Supplementary Material*

Bastos ML, Perlman-Arrow S, Menzies D, et al. The sensitivity and costs of testing for SARS-CoV-2 infection with saliva versus nasopharyngeal swabs. A systematic review and meta-analysis. Ann Intern Med. 2021. [Epub ahead of print]. doi:10.7326/M20-6569

* This supplementary material was provided by the authors to give readers further details on their article. The material was reviewed but not copyedited.

Supplement Table 1 | Search Strategy

(Medline and Embase)
1. ((exp coronavirus/ or exp coronavirus infections/ or (betacoronavirus* or beta coronavirus* or coronavirus* or corona virus*).mp.) and (exp china/ or (china or chinese or hubei or wuhan).af.)) or (coronavirus* or corona virus* or betacoronavirus* or beta coronavirus*).ti,kf
2. (severe acute respiratory syndrome coronavirus or "SARS CoV-2" or cov2 or "sars 2" or COVID or "coronavirus 2" or covid19 or nCov or ((new or Novel) adj3 coronavirus*) or ncp).ti,ab,kf. or ((exp pneumonia/ or pneumonia.ti,ab,kf.) and wuhan.af.)
3. ("COVID-19" or "coronavirus disease 2019").ti,ab,kf.
4. 1 or 2 or 3
5. (detect* or diagnos* or screen* or technique* or test*).ti,ab,kf.
6. exp Nucleic Acid Amplification Techniques/
7. (PCR or (Polymerase adj2 "Chain Reaction*") or nucleic acid*).ti,ab,kf.
8. (Specimen* or sample* or swab* or saliva* or nasopharyngeal or NPS or pharyngeal or oropharyngeal or OPS).ti,ab,kf.
9. exp Saliva/
10. or/5-9
11. 4 and 10
12. 2020*.dt,ez,da.
13. 11 and 12

Supplement Table 2 | Fields Extracted from Included Studies

Field	Variables Extracted
Study Characteristics	
Study Identifiers	Study ID, Title, Type of Publication (Peer Reviewed or Pre-Peer Review)
Study Design	Type of Study (Cohort selection cross-sectional accuracy study or Case-control selection cross-sectional accuracy study), Language, Study Location (Country and City), Time Period of Study (Month and Year),
Index and Reference Tests Used	Sampling Setting (Done/Instructed by Healthcare Professional or Self-Collected), Sample Collection Method, Media Added to Samples, Diagnostic Test Used (Lab based RT-PCR, Point of Care RT-PCR, Digital PCR, LAMP or Transcription Mediated Amplification) Type of Diagnostic Test (Commercial Lab-Based, Commercial Point-of-Care, In-House), Company Name and Machine (For Commercial Lab-Based Tests), Threshold for Positive RT-PCR, SARS-CoV-2 Gene Target, Sample Collection Period
Study Entry Criteria	Inclusion and Exclusion Criteria
Patient Characteristics	
Clinical Characteristics of Population	SARS-CoV-2 diagnosis (Persons with Confirmed SARS-CoV-2 and Negative Controls, Persons with Confirmed SARS-CoV-2, and/or Suspected Cases), Cohort Symptoms (Symptomatic and/or Asymptomatic), Clinical Setting (Inpatient and/or Outpatient), Disease Severity (Mild, Moderate and/or Severe), Time Since Symptom Onset
Patients and Samples Included	Total Patients Enrolled, Total Patients Included, Total Samples Included, Number of Samples Tested, Number Positive on Viral Culture, Number Positive on Any Test (Non-Viral Culture), Number Negative on Both Tests, Number Positive on Index Test, Number Positive on Reference Test, Number Asymptomatic
Stratification by Disease Severity	Definition of Disease Severity. For Asymptomatic, Mild, Moderate and Severe Included Patients: Number Positive on Viral Culture, Number Positive on Any Test (Non-Viral Culture), Number Negative on Both Tests, Number Positive on Index Test, Number Positive on Reference Test
Stratification by Time Since Disease Onset	Definition of Time Since Symptom Onset. For First Week, Second Week, and Third Week Included Patients: Number Positive on Viral Culture, Number Positive on Any Test (Non-Viral Culture), Number Negative on Both Tests, Number Positive on Index Test, Number Positive on Reference Test
Sex	Number Male, Number Female
Age	Age Distribution (Young Children (0-4), Children (5-17), Adults (18-64), Elderly (65+)), Mean or Median (Including SD, IQR or Range)

Abbreviations: RT-PCR: reverse transcription polymerase chain reaction, LAMP: Loop-mediated isothermal amplification, SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

Supplement Table 3 | QUADAS-2 Adapted Quality Assessment Criteria

Criteria Number	Question
Patient Selection	
A. Risk of Bias	
1	Was a consecutive or random sample of patients enrolled (Yes / No / Unclear)
2	Was a case-control design avoided? (Yes / No / Unclear)
3	Did the study avoid inappropriate exclusions (based on exclusion criteria) (Yes / No / Unclear)
4	Could the selection of patients have introduced bias? (Low / High / Unclear)
B. Concerns Regarding Applicability	
5	Is there concern that the included patients do not match the review question? (Low / High / Unclear)
Index Tests	
A. Risk of Bias	
6	Were the index test results interpreted without knowledge of the results of the reference standard? (Yes / No / Unclear)
7	If a threshold was used, was it pre-specified? (Yes / No / Unclear)
8	If interpretation of test was subjective (for e.g., color changes or line changes - only needed for LAMP), was agreement between readers described? (Yes / No / Unclear)
9	Could the conduct or interpretation of the index test have introduced bias (Low / High / Unclear)
B. Concerns Regarding Applicability	
10	Is there concern that the index test, its conduct, or interpretation differ from the review question (Low / High / Unclear)
Reference Tests	
A. Risk of Bias	
11	Is the reference standard likely to correctly classify the target condition? (Yes / No / Unclear)
12	Were the reference standard results interpreted without knowledge of the results of the index test? (Yes / No / Unclear)
13	Could the reference standard, its conduct, or its interpretation have introduced bias? (Low / High / Unclear)
B. Concerns Regarding Applicability	
14	Is there concern that the target condition as defined by the reference standard does not match the review question? (Low / High / Unclear)
Flow and Timing	
A. Risk of Bias	
15	Did >=90% patients receive paired samples? (i.e., did >=90% people who could be included receive both saliva/pharyngeal tests) (Yes / No / Unclear)
16	Did patients receive the same reference standard? (i.e., different sampling technique oro- vs naso and/or different analytical method) (Yes / No / Unclear)
17	Could the patient flow have introduced bias? (Low / High / Unclear)

Notes: Answers highlighted in green indicate those that would improve quality; answers highlighted in red indicate those that would reduce quality

Supplement Table 4 | Component Costs Used to Estimate the Total Cost of Nasopharyngeal and Saliva Sampling per Person Sampled for SARS-CoV-2

Parameter	Cost, 2020 $USD (Per Person Sampled)	Reference
Nasopharyngeal Sampling	**$8.37**	
Nurse Time (6 min)	$3.78	Government of Canada (1), Campbell, et al. (2)
Surgical Mask (One per 20 persons sampled)	$0.01	Personal communication
Face Shield (One per 20 persons sampled)	$0.11	Personal communication
Gloves (2 per person sampled)	$0.17	Personal communication
Gown (1 per person sampled)	$1.50	Personal communication
Swab and Transport Media (1 per person sampled)	$2.80	Fisher Scientific (3)
Saliva Sampling	**$2.04**	
Other Healthcare Professional or Administrative Personnel (4 min)	$1.51	Government of Canada (1), Campbell, et al. (2)
Surgical Mask (One per 20 persons sampled)	$0.01	Personal communication
Gloves (2 per person sampled)	$0.17	Personal communication
Sterile Collection Cup (1 per person sampled)	$0.35	Fisher Scientific (4)

Supplement Table 5 | Cost Estimates Used to Arrive at Component Costs for SARS-CoV-2 Sampling, Sensitivity Estimates for Sampling Methods Among Persons Presenting for SARS-CoV-2 Testing, and the Probability Distribution Used for Each in Analysis

Parameter	Estimate	Probability Distribution Used	Probability Distribution Parameters
Nurse (Hourly Wage)	$37.79	Gamma	Shape = 26.8; Scale = 0.97
Other Healthcare Professional or Administrative Personnel (Hourly Wage)	$22.67	Gamma	Shape = 26.8; Scale = 0.58
Surgical Mask (one)	$0.11	Gamma	Shape = 8.6; Scale = 0.011
Face Shield (one)	$2.14	Gamma	Shape = 47.1; Scale = 0.036
Gloves (two)	$0.17	Gamma	Shape = 10.1; Scale = 0.013
Gown (one)	$1.50	Gamma	Shape = 11.6; Scale = 0.105
Swab and Transport Media (one)	$2.80	Gamma	Shape = 38.7; Scale = 0.057
Sterile Collection Cup (one)	$0.35	Gamma	Shape = 9.3; Scale = 0.031
Difference in Sensitivity [Nasopharyngeal – Saliva] (%)	7.9%	Normal	Mean = 7.9; Standard Deviation = 4.49

Supplement Table 6 | Characteristics of Included Studies

Study	Peer Reviewed (Yes, No)	City and Country	Study Population	Time Period of Study	Setting (Inpatient, Outpatient)	Study Design	Symptoms (Symptomatic, Asymptomatic)
Azzi, et al. (5)	Yes	Varese, Italy	Both persons presenting for SARS-CoV-2 testing and persons with confirmed SARS-CoV-2 (results not stratified)	04/2020 - 05/2020	Both inpatient and outpatient (results not stratified)	Cohort	Both symptomatic and asymptomatic (results not stratified)
Chen, et al. (6)	Yes	Hong Kong, China	Persons with confirmed SARS-CoV-2	NR	Inpatient (non-specified)	Cohort	Symptomatic
Leung, et al. (7)	Yes	Hong Kong, China	Persons with confirmed SARS-CoV-2 (and negative controls)	02/2020 - 03/2020	Inpatient (non-specified setting)	Case-control (unmatched)	Symptomatic
McCormick-Baw, et al. (8)	Yes	Dallas, USA	Both persons presenting for SARS-CoV-2 testing and persons with confirmed SARS-CoV-2 (results not stratified)	NR	Inpatient (non-ICU only: hospitalized or emergency room)	Cohort	Symptomatic
Rao, et al. (9)	Yes	Kuala Lumpur, Malaysia	Persons with confirmed SARS-CoV-2	NR	Both inpatient and outpatient (results not stratified)	Cohort	Asymptomatic
Landry, et al. (10)	Yes	New Haven, USA	Persons presenting for SARS-CoV-2 testing	04/2020	Outpatient	Cohort	Symptomatic
Villar, et al. (11)	Yes	Rio de Janeiro, Brazil	Persons presenting for SARS-CoV-2 testing	NR	Outpatient	Cohort	Both symptomatic and asymptomatic (stratified results)
Akgun Dogan, et al. (12)	No	Istanbul, Turkey	Persons presenting for SARS-CoV-2 testing	NR	Inpatient (non-ICU only: hospitalized or emergency room)	Cohort	Symptomatic
Becker, et al. (13)	No	California, USA	Persons with confirmed SARS-CoV-2 Persons presenting for SARS-CoV-2 testing	03/2020 - 04/2020	Outpatient	Cohort	Symptomatic
Byrne, et al. (14)	Yes	Liverpool, UK	Persons presenting for SARS-CoV-2 testing	04/2020 - 06/2020	Both inpatient and outpatient (results not stratified)	Cohort	Symptomatic

Study	Peer Reviewed (Yes, No)	City and Country	Study Population	Time Period of Study	Setting (Inpatient, Outpatient)	Study Design	Symptoms (Symptomatic, Asymptomatic)
Griesemer, et al. (15)	No	Albany, USA	Persons presenting for SARS-CoV-2 testing	03/2020	Outpatient	Cohort	Both symptomatic and asymptomatic (results not stratified)
Hanson, et al. (16)	Yes	Salt Lake City, USA	Persons presenting for SARS-CoV-2 testing	05/2020-06/2020	Outpatient	Cohort	Symptomatic
Iwasaki, et al. (17)	Yes	Sapporo, Japan	*Both persons presenting for SARS-CoV-2 testing and persons with confirmed SARS-CoV-2 (stratified results)	NR	Both inpatient and outpatient (results not stratified)	Cohort	Both symptomatic and asymptomatic (results not stratified)
Jamal, et al. (18)	Yes	Toronto, Canada	Persons with confirmed SARS-CoV-2	03/2020 to NR	Inpatient (ICU and non-ICU)	Cohort	Symptomatic
Miller, et al. (19)	No	New York, USA	Persons with confirmed SARS-CoV-2	NR	Outpatient	Cohort	Both symptomatic and asymptomatic (results not stratified)
Pasomsub, et al. (20)	Yes	Bangkok, Thailand	Persons presenting for SARS-CoV-2 testing	03/2020 - 04/2020	Outpatient	Cohort	Symptomatic
Ranoa, et al. (21)	No	Urbana, USA	Persons presenting for SARS-CoV-2 testing	NR	Outpatient	Cohort	Both symptomatic and asymptomatic (results not stratified)
Wyllie, et al. (22)	Yes	New Haven, USA	Persons with confirmed SARS-CoV-2	NR	Inpatient (non-specified)	Cohort	Symptomatic
Bhattacharya, et al. (23)	No	Bhubaneswar, India	Persons presenting for SARS-CoV-2 testing	NR	Inpatient (non-specified)	Cohort	Symptomatic
Goldfarb, et al. (24)	No	Vancouver, Canada	Both persons presenting for SARS-CoV-2 testing and persons with confirmed SARS-CoV-2 (results not stratified)	05/2020-09/2020	Outpatient	Cohort	Symptomatic
Ku, et al. (25)	No	Singapore, Singapore	Persons with confirmed SARS-CoV-2	NR	Inpatient (non-specified)	Cohort	Both symptomatic and asymptomatic (stratified results)

Study	Peer Reviewed (Yes, No)	City and Country	Study Population	Time Period of Study	Setting (Inpatient, Outpatient)	Study Design	Symptoms (Symptomatic, Asymptomatic)
Nacher, et al (26)	No	French Guiana	Persons presenting for SARS-CoV-2 testing	07/2020 - 09/2020	Outpatient	Cohort	Both symptomatic and asymptomatic (results not stratified)
Sahajpal, et al. (27)	No	Augusta, USA	Persons presenting for SARS-CoV-2 testing	NR	Both inpatient and outpatient (results not stratified)	Cohort	Both symptomatic and asymptomatic (results not stratified)
Teo, et al. (28)	No	Lucence, Singapore	Persons presenting for SARS-CoV-2 testing Persons with confirmed SARS-CoV-2	06/2020	Outpatient	Cohort	Both symptomatic and asymptomatic (stratified results)
Yee, et al. (29)	No	Los Angeles, USA	Persons presenting for SARS-CoV-2 testing Persons with confirmed SARS-CoV-2	06/2020-08/2020	Outpatient Both inpatient and outpatient (results not stratified)	Cohort	Both symptomatic and asymptomatic (stratified results)
Yokota, et al. (30)	No	Sapporo, Japan	Persons with confirmed SARS-CoV-2	06/2020-08/2020	Inpatient (non-specified)	Cohort	Symptomatic
Yokota, et al. (31)	Yes	Sapporo, Japan	Persons presenting for SARS-CoV-2 testing	06/2020 - 07/2020	Outpatient	Cohort	Asymptomatic
Barat, et al. (32)	No	Bethesda, USA	Persons presenting for SARS-CoV-2 testing	07/2020-09/2020	Outpatient	Cohort	Both symptomatic and asymptomatic (results not stratified)
Aita, et al. (33)	No	Padova, Italy	Persons with confirmed SARS-CoV-2	04/2020	Inpatient (ICU and non-ICU)	Cohort	Symptomatic
Altawalah, et al. (34)	Yes	Kuwait	Persons presenting for SARS-CoV-2 testing	07/2020	Inpatient (non-specified)	Cohort	Symptomatic
Binder, et al. (35)	Yes	Durham, USA	Persons with confirmed SARS-CoV-2	04/2020-05/2020	Both inpatient and outpatient (stratified results)	Cohort	Both symptomatic and asymptomatic (results not stratified)

Study	Peer Reviewed (Yes, No)	City and Country	Study Population	Time Period of Study	Setting (Inpatient, Outpatient)	Study Design	Symptoms (Symptomatic, Asymptomatic)
Caulley, et al. (36)	Yes	Ottawa, Canada	Persons presenting for SARS-CoV-2 testing	04/2020-05/2020	Outpatient	Cohort	Both symptomatic and asymptomatic (results not stratified)
Kojima, et al. (37)	Yes	Los Angeles, USA	Persons with confirmed SARS-CoV-2 (and negative controls)	NR	Outpatient	Case-control (unmatched)	Both symptomatic and asymptomatic (results not stratified)
Procop, et al. (38)	Yes	Cleveland USA	Persons presenting for SARS-CoV-2 testing	NR	Outpatient	Cohort	Symptomatic
Senok, et al. (39)	Yes	Dubai, United Arab Emirates (UAE)	Persons presenting for SARS-CoV-2 testing	06/2020-07/2020	Outpatient	Cohort	Both symptomatic and asymptomatic (stratified results)
Uwamino, et al. (40)	Yes	Tokyo Japan	Persons with confirmed SARS-CoV-2	05/2020-07/2020	Inpatient (non-specified)	Cohort	Symptomatic
			Persons presenting for SARS-CoV-2 testing		Outpatient		
Migueres, et al. (41)	Yes	Toulouse, France	Persons with confirmed SARS-CoV-2	NR	Inpatient (non-specified)	Cohort	Both symptomatic and asymptomatic (stratified results)
			Persons presenting for SARS-CoV-2 testing		Outpatient		

Abbreviations: NR: Not reported, SARS-CoV-2: severe acute respiratory syndrome coronavirus 2
Notes: *The group of persons presenting for SARS-CoV-2 testing was excluded in our stratified analyses, as zero patients were positive on either test.

Supplement Table 7 | Patients' Characteristics for Included Studies

Study	N Participants Included	N Samples Tested	Age in Years (mean/median)	Male:Female	Symptom Severity
Azzi, et al. (5)	122	113	Mean: 53.5 (SD 19.8)	40:82	Mild or moderate or severe
Chen, et al. (6)	58	58	Median: 38 (IQR 31 – 52)	28:30	NR
Leung, et al. (7)	62	95	Mean: 42 (SD 17.1)	26:36	NR
McCormick-Baw, et al. (8)	156	155	Mean: 47.8	90:66	NR
Rao, et al. (9)	217	217	Median: 27 (IQR 18-36)	217:0	NR
Landry, et al. (10)	124	124	NR	NR	NR
Villar, et al. (11)	13	13	NR	NR	NR
Akgun Dogan, et al. (12)	200	200	Mean: 54.9 (SD 16.1)	106:94	Mild or moderate or severe
Becker, et al. (13)	111	109	NR	NR	NR
Byrne, et al. (14)	110	110	NR	49:61	NR
Griesemer, et al. (15)	463	463	NR	248:216	NR
Hanson, et al. (16)	368	354	Mean: 35 (range 18-75)	195:173	NR
Iwasaki, et al. (17)	76	76	Median: 69 (range 30-97)	NR	Mild and moderate
Jamal, et al. (18)	53	91	Median: 63 (range 27-106)	32:21	Mild or moderate or severe
Miller, et al. (19)	91	91	NR	NR	NR
Pasomsub, et al. (20)	200	200	Median: 36 (IQR 28-48)	69:131	NR
Ranoa, et al. (21)	100	99	NR	NR	NR
Wyllie, et al. (22)	142	97	NR	21:41	Asymptomatic, severe or critical
Bhattacharya, et al. (23)	74	74	NR	NR	Mild
Goldfarb, et al. (24)	50	38	Median: 25.1 (IQR 13.6-35.9)	22:28	NR
Ku, et al. (25)	42	42	NR	40:2	NR
Nacher, et al. (26)	776	776	Mean: 40 (SD 16.8)	NR	Mild
Sahajpal, et al. (27)	240	240	NR	NR	NR
Teo, et al. (28)	200	337	NR	NR	Mild or moderate or severe
Yee, et al. (29)	300	300	NR	NR	NR
Yokota, et al. (30)	42	42	Median: 73 (range 27-93)	25:17	NR
Yokota, et al. (31)	161	161	Median: 44.9 (IQR 29.8-66.4)	NR	NR
Barat, et al. (32)	449	459	Median: 42 (range 21-88)	184:265	NR
Aita, et al. (33)	49	43	Median: 60 (range 25-94)	33:16	NR
Altawalah, et al. (34)	891	891	NR	NR	NR
Binder, et al. (35)	19	19	Median: 50 (range 29-91)	NR	NR
Caulley, et al. (36)	272	272	NR	NR	Mild
Kojima, et al. (37)	45	45	Median: 42 (IQR 31-52)	NR	NR
Procop, et al. (38)	216	216	Mean: 44 (range 18-82)	NR	NR
Senok, et al. (39)	401	401	Mean: 35 (SD 9.5)	329:72	NR
Uwamino, et al. (40)	NR	196	NR	NR	NR

Study	N Participants Included	N Samples Tested	Age in Years (mean/median)	Male:Female	Symptom Severity
Migueres, et al. (41)	123	123	Median: 43	49:74	NR

Abbreviations: NR: Not reported

Supplement Table 8 | Information on Laboratory Methods

	Index Test					Reference Test				
Study	Saliva Sampling Method	Instructed by HCW	Diagnostic Testing Method	Gene Target	Ct-value	Swab type	Collected by HCW	Diagnostic Testing Method	Gene Target	Ct-value
Azzi, et al. (5)	Drooling technique	Yes	Lab based RT-PCR	5'UTR region	NR	NPS	Yes	Lab based RT-PCR	Rdp, E, and N	NR
Chen, et al. (6)	Early-morning posterior oropharyngeal saliva spitting technique	Yes	Point of care RT-PCR (Xpert Xpress)	E and N2	NR	NPS	Yes	Point of care RT-PCR (Xpert Xpress)	E and N2	NR
Leung, et al. (7)	Early-morning posterior oropharyngeal saliva spitting technique	Yes	Lab based RT-PCR	E; positive samples tested for RdRp	NR	NPS	Yes	Lab based RT-PCR	E; positive samples tested for RdRp	NR
McCormick-Baw, et al. (8)	General spitting technique	Yes	Point of care RT-PCR (Xpert Xpress)	E and N2	NR	NPS	Yes	Point of care RT-PCR (Xpert Xpress)	E and N2	NR
Rao, et al. (9)	Early-morning posterior oropharyngeal saliva spitting technique	Yes	Lab based RT-PCR	E and RdRp	Ct < 38.	NPS	Yes	Lab based RT-PCR	E and RdRp	Ct < 38.
Landry, et al. (10)	General spitting technique	Yes	Lab based RT-PCR	N1 and N2	NR	NPS	Yes	Lab based RT-PCR	N1 and N2	NR
Villar, et al. (11)	Using a swabbing device	Yes	Lab based RT-PCR	N1 and N2	NR	NPS	NR	Lab based RT-PCR	N1 and N2	NR
Akgun Dogan, et al. (12)	Drooling technique	Yes	Lab based RT-PCR	ORF1ab and N	Ct ≤29	NPS	Yes	Lab based RT-PCR	ORF1ab and N	Ct ≤ 29
Becker, et al. (13)	General spitting technique	Yes	Lab based RT-PCR	ORF1ab	NR	NPS	Yes	Lab based RT-PCR	ORF1ab	NR
Byrne, et al. (14)	General spitting technique	Yes	Lab based RT-PCR	ORF1ab	Ct < 40	Nasal throat[1]	Yes	Lab based RT-PCR	ORF1ab	Ct < 40
Griesemer, et al. (15)	General spitting technique	Yes	Lab based RT-PCR	N1	Ct < 45	NPS	Yes	Lab based RT-PCR	N1	Ct < 45
Hanson, et al. (16)	General spitting technique	Yes	Transcription Mediated Amplification	NR	NA	NPS	Yes	Transcription Mediated Amplification	NR	NA
Iwasaki, et al. (17)	General spitting technique	Yes	Lab based RT-PCR	N2	NR	NPS	Yes	Lab based RT-PCR	N2	NR
Jamal, et al. (18)	General spitting technique	Yes	Lab based RT-PCR	RdRp, E and N	NR	NPS	Yes	Lab based RT-PCR	RdRp, E and N	NR

Study	Index Test					Reference Test				
	Saliva Sampling Method	Instructed by HCW	Diagnostic Testing Method	Gene Target	Ct-value	Swab type	Collected by HCW	Diagnostic Testing Method	Gene Target	Ct-value
Miller, et al. (19)	General spitting technique	Yes	Lab based RT-PCR	N1 and N2	NR	NPS	Yes	Lab based RT-PCR	N1 and N2	NR
Pasomsub, et al. (20)	General spitting technique	Yes	Lab based RT-PCR	ORF1ab and N	Ct ≤ 38	NPS	Yes	Lab based RT-PCR	ORF1ab and N	Ct ≤ 38
Ranoa, et al. (21)	Drooling technique	NR	Lab based RT-PCR	ORF1ab, S, N	NR	NPS	NR	Lab based RT-PCR	ORF1ab, S, N	NR
Wyllie, et al. (22)	General spitting technique	Yes	Lab based RT-PCR	N1 and N2	Ct ≤ 38	NPS	Yes	Lab based RT-PCR	N1 and N2	Ct ≤ 38
Bhattacharya, et al. (23)	NR	Yes	Lab based RT-PCR	ORF1 and E	NR	NPS	Yes	Lab based RT-PCR	ORF1 and E	NR
Goldfarb, et al. (24)	General spitting technique	Yes	Lab based RT-PCR	E and RdRP	Ct < 40	NPS	Yes	Lab based RT-PCR	E and RdRP	Ct < 40
Ku, et al. (25)	Posterior oropharyngeal spitting technique	Yes	Lab based RT-PCR	E	NR	NPS	Yes	Lab based RT-PCR	E	NR
Nacher, et al. (26)	General spitting technique	Yes	Lab based RT-PCR	N, RdRp and E	Ct < 35	NPS	Yes	Lab based RT-PCR	N, RdRp and E	Ct < 35
Sahajpal, et al. (27)	General spitting technique	Yes	Lab based RT-PCR	N and ORF1ab	NR	NPS	Yes	Lab based RT-PCR	N and ORF1ab	NR
Teo, et al. (28)	Posterior oropharyngeal spitting technique	Yes	Lab based RT-PCR	ORF1ab	NR	NPS	Yes	Lab based RT-PCR	ORF1ab	NR
Yee, et al. (29)	General spitting technique	Yes	Lab based RT-PCR	N, S, ORF1ab	Ct < 40	NPS	Yes	Lab based RT-PCR	N, S, ORF1ab	Ct < 40
Yokota, et al. (30)	General spitting technique	Yes	Lab based RT-PCR	N1 and N2	Ct ≤ 40	NPS	Yes	Lab based RT-PCR	N1 and N2	Ct ≤ 40
Yokota, et al. (31)	General spitting technique	Yes	Lab based RT-PCR and LAMP	N2	NR	NPS	Yes	Lab based RT-PCR	N2	NR
Barat, et al. (32)	Drooling technique	Yes	Lab based RT-PCR	N1 and N2	Ct < 40	NPS	Yes	Lab based RT-PCR	N1 and N2	Ct < 40
Aita, et al. (33)	Using a swabbing device	Yes	Lab based RT-PCR	E	NR	NPS	Yes	Lab based RT-PCR	E	NR
Altawalah, et al. (34)	Posterior oropharyngeal spitting technique	Yes	Lab based RT-PCR	ORF1ab, N, S	Ct < 37	NPS	Yes	Lab based RT-PCR	ORF1ab, N, S	Ct < 37

Study	Index Test					Reference Test				
	Saliva Sampling Method	Instructed by HCW	Diagnostic Testing Method	Gene Target	Ct-value	Swab type	Collected by HCW	Diagnostic Testing Method	Gene Target	Ct-value
Binder, et al. (35)	Drooling technique	Yes	Lab based RT-PCR	N1 and N2	Ct < 40	NPS	Yes	Lab based RT-PCR	N1 and N2	Ct < 40
Caulley, et al. (36)	General spitting technique	Yes	Lab based RT-PCR	E	Ct < 37	NPS	Yes	Lab based RT-PCR	N, E, RdRp	Ct < 37
Kojima, et al. (37)	Using a swabbing device	Yes	Lab based RT-PCR	N1 and N2	NR	NPS	Yes	Lab based RT-PCR	N1 and N2	NR
Procop, et al. (38)	Posterior oropharyngeal spitting technique	Yes	Lab based RT-PCR	N1, N2, aN3	NR	NPS	Yes	Lab based RT-PCR	N1, N2, aN3	NR
Senok, et al. (39)	General spitting technique	Yes	Lab based RT-PCR	RdRp and N	Ct < 40	NPS	Yes	Lab based RT-PCR	RdRp and N	Ct < 40
Uwamino, et al. (40)	NR	Yes	Lab based RT-PCR	N1 and N2	NR	NPS	Yes	Lab based RT-PCR	N1 and N2	NR
Migueres, et al. (41)	General spitting technique	NR	Lab based RT-PCR	IP2, IP4	NR	NPS	NR	Lab based RT-PCR	IP2, IP4	NR

Abbreviations: NR: Not reported, SARS-CoV-2: severe acute respiratory syndrome coronavirus 2, RT-PCR: Reverse transcription polymerase chain reaction

Supplement Table 9 | Detailed Collection Descriptions of Saliva Sample Collection Methods

Saliva Sample Collection Method	Detailed Collection Descriptions
General Spitting Technique	Participants spit saliva into a sterile container McCormick-Baw, et al. (8), Landry, et al. (10), Becker, et al. (13), Griesemer, et al. (15), Jamal, et al. (18), Miller, et al. (19), Pasomsub, et al. (20) Byrne, et al. (14), Hanson, et al. (16), Iwasaki, et al. (17), Wyllie, et al. (22), Goldfarb, et al. (24), Nacher, et al. (26) Sahajpal, et al. (27), Yee, et al. (29), Yokota, et al. (30), Yokota, et al. (31), Caulley, et al. (36), Senok, et al. (39), Migueres, et al. (41) Landry, et al., McCormick-Baw, et al, Miller, et al., as well as Wyllie, et al. specified that participants were instructed not to eat or drink for 30 minutes prior to sample collection. McCormick-Baw, et al. and Miller, et al. also specified that participants were instructed not to smoke or chew gum in that same time frame. Goldfarb, et al. specified that participants were instructed not to eat, drink, smoke, brush their teeth or chew gum 1 hour prior to sampling. Wyllie et al. specified their participants were also asked to avoid nasal sprays, but that water could be consumed up to 10 minutes before collection. Wyllie et al. specified that samples were collected upon waking up, before eating, drinking, or brushing teeth. Landry, et al., Griesemer, et al, Byrne, et al., Wyllie, et al., Goldfarb, et al., Nacher, et al., and Senok, et al. specified that they instructed participants to pool saliva in their mouth prior to spitting. Migueres, et al. specified that participants were instructed to salivate and swirl saliva in their mouths for a minimum of 30 seconds before collection. Hanson, et al., Wyllie, et al. and Goldfarb, et al. specified to spit repeatedly. Byrne, et al., Hanson, et al., McCormick-Baw, et al., Wyllie, et al., Goldfarb, et al., Caulley, et al., and Senok, et al. specified the amount of saliva collected: a minimum of 200 microliters for Byrne, et al. , a minimum of around 1 ml for Wyllie, et al., Hanson, et al. and McCormick-Baw, et al., a minimum of 5-10 ml for Goldfarb, et al., a minimum of 1 ml for Caulley, et al., and 2-4 ml for Senok, et al. Pasomsub, et al. and Griesemer et al specified that participants were asked not to cough prior to sample collection. Becker, et al., Byrne, et al, and Miller, et al. specified that patients performed the technique by aid of a funnel, with Becker, et al. using the Orasure Oragene®·Dx OGD-610 or OM-505 device (Oragene®·Dx, DNA Genotek, Canada) and Miller, et al. using the Orasure Oragene®·Dx OGD-510 device (Oragene®·Dx, DNA Genotek, Canada), following the manufacturer's instructions . Caulley, et al., specified that participants used the OMNIgene•ORAL, OM-505 (DNA Genotek, Canada), following the manufacturer's instructions.
Drooling Technique	Participants passively drooled into a conical tube Azzi, et al. (5), Akgun Dogan, et al. (12), Ranoa, et al. (21), Barat, et al. (32), Binder, et al. (35). Barat, et al. (32). specified that participants were instructed not to cough or clear their throats. Four studies specified the amount of saliva collected; around 1 ml for Akgun Dogan, et al.(12), around 1 ml for Azzi, et al. (5), about 2 ml for Binder, et al., and 3-5 ml for Barat, et al. (32)
Early-Morning Posterior Oropharyngeal Saliva Collection	Upon waking up, participants coughed up posterior oropharyngeal saliva by clearing their throat, and spit it into a sterile collection container, prior to eating, drinking or brushing their teeth (6, 7, 9). Rao, et al. and Chen, et al. specified the amount of saliva collected: 2ml in study for Rao, et al.(9) and approximately 1ml in for Chen, et al. (6).

Saliva Sample Collection Method	Detailed Collection Descriptions
Posterior Pharyngeal Saliva Collection	Participants were asked to clear their throats or cough deeply before spitting into the collection tube Ku, et al. (25), Teo, et al. (28), Altawalah, et al. (34), Procop, et al. (38) Procop, et al. and Teo, et al. used a naso-oropharyngeal technique, in which participants were also asked to clear their noses, with Procop, et al. specifying that they should collect any secretions in their mouth. Teo, et al. specified that participants were asked not to eat, drink, brush teeth, use mouthwash, smoke or chew gum for 30 minutes before collection. They were also asked to tilt their heads back while clearing their throat and when clearing their nose. Procop, et al. specified to remove gum or candy from their mouth at least 5 minutes before the collection. Ku, et al. specified that participants were asked to pool saliva for 1-2 minutes and that 1-2 ml of saliva was collected
Using a Saliva Collection Device	Participants used a swab to collect saliva. Villar, et al. (11), Aita, et al. (33), Kojima, et al. (37) Kojima et al. specified that participants were asked to cough deeply three to five times to collect any secretions, then swab their cheeks, above and below their tongue, along the gums and palate for a total of 20 second using a sterile swab. They then placed the swab in a tube containing RNA preservation media. Villar et al. and Aita et al. used the Salivette® device (Salivette, Sarstedt, Germany) manufacturer's instructions were followed. Participants chewed the Salivette® swab in their mouth for 1 minute to stimulating salivation, and then replaced swabs into the Salivette® tube. Tubes were centrifuged for 2 minutes at 1000g to release saliva from the swab.

Supplement Table 10 | Transport Media Added to Saliva Samples

Study	Transport Media Added to Saliva Sample
Azzi, et al. (5), McCormick-Baw, et al. (8),Rao, et al. (9), Landry, et al. (10), Villar, et al. (11), Byrne, et al. (14),, Griesemer, et al. (15), Wyllie, et al. (22), Goldfarb, et al. (24), Ku, et al. (25),,Nacher, et al. (26),Yee, et al. (29), Barat, et al. (32),Aita, et al. (33),Procop, et al. (38),Senok, et al. (39), Uwamino, et al. (40), Migueres, et al. (41)	No media
Chen, et al. (6), Leung, et al. (7), Akgun Dogan, et al. (12), Sahajpal, et al. (27), Altawalah, et al. (34)	Viral transport media (VTM)
Hanson, et al. (16),Pasomsub, et al. (20)	Universal transport media (UTM)
Becker, et al. (13), Miller, et al. (19),Teo, et al. (28),Caulley, et al. (36),Kojima, et al. (37)	Nucleic acid stabilizing solution
Jamal, et al. (18),Iwasaki, et al. (17),Yokota, et al. (30),Yokota, et al. (31), Binder, et al. (35)	Phosphate-Buffered Saline (PBS)
Ranoa, et al. (21)	TE buffer
Bhattacharya, et al. (24)	NR

Abbreviations: NR: Not reported

Supplement Table 11 | Difference in Sensitivity for SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by Population Sampled

Study	N Paired Samples Tested	N Positive on Nasopharyngeal swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
People Presenting for SARS-CoV-2 Testing (N=22)						
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Becker, et al. (13)	85	15	11	23	47.8% (26.8% to 69.4%)	-17.4% (-49.8% to 19.7%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Bhattacharya, et al. (23)	74	58	53	58	91.4% (81% to 97.1%)	-8.6% (-18.6% to -0.7%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Teo, et al. (28)	190	50	95	98	96.9% (91.3% to 99.4%)	45.9% (34% to 56.2%)
Yee, et al. (29)	*70*	62	57	70	81.4% (70.3% to 89.7%)	-7.1% (-20% to 5.9%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Uwamino, et al. (40)	114	2	2	2	100% (15.8% to 100%)	0% (-65.8% to 65.8%)
Migueres, et al. (41)	95	32	29	32	90.6% (75% to 98%)	-9.4% (-24.2% to 3%)
Pooled estimate (95% CI); I^2	5599	1243	1100	1381	85.4% (78.1% to 90.6%); I^2 = 89%	-7.9% (16.7% to 0.8%); I^2 = 89%
Persons with Confirmed SARS-CoV-2 Infection (N=17)						
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Becker, et al. (13)	24	6	4	7	57.1% (18.4% to 90.1%)	-28.6% (-66.4% to 24.4%)
Iwasaki, et al. (17)	10	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Teo, et al. (28)	147	100	114	122	93.4% (87.5% to 97.1%)	11.5% (2.7% to 20.2%)
Yee, et al. (29)	*27*	25	22	27	81.5% (61.9% to 93.7%)	-11.1% (-30.7% to 9%)

Study	N Paired Samples Tested	N Positive on Nasopharyngeal swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Uwamino, et al. (40)	82	45	41	56	73.2% (59.7% to 84.2%)	-7.1% (-24.4% to 10.7%)
Migueres, et al. (41)	28	9	8	12	66.7% (34.9% to 90.1%)	-8.3% (-45.5% to 32%)
Pooled estimate (95% CI); I^2	1158	637	701	808	87.3% (81.3% to 91.6%); I^2 = 74%	1.5% (-7.3% to 10.3%); I^2= 78%
Mixed Population: Persons with Confirmed SARS-CoV-2 or People Presenting for SARS-CoV-2 Testing (N=3)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Pooled estimate (95% CI); I^2	306	103	126	138	91.4% (81.6% to 96.2%); I^2 = 50%	9.8% (-76% to 95.6%); I^2 = 95%

Abbreviations: N: Number, CI: Confidence Interval

Supplement Table 12 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by Symptoms Present at Time of Sampling

Study	N Paired Samples Tested	N Positive on Nasopharyngeal swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal]
Asymptomatic (N=8)						
Rao, et al. (9)	217	84	149	217	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Yokota, et al. (31)	161	41	44	161	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Villar, et al. (11)	7	3	3	7	100% (29.2% to 100%)	0% (-56.1% to 56.1%)
Ku, et al. (25)	12	6	1	12	16.7% (0.4% to 64.1%)	-83.3% (-97% to -27.7%)
Teo, et al. (28)	149	27	64	149	95.5% (87.5% to 99.1%)	55.2% (39.3% to 67.2%)
Yee, et al. (29)	*42*	36	30	*42*	71.4% (55.4% to 84.3%)	-14.3% (-32.7% to 5.6%)
Senok, et al. (39)	195	12	11	195	73.3% (44.9% to 92.2%)	-6.7% (-38.4% to 26.8%)
Migueres, et al. (41)	*17*	17	15	*17*	88.2% (63.6% to 98.5%)	-11.8% (-34.3% to 8.5%)
Pooled estimate (95% CI); I^2	800	226	317	357	85.8% (69.6% to 94.1%); I^2 = 83%	-1.6% (-37.4% to 34.1%); I^2 = 96%
Symptomatic (N=24)						
Villar, et al. (11)	6	6	4	6	66.7% (22.3% to 95.7%)	-33.3% (-70% to 12.3%)
Ku, et al. (25)	30	24	20	25	80% (59.3% to 93.2%)	-16% (-35.7% to 4%)
Teo, et al. (28)	188	123	145	153	94.8% (90% to 97.7%)	14.4% (6.7% to 22.1%)
Yee, et al. (29)	*55*	51	49	55	89.1% (77.8% to 95.9%)	-3.6% (-15.8% to 8.4%)
Senok, et al. (39)	206	14	17	20	85% (62.1% to 96.8%)	15% (-14.3% to 41.3%)
Migueres, et al. (41)	*27*	24	22	27	81.5% (61.9% to 93.7%)	-7.4% (-28.1% to 13.9%)
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Bhattacharya, et al. (23)	74	58	53	58	91.4% (81% to 97.1%)	-8.6% (-18.6% to -0.7%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Uwamino, et al. (40)	196	47	43	58	74.1% (61% to 84.7%)	-6.9% (-23.6% to 10.3%)

Study	N Paired Samples Tested	N Positive on Nasopharyngeal swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal]
Pooled estimate (95% CI); I^2	3605	1292	1221	1437	87.0% (81.6% to 90.9%); I^2 = 82%	-4.9% (-10.2% to 0.4%); I^2 = 75%
Mixed symptomatic and asymptomatic (N=11)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Pooled estimate (95% CI); I^2	2645	465	389	533	86.4% (74.9% to 93.2%); I^2 = 87%	-3.5% (-21.2% to 14.3%); I^2 = 90%

Abbreviations: N: Number, CI: Confidence Interval

Supplement Table 13 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by Setting

Study	N Paired Samples Tested	N Positive on Nasopharyngeal swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Outpatients (N=20)						
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Teo, et al. (28)	337	150	209	220	95% (91.2% to 97.5%)	26.8% (19.4% to 33.9%)
Yee, et al. (29)	70	62	57	70	81.4% (70.3% to 89.7%)	-7.1% (-20% to 5.9%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Uwamino, et al. (40)	114	2	2	2	100% (15.8% to 100%)	0% (-65.8% to 65.8%)
Migueres, et al. (41)	95	32	29	32	90.6% (75% to 98%)	-9.4% (-24.2% to 3%)
Pooled estimate (95% CI); I^2	4429	899	862	1039	87.9% (81.5% to 92.2%); I^2 = 82%	-4.3% (-11.8% to 3.2%); I^2 = 79%
Inpatients (N=14)						
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Bhattacharya, et al. (23)	74	58	53	58	91.4% (81% to 97.1%)	-8.6% (-18.6% to -0.7%)
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Uwamino, et al. (40)	82	45	41	56	73.2% (59.7% to 84.2%)	-7.1% (-24.4% to 10.7%)

Study	N Paired Samples Tested	N Positive on Nasopharyngeal swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Migueres, et al. (41)	28	9	8	12	66.7% (34.9% to 90.1%)	-8.3% (-45.5% to 32%)
Pooled estimate (95% CI); I^2	1917	865	784	950	85.3% (77.3% to 90.9%); I^2 = 85%	-6.6% (-14.7% to 1.4%); I^2 = 79%
Both Inpatients and Outpatients (N=6)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Yee, et al. (29)	*27*	25	22	27	81.5% (61.9% to 93.7%)	-11.1% (-30.7% to 9%)
Pooled estimate (95% CI); I^2	*783*	219	281	338	85.6% (71% to 93.5%); I^2 = 83%	4.6% (-32.1% to 41.2%); I^2 = 93%

Abbreviations: N: Number, CI: Confidence Interval

Supplement Table 14 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by **Age Group**

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
≥ 18 years (N=24)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Teo, et al. (28)	337	150	209	220	95% (91.2% to 97.5%)	26.8% (19.4% to 33.9%)
Yee, et al. (29)	*54*	49	45	54	83.3% (70.7% to 92.1%)	-7.4% (-21.2% to 6.6%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Aita, et al. (33)	43	7	8	8	94.4% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Pooled estimate (95% CI); I^2	3843	983	1104	1243	90.4% (86.1% to 93.5%); I^2 = 76%	3.1% (5.1% to 11.3%); I^2 = 86%
<18 years (N=1)						
Yee, et al. (29)	43	38	34	43	79.1% (64% to 90%)	-9.3% (-26.1% to 8.1%)
Mixed/Unclear age (N=13)*						
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Bhattacharya, et al. (23)	74	58	53	58	91.4% (81% to 97.1%)	-8.6% (-18.6% to -0.7%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Uwamino, et al. (40)	196	47	43	58	74.1% (61% to 84.7%)	-6.9% (-23.6% to 10.3%)
Migueres, et al. (41)	123	41	37	44	84.1% (69.9% to 93.4%)	-9.1% (-23.8% to 5.6%)
Pooled estimate (95% CI); I^2	3243	962	789	1041	78% (69.1% to 84.9%); I^2 = 86%	-15.3% (-23.8% to -6.9%); I^2 = 79%

Abbreviations: N: Number, CI: Confidence Interval.

Notes: * Included studies that included pediatric (<18 years) and adult (≥18 years) and did not report the outcome stratified by age group. It also includes studies that did not report the age group evaluated.

Supplement Table 15 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by **Saliva Collection Method**

Study*	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Early morning posterior oropharyngeal spitting technique (N=3)						
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Pooled estimate (95% CI); I^2	370	184	252	276	91.3% (87.4% to 94.1%); I^2= 0%	15.4% (-42.9% to 73.8%); I^2= 93%
Drooling technique (N=5)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Pooled estimate (95% CI); I^2	882	133	137	173	87.9% (69.9% to 95.8%); I^2= 77%	0.6% (-38.4% to 39.6%); I^2= 90%
Posterior pharyngeal spitting technique (N=5)						
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Teo, et al. (28)	337	150	209	220	95% (91.2% to 97.5%)	26.8% (19.4% to 33.9%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Pooled estimate (95% CI); I^2	1486	562	574	652	91.5% (72.7% to 97.7%); I^2= 94%	-1.8% (-38.8% to 35.1%); I^2= 97%
General spitting technique (N=20)						
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Yee, et al. (29)	300	87	79	97	81.4% (72.3% to 88.6%)	-8.2% (-18.9% to 2.5%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)

Study*	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Migueres, et al. (41)	123	41	37	44	84.1% (69.9% to 93.4%)	-9.1% (-23.8% to 5.6%)
Pooled estimate (95% CI); I^2	4223	960	827	1064	84.7% (77.4% to 90%); I^2= 87%	-8.1% (-15.3% to -0.9%); I^2= 80%
Saliva collection device (N=3)						
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Pooled estimate (95% CI); I^2	101	39	41	46	89.1% (76.4% to 95.4%); I^2= 0%	1.6% (-44.5% to 47.6%); I^2= 47%

Abbreviations: N: Number, CI: Confidence Interval.

Notes: *Two studies did not report the saliva collection method.

Supplement Table 16 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by **Usage of Transport Media with Saliva**

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Used Transport Media (N=18)						
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Teo, et al. (28)	337	150	209	220	95% (91.2% to 97.5%)	26.8% (19.4% to 33.9%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Pooled estimate (95% CI); I^2	3380	1066	1036	1232	88.0% (80.2% to 93%); I^2 = 89%	-2.8% (-11.6% to 6.1%); I^2 = 86%
Did Not Use Transport Media (N=18)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Yee, et al. (29)	300	87	79	97	81.4% (72.3% to 88.6%)	-8.2% (-18.9% to 2.5%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Uwamino, et al. (40)	196	47	43	58	74.1% (61% to 84.7%)	-6.9% (-23.6% to 10.3%)
Migueres, et al. (41)	123	41	37	44	84.1% (69.9% to 93.4%)	-9.1% (-23.8% to 5.6%)
Pooled estimate (95% CI); I^2	3878	859	838	1037	85.4% (79.3% to 89.9%); I^2 = 80%	-3.7% (-14.8% to 7.3%); I^2 = 90%

Abbreviations: N: Number, CI: Confidence interval.

*One study did not report if transport media was used.

Supplement Table 17 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by **Analytical Method Used**

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Lab Based RT-PCR (N=34)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Bhattacharya, et al. (23)	74	58	53	58	91.4% (81% to 97.1%)	-8.6% (-18.6% to -0.7%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Teo, et al. (28)	337	150	209	220	95% (91.2% to 97.5%)	26.8% (19.4% to 33.9%)
Yee, et al. (29)	300	87	79	97	81.4% (72.3% to 88.6%)	-8.2% (-18.9% to 2.5%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Uwamino, et al. (40)	196	47	43	58	74.1% (61% to 84.7%)	-6.9% (-23.6% to 10.3%)
Migueres, et al. (41)	123	41	37	44	84.1% (69.9% to 93.4%)	-9.1% (-23.8% to 5.6%)
Pooled estimate (95% CI); I^2	6765	1799	1746	0	85.9% (80.9% to 89.8%); I^2 = 87%	-3.6% (-10.7% to 3.6%); I^2 = 89%

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Other Molecular Method (N=3)						
Chen, et al. (6)*	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
McCormick-Baw, et al. (8)*	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Hanson, et al. (16)†	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Pooled estimate (95% CI); I^2	567	184	181	194	93.3% (88.8% to 96.1%); I^2 = 0%	-1.4% (-9.1% to 6.3%); I^2 = 8%

Abbreviations: N: Number, RT-PCR: Reverse transcription polymerase chain reaction, CI: Confidence Interval.
Notes *Point of care test, †Transcription-mediated amplification

Supplement Table 18 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by **Study Design**

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Cohorts (N=35)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Bhattacharya, et al. (23)	74	58	53	58	91.4% (81% to 97.1%)	-8.6% (-18.6% to -0.7%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Teo, et al. (28)	337	150	209	220	95% (91.2% to 97.5%)	26.8% (19.4% to 33.9%)
Yee, et al. (29)	300	87	79	97	81.4% (72.3% to 88.6%)	-8.2% (-18.9% to 2.5%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Uwamino, et al. (40)	196	47	43	58	74.1% (61% to 84.7%)	-6.9% (-23.6% to 10.3%)
Migueres, et al. (41)	123	41	37	44	84.1% (69.9% to 93.4%)	-9.1% (-23.8% to 5.6%)

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Pooled estimate (95% CI); I^2	7192	1915	1850	2240	86.8% (81.9% to 90.5%); I^2 = 87%	-4.2% (-11% to 2.6%); I^2 = 89%
Case-Control (N=2)						
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)

Abbreviations: N: Number, CI: Confidence Interval

Supplement Table 19 | Difference in Sensitivity to SARS-CoV-2 Between Nasopharyngeal Swabs and Saliva, Stratified by **Quality Assessment**

Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Scored ≥ 4 Points Across All Seven Domains (N=31)						
Azzi, et al. (5)	113	26	55	59	93.2% (83.5% to 98.1%)	49.2% (31.3% to 62.9%)
McCormick-Baw, et al. (8)	155	49	48	50	96% (86.3% to 99.5%)	-2% (-11.6% to 7.1%)
Rao, et al. (9)	217	84	149	160	93.1% (88% to 96.5%)	40.6% (30.5% to 49.6%)
Landry, et al. (10)	124	33	30	35	85.7% (69.7% to 95.2%)	-8.6% (-24.6% to 7.3%)
Villar, et al. (11)	13	9	7	9	77.8% (40% to 97.2%)	-22.2% (-54.7% to 11.7%)
Akgun Dogan, et al. (12)	200	58	36	63	57.1% (44% to 69.5%)	-34.9% (-49% to -18.4%)
Becker, et al. (13)	109	21	15	30	50% (31.3% to 68.7%)	-20% (-47.5% to 11.6%)
Byrne, et al. (14)	110	14	12	14	85.7% (57.2% to 98.2%)	-14.3% (-39.9% to 9.6%)
Griesemer, et al. (15)	463	103	87	105	82.9% (74.3% to 89.5%)	-15.2% (-23.8% to -7.3%)
Hanson, et al. (16)	354	80	81	86	94.2% (87% to 98.1%)	1.2% (-7.1% to 9.5%)
Iwasaki, et al. (17)	76	9	9	10	90% (55.5% to 99.7%)	0% (-32.4% to 32.4%)
Jamal, et al. (18)	91	64	52	72	72.2% (60.4% to 82.1%)	-16.7% (-30.2% to -2.4%)
Miller, et al. (19)	91	34	35	36	97.2% (85.5% to 99.9%)	2.8% (-9.5% to 15.7%)
Pasomsub, et al. (20)	200	19	18	21	85.7% (63.7% to 97%)	-4.8% (-27.1% to 17.8%)
Bhattacharya, et al. (23)	74	58	53	58	91.4% (81% to 97.1%)	-8.6% (-18.6% to -0.7%)
Ku, et al. (25)	42	30	21	31	67.7% (48.6% to 83.3%)	-29% (-47.2% to -9%)
Nacher, et al. (26)	776	152	86	162	53.1% (45.1% to 61%)	-40.7% (-49.5% to -30.9%)
Sahajpal, et al. (27)	240	61	34	68	50% (37.6% to 62.4%)	-39.7% (-53.9% to -22.5%)
Teo, et al. (28)	337	150	209	220	95% (91.2% to 97.5%)	26.8% (19.4% to 33.9%)
Yee, et al. (29)	300	87	79	97	81.4% (72.3% to 88.6%)	-8.2% (-18.9% to 2.5%)
Yokota, et al. (30)	42	34	38	38	100% (90.7% to 100%)	10.5% (-0.6% to 24.1%)
Yokota, et al. (31)	161	41	44	47	93.6% (82.5% to 98.7%)	6.4% (-6.9% to 19.9%)
Barat, et al. (32)	451	29	26	30	86.7% (69.3% to 96.2%)	-10% (-26.8% to 6.1%)
Altawalah, et al. (34)	891	344	305	362	84.3% (80.1% to 87.9%)	-10.8% (-15.4% to -6.2%)
Binder, et al. (35)	19	11	11	12	91.7% (61.5% to 99.8%)	0% (-28.5% to 28.5%)
Caulley, et al. (36)	272	8	11	13	84.6% (54.6% to 98.1%)	23.1% (-16% to 54.6%)
Kojima, et al. (37)	45	23	26	29	89.7% (72.6% to 97.8%)	10.3% (-10.5% to 30.4%)
Procop, et al. (38)	216	38	39	39	100% (91% to 100%)	2.6% (-6.6% to 13.2%)
Senok, et al. (39)	401	26	28	35	80% (63.1% to 91.6%)	5.7% (-16.5% to 27.2%)
Uwamino, et al. (40)	196	47	43	58	74.1% (61% to 84.7%)	-6.9% (-23.6% to 10.3%)
Migueres, et al. (41)	123	41	37	44	84.1% (69.9% to 93.4%)	-9.1% (-23.8% to 5.6%)
Pooled estimate (95% CI); I^2	6902	1783	1724	2093	86.5% (81.1% to 90.5%); I^2 = 89%	-4.1% (-11.7% to 3.5%); I^2 = 91%
Score < 4 Points Across All Seven Domains (N=6)						
Chen, et al. (6)	58	55	52	58	89.7% (78.8% to 96.1%)	-5.2% (-16.4% to 5.7%)
Leung, et al. (7)	95	45	51	58	87.9% (76.7% to 95%)	10.3% (-4.9% to 25.1%)

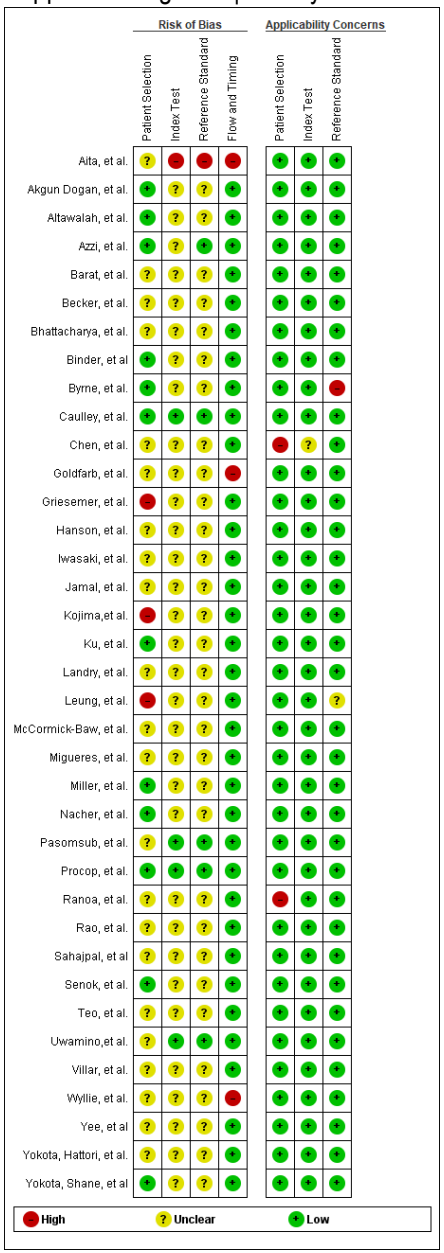
Study	N Paired Samples Tested	N Positive on Nasopharyngeal Swab	N Positive on Saliva	N Positive on Any Sample (Reference)	Sensitivity Saliva (95% CI)	Difference in Sensitivity (95% CI) [Saliva-Nasopharyngeal swab]
Ranoa, et al. (21)	99	9	9	9	100% (66.4% to 100%)	0% (-29.9% to 29.9%)
Wyllie, et al. (22)	97	56	60	72	83.3% (72.7% to 91.1%)	5.6% (-8.9% to 19.7%)
Goldfarb, et al. (24)	38	28	23	29	79.3% (60.3% to 92%)	-17.2% (-35.4% to 1.1%)
Aita, et al. (33)	43	7	8	8	100% (63.1% to 100%)	12.5% (-21.5% to 47.1%)
Pooled estimate (95% CI); I^2	430	200	203	234	86.8% (81.8% to 90.5%); I^2 = 0%	-0.1% (-11.4% to 11.2%); I^2 = 44%

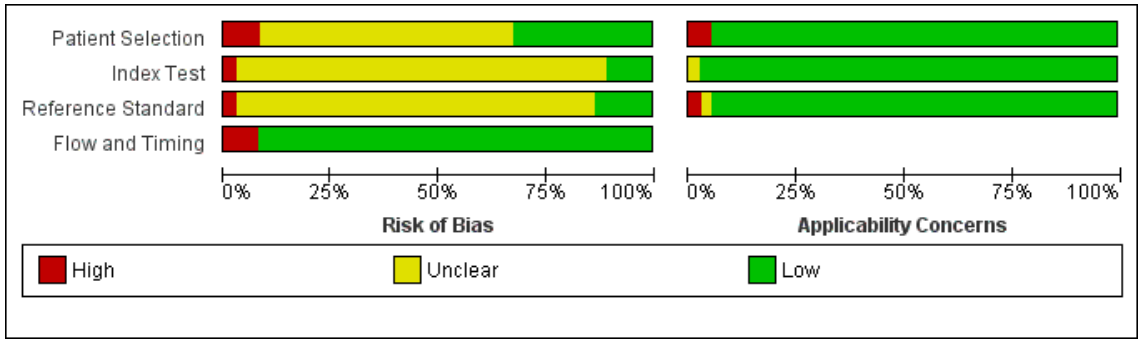
Abbreviations: N: Number, CI: confidence interval

Supplement Table 20 | How the Incremental Cost per Additional SARS-CoV-2 Infection Identified Varies with Difference in Sampling Method Sensitivity and Prevalence of SARS-CoV-2

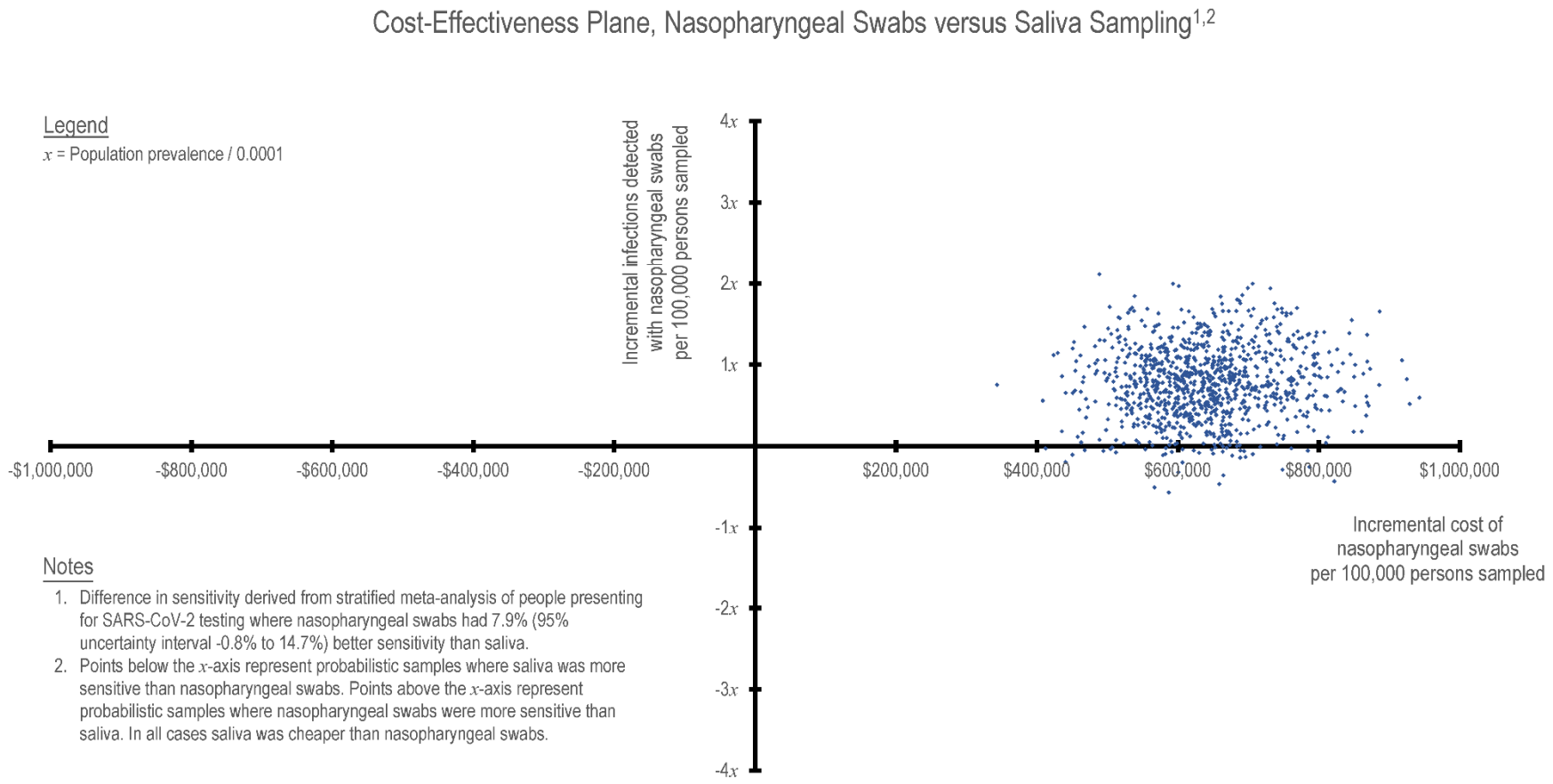
Prevalence of SARS-CoV-2 in Sampled Population	Difference in Sampling Method Sensitivity [Nasopharyngeal – Saliva]	Difference in Cost per 100,000 Persons Sampled (2020 $USD) [Nasopharyngeal – Saliva]	Additional SARS-CoV-2 Infections Identified per 100,000 Persons Sampled [Nasopharyngeal – Saliva]	Incremental Cost per Additional SARS-CoV-2 Infection Identified [Nasopharyngeal – Saliva]
0.01%	1%	$633,000	0.1	$6,330,000
	2%	$633,000	0.2	$3,165,000
	5%	$633,000	0.5	$1,266,000
	10%	$633,000	1	$633,000
	20%	$633,000	2	$316,500
0.1%	1%	$633,000	1	$633,000
	2%	$633,000	2	$316,500
	5%	$633,000	5	$126,600
	10%	$633,000	10	$63,300
	20%	$633,000	20	$31,650
1%	1%	$633,000	10	$63,300
	2%	$633,000	20	$31,650
	5%	$633,000	50	$12,660
	10%	$633,000	100	$6,330
	20%	$633,000	200	$3,165
10%	1%	$633,000	100	$6,330
	2%	$633,000	200	$3,165
	5%	$633,000	500	$1,266
	10%	$633,000	1000	$633
	20%	$633,000	2000	$317

Supplement Figure 1 | Quality Assessment of Included Studies





Supplement Figure 2 | Cost-Effectiveness Plane, Nasopharyngeal Swabs versus Saliva Sampling



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