Supplementary Methods:

Example search method employed in systematic review and meta-analysis:

The following strategy was used in Medline/Pubmed to identify articles providing a quantitative evaluation of diagnostic tests by specimen type: *("COVID-19 diagnostic testing"[MeSH Supplementary Concept]* AND "Coronavirus Infection" [MeSH Major Topic] AND ["saliva"[MeSH Major Topic] OR "nose" [MeSH Major Topic] OR "nasal" "oropharynx" [MeSH Major Topic] OR "oropharyngeal" OR "oral" OR "nasopharynx" [MeSH Major Topic] OR "nasopharyngeal"]. We also searched the grey literature via Google Scholar as well as Medrvix and bioRxiv via search terms that included a combination of subject headings (when applicable) and text-words for the concepts: (1) Sample type ("saliva" OR "oral" OR "oropharyngeal" OR "nasopharyngeal" OR "nasal" OR "swab"); (2) Diagnosis and (3) Disease ("SARS-COV-2" OR "COVID").

Supplementary Table 1: Available LOD data in saliva and nasal swab studies

Ref.	Saliva Studies	
(1)	McCormick-Baw et al.	**No LOD reported**
(2)	Becker et al.	**Reported as primary data in study**
(3)	Pasomub et al.	**Manufacturer report**
(4)	Iwasaki et al.	**No LOD**
(5)	SoRelle et al.	**Manufacturer report**
(6)	Zheng et al.	**Reported as primary data in study**
(7)	Landry et al.	**CDC**
(8)	Chen et al.	**No LOD**
(9)	Jamal et al.	**Manufacturer report**
(10)	Dogan et al.	**No LOD**
(11)	Rao et al.	**Manufacturer report**
(12)	Williams et al.	**No LOD**
(13)	Rutgers EUA	**Reported as primary data in study**
(14)	Skolimowska et al.	**No LOD**
(15)	L'Helgouach et al.	**No LOD**
(16)	Miller et al.	**Reported as primary data in study**
(17)	Bhattacharya et al.	**No LOD**
(18)	Yokota et al.	**No LOD**
(19)	Yokota et al.	**No LOD**
(20)	Griesemer et al.	**CDC**
(21)	Byrne et al.	**Manufacturer report**
(22)	Migueres et al.	**No LOD**
(23)	Hanson et al.	**No LOD**
(24)	Otto et al.	**No LOD**
(25)	Nacher et al.	**No LOD**
Ref.	Nasal Swab Studies	
(26)	Berenger et al.	**LOD reported in another study**
(27)	Wehrhahn et al.	**Manufacturer report**
(28)	Kojima et al.	**CDC**
(29)	Pinninti et al.	**CDC**
(30)	Pere et al.	**Manufacturer report**
(31)	Tu et al.	**Manufacturer report**
(23)	Hanson et al.	**No LOD**
(20)	Griesemer et al.	**CDC**
(32)	Basu et al.	**Manufacturer report**
(33)	Harrington et al.	**Manufacturer report**
(34)	Callahan et al.	**Reported as primary data in study**

Supplementary Table 2: Risk of bias in saliva studies

Ref.	Study	Risk of bias				Applicability concerns		
		Patient selection	Index Test	Reference Standard	Flow and Timing	Patient selection	Index Test	Reference Standard
(1)	McCormick-Baw et al.	U	L	L	L	L	L	L
(2)	Becker et al.	H	L	L	L	H	H	H
(3)	Pasomub et al.	U	L	L	L	L	L	L
(4)	Iwasaki et al.	U	L	L	L	L	L	L
(5)	SoRelle et al.	U	L	L	L	L	L	L
(6)	Zheng et al.	H	L	L	L	H	H	H
(7)	Landry et al.	U	L	L	L	L	L	L
(8)	Chen et al.	H	L	L	L	H	H	H
(9)	Jamal et al.	H	L	L	L	H	H	H
(10)	Dogan et al.	U	L	L	L	L	L	L
(11)	Rao et al.	H	L	L	L	H	H	H
(12)	Williams et al.	U	L	L	L	L	L	L
(13)	Rutgers EUA	H	L	L	L	H	H	H
(14)	Skolimowska et al.	U	L	L	L	L	L	L
(15)	L'Helgouach et al.	H	L	L	L	H	H	H
(16)	Miller et al.	U	L	L	L	L	L	L
(17)	Bhattacharya et al.	U	L	L	L	L	L	L
(18)	Yokota et al.	H	L	L	L	H	H	H
(19)	Yokota et al.	U	L	L	L	L	L	L
(20)	Griesemer et al.	U	L	L	L	L	L	L
(21)	Byrne et al.	U	L	L	L	L	L	L
(22)	Migueres et al.	U	L	L	L	L	L	L
(23)	Hanson et al.	U	L	L	L	L	L	L
(24)	Otto et al.	U	L	L	L	L	L	L
(25)	Nacher et al.	U	L	L	L	L	L	L

L = low risk, U = unclear risk, H = high risk

Supplementary Table 3: Risk of bias in OP swab studies

Ref.	Study	Risk of bias				Applicability concerns		
		Patient selection	Index Test	Reference Standard	Flow and Timing	Patient selection	Index Test	Reference Standard
Oral swabs								
(26)	Berenger et al.	**H**	**L**	**L**	**L**	**H**	**L**	**L**
(27)	Wehrhahn et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(35)	Wang et al.	**H**	**L**	**L**	**L**	**H**	**L**	**L**
(36)	Yu et al.	**H**	**L**	**L**	**L**	**H**	**L**	**L**
(37)	Calame et al.	**H**	**L**	**L**	**L**	**H**	**L**	**L**
(38)	Patel et al.	**U**	**L**	**L**	**U**	**L**	**L**	**L**

L = low risk, U = unclear risk, H = high risk

Supplementary Table 4: Risk of bias in nasal swab studies

Ref.	Study	Risk of bias				Applicability concerns		
		Patient selection	Index Test	Reference Standard	Flow and Timing	Patient selection	Index Test	Reference Standard
(26)	Berenger et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(27)	Wehrhahn et al.	**U**	**L**	**L**	**H**	**L**	**L**	**L**
(28)	Kojima et al.	**U**	**L**	**L**	**L**	**H**	**L**	**L**
(29)	Pinninti et al.	**H**	**L**	**L**	**L**	**H**	**L**	**L**
(30)	Pere et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(31)	Tu et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(23)	Hanson et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(20)	Griesemer et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(32)	Basu et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(33)	Harrington et al.	**L**	**L**	**L**	**L**	**L**	**L**	**L**
(34)	Callahan et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
Combined oropharyngeal and nasal swabs								
(39)	LeBlanc et al.	**U**	**L**	**L**	**U**	**L**	**L**	**L**
(27)	Wehrhahn et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(40)	Vlek et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**
(41)	Desmet et al.	**U**	**L**	**L**	**L**	**L**	**L**	**L**

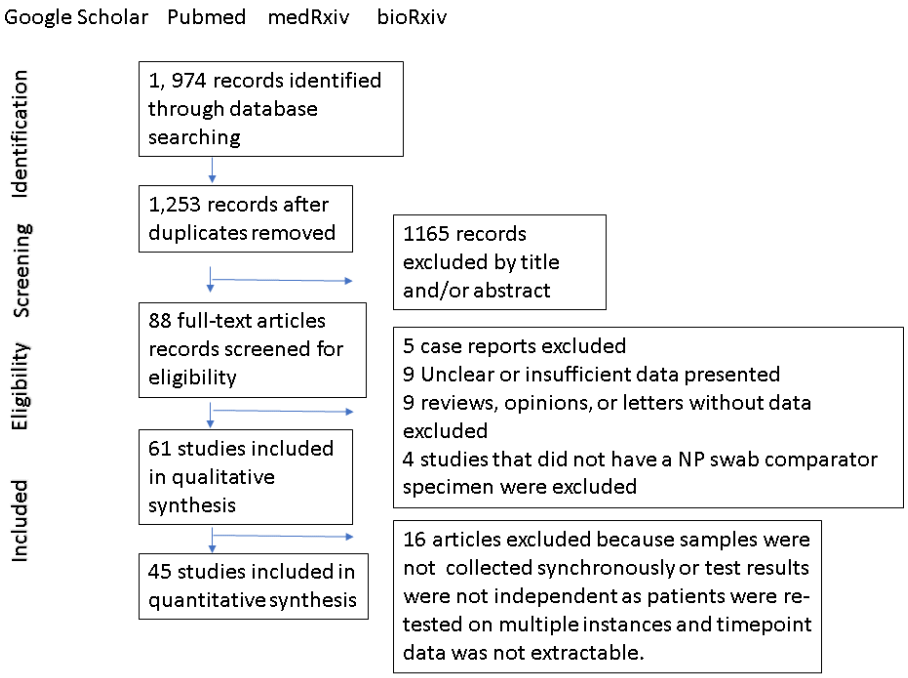
L = low risk, U = unclear risk, H = high risk

Supplementary Table 5: Saliva collection procedures specified in methodology for meta-analysis studies

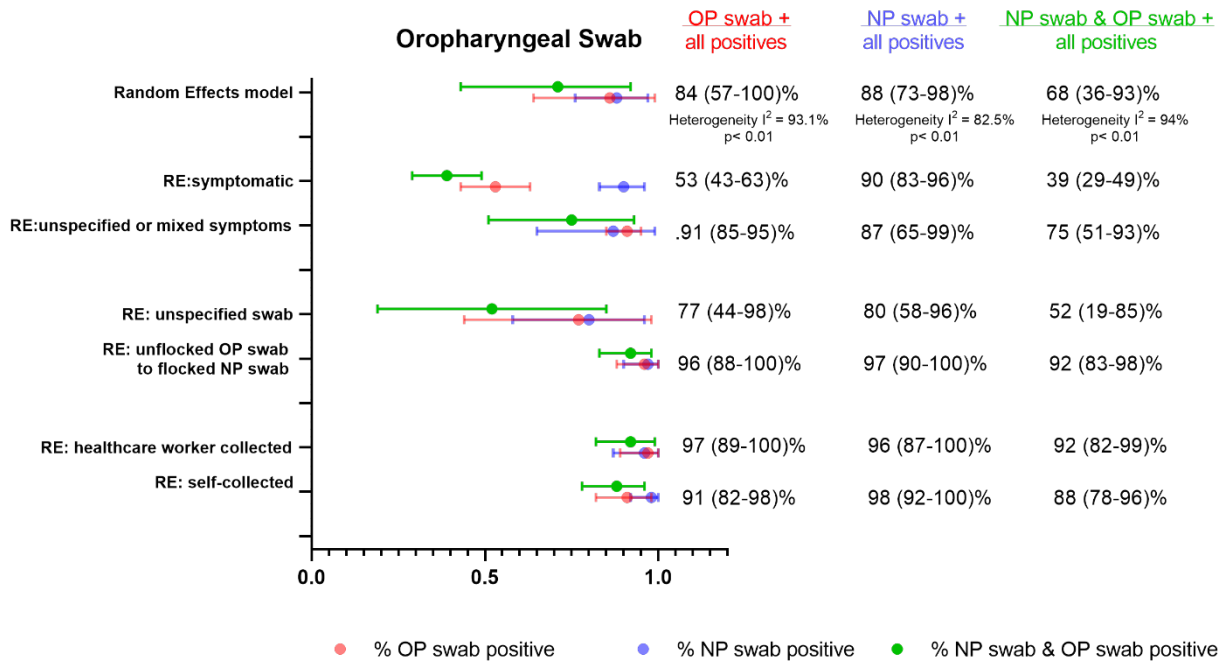
	n/25 total studies (%)
Coughing before collection (6, 8, 24)	3 (12%)
Drooling or spitting (1–5, 7, 9, 10, 12–23, 25, 42)	22 (88%)
Specified deep throat or posterior oropharyngeal (11)	2 (8%)
Avoiding food, drink, brushing teeth (1, 2, 6–8, 11, 16, 20)	10 (40%)
Morning submission (8, 11)	2 (8%)
Nucleic acid extraction free (10, 15)	2 (8%)
Diluted (2–4, 8–10, 12, 14, 16, 18–20, 23, 24)	14 (56%)
Undiluted (1, 7)	2 (8%)
Assay LOD < 1000 copies/mL (3, 5, 6, 13, 21)	5 (20%)
Assay LOD ≥ 1000 copies/mL (2, 7, 9, 11, 16, 20, 42)	7 (28%)
Self-collection (4, 6–9, 11–14, 18, 19, 21, 24)	13 (52%)
Supervised or HCW collected saliva (1, 10, 16, 23, 25)	5 (20%)
Asymptomatic patients (11, 15, 19)	6 (24%)
Symptomatic patients (1, 2, 4–6, 8–10, 17, 18, 21, 23, 24)	13 (52%)

Supplementary Table 6: Nasal swab collection procedures specified in methodology for meta-analysis studies

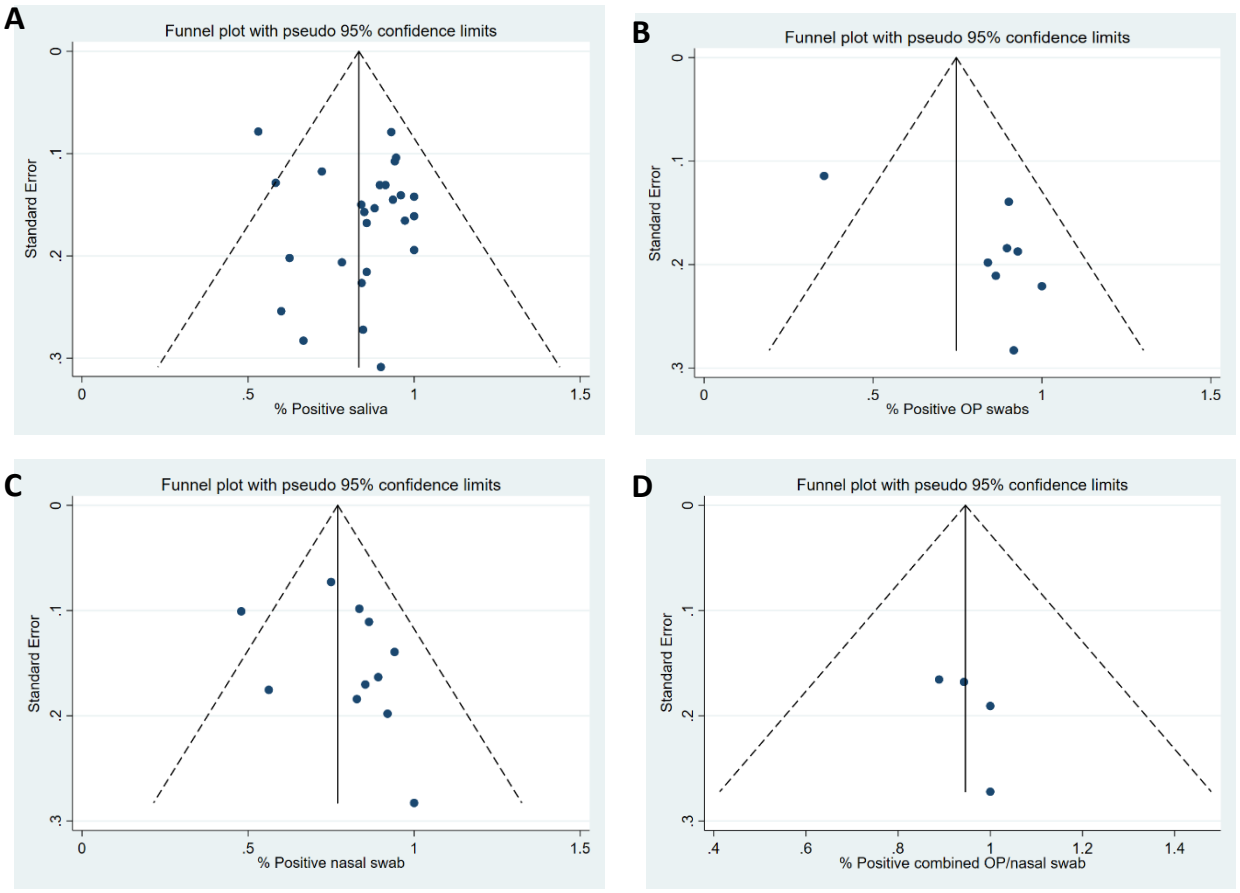
	n/11 total studies (%)
Nasal swab first before NP swab (23, 27, 31, 34)	4 (36%)
Anterior nares swab (23, 31)	10 (91%)
Mid-turbinate nares swabs (26–30, 34)	6 (55%)
Both swabs flocked (28, 30)	2 (18%)
Nasal swab unflocked in comparison to flocked NP swab (23, 26, 27, 32, 34)	5 (45%)
Both nares (23, 26, 29, 31, 32, 34)	6 (55%)
One nare (27, 28, 30)	3 (27%)
Assay LOD < 1000 copies/mL (32–34)	3 (27%)
Assay LOD ≥ 1000 copies/mL (20, 26–30)	6 (55%)
Self-collected nasal swab (23, 27, 31)	3 (27%)
Supervised nasal swab collection (28)	1 (9.1%)
HCW collected saliva (26, 29, 32, 34)	4 (36%)
Symptomatic patients (23, 29–33)	6 (55%)



Supplementary Fig. 1: Study retrieval diagram



Supplementary Fig. 2: Summary forest plot of sub-group data from OP swabs



Supplementary Fig. 3: Funnel plots for saliva, OP, nasal, and OP/nasal swabs studies respectively (A-D).

Supplementary File: 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.	3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4
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
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.	4
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Suppl, Methods
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).	4
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.	4-5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	4-5
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.	5
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	5
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.	5

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).	5
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	5
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.	6
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.	6-11
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).	11, Suppl Tables 1-3
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.	6-11, Fig. 1-6
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	6-11, Fig.1-6
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Supp. Fig. 3
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	6-11
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).	11-13
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).	12
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13
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.	13

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