	9
Rosenthal_N_USA_2020 ¹¹⁰	USA	AMR	HI	73.9	76.2	4/1/2020	5/31/2020	ARS	C-S	Yes	Yes	No	64,781	57.0	49.0	OR	Independent	7
Rossi_AP_ITA_2020 ¹¹¹	Italy	EUR	HI	81.1	51.9	3/8/2020	3/30/2020	ARS	Cohort	No	No	Yes	95	62.5	82.1	HR	Not reported	9
Rossi_PG_ITA_2020 ¹¹²	Italy	EUR	HI	81.1	51.9	2/27/2020	4/2/2020	ARS	Cohort	Yes	Yes	Yes	2,653	63.2	50.1	HR	Independent	9
Rottoli_M_ITA_2020 ¹¹³	Italy	EUR	HI	81.1	51.9	3/1/2020	4/27/2020	ARS	Cohort	Yes	Yes	Yes	482	66.2	63.0	HR	None or NA	9
Rozaliyani_A_IDN_2020 ¹¹⁴	Indonesia	SEAR	UMI	72.7	49.2	3/2/2020	4/29/2020	ARS	Cohort	Yes	Yes	No	4,052	45.8	54.0	OR	Not reported	9
Saand_AR_USA_2020 ¹¹⁵	USA	AMR	HI	73.9	76.2	3/15/2020	5/30/2020	ARS	Cohort	Yes	No	Yes	495	68.0	58.4	HR	None or NA	9
Salacup_G_USA_2020 ¹¹⁶	USA	AMR	HI	73.9	76.2	3/1/2020	4/24/2020	EHR	Cohort	Yes	Yes	No	242	66.0	51.0	OR	Not reported	9
Santos_MM_BRA_2020 ¹¹⁷	Brazil	AMR	UMI	72.0	51.0	2/20/2020	6/2/2020	ARS	Cohort	Yes	No	No	80,123	51.0	57.0	HR	Not reported	9
Seiglie_J_USA_2020 ¹¹⁸	USA	AMR	HI	73.9	76.2	3/11/2020	4/30/2020	ARS	Cohort	Yes	Yes	Yes	450	63.3	57.6	OR	Independent	9
Shah_C_USA_2020 ¹¹⁹	USA	AMR	HI	73.9	76.2	1/1/2020	5/31/2020	EHR	Cohort	Yes	Yes	No	487	68.4	56.1	OR	None or NA	9
Shah_P_USA_2020 ¹²⁰	USA	AMR	HI	73.9	76.2	3/2/2020	5/6/2020	EHR	Cohort	Yes	Yes	No	522	63.0	41.8	OR	Not reported	8
Shang_J_CHN_2020 ¹²¹	China	WPR	UMI	82.8	49.0	12/25/2019	3/20/2020	EHR	Cohort	Yes	Yes	No	584	59.0	47.4	HR	Independent	9
Sheshah_E_SAU_2020 ¹²²	Saudi Arabia	EMR	HI	74.5	45.0	5/1/2020	7/31/2020	OTH	Cohort	Yes	Yes	No	300	49.7	86.3	OR	Independent	8
Shi_S_CHN_2020 ¹²³	China	WPR	UMI	82.8	49.0	1/1/2020	2/23/2020	EHR	Cohort	Yes	Yes	No	671	63.0	48.0	HR	Independent	8
Singh_S_USA_2020 ¹²⁴	USA	AMR	HI	73.9	76.2	1/20/2020	5/31/2020	EHR	C-C	No	No	Yes	16,224	50.0	39.0	RR	Independent	8
Smith_AA_USA_2020 ¹²⁵	USA	AMR	HI	73.9	76.2	3/1/2020	4/22/2020	EHR	Cohort	Yes	No	No	346	66.9	56.0	RR	None or NA	8
Sousa_GJB_BRA_2020 ¹²⁶	Brazil	AMR	UMI	72.0	51.0	2/20/2020	4/14/2020	ARS	Cohort	Yes	No	Yes	2,070	44.0	49.0	HR	None or NA	7
Sun_H_CHN_2020 ¹²⁷	China	WPR	UMI	82.8	49.0	1/29/2020	3/5/2020	EHR	Cohort	No	Yes	No	244	69.0	54.5	OR	Not reported	9
Sun_Y_CHN_2020 ¹²⁸	China	WPR	UMI	82.8	49.0	1/15/2020	4/15/2020	EHR	Cohort	Yes	Yes	No	3,400	61.0	49.0	OR	Not reported	8

Sutter_W_FRA_2020 ¹²⁹	France	EUR	HI	80.5	62.6	2/26/2020	4/20/2020	EHR	C-C	Yes	No	No	1,206	71.2	61.8	HR	None or NA	8
Tartof_SY_USA_2020 ¹³⁰	USA	AMR	HI	73.9	76.2	2/13/2020	5/2/2020	EHR	Cohort	Yes	Yes	No	6,916	49.1	45.0	RR	Independent	9
Tavares_C_BRA_2020 ¹³¹	Brazil	AMR	UMI	72.0	51.0	2/26/2020	6/30/2020	ARS	C-S	Yes	Yes	Yes	89,405	58.9	56.5	OR	None or NA	7
Thompson_J_GBR_2020 ¹³²	UK	EUR	HI	78.8	68.3	3/12/2020	5/19/2020	EHR	Cohort	No	Yes	No	470	68.7	54.0	OR	None or NA	9
van_Gerwen_M_USA_2020 ¹³³	USA	AMR	HI	73.9	76.2	3/20/2020	5/13/2020	EHR	Cohort	Yes	Yes	Yes	2,015	56.8	55.3	OR	None or NA	9
Wang_Z_USA_2020 ¹³⁴	USA	AMR	HI	73.9	76.2	3/1/2020	4/15/2020	EHR	C-S	Yes	Yes	Yes	3,273	65.0	57.0	HR	None or NA	7
Workinggroup_ESP_2020 ¹³⁵	Spain	EUR	HI	80.5	60.4	1/31/2020	4/27/2020	ARS	C-S	Yes	Yes	No	218,652	61.0	43.8	OR	Not reported	7
Wu_R_CHN_2020 ¹³⁶	China	WPR	UMI	82.8	49.0	12/10/2019	3/18/2020	ARS	Cohort	Yes	Yes	No	21,392	50.0	52.0	HR	Independent	7
Xie_J_USA-2020 ¹³⁷	USA	AMR	HI	73.9	76.2	3/30/2020	4/5/2020	OTH	Cohort	Yes	Yes	Yes	287	61.5	43.0	OR	Independent	9
Yang_Q_CHN_2020 ¹³⁸	China	WPR	UMI	82.8	49.0	1/1/2020	2/29/2020	EHR	Cohort	No	Yes	No	226	53.9	51.8	HR	None or NA	8
Yazdanpanah_Y_FRA_2020 ¹³⁹	France	EUR	HI	80.5	62.6	1/24/2020	3/15/2020	ARS	Cohort	Yes	No	Yes	246	65.0	57.0	HR	Independent	9
You_H_KOR_2020 ¹⁴⁰	South Korea	WPR	HI	84.1	65.9	1/20/2020	3/31/2020	ARS	Cohort	Yes	No	No	5,473	45.0	44.6	OR	Not reported	9
Yu_C_CHN_2020 ¹⁴¹	China	WPR	UMI	82.8	49.0	1/14/2020	3/26/2020	OTH	Cohort	Yes	Yes	No	1,464	64.0	50.3	OR	Independent	9
Zandkarimi_E_IRN_2020 ¹⁴²	Iran	EMR	UMI	74.8	39.5	2/22/2020	5/18/2020	EHR	Cohort	Yes	No	No	1,831	57.7	55.7	HR	Independent	9
Zhang_J_CHN_2020 ¹⁴³	China	WPR	UMI	82.8	49.0	1/1/2020	3/17/2020	EHR	Cohort	Yes	No	No	312	57.0	44.9	HR	Independent	9
Zhang_Y_CHN_2020 ¹⁴⁴	China	WPR	UMI	82.8	49.0	1/29/2020	3/12/2020	OTH	Cohort	Yes	No	No	258	64.2	54.0	HR	Independent	8
Zhu_L_CHN_2020 ¹⁴⁵	China	WPR	UMI	82.8	49.0	12/30/2019	3/20/2020	OTH	Cohort	Yes	No	No	7,337	54.0	47.4	HR	Independent	4

Note: UK = United Kingdom, USA = United States of America, HI = high income, UMI = upper middle income, LMI = lower middle income, GHSI = global health security index, WHO = World Health Organization, WB = World Bank, AFR = African Region, SEAR = Southeast Asian Region, AMR = American Region, EMR = East Mediterranean Region, EUR = European Region, WPR = West Pacific Region, EHR = electronic health (medical) record, ARS = administrative/registry/surveillance or (case) reporting system, C-C = case-control, C-S = cross-sectional, DM = diabetes mellitus, HTN = hypertension, OB = obesity, ES = effect size, OR = Odds ratio, HR = hazard ratio, RR = relative risk, NOS = Newcastle-Ottawa Scale.

† Population size.

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