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Supplementary appendix

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

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Supplementary material

Physical distancing, face masks, and eye protection to prevent person-person SARS-CoV2 and COVID-19 transmission: A systematic review and meta-analysis

The COVID-19 Systematic Urgent Review Group Effort (SURGE) Study Group

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Contents:

Appendix 1. Search strategies for the different databases ran on March 26, 2020. Preprint and coronavirus searches were run daily until May 3, 2020.

We developed the search strategy with the assistance of an information specialist experienced with systematic reviews (LH). Two information specialists (Ms. Neera Bhatnagar and Ms. Aida Farha) peer reviewed the search strategy. Other members of the team, particularly the content experts provided feedback to the search strategy. The strategies combined medical subject headings (MeSH) and keywords for the two following concepts: COVID-19 and personal protection by any of physical distancing, masks, or eye protection. PubMed search terms were informed by the Biomedical Information of the Dutch Library Association specialists curated search blocks at https://blocks.bmi-online.nl/catalog/397.

Medline (OVID)

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily 1946 to March 26, 2020

1 (pneumonia/ or pneumonia, viral/ or exp Viruses/) and (exp Disease Outbreaks/ or exp Epidemiology/ or Epidemiology.fs.) (104129)

2 coronaviridae/ or exp coronavirus/ or exp Coronavirus Infections/ or exp Betacoronavirus/ (15998)

3 (Betacoronavirus or Beta-coronavirus or Coronavirus* or COVID).mp. (14380)

4 1 or 2 or 3 (121096)

5 limit 4 to ez="20191101-20200325" (1524)

6 (("2019" adj (novel or new) adj corona*) or ("2019" adj (CoV or nCoV)) or (coronavirus adj (disease adj "2019")) or COVID19 or COVID-19 or ((Novel or New) adj Corona*) or SARS2 or SARS-CoV-2 or (SARS adj2 (coronaviridae or coronavirus)) or ((sars or Coronavirus) adj "2") or nCov or 2019ncov).mp. (4983)

7 5 or 6 (5522)

8 (Mask? or facemask? or face-mask? or ppe or (body adj substance* adj isolati*) or bsi or (infect* adj prevent* adj control*) or ipc or N95 or ffp or ffp1 or ffp3 or ffp2 or (filter* adj face adj piece) or ((face or respiratory or eye) adj2 (shield or equipment? or protect* or cover*)) or ((airborne or air-borne or droplet*) adj precau*) or N99 or N97 or respirator? or goggle? or ((patient? or person* or individual?) adj1 isolat*) or distanc* or space or spacing or separation or (aerosol adj generat* adj procedur*) or ((safety or protective) adj (supply or supplies or device* or equipment? or material* or measure* or gear?)) or (safely adj1 equipped) or meter? or metre? or foot or feet or (non-pharm* adj intervention*) or ((physical or person*) adj (intervention* or barrier? or protect*)) or transmission* or contamination? or shedding? or fomite? or gap? or ((head or face) adj cover?) or (protective adj clothing?)).mp. or masks/ or protective devices/ or personal protective equipment/ or respiratory protective devices/ or Eye Protective Devices/ (2489045)

9 7 and 8 (3314)

PubMed

Search Query

#7 Search ((((#4 OR #5))) AND (((mask[tw] OR masks[tw] OR facemask[tw] OR facemasks[tw] OR face-mask[tw] OR face-masks[tw] OR PPE[tw] OR body substance isolation*[tw] OR bsi[tw] OR infection prevention control*[tw] OR ipc[tw] OR N95[tw] OR ffp[tw] OR ffp1[tw] OR ffp3[tw] OR ffp2[tw] OR N97[tw] OR N99[tw] OR physical barrier*[tw] OR physical intervention*[tw] OR physical protection*[tw] OR personal protection*[tw] OR person protection*[tw] OR transmission[tw] OR transmissions[tw] OR contamination[tw] OR contaminations[tw] OR shedding[tw] OR fomite[tw] OR gap[tw] OR gaps[tw] OR non-pharm intervention*[tw] OR non-pharmaceutical intervention*[tw] OR distancing[tw] OR space [tw] OR distances[tw] OR spacing[tw] OR separation[tw] OR respirator[tw] OR respirators[tw] OR aerosol-generating procedure*[tw] OR patient isolation*[tw] OR patient isolator*[tw] OR person isolation[tw] OR person isolator*[tw] OR individual isolation[tw] OR individual isolator*[tw] OR filtering face piece[tw] OR filtering face piece*[tw] OR [tw] OR face protection*[tw] OR face shield*[tw] OR face protective device*[tw] OR face protective gear*[tw] OR eye protection*[tw] OR eye shield*[tw] OR eye protective device*[tw] OR eye protective gear*[tw] OR airborne precaution*[tw] OR droplet precautions*[tw] OR safety supply*[tw] OR safety supplies*[tw] OR safety device*[tw] OR safety equipment*[tw] OR safety measure*[tw] OR safety gear*[tw] OR protective supply*[tw] OR protective supplies*[tw] OR protective device*[tw] OR protective equipment*[tw] OR protective measure*[tw] OR protective gear*[tw] OR person isolation[tw] OR personal isolation[tw] OR individual isolation[tw] OR respirator[tw] OR respirators[tw] OR respiratory protection*[tw] OR respiratory protective device*[tw] OR respiratory protective supply*[tw] OR respiratory protective supplies*[tw] OR respiratory protective equipment*[tw] OR respiratory protective gear*[tw] OR safely equipped*[tw] OR meter[tw] OR metre[tw] OR foot[tw] OR feet[tw] OR meters[tw] OR metres[tw] OR head cover*[tw] OR face cover*[tw] OR eye cover*[tw] OR goggle*[tw] OR protective clothing*[tw])) OR (((("Masks"[Mesh:NoExp]) OR "Protective Devices"[Mesh]) OR "Personal Protective Equipment"[Mesh:NoExp]) OR "Respiratory Protective Devices"[Mesh:NoExp] OR "Eye Protective Devices"[Mesh:NoExp])))

#6 Search ((#4 OR #5))

#5 Search (((2019-novel-corona* OR 2019-new-corona* OR novel-corona* OR new-corona* OR 2019-Cov OR 2019-nCov OR nCov OR coronavirus disease-2019 OR SARS2 OR SARS-2 OR SARS-CoV-2 OR sars cORona* OR CORonavirus-2 OR 2019ncov)))

#4 Search ((((#1 OR #2 OR #3) AND 2019/11:2020/03 [crdt])))

#3 Search (((BetacORonavirus[tw] OR Beta-cORonavirus[tw] OR corona[tw] OR corona'[tw] OR corona's[tw] OR OR coronaviral[tw] OR coronavirdae[tw] OR coronavirida[tw] OR coronaviridae[tw] OR coronaviridea[tw] OR coronaviridiae[tw] OR coronavirinae[tw] OR coronavirion[tw] OR coronavirions[tw] OR coronavirologists[tw] OR coronavirology[tw] OR coronaviroses[tw] OR coronavirous[tw] OR coronavirues[tw] OR coronavirus[tw] OR coronavirus'[tw] OR coronavirus's[tw] OR

coronaviruscpe[tw] OR coronaviruse[tw] OR coronaviruses[tw] OR coronaviruses'[tw] OR coronaviruslike[tw] OR coronaviser[tw] OR coronaviurs[tw] OR coronaviuses[tw] OR coronavrius[tw] OR coronavvirus[tw] OR COVID[tw])))
#2 Search ((((pneumonia[Mesh:noexp] OR pneumonia, viral[Mesh:noexp] OR Viruses[Mesh]) and ("Disease Outbreaks"[Mesh] OR Epidemiology[Mesh] OR Epidemiology [Mesh subject heading]))))
#1 Search (((cORonaviridae[Mesh:noexp] OR cORonavirus[Mesh] OR "Coronavirus Infections"[Mesh] OR BetacORonavirus[Mesh])))

EMBASE

No.	**Query**
#18	#7 AND #17
#17	#8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16
#16	'mask'/de OR 'protective equipment'/de OR 'respiratory protection'/de OR 'eye mask'/de
#15	meter$:ti,ab,kw OR metre$:ti,ab,kw OR foot:ti,ab,kw OR feet:ti,ab,kw OR (('non pharm*' NEXT/0 intervention*):ti,ab,kw) OR (((physical OR person*) NEXT/0 (intervention* OR barrier$ OR protect*)):ti,ab,kw) OR transmission*:ti,ab,kw OR contamination$:ti,ab,kw OR shedding$:ti,ab,kw OR fomite$:ti,ab,kw OR gap$:ti,ab,kw
#14	((filter* NEXT/0 face NEXT/0 piece):ti,ab,kw) OR (((face OR respiratory OR eye) NEAR/2 (shield OR equipment$ OR protect* OR cover$)):ti,ab,kw)
#13	((safety OR protective) NEXT/0 (supply OR supplies OR device* OR equipment? OR material* OR measure* OR gear$)) AND ti,ab,kw OR ((safely NEAR/1 equipped):ti,ab,kw)
#12	distanc*:ti,ab,kw OR space:ti,ab,kw OR spacing:ti,ab,kw OR separation:ti,ab,kw OR ((aerosol NEXT/0 generat* NEXT/0 procedur*):ti,ab,kw)
#11	(((airborne OR 'air borne' OR droplet$) NEXT/0 precau*):ti,ab,kw) OR n99:ti,ab,kw OR n97:ti,ab,kw OR goggle$:ti,ab,kw OR respirator$:ti,ab,kw OR (((patient$ OR person* OR individual$) NEXT/0 isolat*):ti,ab,kw)
#10	((filter* NEXT/0 face NEXT/0 piece):ti,ab,kw) OR (((face OR respiratory) NEAR/2 (shield OR equipment$ OR protect*)):ti,ab,kw)
#9	'ppe':ti,ab,kw OR ((body NEXT/0 substance$ NEXT/0 isolati*):ti,ab,kw) OR bsi:ti,ab,kw OR ((infect* NEXT/0 prevent* NEXT/0 control*):ti,ab,kw) OR ipc:ti,ab,kw OR n95:ti,ab,kw OR ffp:ti,ab,kw OR ffp1:ti,ab,kw OR ffp3:ti,ab,kw OR ffp2:ti,ab,kw
#8	mask$:ti,ab,kw OR facemask$:ti,ab,kw OR 'face mask':ti,ab,kw
#7	#5 OR #6
#6	((2019 NEXT/0 novel):ti,ab,kw) OR ((2019 NEXT/0 cov):ti,ab,kw) OR ((coronavirus NEXT/0 disease NEXT/0 2019):ti,ab,kw) OR covid19:ti,ab,kw OR 'covid 19':ti,ab,kw OR (((novel OR new) NEXT/0 corona*):ti,ab,kw) OR sars2:ti,ab,kw OR 'sars cov 2':ti,ab,kw OR ((sars NEAR/2 coronaviridae):ti,ab,kw) OR coronavirus:ti,ab,kw OR sars:ti,ab,kw OR ((coronavirus NEXT/0 '2'):ti,ab,kw) OR ncov:ti,ab,kw OR 2019ncov:ti,ab,kw
#5	#4 AND [1-11-2019]/sd
#4	#1 OR #2 OR #3
#3	betacoronavirus:ti,ab,kw OR 'beta coronavirus':ti,ab,kw OR coronavirus*:ti,ab,kw OR covid:ti,ab,kw
#2	'coronaviridae'/exp OR 'coronavirus infection'/exp OR 'betacoronavirus'/exp
#1	('pneumonia'/de OR 'virus pneumonia'/de OR 'virus'/exp) AND ('epidemic'/exp OR 'epidemiology'/exp OR epidemiology:lnk)

CINAHL (OVID)

Cochrane Library

ID	**Search**	**Hits**
#1	MeSH descriptor: [Pneumonia, Viral] this term only	51
#2	MeSH descriptor: [Pneumonia] this term only	1976
#3	MeSH descriptor: [Viruses] explode all trees	8746
#4	#1 OR #2 OR #3	10734
#5	MeSH descriptor: [Disease Outbreaks] explode all trees	262
#6	MeSH descriptor: [Epidemiology] explode all trees	37
#7	(Epidemiology):ti,ab,kw	48587
#8	#5 OR #6 OR #7	48682
#9	#4 AND #8	1315
#10	MeSH descriptor: [Coronaviridae] this term only	0
#11	MeSH descriptor: [Coronavirus] explode all trees	11
#12	MeSH descriptor: [Coronavirus Infections] explode all trees	12
#13	MeSH descriptor: [Betacoronavirus] explode all trees	10
#14	(Betacoronavirus or Beta-coronavirus or Coronavirus* or COVID):ti,ab,kw	98
#15	#9 OR #10 OR #11 OR #12 OR #13 OR #14 with Cochrane Library publication date Between Nov 2019 and Mar 2020	44
#16	((2019 NEXT (novel or new) NEXT corona*)):ti,ab,kw	8

#17 (("2019" NEXT (CoV or nCoV)) or (coronavirus NEXT (disease NEXT "2019")) or COVID19 or COVID-19 or ((Novel or New) NEXT Corona*) or SARS2 or SARS-CoV-2 or (SARS NEAR/2 (coronaviridae or coronavirus)) or ((sars or Coronavirus) NEXT "2") or nCov or 2019ncov):ti,ab,kw 118
#18 #15 OR #16 OR #17 145
#19 MeSH descriptor: [Masks] this term only 475
#20 MeSH descriptor: [Protective Devices] this term only 207
#21 MeSH descriptor: [Personal Protective Equipment] this term only 19
#22 MeSH descriptor: [Respiratory Protective Devices] this term only 66
#23 MeSH descriptor: [Eye Protective Devices] this term only 65
#24 (Mask? OR facemask? OR face-mask? OR ppe OR (body NEAR substance* NEAR isolati*) OR bsi OR (infect* NEAR prevent* NEAR control*) OR ipc OR N95 OR ffp OR ffp1 OR ffp3 OR ffp2 OR (filter* NEAR face NEAR piece) OR ((face OR respiratORy OR eye) NEXT/2 (shield OR equipment? OR protect* OR cover*)) OR ((airbORne OR air-bORne OR droplet*) NEAR precau*) OR N99 OR N97 OR respiratOR? OR goggle? OR ((patient? OR person* OR individual?) NEXT/1 isolat*) OR distanc* OR space OR spacing OR separation OR (aerosol NEAR generat* NEAR procedur*) OR ((safety OR protective) NEAR (supply OR supplies OR device* OR equipment? OR material* OR measure* OR gear?)) OR (safely NEAR/1 equipped) OR meter? OR metre? OR foot OR feet OR (non-pharm* NEAR intervention*) OR ((physical OR person*) NEAR (intervention* OR barrier? OR protect*)) OR transmission* OR contamination? OR shedding? OR fomite? OR gap? OR ((head or face) NEXT cover?) OR (protective NEXT clothing?)):ti,ab,kw 161945
#25 #19 OR #20 OR #21 OR #22 OR #23 OR #24 161945
#26 #18 AND #25 43

China National Knowledge Infrastructure (CNK)I 中国知网--topic words searching in Chinese

新型冠状病毒性肺炎，新冠肺炎，新型冠状病毒，冠状病毒感染，冠状病毒肺炎，冠状病毒，COVID-19

Science Chinese Biomedical Literature Database (SinoMed)—field searching in Chinese

("2019冠状病毒"[常用字段:智能] OR "新型冠状病毒"[常用字段:智能] OR "新冠肺炎"[常用字段:智能] OR "2019-nCoV"[常用字段:智能] OR "SARS-CoV-2"[常用字段:智能] OR "Novel coronavirus"[常用字段:智能] OR "nCoV"[常用字段:智能] OR "Emerging Coronaviruses"[常用字段:智能] OR "new coronavirus"[常用字段:智能] OR "COVID-19"[常用字段:智能] OR "coronavirus"[常用字段:智能] AND ("Wuhan"[常用字段] OR "Hubei"[常用字段] OR "China"[常用字段])) AND 2019-2020[日期]

Appendix 2. Characteristics of included studies

Study ID[Reference]	Study Design	Country	Setting	Virus
Alameer 2015(1)	Non-comparative	Saudi Arabia	Healthcare setting	MERS
Alanazi 2018(2)	Non-comparative	Saudi Arabia	Healthcare setting	MERS
Alfaraj 2018(3)	Comparative NRS	Saudi Arabia	Non-healthcare setting	MERS
Alraddadi 2016(4)	Comparative NRS	Saudi Arabia	Healthcare setting	MERS
Al-Tawfiq 2019(5)	Qualitative	Saudi Arabia	Healthcare setting	MERS
Assiri 2013(6)	Non-comparative	Saudi Arabia	Healthcare setting	MERS
Bai 2020(7)	Non-comparative	China	Non-healthcare setting	COVID-19
Bai 2020(8)	Comparative	China	Healthcare setting	COVID-19
Barratt 2019(9)	Qualitative	Australia	Healthcare setting	Other
Baseer 2016(10)	Qualitative	Saudi Arabia	Healthcare setting	MERS
Booth 2005(11)	Mechanistic	Canada	Healthcare setting	SARS
Cai 2020(12)	Contextual factors - qualitative or quantiative	China	Non-healthcare setting	COVID-19
Cao 2020(13)	Non-comparative	China	Non-healthcare setting	COVID-19
Caputo 2006(14)	Comparative NRS	Canada	Healthcare setting	SARS
Chau 2010(15)	Qualitative	China	Healthcare setting	Other
Chen 2004(16)	Non-comparative	Taiwan	Healthcare setting	SARS
Chen 2009(17)	Comparative NRS - Cohort	China	Healthcare setting	SARS
Chen 2020(18)	Contextual factors - qualitative or quantiative	China	Non-healthcare setting	COVID-19
Chen 2020(19)	Non-comparative	China	Non-healthcare setting	COVID-19
Chen 2020(20)	Comparative NRS	China	Non-healthcare setting	COVID-19
Chen 2020(21)	Non-comparative	China	Healthcare setting	COVID-19
Cheng 2020(22)	Non-comparative - mechanistic	China	Healthcare setting	COVID-19
Chia 2005(23)	Qualitative	Singapore	Healthcare setting	SARS
Christian 2004(24)	Non-comparative - Case series	Canada	Healthcare setting	SARS
Chughtai 2015(25)	Qualitative	Vietnam	Healthcare setting	Other

Study ID[Reference]	Study Design	Country	Setting	Virus
Chughtai 2020(26)	Qualitative	Australia	Healthcare setting	Other
Cui 2020(27)	Comparative NRS	China	Non-healthcare setting	COVID-19
Du 2020(28)	Comparative NRS	China	Non-healthcare setting	COVID-19
El Bushra 2016(29)	Non-comparative - Case series	Saudi Arabia	Healthcare setting	MERS
Fan 2020(30)	Comparative NRS - Cohort	China	Healthcare setting	COVID-19
Feng 2020(31)	Non-comparative	China	Non-healthcare setting	COVID-19
Fix 2019(32)	Qualitative	United States of America	Healthcare setting	SARS
Gan 2020(33)	Comparative NRS	China	Non-healthcare setting	COVID-19
Goh 2019(34)	Qualitative	Singapore	Healthcare setting	NA
Gomersall 2006(35)	Non-comparative - Cohort (but all received the intervention)	China	Healthcare setting	SARS
Ha 2004(36)	Comparative NRS - Cohort	Vietnam	Healthcare setting	SARS
Hall 2014(37)	Comparative NRS - Cohort	Saudi Arabia	Healthcare setting	MERS
Hines 2019(38)	Qualitative	United States of America	Healthcare setting	Other
Ho 2003(39)	Non-comparative - Case series	China	Healthcare setting	SARS
Ho 2004(40)	Comparative NRS - Cohort	Singapore	Healthcare setting	SARS
Ho 2012(41)	Qualitative	China	Healthcare setting	Other
Honarbakhsh 2018(42)	Qualitative	Iran	Healthcare setting	Other
Huang 2011(43)	Qualitative	Taiwan	Healthcare setting	Respiratory infectious diseases
Hunter 2016(44)	Non-comparative - Case series	United Arabic Emirates	Healthcare setting	MERS
Huynh 2020(45)	Contextual factors - qualitative or quantiative	Vietnam	Non-healthcare setting	COVID-19
Jia 2020(46)	Non-comparative	China	Healthcare setting	COVID-19
Jiang 2020(47)	Qualitative	China	Healthcare setting	COVID-19
Kang 2018(48)	Qualitative	South Korea	Healthcare setting	MERS
Kao 2004(49)	Qualitative	China	Healthcare setting	SARS
Khalid 2016(50)	Qualitative	Saudi Arabia	Healthcare setting	MERS
Khoo 2005(51)	Qualitative	China	Healthcare setting	SARS

Study ID[Reference]	Study Design	Country	Setting	Virus
Ki 2019(52)	Comparative NRS - Cohort	South Korea	Healthcare setting	MERS
Kim 2016(53)	Comparative NRS - Cohort	South Korea	Healthcare setting	MERS
Kinlay 2015(54)	Qualitative	United States of America	Healthcare setting	NA
Knapp 2008(55)	Qualitative	United States of America	Healthcare setting	Other
Lau 2003(56)	Qualitative	China	Non-healthcare setting	SARS
Lau 2004(57)	Comparative NRS - Cohort	China	Non-healthcare setting	SARS
Lau 2007(58)	Qualitative	China	Non-healthcare setting	Other
Li 2020(59)	Comparative NRS	China	Non-healthcare setting	COVID-19
Li 2020(60)	Non-comparative	China	Non-healthcare setting	COVID-19
Li 2020(61)	Non-comparative	China	Healthcare setting	COVID-19
Li 2020(62)	Comparative NRS	China	Non-healthcare setting	COVID-19
Li 2020(63)	Non-comparative	China	Non-healthcare setting	COVID-19
Li 2020(64)	Contextual factors - qualitative or quantiative	China	Non-healthcare setting	COVID-19
Lim 2004(65)	Qualitative	Singapore	Non-healthcare setting	SARS
Lin 2020(66)	Non-comparative	China	Non-healthcare setting	COVID-19
Liu 2009(67)	Comparative NRS - Cohort	China	Healthcare setting	SARS
Liu 2020(68)	Non-comparative	China	Non-healthcare setting	COVID-19
Liu 2020(69)	Non-comparative	China	Non-healthcare setting	COVID-19
Liu 2020(70)	Non-comparative	China	Non-healthcare setting	COVID-19
Liu 2020(71)	Comparative NRS	China	Non-healthcare setting	COVID-19
Liu 2020(72)	Comparative NRS	China	Non-healthcare setting	COVID-19
Liu 2020(73)	Comparative NRS	China	Non-healthcare setting	COVID-19
Loeb 2004(74)	Comparative NRS - Cohort	Canada	Healthcare setting	SARS
Loh 2004(75)	Qualitative	Malaysia	Healthcare setting	SARS
Lu 2003(76)	Non-comparative	China	Healthcare setting	SARS
Luo 2020(77)	Non-comparative	China	Non-healthcare setting	COVID-19
Ma 2004(78)	Comparative NRS	China	Healthcare setting	SARS

Study ID[Reference]	Study Design	Country	Setting	Virus
Ma 2020(79)	Comparative NRS	China	Healthcare setting	COVID-19
MacIntyre 2015(80)	RCT	Vietnam	Healthcare setting	Other
Maclntyre 2016(81)	RCT	China	Healthcare setting	Respiratory infectious diseases
Marchand-Senecal 2020(82)	Non-comparative - Case series	Canada	Healthcare setting	COVID-19
Maroldi 2017(83)	Qualitative	Brazil		Other
Matthews Pillemer 2015(84)	Qualitative	United States of America, China, Taiwan and Singapore	Non-healthcare setting	SARS
Moore 2005(85)	Qualitative	Canada	Healthcare setting	SARS
Mukerji 2017(86)	Qualitative	China	Healthcare setting	Respiratory infection (Clinical respiratory illness [CRI])
Nichol 2008(87)	Qualitative	Canada	Healthcare setting	SARS
Nichol 2013(88)	Qualitative	Canada	Healthcare setting	Occupational transmission
Nishiura 2005(89)	Comparative NRS - Cohort	Vietnam	Healthcare setting	SARS
Nishiyama 2008(90)	Comparative NRS	Vietnam	Healthcare setting	SARS
Ofner-Agostini 2006(91)	Non-comparative - Case series	Canada	Healthcare setting	SARS
Olsen 2003(92)	Comparative NRS - Cohort	China	Non-healthcare setting	SARS
Ong 2020(93)	Mechanistic	Singapore	Healthcare setting	SARS
Ou 2020(94)	Comparative NRS	China	Non-healthcare setting	COVID-19
Park 2004(95)	Comparative NRS - Cohort	United States of America	Healthcare setting	SARS
Park 2015(96)	Non-comparative - Case series	South Korea	Healthcare setting	MERS
Park 2016(97)	Comparative NRS - Cohort	South Korea	Healthcare setting	MERS
Park 2020(98)	Non-comparative	South Korea	Healthcare setting	MERS
Parker 2006(99)	Qualitative	Canada	Healthcare setting	SARS
Peck 2004(100)	Comparative NRS - Cohort	United States of America	Healthcare setting	SARS
Pei 2006(101)	Comparative NRS - Cohort	China	Healthcare setting	SARS
Qi 2020(102)	Contextual factors - qualitative or quantiative	China	Healthcare setting	COVID-19
Qian 2020(103)	Comparative NRS	China	Non-healthcare setting	COVID-19

Study ID[Reference]	Study Design	Country	Setting	Virus
Qian 2020(104)	Non-comparative	China	Healthcare setting	COVID-19
Qiu 2020(105)	Non-comparative	China	Non-healthcare setting	COVID-19
Rabaan 2017(106)	Qualitative	Saudi Arabia	Healthcare setting	MERS
Radonovich 2019(107)	Qualitative	United States of America	NR	Viral respiratory infections
Rea 2007(108)	Comparative NRS - Cohort	Canada	Non-healthcare setting	SARS
Reuss 2014(109)	Comparative NRS	Germany	Healthcare setting	MERS
Reynolds 2006(110)	Comparative NRS - Cohort	Vietnam	Healthcare setting	SARS
Rozenbojm 2015(111)	Qualitative	Canada	Healthcare setting	Other
Ryu 2019(112)	Comparative NRS - Cohort (but none infected)	South Korea	Healthcare setting	MERS
Scales 2003(113)	Comparative NRS	Canada	Healthcare setting	SARS
Seto 2003(114)	Comparative NRS - Cohort	China	Healthcare setting	SARS
Shen 2020(115)	Comparative NRS	China	Healthcare setting	COVID-19
Shigayeva 2007(116)	Qualitative	Canada	Healthcare setting	SARS
Siu 2016(117)	Qualitative	China	Healthcare setting	SARS
Sun 2020(118)	Non-comparative	China	Non-healthcare setting	COVID-19
Tan 2006(119)	Qualitative	Singapore	Healthcare setting	SARS
Tang 2004(120)	Qualitative	Hong Kong		SARS
Tang 2005(121)	Qualitative	Singapore	Healthcare setting	SARS
Teleman 2004(122)	Comparative NRS - Cohort	Singapore	Healthcare setting	SARS
Tian 2020(123)	Non-comparative	China	Healthcare setting	COVID-19
Timen 2010(124)	Qualitative	Netherlands	Healthcare setting	NA
Tuan 2007(125)	Comparative NRS - Cohort	Vietnam	Non-healthcare setting	SARS
Turnberg W 2008(126)	Qualitative	Washington	Healthcare setting	None
Twu 2003(127)	Non-comparative - Case series	Taiwan	Healthcare setting	SARS
Varia 2003(128)	Non-comparative - Case series	Canada	Healthcare setting	SARS
Visentin 2009(129)	Qualitative	Canada	Healthcare setting	SARS
Wang 2015(130)	RCT - Cluster RCT	Saudi Arabia	Non-healthcare setting	MERS and other respiratory viruses

Study ID[Reference]	Study Design	Country	Setting	Virus
Wang 2020(131)	Comparative NRS	China	Non-healthcare setting	COVID-19
Wang 2020(132)	Non-comparative	China	Non-healthcare setting	COVID-19
Wang 2020(133)	Comparative NRS	China	Non-healthcare setting	COVID-19
Wang 2020(134)	Contextual factors - qualitative or quantiative	China	Healthcare setting	COVID-19
Wiboonchutikul 2016(135)	Comparative NRS	Thailand	Healthcare setting	MERS
Wilder-Smith 2005(136)	Comparative NRS - Cohort	Singapore	Healthcare setting	SARS
Wizner 2016(137)	Qualitative	United States of America	Healthcare setting	SARS
Wong 2004(138)	Qualitative	China	NR	SARS
Wong 2005(139)	Qualitative	China	NR	SARS
Wong 2013(140)	Qualitative – RCT + EtD	China	NR	Other
Wu 2004(141)	Comparative NRS	China	Healthcare setting	SARS
Wu 2020(142)	Non-comparative	China	Non-healthcare setting	COVID-19
Wu 2020(143)	Qualitative	China	Healthcare setting	COVID-19
Wu 2020(144)	Non-comparative - Case series	China	Healthcare setting	COVID-19
Xiang 2020(145)	Non-comparative	China	Non-healthcare setting	COVID-19
Xiao 2020(146)	Non-comparative	China	Non-healthcare setting	COVID-19
Xie 2020(147)	Non-comparative - Case series	China	NR	COVID-19
Yang 2011(148)	Non-comparative + EtD	China	NR	Respiratory infection (Clinical respiratory illness [CRI])
Yang 2020(149)	Comparative NRS	China	Non-healthcare setting	COVID-19
Yang 2020(150)	Non-comparative	China	Healthcare setting	COVID-19
Yin 2004(151)	Comparative NRS - Cohort	China	Healthcare setting	SARS
Yu 2005(152)	Comparative NRS - Cohort	China	Healthcare setting	SARS
Yu 2007(153)	Comparative NRS - Cohort (cluster, not by patient)	China	Healthcare setting	SARS
Yu 2020(154)	Non-comparative	China	Non-healthcare setting	COVID-19
Yue 2020(155)	Non-comparative	China	Healthcare setting	COVID-19

Study ID[Reference]	Study Design	Country	Setting	Virus
Zeng 2020(156)	Comparative NRS	China	Non-healthcare setting	COVID-19
Zhang 2020(157)	Comparative NRS	China	Non-healthcare setting	COVID-19
Zhang 2020(158)	Non-comparative	China	Non-healthcare setting	COVID-19
Zhang 2020(159)	Non-comparative	China	Non-healthcare setting	COVID-19
Zhao 2020(160)	Comparative NRS	China	Healthcare setting	COVID-19
Zhou 2020(161)	Non-comparative	China	Healthcare setting	COVID-19
Zhou 2020(162)	Non-comparative	China	Non-healthcare setting	COVID-19
Zhu 2020(163)	Contextual factors - qualitative or quantiative	China	Non-healthcare setting	COVID-19
Zhuang 2020(164)	Non-comparative	China	Non-healthcare setting	COVID-19

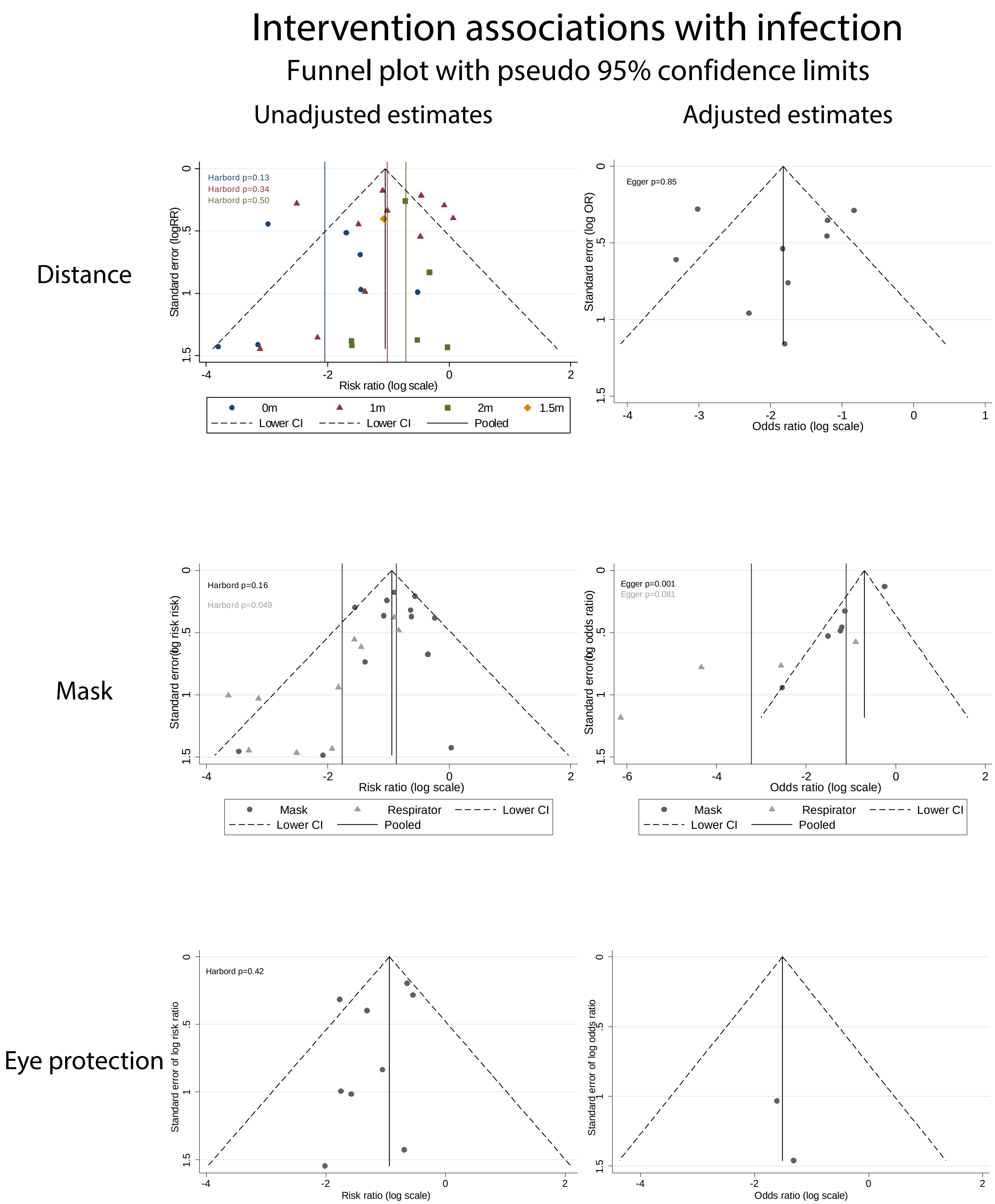
Appendix 3. Newcastle-Ottawa for non-randomized studies, for the outcome of disease transmission

Study	Selection*	Comparability	Outcome/Exposure	Overall Rating (more stars = lower risk of bias)	Disease
Alraddadi 2016	★★★	★★	★★★	★★★★★★★★	MERS
Arwady 2016	★★★	-	★★★	★★★★★★	MERS
Bai 2020	★★	-	★★★	★★★★★	COVID-19
Burke 2020	★★★	-	★	★★★★	COVID-19
Caputo 2006	★★	-	★★★	★★★★★	SARS
Chen 2009	★★★★	★★	★	★★★★★★★	SARS
Cheng 2020	★★★	-	★★	★★★★★	COVID-19
Fan 2020	★★	-	★★	★★★★	COVID-19
Ha 2004	★★	-	-	★★	SARS
Hall 2014	★★★	-	-	★★★	MERS
Heinzerling 2020	★★	-	★★	★★★★	COVID-19
Ho 2004	★★★	★★	★★★	★★★★★★★★	SARS
Ki 2019	★★	★★	★★★	★★★★★★	MERS
Kim 2016	★★★★	-	★★	★★★★★★	MERS
Kim 2016	★★★★	-	★★	★★★★★★	MERS
Lau 2004	★★★	★★	★★	★★★★★★★	SARS
Liu 2009	★★★	★	★	★★★★★	SARS
Liu ZQ 2020	★★★★	-	★★★	★★★★★★★	COVID-19
Loeb 2004	★★	-	-	★★	SARS
Ma 2004	★★★★	★★	★★★	★★★★★★★★★	SARS
Nishiura 2005	★★★	★★	★★★	★★★★★★★★	SARS
Nishiyama 2008	★★	★★	★★	★★★★★★	SARS
Olsen 2003	★★★	-	★★★	★★★★★★	SARS
Park 2004	★★★★	★★	★★★★	★★★★★★★★★★	SARS

Park 2016	★★	-	★	★★★	MERS
Peck 2004	★★★★	★★	★★★	★★★★★★★★★	SARS
Pei 2006	★★★	★★	★★★	★★★★★★★★	SARS
Rea 2007	★★	-	★★	★★★★	SARS
Reuss 2014	★★★	-	★★	★★★★★	MERS
Reynolds 2006	★★	-	★	★★★	SARS
Ryu 2019	★★★	★	★★★	★★★★★★★	MERS
Scales 2003	★★	-	-	★★	SARS
Seto 2003	★★★★	★★	★★	★★★★★★★★	SARS
Teleman 2004	★★★★	★★	★★	★★★★★★★★	SARS
Tuan 2007	★★	★★	★★	★★★★★★	SARS
Wang QP 2020	★★★	-	★★	★★★★★	COVID-19
Wiboonchutikul 2016	★★	-	★★★	★★★★★	MERS
Wilder-Smith 2005	★★★	★★	★★★	★★★★★★★★	SARS
Wong TW 2004	★★★	-	★★	★★★★★	SARS
Wu 2004	★★★★	★★	★★	★★★★★★★★	SARS
Wu 2020	★★	-	★★	★★★★	COVID-19
Yin 2004	★★★★	★★	-	★★★★★★	SARS
Yu 2005	★★★	★	★★★	★★★★★★★	SARS
Yu 2007	★★★	★★	★★	★★★★★★★	SARS

*For each category, A single dash (-) indicates no stars, and therefore high risk of bias.

Appendix 4. Funnel plots



Appendix 5. Evidence Profiles

Author(s): Derek K. Chu, Elie Akl, Amena El-Harakeh, Antonio Bognanni, Tamara Lotfi, Mark Loeb, Aida Farha, Anisa Hajizadeh, Anna Bak, Ariel Izcovich, Carlos A. Cuello-Garcia, Chen Chen, David James Harris, Ewa Borowiack, Fatimah Chamseddine, Finn Schünemann, Gian Paolo Morgano, Giovanna Elsa Ute Muti Schünemann, Guang Chen, Hong Zhao, Ignacio Neumann, Jeffrey Chan, Joanne Khabsa, Layal Hneiny, Leila Harrison, Maureen Smith, Nesrine Rizk, Paolo Giorgi Rossi, Pierre AbiHanna, Rayane El-Khoury, Rosa Stalteri, Tejan Baldeh, Thomas Piggott, Yuan Zhang, Zahra Saad, Assem Khamis, Marge Reinap, Stephanie Duda, Karla Solo, Sally Yaacoub, Holger Schünemann

Question: Should physical distancing of more than one meter compared to one meter or less, masks versus no masks, and/or eye protection versus no eye protection be used to prevent disease transmission to people exposed to patients infected or suspected to be with COVID-19?

Setting: Any (Healthcare and non-healthcare)

Bibliography: Chu et al. prepared for publication

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Relative (95% CI)	Absolute (95% CI)		
Infection with COVID-19 (follow up: range 10 days to more days; assessed with: COVID-19, SARS, MERS infection)												
9	observational studies A physical distance of more than one meter vs less than one meter	not serious [a]	not serious [b]	not serious [c,d]	not serious	strong association [e,f]	97/5065 (1.9%) [g]	347/2717 (12.8%)	aOR 0.18 (0.09 to 0.38)	102 fewer per 1,000 (from 115 fewer to 75 fewer)	⊕⊕⊕◯ MODERATE	CRITICAL
10	observational studies Masks vs no masks	not serious i	not serious [h]	not serious [j]	not serious	none [k]	145/1066 (13.6%)	197/1134 (17.4%)	aOR 0.15 (0.07 to 0.34)	143 fewer per 1,000 (from 159 fewer to 107 fewer)	⊕⊕◯◯ LOW	CRITICAL
13	observational studies Eye protection (face shield, goggles)	not serious n	not serious [m]	not serious [o]	not serious	none [p]	62/1335 (4.6%)	388/2378 (16.3%)	RR 0.34 (0.22 to 0.52) [l]	108 fewer per 1,000 (from 127 fewer to 78 fewer)	⊕⊕◯◯ LOW	CRITICAL

CI: Confidence interval; OR: Odds ratio

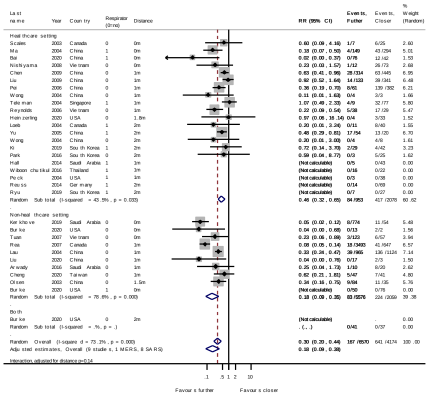
a. All studies were non-randomized and evaluated using the Newcastle-Ottawa Scale. Some studies had higher risk of bias than others but there was no important difference in the sensitivity analyses excluding studies at higher risk of bias. We did not further rate down for risk of bias.
b. Although there was a high I2 value and lack of overlapping confidence intervals, all point estimates of the studies exceeded the thresholds for large effects and we did not rate down for inconsistency.
c. We did not rate down for indirectness for the association between distance and infection because the SARS and COVID-19 viruses all belong to the same family and have each caused epidemics with sufficient similarity; there was also no convincing statistical evidence of effect modification across viruses
d. Some studies included the use of masks, but subgroup analysis did not reveal important differences. Some studies also used bundled interventions and the effect of distances could not be evaluated in isolation but the studies shown here include only those that provide adjusted estimates. We did not rate down for intervention indirectness.
e. The effect is large considering the thresholds set by GRADE assuming that the odds ratios translate into similar magnitudes of relative risk estimates. This also mitigated concerns about risk of bias.
f. The data suggest a dose-response gradient with associations increasing from smaller distances to 2 meters and beyond. This was also suggested by a meta-regression. We did not rate up for this domain alone but in combination with the large effects.
g. One of the studies, did report the raw data but only the adjusted estimates.
h. Although there was a high I2 value, all point estimates of the studies were relatively large and the confidence intervals were overlapping and we did not rate down for inconsistency.
i. All studies were non-randomized and evaluated using the Newcastle-Ottawa Scale. Some studies had higher risk of bias than others but there was no important difference in the sensitivity analyses excluding studies at higher risk of bias. We did not further rate down for risk of bias.
j. We did not rate down for indirectness for the association between eye protection and infection because the SARS and COVID-19 belong to the same family and are considered sufficiently similar. Some studies also used bundled interventions and the effect of distances could not be evaluated in isolation but the studies shown here include only those that provide adjusted estimates. We did not rate down for intervention indirectness.
k. The effect is large considering the thresholds set by GRADE assuming that the odds ratio translate into similar magnitudes of relative risk estimates. This mitigate concerns about risk of bias but all studies were unadjusted and risk of bias still too high to rate up for large effects.
l. Two of these studies (Ma 2004 and Yin 2004) provided adjusted estimates with a total of 295 in the goggles group and 107 in the group not wearing goggles. The results were similar to the unadjusted estimate (OR 0.22, 95% CI 0.12 - 0.39).
m. Although there was a high I2 value, all point estimates of the studies were relatively large and the confidence intervals were overlapping and we did not rate down for inconsistency.
n. All studies were non-randomized and evaluated using the Newcastle-Ottawa Scale. Some studies had higher risk of bias than others but there was no important difference in the sensitivity analyses excluding studies at higher risk of bias. We did not further rate down for risk of bias.
o. We did not rate down for indirectness for the association between eye protection and infection because the SARS and COVID-19 belong to the same family and are considered sufficiently similar. Some studies also used bundled interventions and the effect of distances could not be evaluated in isolation but the studies shown here include only those that provide adjusted estimates. We did not rate down for intervention indirectness.
p. The effect is large considering the thresholds set by GRADE assuming that the odds ratio translate into similar magnitudes of relative risk estimates. This mitigate concerns about risk of bias but all studies were unadjusted and risk of bias still too high to rate up for large effects.

Appendix 6. Forest plots of additional analyses

Appendix 6. Forest plots of additional analyses

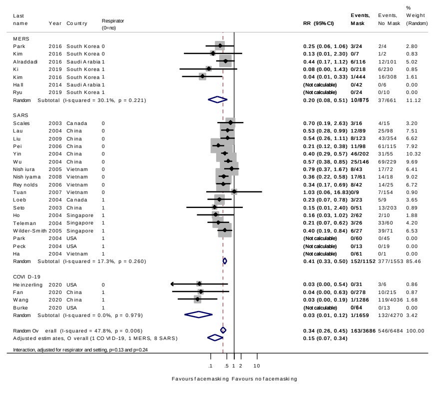
Association of exposure proximity with infection
Sub-divided by setting and intervention

Setting



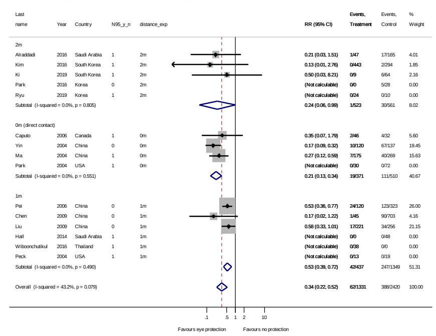
Association of mask use with infection
Sub-divided by population and setting

Virus

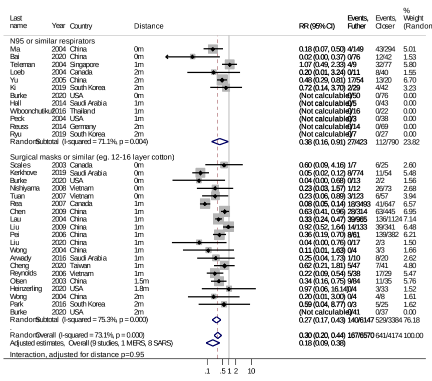


Association of eye protection with infection
Sub-divided by intervention

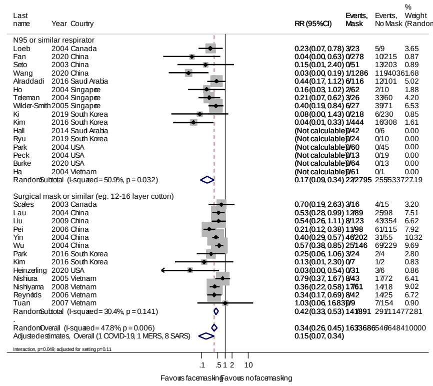
Unadjusted estimates by distance to infected individual



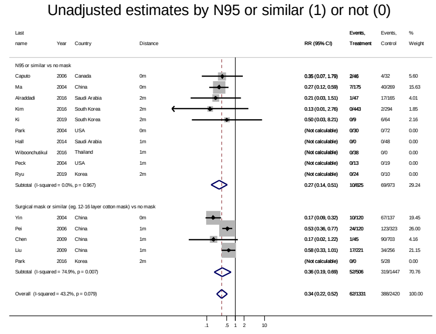
Facemask



Facemask



Unadjusted estimates by N95 or similar (1) or not (0)



Appendix 7. Sensitivity analyses, and Bayesian Meta-analyses

	Distancing		Masks		Eye protection	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Sensitivity analyses						
Bayesian Influenza RCTs (mean=0.93, SD of logRR=0.57)			0.54 (95%CrI 0.43-0.82)	0.40 (95%CrI 0.16-0.97)		
Exclude Preprints	0.32 (0.21-0.48)	0.15 (0.07-0.31)	0.38 (0.31-0.48)	0.21 (0.10-0.43)	0.34 (0.22-0.52)	0.22 (0.12-0.39)
Fixed effect model	0.34 (0.29-0.40)	0.16 (0.12-0.22)	0.32 (0.27-0.38)	0.16 (0.12-0.22)	0.36 (0.28-0.46)	0.22 (0.12-0.39)
Hartung-Knapp-Sidik-Jonkman random effects model	0.30 (0.20-0.44)	0.15 (0.08-0.30)	0.34 (0.25-0.47)	0.15 (0.08-0.30)	0.34 (0.22-0.51)	0.22 (0.04-1.27)

Bayesian meta-analysis if MacIntyre 2013(165) cluster RCT used as likelihood function (OR 0.50 [95%CI 0.34-0.74]), posterior probability for OR<1 of N95 masks being more protective versus medical masks = 98.4%.

Pooled unadjusted odds ratios were similar to risk ratios:
Distancing: OR 0.22 (0.14- 0.35)
Masks: OR 0.22 (0.15- 0.32)
Eye protection: OR 0.26 (0.16-0.45)

Exclusion of Seto from adjusted estimates, because about 54% of its population used N95 masks, did not change the findings: aOR 0.03 (0.001-0.56)

The pooled aORs for studies with the various types of facemasks were:
N95 or similar respirators: 0.04 (0.004-0.30)

versus

Surgical masks: 0.20 (0.06-0.63)
12-16 multilayer cotton masks: 0.33 (0.10-1.03)
Surgical masks or multilayer cotton masks: 0.31 (0.16-0.53)
Test for interaction of surgical versus multilayer cotton masks, $p_{interaction} = 0.91$

Appendix 8. Credibility assessment of potential effect modifiers (modified from GRADE inconsistency guidelines to include 'other considerations')

Outcome	COVID-19, SARS, MERS viral transmission		
Potential effect modifier **Criteria**	Distance dose-response	N95 or similar versus surgical mask or similar (eg. 12-16 layer cotton)	Healthcare versus non-healthcare settings for mask use
Is the subgroup variable a characteristic specified at baseline (in contrast with after randomization)?	Yes	Yes	Yes
Is the subgroup difference suggested by comparisons within rather than between studies?	No	Yes, the included studies report a potential hierarchy of least protective being no mask, paper mask, disposable or 12-16 layer reusable cotton mask, then N95 or similar respirator	No
Does statistical analysis suggest that chance is an unlikely explanation for the subgroup difference?	Possibly, mean > 1 with wide CIs expected from few studies at each cut point, $p=0.041$	Yes, $p=0.033$ Bayesian analyses also support this with posterior probability of RR<1 being >95%.	Possibly, $p=0.049$ in univariate meta-regression, and when controlling for differential N95 use between settings, still low at $p=0.11$
Did the hypothesis precede rather than follow the analysis, and include a hypothesized direction that was subsequently confirmed?	Yes	Yes	Yes
Was the subgroup hypothesis one of a small number tested?	Yes	Yes	Yes
Is the subgroup difference consistent across studies and across important outcomes?	Consistent with findings with other interventions presented here	Yes across studies	No
Does external evidence (biological or sociological rationale) support the hypothesized subgroup difference?	Yes, it would be expected that the further away one is from a person with infection that transmits by droplets, that the further distances lead to decreased risk of infection.	The increased filtration capacity of respirators would be expected to have enhanced protection against viral droplets, or smaller versions of such droplets or aerosols.	Possibly, some hypothesize that mask use in non-healthcare settings can lead to self-inoculation virus through mechanisms such as improper use or touching the mask with contaminated hands, but there is no definitive evidence with hard outcomes that community-based mask interventions are ineffective or harmful.
Absence of other considerations that would decrease confidence of true effect-modification?	Imprecision. Association primarily based on unadjusted data, albeit estimates of unadjusted and adjusted data were similar.	Although influenza is very different from pandemic COVID-19, SARS, MERS, it provides very indirect and limited RCT data suggesting no difference, albeit the Bayesian analyses here attempt to account for that.	Imprecision, particularly few community-focused studies
Criteria fulfilled, out of 8 (not an absolute cutoff)	**5**	**6-7**	**3-4**
Overall credibility of subgroup analysis	**MODERATE**	**MODERATE-HIGH**	**LOW-MODERATE**

Low credibility, likely spurious; Moderate credibility, plausible, possibly even likely, but some important doubt remains; High credibility, Likely convincing.

Appendix 9. Summary of contextual factor data

Resource use

Two qualitative and two cross-sectional studies reported on data related to the cost and resource use in the management of SARS (51, 65), MERS (5) and coronavirus (83). The four studies were conducted in Hong Kong, Brazil, Singapore and Saudi Arabia. Khoo et al. (2005) reported the cost of 3M powered air-purifying respirators (PAPR) to be US$860 and Stryker PARP US$580 as compared to N95 (US$0.70) (51). In another study, health workers perceived the management of SARS as a burden which costs hundreds of millions; with direct operating expenditure (e.g., medical supplies, personal protective equipment, and screening) costing US$110 million(65). Malordi et al. (2017) highlighted the consequences of the lack of resources which include inadequate training on measures to prevent disease transmission(83). Al-Tawfiq et al. (2019) highlighted a monthly added cost of $16,400 for infection control items, such as hand sanitizers, soap, surgical masks, and N95 respirators during MERS outbreak in one hospital in Saudi Arabia (5). A survey of health workers in a hospital (doctors, nurses and respiratory therapists, n=51) showed that the majority of health workers (84%) preferred using PAPR over N-95 respirators when treating suspected SARS patients despite its high cost (51).

Acceptability

Six qualitative studies conducted in China and one cross-sectional study conducted in Vietnam reported on the acceptability of physical distancing and/or wearing masks as preventive measures for COVID-19.

Acceptability by visitors of suspected or confirmed COVID-19 cases

Wang et al. (2020) carried out an online survey to investigate the protective behaviors of visitors accompanying hospitalized patients during COVID-19 pandemic (134). 208 questionnaires were collected, and the survey showed that 85% of visitors accompanying suspected COVID-19 cases wear masks while present in the hospital.

Acceptability by the public

Four qualitative studies presented information on the willingness of residents in China to wear masks in public places and to avoid crowds (18, 64, 102, 166). The four studies used online questionnaires to survey members of the public and the samples were respectively, n=1,138 (64), n=917 (166), n=3,083 (102), and n=4,016 (18). Across the four studies, most of the participants reflected high willingness to wear masks in public places (95%, 99%, 97%, 94% respectively). In terms of social gatherings, the majority of the participants across three of the studies favored avoiding crowded areas (91%, 96%, 97% respectively) (18, 64, 102).

Another survey conducted in Vietnam (n=345) found that the risk perception of COVID-19 threat significantly increased the likelihood of wearing medical masks ($p<0.01$). The increased likelihood of wearing masks was also shown to increase with age (45).

Acceptability by college students

A survey to assess the knowledge and protective behaviors among college students (n=22,302 online questionnaires) in China during COVID-19 pandemic(12), found that 99% of students were willing to avoid close contact with others (less than 1 meter), 95% considered avoiding crowded places as an important way to control the epidemic, and 99% reported wearing a mask in public places for week prior to being surveyed.

Acceptability by healthcare workers

A cross-sectional survey (56) performed in the context of the SARS epidemic in Hong Kong, assessed various precautionary measures from the viewpoint of 1,397 residents. Most of the respondents believed that SARS could be transmitted via direct body contact with patients (84%) and via respiratory droplets (97%). The perceived risk of transmission increased during the escalating phase of the epidemic (52%) and declined during a later stage (36%).

During the first phase of the epidemic, respondents reported a significant increase in the application of preventive measures such as avoiding going outside and avoiding crows, which dropped at a later stage. Those who perceived avoiding crowded places as an effective preventive measure (OR: 31.564, 95% CI: 15.610 -63.824) were likely to avoid crowded places. In terms of the acceptability of wearing masks, most of the respondents (95%) regarded this action as a 'civic responsibility' and reflected commitment to wearing masks in public places. Those who perceived wearing a mask as an efficacious means of prevention (OR: 7.151, 95% CI: 4.245-12.045) were more likely than others to wear a mask (56).

Five studies conducted on health professionals (including medical staff and nurses) in primary health care and hospital settings showed that an increase in the perceptions and awareness of risk of transmission of SARS was associated with better adherence to preventive measures including wearing masks and eye protection (32, 75, 83, 88, 116).

A cross-sectional quantitative survey of dental health professionals (n=406) working in dental facilities in Saudi Arabia showed good practices related to making patients with MERS infection wear masks during transport (84%). However, knowledge was relatively limited (56.4%) about the need to wear a mask within a 90 cm distance from a patient under droplet precaution care (10). Another cross-sectional survey of health workers (N=10,236) was conducted about the appropriateness of using PAPR and N95 respirators in public hospitals and polyclinics during the SARS outbreak in Singapore (23). Among doctors (n=873), nurses (n=4,404), and clerical staff (n=921), 99.5%, 99% and 97% respectively viewed N95 respirator to be an adequate protection against SARS.

A cross-sectional study (two surveys) was conducted to assess the use of personal protective equipment among medical students during and after the SARS outbreak in a teaching hospital in Hong Kong and study its impact on their personal hygiene practice when they contacted patients (139). Prior to the SARS outbreak, none of the students wore masks during history taking and physical examination. In the 2004 survey, 86.1% and 93.8% of students wore masks during history taking and physical examination, respectively.

Another study (secondary data analysis) conducted in Saudi Arabia evaluating the use of masks before and during MERS showed an increase in the use of both, surgical masks (from 2,947.4 to 10,283.9 per 1,000 patient-days) and N-95 respirators (from 22 to 232 per 1,000 patient-days) ($p < .0000001$) (5).

Feasibility

In this section, we summarized barriers and facilitators to the implementation and sustainability of using masks based on findings from the included studies. Among barriers, we identified:

Barriers to the use of protective masks

A study showed that N-95 respirators was perceived by health workers as uncomfortable during the SARS outbreak (48). N95 respirators often developed cracks in the chin area for small-jawed female health professionals and the overlapping parts of different PPE items were ill-fitted (e.g., gaps between goggles and N95 respirator) (48).

Family physicians (n=7) in Singapore stressed on the physical discomfort during prolonged use of the N-95 mask (e.g., breathing difficulty, headache, development of allergic facial rash around the mask) in a qualitative study employing interviews about factors that influence the use of PPE during the SARS outbreak (119) . In this study, family physicians in Singapore also showed that the use of the N-95 mask led to difficulty in communication with patients who had adverse reaction (i.e., worries and concern as PPE was a sign that the physician could have been exposed to SARS) (119). In addition, Khoo et al. (2005) showed that PAPR made most of the health workers (64%) feel that they looked frightening to their patients when using it (51).

Another qualitative study used 15 focus group discussions to examine the perceptions of health workers (n=105) in Canada regarding factors associated with self-protective behavior during the SARS outbreak (85). This study identified mask fitting and uncomfortable PPE to be among the barriers to effective use of PPE.

Absence of a monitoring system

Moore et al. (2005) showed that barriers to the use of protective wear included deficiencies in the tracking system to monitor the development, delivery and evaluation of training in infection control (85).

Lack of adherence to available guidance

In a qualitative study among health professionals (n=26) in the Netherlands about barriers to implementing infection prevention and control guidelines during crises, respondents highlighted the below as potential reasons for the lack of adherence to guidelines during outbreaks such as SARS (124):

- lack of imperative or precise wording
- lack of easily identifiable instructions specific to each profession
- lack of concrete performance targets
- lack of timely and adequate guidance on personal protective equipment and other safety measures

Other barriers that were described in the included studies were the shortage of PPE and cost due to bulk purchase (119), lack of consistent policies for quarantining individuals, reuse of masks, and deficiencies in decision regarding the assignment of patients to negative pressure rooms (85).

Facilitators to the use of protective masks

Most of the health workers perceived both types of PAPR (3M and Stryker) to be easy or relatively easy to use (74% and 91%) with an acceptable level of visual impairment attributable to the PAPR (98% and 95% for the 3M and Stryker PAPR, respectively) (51).

Perceived susceptibility and perceived benefits

A survey about factors influencing the wearing of facemasks for the prevention of SARS among adult Chinese (n=1329) in Hong Kong showed that 61% of respondents reported consistent use of facemasks to prevent SARS and the following predicting factors (120):

- Awareness of the risks and serious consequences associated with SARS: respondents who felt more susceptible to contracting SARS (OR = 2.575; CI = 1.586, 4.181) and those who perceived SARS as having more serious consequences (OR =1.176; CI = 0.909, 1.521) were more likely to wear facemasks.
- Awareness of the benefits of wearing facemasks: respondents who believed greater benefits in wearing facemasks (OR = 1.354; CI = 1.019, 1.800) were more likely to wear facemasks.

Appendix 10. PROSPERO Registration number

Registration number CRD42020177047

A rapid systematic review of physical distancing with or without masks and with or without eye protection to prevent COVID-19 transmission between patients with confirmed COVID-19 infection and other people, including health care workers

Holger Schunemann, Derek Chu, Elie Akl, Mark Loeb, Sally Yaacoub, Layal Hneiny, Neera Bhatnagar, Aida Farha, Ray Yuan Zhang, Ariel Izcovich, Ignacio Neumann, Carlos Cuello Garcia, Finn Schünemann, Giovanna Muti-Schünemann, Gian Paolo Morgano, Tamara Lotfi, Thomas Piggott, Ewa Borowiack, Anna Bak, Tejan Baldeh, Rosa Stalteri, Anisa Hajizadeh, Leila Harrison, Hong Zhao, Guang Chen, Antonio Bognanni, Marge Reinap, Paolo Giorgi Rossi

Citation

Holger Schunemann, Derek Chu, Elie Akl, Mark Loeb, Sally Yaacoub, Layal Hneiny, Neera Bhatnagar, Aida Farha, Ray Yuan Zhang, Ariel Izcovich, Ignacio Neumann, Carlos Cuello Garcia, Finn Schünemann, Giovanna Muti-Schünemann, Gian Paolo Morgano, Tamara Lotfi, Thomas Piggott, Ewa Borowiack, Anna Bak, Tejan Baldeh, Rosa Stalteri, Anisa Hajizadeh, Leila Harrison, Hong Zhao, Guang Chen, Antonio Bognanni, Marge Reinap, Paolo Giorgi Rossi. A rapid systematic review of physical distancing with or without masks and with or without eye protection to prevent COVID-19 transmission between patients with confirmed COVID-19 infection and other people, including health care workers. PROSPERO 2020 CRD42020177047 Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020177047

Review question

From patients infected with COVID-19, what distance can the COVID-19 virus travel (mechanistic question)? What is the impact on people maintaining at least one meter distance compared to a smaller distance from a patient or suspected patient with COVID-19 on droplet transmission (intervention question)?

Sub-questions:

(1) With or without a mask on the patient;

(2) With or without a mask and with or without eye protection on the non-infected person

Searches

We will search the following electronic databases:

• PubMed, MEDLINE, EMBASE, CINAHL, and the Cochrane Library from 2019 to current date.

We will search the following Chinese electronic databases:

• WHO Chinese database

• CNKI (http://new.oversea.cnki.net/index/)

• China Biomedical Literature Service (http://www.sinomed.ac.cn/login.do)

In addition, we will search the following COVID-19 specific databases from 2019 to current date

• Epistemonikos COVID-19 L·OVE platform (https://app.iloveevidence.com/loves/5e6fdb9669c00e4ac072701d);

• EPPI Centre living systematic map of the evidence (http://eppi.ioe.ac.uk/cms/Projects/DepartmentofHealthandSocialCare/Publishedreviews/COVID-19Livingsystematicmapoftheevidence/tabid/3765/Default.aspx);

• CORD-19 (https://www.kaggle.com/allen-institute-for-ai/CORD-19-research-challenge);

• COVID-19 Research Database maintained by the World Health Organization (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov)

We will conduct a search for ongoing trials using the U.S. National Library of Medicine Register of Clinical Trials (ClinicalTrials.gov) and the WHO International Clinical Trials Registry Platform (ICTRP). We will hand-search the reference lists of the included papers. We will also review the studies included in any identified relevant systematic reviews.

Search strategy combines relevant medical subject headings (MeSH) and keywords, which include “COVID-19”, and “corona virus”. PubMed search terms are informed by https://blocks.bmi-online.nl/catalog/397. The search strategy has been drafted by Ms. Layal Hneiny and is being peer reviewed by two information specialists (Ms. Neera Bhatnagar and Ms. Aida Farha). Finalized search strategies will be available on March 26, 2020 but the final draft can be found in the appendix.

Content experts will search websites of governmental and organizational websites for relevant grey literature documents.

Additional search strategies to identify indirect evidence on SARS and MERS will also be constructed and peer-reviewed by information specialists. This latter search will focus on systematic reviews.

Types of study to be included

No restrictions will be placed on study design. However, evidence will be prioritized by study design as follows: i) randomized controlled trials; ii) non-randomized comparative studies; iii) non-comparative studies (i.e., case reports, case series); iv) qualitative studies. We will exclude single case reports if non-randomized studies comparative studies provide the same certainty of evidence. We will also review modelling studies. For the question addressing how far the virus can travel we will consider mechanistic human studies.

Condition or domain being studied

Infections and infestations, respiratory disorders

Participants/population

Studies focused on patients with confirmed COVID-19 infection [or SARS or MERS] and people in close contact with them, including health care workers, will be eligible for inclusion. Other related populations to consider are:

• individuals with suspected COVID-19 infection who are waiting to be tested (e.g., presenting to a lab, emergency department, or dedicated clinic to get tested), or cannot be tested (because of lack of resources)

• individuals with suspected or confirmed COVID-19 infection (whether symptomatic or not) who are in isolation in non-healthcare settings (e.g., at home, and other dedicated spaces such as stadiums and tents)?

Intervention(s), exposure(s)

At least one meter distance between people and COVID-19 infected patients:

(1) With or without a mask on the patient;

(2) With or without a mask and with or without eye protection on the HCW.

Subgroups:

• Masks include surgical mask and N95 mask among others; Similar names for N95 are:

o FFP2 (Europe EN 149-2001)

o KN95 (China GB2626-2006)

o P2 (Australia/New Zealand AS/NZA 1716:2012) o Korea 1st class (Korea KMOEL - 2017-64)

o DS (Japan JMHLW-Notification 214, 2018)

• Eye protection include visors, shields, and goggles among others

Comparator(s)/control
less than one meter of physical distancing

Main outcome(s)
· Transmission
· Risk of transmission to members of the community (herd immunity)
· Acceptability by different stakeholders (patient, HCW, individuals handling the dead bodies, health authorities) (e.g., possibly as a surrogate for harms if people are not wearing masks or eye protection)
· Unintended harms of distancing (e.g., when providing care) and of using masks or eye protection, stigmatization
· COVID19 infection (confirmed)
· COVID19 probable case
· ICU admission
· Hospitalization
· Death
· (Time to) Recovery

* Measures of effect
relative risks, odds ratios, risk difference, narrative summary

Additional outcome(s)
Droplet transmission (as measured by infection of others and confirmed by serological or microbiological or virolgical testing)

* Measures of effect
narrative

Data extraction (selection and coding)
A single reviewer will extract data using a piloted form and a second reviewer will verify all extracted data. Minimal data will be extracted addressing the following domains: study identifier; study design; setting; population characteristics; intervention and comparator characteristics; outcomes (quantitative if possible); source of funding and reported conflicts of interests; ethical approval; study limitations or other important comments.

Risk of bias (quality) assessment
One reviewer will perform risk of bias assessments and a second reviewer will verify all assessments. We will use the Cochrane risk of bias tool (version 2) for randomized controlled trials, and Newcastle Ottawa scale for non-randomized studies.

Strategy for data synthesis
We will synthesize data in both tabular and narrative formats. We anticipate our outcomes to be dichotomous, such as transmission, and therefore they will be analyzed as pooled risk ratios (RRs), if they are unadjusted estimates. If there are adjusted odds ratios from multivariable regression reported in the studies, then these will be pooled as adjusted odds ratios (aORs). These will be summarized using random effects meta-analysis using the DerSimonian and Laird random effects model, with heterogeneity calculated from the Mantel-Haenszel model. If there are time to event outcomes, shared frailty cox prorportional hazards models will be completed, with validation of the assumption of proportionality. This may necessitate digitization of Kaplan-Meier curves from published studies. All summary measures will be reported with an accompanying 95% confidence interval.

We anticipate that traditional statistical measures of heterogeneity will be less informative than established criteria per GRADE. Because of the poor performance of I^2 to quantify true heterogeneity, then we will accept any magnitude of I² for meta-analysis. Nevertheless, we will collect the I² statistic, but comment on its limitations in the presentation of final product. We will also accept any number of study for comparative or non comparative meta-analysis. Summary measures will include absolute and relative risks for the outcomes outlined above, displayed using funnel plots and calculated using random effects models. Publication bias will also be assessed visually using funnel plots and Harbord's modification to Egger test, or if adjusted odds ratios are used, then Egger's original test. If necessary, mean and SD will be calculated from medians and IQR or range by the method of Wan (BMC Medical Research Methodology201414:135).

If there are only non-comparative studies, then we will meta-analyze these by proportions (ie. incidence of outcome per report [eg. numerator=events of transmission, denominator=total exposed]. In the presence of sparse data, we will give preference to the logit transformation when completing this, otherwise we will use the Freeman-Tukey double arcsine transformation.

The synthesis of contextual factors (acceptability, etc.) will be narrative.

Subgroup effects will be analysed by meta-regression with tests of interaction by 10, 000 Monte-Carlo permutations to calculate p values to avoid spurious findings.

Sensitivity analyses will include analysis by fixed effect and Knapp-Hartung-Sidik-Jonkman random effects model. We will also employ Bayesian meta-analyses of existing literature on the efficacy of mask use to prevent viral transmission, using as charitable assumptions as plausible that the RCT data represent the true effect estimates. This will include shrinking the effect estimate of the observational data, decreasing its weight (ie. increasing its variance as a prior) or both. We will also employ noninformative priors.

Data analyses will be performed using STATA 14.3. GRADEpro GDT will be used to construct the summary of findings table.

The analyses and reporting of the review will be done according to the PRISMA and MOOSE guidelines. A single reviewer will grade the certainty of the evidence using the GRADE approach and a second reviewer will verify all assessments. If applicable, we will follow published guidance for rating the certainty in evidence in the absence of a single estimate of effect. Evidence will be presented using GRADE Evidence Profiles developed in the GRADEpro (www.gradepro.org) software.

Analysis of subgroups or subsets

Health care workers versus non health care workers, by mask type, with or without goggles or eye protection

Contact details for further information

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McMaster University

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Collaborators

Stephanie Duda. McMaster University
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Type and method of review

Epidemiologic, Meta-analysis, Narrative synthesis, Systematic review

Anticipated or actual start date

25 March 2020

Anticipated completion date

28 April 2020

Funding sources/sponsors

World Health Organization, McMaster University, and American University of Beirut

Conflicts of interest

Language

English

Country

Argentina, Canada, Chile, China, Denmark, Germany, Italy, Lebanon

Stage of review

Review Ongoing

Subject index terms status

Subject indexing assigned by CRD

Subject index terms

COVID-19; Health Personnel; Humans; Infections; Masks; severe acute respiratory syndrome coronavirus 2

Date of registration in PROSPERO

16 April 2020

Date of first submission

28 March 2020

Stage of review at time of this submission

Stage	Started	Completed
Preliminary searches	Yes	No
Piloting of the study selection process	Yes	No
Formal screening of search results against eligibility criteria	Yes	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

The record owner confirms that the information they have supplied for this submission is accurate and complete and they understand that deliberate provision of inaccurate information or omission of data may be construed as scientific misconduct.

The record owner confirms that they will update the status of the review when it is completed and will add publication details in due course.

Versions

16 April 2020

Appendix 11. PRISMA checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4-6
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	4
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4-6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5-6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5-6
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5-7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5-7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	7-8
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	7-8

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	7-8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	7-8
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	9, Fig 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	9, Table 1, Appendix
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	10, Table 1, Appendix
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10-12, Fig 2-4
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	10-12, Figs 2-4 Table 2
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Table 2, Appendix
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	10-12, Appendix
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	13
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	16
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	17
FUNDING			

Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	8

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: **www.prisma-statement.org**.

Appendix 11 continued – MOOSE checklist

Reporting of background should include	Page/Location
Problem definition	3-4
Hypothesis statement	3-4
Description of study outcome(s)	6
Type of exposure or intervention used	5-6
Type of study designs used	5-6
Study population	5-6
Reporting of search strategy should include	
Qualifications of searchers (eg, librarians and investigators)	5-6, Appendix
Search strategy, including time period included in the synthesis and keywords	5-6, Appendix
Effort to include all available studies, including contact with authors	5-6, Appendix
Databases and registries searched	5-6, Appendix
Search software used, name and version, including special features used (eg, explosion)	5-6, Appendix
Use of hand searching (eg, reference lists of obtained articles)	5-6, Appendix
List of citations located and those excluded, including justification	Figure 1, Appendix
Method of addressing articles published in languages other than English	5-6
Method of handling abstracts and unpublished studies	5-6
Description of any contact with authors	5-6
Reporting of methods should include	
Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	5-6
Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	5-7
Documentation of how data were classified and coded (eg, multiple raters, blinding, and interrater reliability)	5-7
Assessment of confounding (eg, comparability of cases and controls in studies where appropriate)	5-7
Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	7
Assessment of heterogeneity	7
Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	7-8
Provision of appropriate tables and graphics	Figures 1-4, Table 1-2, Appendix
Reporting of results should include	
Graphic summarizing individual study estimates and overall estimate	Figures 2-4, Appendix
Table giving descriptive information for each study included	Table 1, Appendix
Results of sensitivity testing (eg, subgroup analysis)	9-12, Appendix
Indication of statistical uncertainty of findings	9-12, Figures 2-4, Table 2
Reporting of discussion should include	
Quantitative assessment of bias (eg, publication bias)	16
Justification for exclusion (eg, exclusion of non-English-language citations)	16
Assessment of quality of included studies	Table 2, 13
Reporting of conclusions should include	
Consideration of alternative explanations for observed results	16
Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	13-14
Guidelines for future research	14-15
Disclosure of funding source	8

References for the Supplementary material

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