Supplementary file 1. Search strategy

Search strategy

On October 28th 2020 the comprehensive set of studies included in the COAP database (available on https://ispmbern.github.io/covid-19/living-review/collectingdata.html) was loaded in Endnote X9.

The dataset consisted of 82,401 references related to research on COVID-19. The following search was performed within this dataset:

(contact OR tracing OR track OR tracking OR warn OR warning) AND (smartphone OR app OR smartwatch OR device OR mobile OR smart phone OR bluetooth OR wearable OR iphone OR cell phone)

Background COAP database

The COAP database is a repository provided by Bern University, in which studies related to COVID-19 are incorporated. (available on https://ispmbern.github.io/covid-19/living-review/collectingdata.html)

Studies included in this repository are extracted on a daily basis from EMBASE (OVID), MEDLINE (PubMed), BioRxiv, and MedRxiv. References that are not yet available in the repository are added based on the date of publication provided by the aforementioned databases. The date on which the reference is added to the COAP database is included under the heading 'strategydate'.

Search strategies used for the COAP database are updated on a regular basis. An overview of these updates can be found below.

Initial search: 01.01.2020

MEDLINE

("Wuhan coronavirus" [Supplementary Concept] OR "COVID-19" OR "2019 ncov"[tiab] OR (("novel coronavirus"[tiab] OR "new coronavirus"[tiab]) AND (wuhan[tiab] OR 2019[tiab])) OR 2019-nCoV[All Fields] OR (wuhan[tiab] AND coronavirus[tiab])))))

EMBASE

ncov OR (wuhan AND corona) OR COVID

BioRxiv/MedRxiv

ncov or corona or wuhan or COVID

Update #1: 26.03.2020

MEDLINE
("Wuhan coronavirus" [Supplementary Concept] OR "COVID-19" OR SARS-CoV-2 OR "2019 ncov"[tiab] OR (("novel coronavirus"[tiab] OR "new coronavirus"[tiab]) AND (wuhan[tiab] OR 2019[tiab])) OR 2019-nCoV[All Fields] OR (wuhan[tiab] AND coronavirus[tiab]))

EMBASE
(nCoV or 2019-nCoV or ((new or novel or wuhan) adj3 coronavirus) or covid19 or covid-19 or SARS-CoV-2).mp.

BioRxiv/MedRxiv
ncov or corona or wuhan or COVID or SARS-CoV-2
With the kind support of the Public Health & Primary Care Library PHC, and following guidance of the Medical Library Association

Update #2: 01.04.2020

From 01.04.2020, we retrieve the currate BioRxiv/MedRxiv dataset Link

Update #3: 29.04.2020

MEDLINE
("coronavirus"[MH] OR "coronavirus infections"[MH] OR "coronavirus"[TW] OR "corona virus"[TW] OR "HCoV"[TW] OR "nCov"[TW] OR "covid"[TW] OR "covid19"[TW] OR "Severe Acute Respiratory Syndrome Coronavirus 2"[TW] OR "SARS-CoV2"[TW] OR "SARS-CoV 2"[TW] OR "SARS Coronavirus 2"[TW] OR "MERS-CoV"[TW]) AND (2019/1/1:3000[PDAT])

Update #4: 01.05.2020

EMBASE
(SARS coronavirus/ or middle east respiratory syndrome/ or severe acute respiratory syndrome/ or (coronavirus* or corona virus* or HCoV* or ncov* or covid or covid19 or sars-cov* or sarscov* or Sars-coronavirus* or Severe Acute Respiratory Syndrome Coronavirus*).mp.) and 20191201:20301231.(dc).

Update #5: 30.10.2020

EMBASE
(exp SARS-related coronavirus/ or severe acute respiratory syndrome/ or coronavirus disease 2019/ or (coronavir* or corona virus* or HCoV* or ncov* or 2019 cov or covid or covid19 or sars-cov* or sarscov* or sars-coronavirus* or Severe Acute Respiratory Syndrome Coronavirus* or nCoV).mp.) and 20191101:20301231.(dc).

MEDLINE

("severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "COVID-19" [Supplementary Concept] OR "coronavirus" OR "corona virus" OR "HCoV" OR "nCoV" OR "2019 CoV" OR "covid" OR "covid19" OR "Severe Acute Respiratory Syndrome Coronavirus 2" OR "SARS-CoV2" OR "SARS-CoV 2" OR "SARS Coronavirus 2") AND (2019/11/01:3000/12/31[PDAT])

Supplementary file 2. Method for critical appraisal of empirical studies

Method used for critical appraisal of empirical epidemiologic studies

Confounding
Have the authors identified all important confounding factors? **Yes / No / Unclear**
Were the identified confounding factors adjusted for in the design and/or analysis? **Yes / No / Unclear** - Model-based adjustment of confounders - Stratification - Matching - No adjustment required (randomization)
Selection bias
Was patient exposure / intervention status at inclusion likely to result in bias? **Yes / No / Unclear** - Non-randomized study - Randomized study with issues regarding allocation concealment or non-random sequencing - Stringent exclusion criteria
Was missing data or loss to follow-up during the study likely to result in bias? **Yes / No / Unclear** - Missingness likely not completely at random (i.e. not MCAR or % of missingness different between groups) - No methods described for handling missingness (i.e. imputation) - Other methods explored to prevent missingness (i.e. cross checking data sources)
Informationbias
Was measurement of exposure / administration of the intervention likely to result in bias? **Yes / No / Unclear** - Blinding - Standardization - Objective - Non-compliance - Breaking protocol
Was measurement of outcome likely to result in bias? **Yes / No / Unclear** - Blinding - Standardization - Objective (note: if this is the case item should be scored 'No')
Other concerns? FREE TEXT
Items to consider (but not limited to) - Reporting bias - Conflict of interest

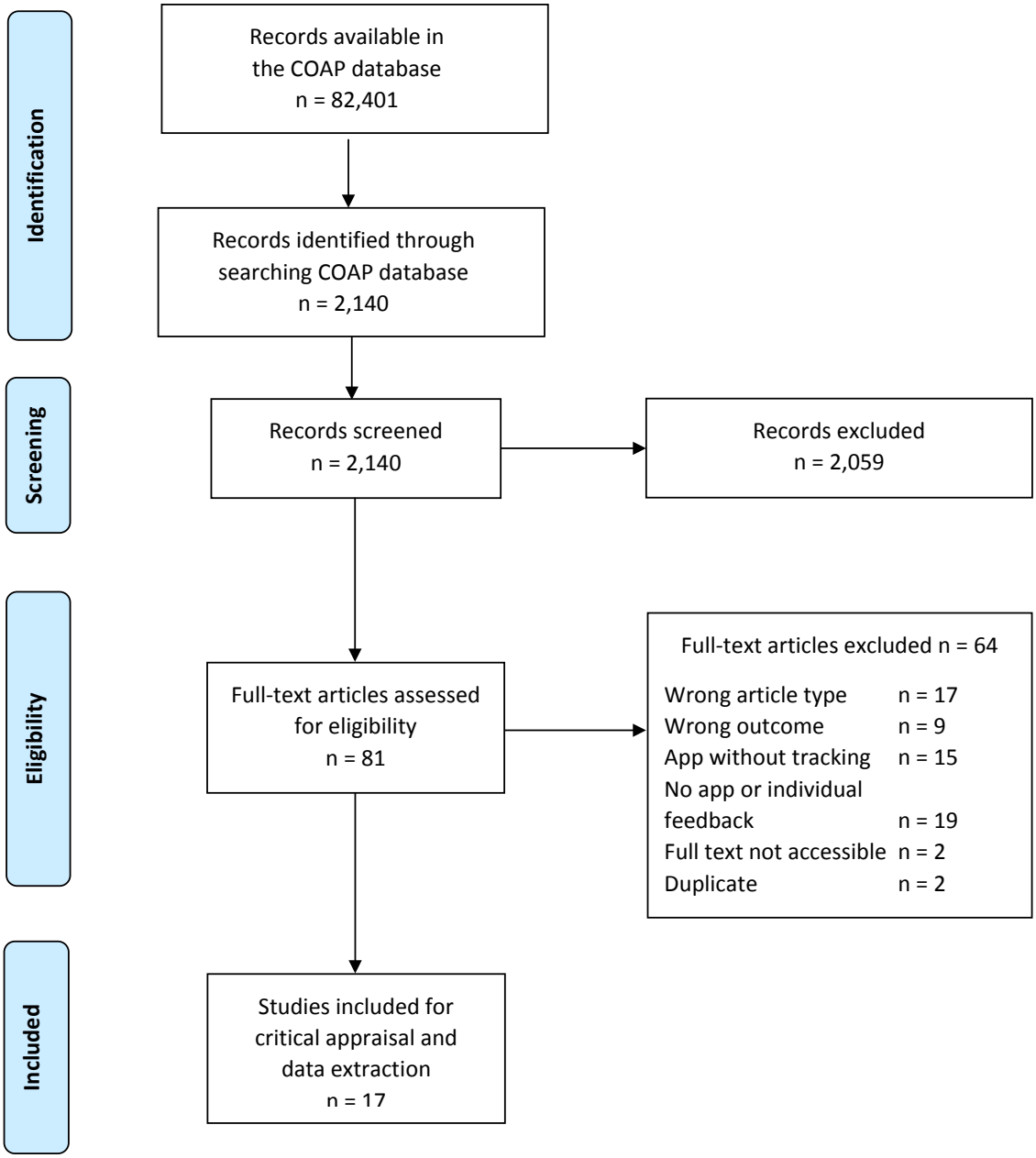
Supplementary file 3. Method for critical appraisal of model-based studies

Method used for critical appraisal of model based studies

Were empirical distributions used for a varying infectiousness since time of infection? Yes / No / Unclear Keywords indicating distributions were used • Weibull • Log-normal • Exponential distribution
Were various different scenarios evaluated for important model assumptions and parameter values? Yes / No / Unclear Keywords indicating uncertainty was taken into account • Sensitivity analysis • Scenario analysis
Were models reported transparently? (i.e. no black box) Yes / No / Unclear Key elements indicating that model can be reproduced • (differential) Equation specified • Behavior of agents specified • Graphic representation of model • All variables and distributions specified
Other concerns? FREE TEXT Items to consider (but not limited to) • Reporting bias • Conflict of interest • Illogical properties of the model not captured by the criteria above

Supplementary file 4. Flowchart study selection

Flowchart regarding selection of studies looking at effectiveness of contact- and tracing apps for SARS-CoV-2



Supplementary file 5. Excluded studies

Studies not meeting inclusion criteria after full text screening, and excluded from analyses (n=64)

Reference	Reason for exclusion
Aleta 2020	No app or individual feedback
Aleta 2020	No app or individual feedback
Ayres 2020	Wrong outcome
Bian 2020	Wrong article type
Bianconi 2020	Full text not accessible
Braithwaite 2020	Wrong article type
Braithwaite 2020	Duplicate
Braun 2020	Full text not accessible
Brooks-Pollock 2020	No app or individual feedback
Chan 2020	Wrong article type
Chen 2020	No app or individual feedback
Di Domenico 2020	No app or individual feedback
Drake 2020	Wrong article type
Drew 2020	App without tracking
Fateh-Moghadam 2020	App without tracking
Fenton 2020	Wrong outcome
Firth 2020	No app or individual feedback
Gozzi 2020	App without tracking
Grantz 2020	Wrong outcome
Güemes 2020	App without tracking
Haller 2020	Wrong article type
Huang 2020	Wrong outcome
Hussein 2020	No app or individual feedback
Jian 2020	Wrong outcome
Kassaye 2020	App without tracking
Kendall 2020	Duplicate
Khataee 2020	Wrong article type
Kogan 2020	Wrong outcome
Kretzschmar 2020	Duplicate
Lambert 2020	Wrong article type
Leith 2020	Wrong article type
Liu 2020	No app or individual feedback
Maghdid 2020	Wrong article type
Marín-García 2020	Wrong article type
Menni 2020	App without tracking
Menni 2020	App without tracking
Milenkovic 2020	No app or individual feedback
Mishra 2020	App without tracking
Morley 2020	No app or individual feedback

Nagarajan 2020	No app or individual feedback
Ni Lochlainn 2020	App without tracking
Pépin 2020	Wrong outcome
Petrellis 2020	Wrong article type
Ranjan 2020	App without tracking
Ruediger 2020	No app or individual feedback
Salathe 2020	Wrong outcome
Sattler 2020	Wrong article type
Serafino 2020	App without tracking
Sun 2020	App without tracking
Sun 2020	No app or individual feedback
Szocska 2020	No app or individual feedback
Unwin 2020	No app or individual feedback
Vannoni 2020	No app or individual feedback
Varsavsky 2020	No app or individual feedback
Vinceti 2020	App without tracking
Wallentin 2020	Wrong article type
Whaiduzzaman 2020	Wrong article type
Wilson 2020	Wrong article type
Wong 2020	Wrong article type
Yabe 2020	No app or individual feedback
Yap 2020	Wrong outcome
Yasaka 2020	Wrong article type
Zens 2020	App without tracking
Zhan 2020	No app or individual feedback