

Supplementary Appendix

Scoping Review Protocol

We included all publications which data were based on individual outcomes (eg. extracted directly from single study subjects) of covid infection such as disease presentation or severity, hospitalization and death. We included all observational studies (cohort and case-control) studies published in peer-reviewed journals, presented in conference papers and grey literature. Studies not designed to target these associations and/or using aggregated data such as mortality or hospitalization rates were excluded.

A search was conducted on Pubmed, Scopus and Web of Science, combining three different search queries related to covid, air pollution and individual-level data, while using Boolean Operators. As a last stage, we searched the reference list of included studies to look for other potentially relevant studies. After deduplication, title and abstract screening were undertaken against the inclusion/exclusion criteria. The full texts of the selected studies were then reviewed for eligibility. The two main reviewers (AA and DN) screened all of the literature. Conflicts were resolved through discussion. A data chart was created in Excel, with columns on author and publication year, study location, sample size, study population (community, hospitalized patients, etc), geographical and temporal exposure units, pollutants measured, outcome measured, confounders controlled for and summary of findings. Data charting was carried out primarily by AA but checked by DN and TM. No quality appraisal was undertaken for this scoping review as the aim was to summarize existing evidence on the topic to inform future research, policy and practice, not to include or exclude studies based on quality.

Web of Science

Search date: 28-01-2024

Search fields: topic (title, abstract, author keywords and keywords plus)

Filters: Human; 2019-2023

Search Terms:

"air pollu*" OR "fine particulate matter" OR ("particulate matter" AND "2.5 microns") OR ("particulate matter" AND "10 microns") OR "PM 2.5" OR "PM 10" OR "nitrogen dioxide" OR NO_x OR NO₂ OR "carbon monoxide" OR "CO" OR ozone OR O₃ OR SO₂

OR benzene OR "particulate matter exposure" OR "PM exposure" OR "particulate matter pollu*"

AND

(COVID-9 OR SARS-CoV-2) AND (severity OR mortality OR death OR morbidity OR hospitalization* OR "ICU admission*" OR intubation OR "intensive respiratory support" OR "invasive ventilation" OR "emergency department visit*")

AND

"individual patient" OR "individual outcome*" OR "individual-level"

Pubmed

Search date: 28-01-2024

Search fields: ALL fields

Filters: Humans, 2019-2023

Search Terms:

"air pollu*" OR "fine particulate matter" OR ("particulate matter" AND "2.5 microns") OR ("particulate matter" AND "10 microns") OR "PM 2.5" OR "PM 10" OR "nitrogen dioxide" OR NO_x OR NO₂ OR "carbon monoxide" OR "CO" OR ozone OR O₃ OR SO₂ OR benzene OR "particulate matter exposure" OR "PM exposure" OR "particulate matter pollu*"

AND

(COVID-9 OR SARS-CoV-2) AND (severity OR mortality OR death OR morbidity OR hospitalization* OR "ICU admission*" OR intubation OR "intensive respiratory support" OR "invasive ventilation" OR "emergency department visit*")

AND

"individual patient" OR "individual outcome*" OR "individual-level"

Scopus

Search date: 28-01-2024

Search fields: Article Title, abstract, keywords

Filters: 2019-2023

Search Terms:

"air pollu*" OR "fine particulate matter" OR ("particulate matter" AND "2.5 microns")
OR ("particulate matter" AND "10 microns") OR "PM 2.5" OR "PM 10" OR "nitrogen
dioxide" OR NO_x OR NO₂ OR "carbon monoxide" OR "CO" OR ozone OR O₃ OR SO₂
OR benzene OR "particulate matter exposure" OR "PM exposure" OR "particulate
matter pollu*"

AND

(COVID-9 OR SARS-CoV-2) AND (severity OR mortality OR death OR morbidity
OR hospitalization* OR "ICU admission*" OR intubation OR "intensive respiratory
support" OR "invasive ventilation" OR "emergency department visit*")

AND

"individual patient" OR "individual outcome*" OR "individual-level"

Supplementary Table S1: Newcastle-Ottawa Scale for included articles

Newcastle - Ottawa	Selection ¹ /Case definition ²				Comparability	Outcome ¹ /Exposure ²			Total
Item	1	2	3	4	1	1	2	3	
Beloconi ¹	a)*	a)*	a)*	a)*	a)*b)*	b)*	NA	b)*	8*/8
Bowe ¹	a)*	a)*	a)*	a)*	a)*b)*	b)*	NA	a)*	8*/8
Bozack ¹	b)*	a)*	a)*	a)*	a)*b)*	b)*	NA	b)*	8*/8
Chen C ¹	a)*	a)*	a)*	a)*	a)*b)*	b)*	NA	a)*	8*/8
Elliott ¹	c)	a)*	d)	a)*	a)*b)*	b)*	NA	a)*	6*/8
Chen Z ¹	c)	b)*	a)*	b)	a)*b)*	b)*	NA	a)*	6*/8
Hoskovec ¹	a)*	a)*	a)*	b)	a)*b)*	b)*	NA	c)	6*/8
Hyman ¹	a)*	a)*	a)*	a)*	a)*b)*	b)*	NA	a)*	8*/8
Jerrett ¹	c)	a)*	a)*	a)*	a)*	b)*	NA	a)*	6*/8
Lavigne ²	b)*	a)*	NA	NA	a)*	a)*	a)*	NA	5*/6
Lopez-Feldman ¹	a)*	a)*	a)*	a)*	a)*	a)*	NA	a)*	7*/8
Mendy ¹	b)*	a)*	a)*	a)*	a)*	b)*	NA	b)*	7*/8
Pergoraro ¹	a)*	a)*	a)*	a)*	a)*	b)*	NA	d)	6*/8
Ponzano ²	c)	a)*	a)*	a)*	a)*b)*	a)*	a)*	a)*	8*/9
Rigolon ¹	c)	a)*	a)*	a)*	a)*b)*	a)*	NA	a)*	7*/8
Di Ciaula ¹	c)	a)*	a)*	a)*	a)*b)*	b)*	NA	a)*	7*/8
Kogevinas ¹	c)	a)*	b)*	a)*	a)*b)*	c)	a)*	a)*	7*/9
English ¹	a)*	a)*	a)*	a)*	a)*b)*	b)*	NA	c)	7*\8
Bronte ¹	b)*	a)*	a)*	a)*	a)*	b)*	NA	a)*	7*/8
Zhang ¹	a)*	a)*	a)*	a)*	a)*b)*	b)*	a)*	a)*	9*/9
Kim ²	a)*	a)*	NA	NA	a)*b)*	b)*	a)*	NA	6*/6
Izadi ¹	c)	a)*	a)*	a)*	a)*	b)*	a)*	a)*	7*/9

1. According to the NOS version designed for cohort studies

2. According to the NOS version designed for case-control studies

Supplementary Table S2: PRISMA checklist

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	NA
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	1-2
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	2-3
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	NA
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	5/Sup. appendix
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Sup. appendix
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Sup. appendix
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Sup. appendix
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Sup. appendix
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Sup. appendix
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	5/Sup. appendix
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Sup. appendix