

### **Review: Case definitions for surveillance integrated for influenza and COVID-19**

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### Section 1 – Introduction

Global influenza surveillance has been conducted through WHO's Global Influenza Surveillance and Response System (GISRS) for almost 70 years. GISRS is continuously functioning as global mechanism of surveillance, preparedness and response for influenza; global platform for monitoring influenza epidemiology and disease; and global alert for novel influenza viruses and other respiratory pathogens.<sup>1</sup>

Since the beginning of the COVID-19 pandemic, GISRS network has integrated the testing of COVID-19 specimens into the workflows, in order to understand community transmission trends for COVID-19 and inform the national response to the COVID-19 pandemic. However, the influenza surveillance was disrupted due to repurposing of staff and supplies at sentinel sites and laboratories in response to COVID-19. With the next influenza season upcoming, countries need to invest in building longerterm health emergency preparedness for both influenza and COVID-19.

Two case definitions, influenza-like illness (ILI) and severe acute respiratory infection (SARI) are used in GISRS for influenza surveillance. ILI is defined as acute onset ( $\leq$ 10 days) of cough and fever ( $\geq$ 38 C°) in community-based settings and SARI is defined as acute onset ( $\leq$ 10 days) of cough and fever ( $\geq$ 38 C°) or history of fever that requires hospitalisation. However, it is unclear whether these case definitions, ILI and SARI, capture COVID-19 cases well. Recent systematic reviews reported that besides respiratory symptoms, COVID-19 cases could also develop gastrointestinal<sup>2</sup> and neurological<sup>3</sup> symptoms, including the loss of sense of smell (anosmia) and loss of sense of taste (dysgeusia)<sup>4</sup>. Therefore, it is important to review how the existing case definitions for influenza surveillance perform for COVID-19 surveillance and whether the case definitions need to be modified to achieve good sensitivity and specificity for both influenza and COVID-19.

To this end, we conducted two rapid reviews, 1) on the clinical characteristics of COVID-19 (**Section 2**); 2) on the case definitions used for COVID-19 surveillance based on influenza surveillance and its performance metrics, e.g. sensitivity and specificity (**Section 3**).

### Section 2 – Clinical characteristics of COVID-19

#### Methods

#### Data source

Due to time constraints, we only focused on existing systematic reviews on the clinical characteristics of COVID-19. We screened reviews that were under the collection of "clinical characteristics" indexed by the "COVID-19 evidence review" website<sup>5</sup> according to the eligibility criteria below.

#### Inclusion criteria

- Systematic review/rapid review that reported clinical symptoms of laboratory-confirmed COVID-19 (e.g. RT-PCR or rapid diagnostic test, RDT); AND
- A pooled estimate of the prevalence of clinical characteristics should be reported.

#### **Exclusion criteria**

- Reviews that focused on population sub-groups or patients with special medical conditions (e.g. patients with comorbidities, pregnant women, etc.) since the focus of the current review is general population; OR
- Reviews that focused on biochemical or radiological characteristics of COVID-19; OR
- Reviews that focused on particular syndromes that may be a sequalae of COVID-19 (e.g. Multisystem inflammatory syndrome in children (MIS-C), Guillain-Barre syndrome and acute respiratory distress syndrome)

#### Selection and extraction

All reviews were screened by title and aim and then by full-text screening. An Excel spreadsheet template was designed for data extraction. The following general information was collected from each review: last date of literature search, country, age group and severity. For each symptom, we collected the point estimate and the 95% confidence intervals (CI) of pooled estimate of prevalence; we also collected the number of studies and subjects involved for that estimate. Where reported by these reviews, we also collected data on the prevalence of asymptomatic cases. We extracted the estimates separately by age group if available.

#### Data analysis

As the main analysis, for each symptom, we calculated the median and interquartile range (IQR) of the point estimates of the pooled prevalence reported by the reviews. We ranked the symptoms by their median prevalence. Since there is a potential of same studies being included multiple times by these reviews, as a sensitivity analysis, we only included the latest review (as indicated by the last date of search) for each symptom and compared the rankings of the symptoms with the main analysis. Data analysis and visualisation was conducted using R software (version 3.6.1).

#### Results

#### General characteristics of included reviews

We screened 159 reviews by title and abstract, and 59 reviews by full-text (**Figure 1**). A total of 31 reviews were included in the analysis.<sup>2-4,6-33</sup> Details of these reviews are available in the appendix **Table S1**. Of the 31 reviews, 23 reported for all ages; 8 reported only for children; and 4 reported only for adults. Six initial reviews only reported data from China and the remaining 25 reviews published later included all countries. All reviews included COVID-19 cases of all range of severity (except for one review<sup>15</sup> that focused on asymptomatic cases).

#### Prevalence of symptoms

Fever and cough were the two most common clinical symptoms of COVID-19 cases for all ages, with median prevalence of 83% (IQR: 80–87) and 60% (IQR: 58–63), respectively. These two symptoms were followed by loss of smell or taste (41%, IQR: 26–48), fatigue (31%, IQR: 23–39) and anorexia (30%, IQR: 28–34). Asymptomatic cases accounted for 12% of COVID-19 cases (IQR: 9–14). (Figure 2) The prevalence of symptoms was broadly similar between children (under ~18y) and adults except for fatigue and asymptomatic cases: only 9% of paediatric COVID-19 cases had fatigue whereas 30% of adult cases had fatigue; 19% of paediatric COVID-19 cases were asymptomatic whereas only 0.4% of adult COVID-19 cases were asymptomatic (Figure 3 and Figure 4). Similar results were observed from our sensitivity analysis that only included the latest review for each symptom (Figures S1–S3). No reviews reported the prevalence of different combinations of symptoms, e.g. fever and cough. Results from the individual reviews included in the analysis can be found in Table S2 of the appendix.



Figure 1. PRISMA flowchart of selection process



*Figure 2.* Box and whiskers plot showing the prevalence of each symptom reported by reviews for all ages. Dots denote outliers.



*Figure 3.* Box and whiskers plot showing the prevalence of each symptom reported by reviews for children. Dots denote outliers.

![](_page_5_Figure_0.jpeg)

*Figure 4. Box and whiskers plot showing the prevalence of each symptom reported by reviews for adults. Dots denote outliers.* 

#### Conclusion

- Prevalence of COVID-19 symptoms can indicate the sensitivity of a COVID-19 surveillance using that/those symptom(s).
- Fever and cough are the two most common symptoms of COVID-19, accounting for 83% and 60% of all COVID-19 cases, respectively.
- Loss of smell/taste (41%), fatigue (31%) and anorexia (30%) are also common, and thus might be considered for COVID-19 surveillance.
- A higher proportion (19%) of paediatric COVID-19 cases were asymptomatic, compared with 0.4% of adult cases.
- However, little is known about the prevalence of combinations of different COVID-19 symptoms from existing systematic reviews. Large-scale meta-analyses of individual-level patient data are warranted to explore the different combinations of symptoms in order to optimise COVID-19 case definitions.
- Due to time constraints, this analysis is limited by only including systematic/rapid reviews. There is potential for these systematic/rapid reviews to include same studies multiple times. Nonetheless, sensitivity analysis that only included the latest review for each symptom demonstrates similar results as the main analysis.

# Section 3 – performance of COVID-19 surveillance based on existing flu surveillance

#### Method

#### Search

We searched the WHO database of global COVID-19 literature on 18<sup>th</sup> August 2020. We considered two different search strategies, namely strategy A and strategy B, which focused on capturing different types of research. Strategy A focused on case definitions that had been used by countries for COVID-19 surveillance and did not contain any terms on the performance of the surveillance (e.g. sensitivity and specificity) whereas strategy B focused on the performance metrics of the surveillance. Details on the two strategies can be found in the appendix **Text S1**.

#### Selection and extraction

The records retrieved from the two strategies were combined and de-duplicated before undergoing screening. All papers were screened by title and abstract and subsequently shortlisted papers were included for full-text screening. An Excel spreadsheet template was designed for data extraction. Information was collected on country, study period, method, main findings and interpretations of findings relevant to COVID-19 surveillance.

#### Results

We screened 974 papers by title and abstract and 31 papers were eligible for full-text screening. While we did not identify any studies that formally assessed the performance of COVID-19 surveillance, we included ten papers that had relevant information on the performance of COVID-19 surveillance (**Figure 5**). We divided the ten papers<sup>34-43</sup> into two broad groups based on the nature of the study design: three studies<sup>37,39,40</sup> in group 1, which reported the positive proportion of SARS-CoV-2 among all cases included in the surveillance; and seven studies in group 2, which were ecological studies that reported the correlation between numbers of ILI/ARI/SARI cases and COVID-19 cases.

As shown in **Table 1**, the three studies in group 1 (from Brazil, India and England, respectively) used slightly different case definitions in their surveillance systems. In Sao Paulo and Rio de Janeiro, Brazil, both ILI and history of travel to affected areas or contact with a suspected or confirmed COVID-19 case were required. SARI case definition was used in India. England used a case definition similar to Brazil for the national surveillance during the "containment" phase (before 13-Mar-2020) at the beginning of the pandemic. England then incorporated testing of SARS-CoV-2 into its community-based ILI surveillance and removed the criterion regarding history of travel to affected areas or contact with COVID-19 cases, starting from the "delay" phase (after 13-Mar-2020). SARS-CoV-2 positivity among cases in the surveillance systems, which could be considered as positive predicted value (PPV), aligned well with the course of the pandemic in all three studies, ranging from 1.8% and 25.6%. SARS-CoV-2 positivity was found to be highest in the elderly and lowest in children.

As shown in **Table 2**, the seven studies in group 2 (from Brazil, China, Spain and USA) found that excess ILI/ARI was positively correlated with COVID-19 cases or influenza-negative cases.

![](_page_7_Figure_0.jpeg)

Figure 5. PRIMSA flowchart presenting selection process

Study	Location	Study period	Case definition	Methods	Main findings
Diaz-Quijano, 2020	Sao Paulo and Rio de Janeiro, Brazil	11/01/2020– 25/03/2020	Respiratory symptoms and fever (temperature cut-off not reported), travel to area of transmission, close contact with confirmed or suspected case	<ul> <li>All cases meeting case definitions were tested for SARS- CoV-2 using PCR</li> </ul>	<ul> <li>Overall SARS-CoV-2 positivity of 25.6%</li> <li>SARS-CoV-2 positivity highest in 50y- (~35%) and lowest in &lt;15y (~5%)</li> <li>Increasing SARS-CoV-2 positivity over time, from &lt;5% to ~80%</li> </ul>
Gupta, 2020	India	15/02/2020– 02/04/2020	SARI	<ul> <li>41 sentinel sites selected to test throat/ nasopharyngeal swabs from a sample of SARI patients before 19-Mar-2020 (selection and sampling strategies not reported) and from all SARI patients thereafter</li> </ul>	<ul> <li>Overall SARS-CoV-2 positivity of 1.8%</li> <li>SARS-CoV-2 positivity highest in 50-59y (4.9%), lowest in 10-19y (0%)</li> <li>Increasing SARS-CoV-2 positivity over time, from 0% at the start to 2.6% at the end of the study</li> </ul>
Ladhani, 2020	England	01/01/2020 -03/05/2020	<ul> <li>National surveillance</li> <li>Before 13/03/2020: History of travel to affected countries or close contact with COVID-19 cases, AND SARI or ARI or fever with no other symptoms</li> <li>After 13/03/2020: Requiring admission to hospital, AND Pneumonia or ARDS or ILI (defined as fever + at least one of the following, persistent cough, hoarseness, nasal discharge or congestion, shortness of breath, sore throat, wheezing or sneezing)</li> <li>Community-based surveillance From Mar 2020: ILI (defined as fever with one systemic and one respiratory symptom)</li> </ul>	<ul> <li>National surveillance</li> <li>All cases tested for SARS-CoV-2 using PCR</li> <li>Community-based surveillance</li> <li>Clinicians taking one or two tests per week (total 300 GPs involved; sampling strategy not reported)</li> </ul>	<ul> <li>National surveillance</li> <li>SARS-CoV-2 positivity of 6.6% in children and 19–35% in adults</li> <li>SARS-CoV-2 positivity varied over the course of the pandemic and peaked around the same time as the peak in COVID-19 cases</li> <li>Community-based surveillance</li> <li>SARS-CoV-2 positivity of 2.8% in children, 9.3% in 15-44y, 18.6% in 45-64y, 20.6% in 65-79y and 45.5% in 80y-</li> <li>SARS-CoV-2 positivity varied over the course of the pandemic and peaked around the same time as the peak in COVID-19 cases</li> </ul>

#### **Table 1.** Summary of studies in group 1 that reported the positive proportion of SARS-CoV-2 in the surveillance

Study	Location	Study period	Methods	Main findings and interpretations (in relevance to COVID-19 surveillance)
Bastos, 2020	Brazil	Weeks 9–12, 2020	<ul> <li>Data on COVID-19 cases collected by two independent data aggregators</li> <li>Data on SARI collected from the Information System on Diseases of Notification in 2010-20</li> <li>Estimated excess SARI cases in 2020 using 2010-19 data as baseline</li> </ul>	<ul> <li>A considerable rise in flu negative proportion compared with previous years, suggesting circulation of a different virus (e.g. SARS-CoV-2)</li> <li>The increase of SARI cases compared with previous years was most pronounced in the elderly</li> </ul>
Boëlle, 2020	France	24/02/20– 08/03/20	<ul> <li>Confirmed COVID-19 case counts obtained from the Santé Publique France website.</li> <li>Data on ILI/ARI obtained from GP-based surveillance</li> <li>Estimated excess ILI/ARI due to COVID-19 in 11/13 regions of France</li> </ul>	• The number of excess cases correlated with the cumulated number of COVID-19 cases reported in the same regions (r = 0.59; p < 0.05).
Coma Redon, 2020	Catalonia, Spain	2010–2020	<ul> <li>Data on ILI and COVID-19 obtained from Institut Català de la Salut (ICS).</li> <li>Age-specific ARIMA models developed to estimate excess ILI cases in the season 2019-20 compared with 2010-19 seasons.</li> </ul>	• Between 4 February and 20 March 2020, 8017 (95% CI: 1841 to 14 718) excess influenza cases were identified. This excess was highest in 15–64y, likely to be associated with SARS-CoV-2
Du, 2020	Wuhan, China and Seattle, USA	30/12/2019– 12/01/2020 (Wuhan); 01/01/2020– 09/03/2020 (Seattle)	<ul> <li>For Wuhan, data on COVID-19 and influenza positive patients among tested ILI obtained from two hospitals.</li> <li>For Seattle, data on COVID-19 and influenza positive patients among tested ARI obtained from the Seattle Flu pandemic surveillance platform</li> <li>COVID-19-to-influenza ratio calculated to represent relative strength of COVID-19 and used to extrapolate COVID-19 prevalence if influenza prevalence is known.</li> </ul>	• The study extrapolated COVID-19 cases for both areas but did not validate the model.
Pulia, 2020	USA	17/02/2020– 30/03/2020	<ul> <li>Data on ARI collected from ED visits records based on four different separate criteria (four different ARI-related outcomes): chief complaints specific to ARI, discharge diagnoses specific to ARI, respiratory pathogen isolation order and respiratory pathogen test order</li> <li>The differences between ARI before and after confirmed local SARS-CoV-2 transmission were estimated for each of the four ARI outcomes</li> </ul>	<ul> <li>The difference in the number of ARI cases between before and after local SARS-CoV-2 transmission was most pronounced if using ARI without identified pathogen.</li> </ul>
Silverman, 2020	USA	08/03/2020– 28/03/2020	<ul> <li>Data on ILI collected from US CDC</li> <li>Excess flu-negative ILI cases estimated based on data from previous seasons</li> </ul>	• A surge of non-influenza ILI above the seasonal average was observed in March 2020 and this surge correlated with COVID-19 case counts across states.
Wiemken, 2020	USA	Week 40, 2017–Week 12, 2020	<ul> <li>Data on ILI collected from US CDC</li> <li>Compared the burden of ILI vs positive influenza tests</li> </ul>	• Unlike the prior 3 influenza seasons, a 76% decrease in influenza positive cases and a 27% increase in ILI were found during the weeks since COVID-19 began in USA

#### Table 2. Summary of studies in group 2 that reported the correlation between numbers of COVID-19 cases and cases in the flu surveillance

#### Conclusion

- History of travel to COVID-19 affected areas and contact with suspected and confirmed COVID-19 cases was used for COVID-19 surveillance, at the beginning of the pandemic.
- No studies that formally reported the performance of COVID-19 surveillance were identified.
- Nonetheless, some studies reported the SARS-CoV-2 positivity in ILI/ARI/SARI surveillance, which can indicate positive predictive value. SARS-CoV-2 positivity in ILI/ARI/SARI surveillance ranged between 1.8% and 25.6% and was highest in the elderly group and lowest among children.
- Ecological studies found positive correlation between excess ILI/ARI and COVID-19 cases or influenza-negative cases, indirectly supporting the use of flu surveillance for capturing COVID-19 cases.

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### Appendix Table S1. Summary of included reviews on clinical characteristics of COVID-19

Review	Last date of	Countr	Age group	Severity	Data	a avail	ability	for po	oled e	stimat	e of sy	mpto	m prev	alenco	e									
	search	Y			Asymptomatic	Fever	Cough	Fatigue	Rhinorrhoea	Sore throat	Shortness of breath	Abdominal pain/diarrhoea	Vomiting/nausea	Headache/dizziness	Rash	Loss of smell/taste	Expectoration	Anorexia	Tachycardia	Nasal congestion	Tachypnea	Нурохетіа	Chest pain	Impaired consciousness
Abdullahi, 2020	17/04/2020	Global	All ages (but excluded studies that only included children)	All				√						√		√								√
Aziz, 2020	21/04/2020	Global	All ages	All												$\checkmark$								
Borsetto, 2020	04/05/2020	Global	All ages	All												$\checkmark$								
Cao, 2020	01/03/2020	China	All ages	All		$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$			$\checkmark$						$\checkmark$	
Chen, 2020	20/04/2020	Global	All ages	All										$\checkmark$		$\checkmark$								$\checkmark$
Cheung, 2020	11/03/2020	Global	All ages	Excluded asymptomati c cases								~	~					~						
Collantes, 2020	18/04/2020	Global	All ages	All				$\checkmark$					$\checkmark$	$\checkmark$										
Cui, 2020	30/04/2020	Global	<18	All	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$						$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
Fu, 2020	02/03/2020	China	All ages	All	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$			$\checkmark$			$\checkmark$							
Ghayda, 2020	14/04/2020	Global	All ages	All		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$						$\checkmark$	
Grant, 2020	05/04/2020	Global	>16 years	All		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	1	$\checkmark$	$\checkmark$			$\checkmark$			$\checkmark$	
Не, 2020	20/05/2020	Global	All ages	Asymptomati c	~																			
Hoang, 2020	14/05/2020	Global	<21	All	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$		$\checkmark$										
Jutzeler, 2020	28/03/2020	Global	All ages	All	$\checkmark$	$\checkmark$	$\checkmark$	√	1	1	1	1	1	$\checkmark$			1	$\checkmark$		1			$\checkmark$	$\checkmark$

Review	Last date of	Countr	Age group	Severity	Data	ata availability for pooled estimate of symptom prevalence																		
	search	Y			Asymptomatic	Fever	Cough	Fatigue	Rhinorrhoea	Sore throat	Shortness of breath	Abdominal pain/diarrhoea	Vomiting/nausea	Headache/dizziness	Rash	Loss of smell/taste	Expectoration	Anorexia	Tachycardia	Nasal congestion	Tachypnea	Нурохетіа	Chest pain	Impaired consciousness
Koh, 2020	11/02/2020	Global	All ages	All		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			~						$\checkmark$	
Lovato, 2020	01/03/2020	Global	All ages	All		$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$										
Ma, 2020	21/04/2020	Global	Children	All		$\checkmark$	$\checkmark$	$\checkmark$				$\checkmark$	$\checkmark$							$\checkmark$				
Manabe, 2020	01/03/2020	China	All ages	Hospitalized/ treated in clinic		√	~	~		~	~	√		✓			~							
Meena, 2020	10/05/2020	Global	1 mo 19 yr	All	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$							$\checkmark$	$\checkmark$		
Parasa, 2020	30/03/2020	Global	All ages	All								$\checkmark$	$\checkmark$											
Pinzon, 2020	08/04/2020	Global	All ages	All				$\checkmark$					$\checkmark$	$\checkmark$										$\checkmark$
Pormohammad, 2020	28/02/2020	China	All ages	All		$\checkmark$	~	~	$\checkmark$	$\checkmark$	~	$\checkmark$	~	$\checkmark$			$\checkmark$							
Rodriguez-Morales, 2020	23/02/2020	Global	All ages	All		$\checkmark$	$\checkmark$	~		$\checkmark$	~	$\checkmark$		$\checkmark$			~							
Rokkas, 2020	20/04/2020	Global	All ages	All								$\checkmark$	$\checkmark$											
Suresh Kumar, 2020	20/03/2020	Global	>18	All								$\checkmark$	$\checkmark$					$\checkmark$						
Tahvildari, 2020	24/04/2020	Global	All ages	All		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$							
Wan, 2020	15/03/2020	China	All ages	All		$\checkmark$	$\checkmark$	$\checkmark$				$\checkmark$												
Wang, 2020	31/03/2020	Global	<18	All	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			1			$\checkmark$				
Wang, 2020	03/05/2020	Global	All ages	All				$\checkmark$			$\checkmark$		$\checkmark$	$\checkmark$				$\checkmark$						
Yasuhara, 2020	20/06/2020	Global	<18	All	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$							
Zhu, 2020	28/02/2020	China	All ages	All	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$					$\checkmark$	

## Figure S1. Prevalence of each symptom in all ages, extracted from the latest review only

![](_page_15_Figure_1.jpeg)

## Figure S2. Prevalence of each symptom in children, extracted from the latest review only

![](_page_16_Figure_1.jpeg)

## Figure S3. Prevalence of each symptom in adults, extracted from the latest review only

![](_page_17_Figure_1.jpeg)

# Table S2. Detailed findings from individual reviews on clinical characteristics of COVID-19

Review	Symptom	Age group	Number of studies included	Point estimate	Lower bound of 95% Cl	Upper bound of 95% Cl
Abdullahi, 2020	Fatigue	All ages	45	19	16	23
Abdullahi, 2020	Headache/dizziness	All ages	34	12	9	15
Abdullahi, 2020	Loss of smell/taste	All ages	3	35	0	94
Abdullahi, 2020	Impaired consciousness	All ages	2	2	1	2
Aziz, 2020	Loss of smell/taste	All ages	5	49.8	8.2	91.5
Borsetto, 2020	Loss of smell/taste	All ages	16	47	36	59
Cao, 2020	Fever	All ages	27	87.3	83.8	90.9
Cao, 2020	Cough	All ages	27	58.1	50.2	66
Cao, 2020	Fatigue	All ages	18	35.5	25.3	45.6
Cao, 2020	Sore throat	All ages	9	12	6.2	17.7
Cao, 2020	Shortness of breath	All ages	11	38.3	24.6	52
Cao, 2020	Abdominal	All ages	15	6.8	4.4	9.2
Cao, 2020	Headache/dizziness	All ages	14	9.4	6.3	12.6
Cao, 2020	Expectoration	All ages	10	29.4	17.1	41.7
Cao, 2020	Chest pain	All ages	5	31.2	-2.4	64.8
Chen, 2020	Headache/dizziness	All ages	8	0.121	0.098	0.149
Chen, 2020	Loss of smell/taste	All ages	6	0.592	0.56	0.624
Chen, 2020	Impaired consciousness	All ages	9	0.051	0.043	0.059
Cheung, 2020	Abdominal pain/diarrhoea	All ages	NA	12.5	9.6	16
Cheung, 2020	Vomiting/nausea	All ages	NA	10.2	6.6	15.3
Cheung, 2020	Anorexia	All ages	NA	26.8	16.2	40.8
Collantes, 2020	Fatigue	All ages	25	21	18	25
Collantes, 2020	Vomiting/nausea	All ages	7	7	4	11
Collantes, 2020	Headache/dizziness	All ages	24	12	10	14
Cui, 2020	Asymptomatic	Children	42	20	14	26
Cui, 2020	Fever	Children	48	51	45	57
Cui, 2020	Cough	Children	45	41	35	47
Cui, 2020	Fatigue	Children	42	12	7	17
Cui, 2020	Rhinorrhoea	Children	36	14	8	19
Cui, 2020	Sore throat	Children	38	16	7	25
Cui, 2020	Abdominal pain/diarrhoea	Children	42	8	6	11
Cui, 2020	Vomiting/nausea	Children	42	7	5	10
Cui, 2020	Tachycardia	Children	35	12	3	21
Cui, 2020	Nasal congestion	Children	33	17	6	27
Cui, 2020	Tachypnea	Children	29	0.09	0.04	0.14
Cui, 2020	Нурохетіа	Children	33	0.03	0.01	0.04
Cui, 2020	Chest pain	Children	34	0.03	0	0.05
Fu, 2020	Asymptomatic	All ages	11	5.6	1.4	11.6
Fu, 2020	Fever	All ages	36	83.3	78.4	87.7
Fu, 2020	Cough	All ages	35	60.3	54.2	66.3

Review	Symptom	Age group	Number of studies included	Point estimate	Lower bound of 95% Cl	Upper bound of 95% CI
Fu, 2020	Fatigue	All ages	23	38	29.8	46.5
Fu, 2020	Rhinorrhoea	All ages	6	3.5	0.8	7.4
Fu, 2020	Sore throat	All ages	18	12.3	8.5	16.5
Fu, 2020	Shortness of breath	All ages	13	24.9	16.6	34.4
Fu, 2020	Abdominal	All ages	25	8.4	4.8	12.6
Fu, 2020	Vomiting/nausea	All ages	7	3.6	1	7.4
Fu, 2020	Headache/dizziness	All ages	10	14	9.9	18.6
Fu, 2020	Expectoration	All ages	16	26.9	18.3	36.4
Fu, 2020	Nasal congestion	All ages	5	1.8	0.4	3.9
Fu, 2020	Chest pain	All ages	9	14.9	4.9	28.4
Ghayda, 2020	Fever	All ages	30	77	69	85
Ghayda, 2020	Cough	All ages	32	60	48	71
Ghayda, 2020	Fatigue	All ages	24	31	23	40
Ghayda, 2020	Rhinorrhoea	All ages	12	6	4	8
Ghayda, 2020	Sore throat	All ages	16	13	9	16
Ghayda, 2020	Shortness of breath	All ages	19	25	20	31
Ghayda, 2020	Abdominal pain/diarrhoea	All ages	22	6	5	8
Ghayda, 2020	Vomiting/nausea	All ages	15	5	3	6
Ghayda, 2020	Headache/dizziness	All ages	15	10	6	14
Ghayda, 2020	Expectoration	All ages	16	23	15	32
Ghayda, 2020	Chest pain	All ages	14	17	11	23
Grant, 2020	Fever	Adults	138	78	75	81
Grant, 2020	Cough	Adults	138	57	54	60
Grant, 2020	Fatigue	Adults	78	31	27	35
Grant, 2020	Rhinorrhoea	Adults	36	8	5	12
Grant, 2020	Sore throat	Adults	78	12	10	14
Grant, 2020	Shortness of breath	Adults	94	23	19	28
Grant, 2020	Abdominal	Adults	93	10	8	12
Grant, 2020	pain/diarrhoea Vomiting/nausea	Adults	27	6	3	10
Grant, 2020	Headache/dizziness	Adults	65	13	10	16
Grant, 2020	Rash	Adults	1	0	0	1
Grant, 2020	Loss of smell/taste	Adults	3	25	4	55
Grant, 2020	Expectoration	Adults	70	25	22	28
Grant, 2020	Nasal congestion	Adults	10	5	3	7
Grant, 2020	Chest pain	Adults	30	7	4	10
Не, 2020	Asymptomatic	All ages	41	15.56	10.09	23.43
Hoang, 2020	Asymptomatic	Children	119	19.3	NA	NA
Hoang, 2020	Fever	Children	119	59.1	NA	NA
Hoang, 2020	Cough	Children	119	55.9	NA	NA
Hoang, 2020	Fatigue	Children	119	18.7	NA	NA
Hoang, 2020	Rhinorrhoea	Children	119	20	NA	NA
Hoang, 2020	Sore throat	Children	119	18.2	NA	NA

Review	Symptom	Age group	Number of studies included	Point estimate	Lower bound of 95% Cl	Upper bound of 95% Cl
Hoang, 2020	Shortness of breath	Children	119	11.7	NA	NA
Hoang, 2020	Abdominal pain/diarrhoea	Children	119	6.5	NA	NA
Hoang, 2020	Vomiting/nausea	Children	119	5.4	NA	NA
Hoang, 2020	Headache/dizziness	Children	119	4.3	NA	NA
Hoang, 2020	Rash	Children	119	0.25	NA	NA
Hoang, 2020	Anorexia	Children	119	1.7	NA	NA
Hoang, 2020	Nasal congestion	Children	119	20	NA	NA
Jutzeler, 2020	Asymptomatic	Adults	69	0.4	0.07	2.21
Jutzeler, 2020	Fever	Adults	110	82.96	79.13	86.21
Jutzeler, 2020	Cough	Adults	102	58.38	53.92	62.7
Jutzeler, 2020	Fatigue	Adults	69	29.25	24.03	35.07
Jutzeler, 2020	Rhinorrhoea	Adults	25	7.3	4.57	11.46
Jutzeler, 2020	Sore throat	Adults	49	13.04	10	16.84
Jutzeler, 2020	Shortness of breath	Adults	39	15.2	10.54	21.43
Jutzeler, 2020	Abdominal pain/diarrhoea	Adults	58	8.32	6.63	10.4
Jutzeler, 2020	Vomiting/nausea	Adults	31	7.06	4.87	10.11
Jutzeler, 2020	Headache/dizziness	Adults	48	10.4	8.29	12.97
Jutzeler, 2020	Expectoration	Adults	48	25.06	19.68	31.35
Jutzeler, 2020	Anorexia	Adults	10	14.21	7.3	25.84
Jutzeler, 2020	Nasal congestion	Adults	20	9.32	4.7	17.65
Jutzeler, 2020	Chest pain	Adults	46	7.78	2.97	18.86
Jutzeler, 2020	Impaired consciousness	Adults	18	13.6	6.92	24.97
Jutzeler, 2020	Asymptomatic	Children	26	16.17	8.51	28.59
Jutzeler, 2020	Fever	Children	22	67.51	51.63	80.17
Jutzeler, 2020	Cough	Children	14	51.29	35.07	67.25
Jutzeler, 2020	Fatigue	Children	6	8.51	5.56	12.82
Jutzeler, 2020	Rhinorrhoea	Children	10	10.67	3.36	29.12
Jutzeler, 2020	Sore throat	Children	3	11.51	3.17	34.03
Jutzeler, 2020	Shortness of breath	Children	2	14.29	4.68	36.14
Jutzeler, 2020	Abdominal pain/diarrhoea	Children	10	18.73	8.91	35.19
Jutzeler, 2020	Vomiting/nausea	Children	5	29.1	6.56	70.6
Jutzeler, 2020	Headache/dizziness	Children	2	10.26	3.9	24.33
Jutzeler, 2020	Expectoration	Children	6	36.45	11.22	72.24
Jutzeler, 2020	Nasal congestion	Children	4	6.57	3.85	10.98
Koh, 2020	Fever	All ages	11	90	81	97
Koh, 2020	Cough	All ages	11	58	47	68
Koh, 2020	Fatigue	All ages	6	50	29	71
Koh, 2020	Rhinorrhoea	All ages	6	5	3	10
Koh, 2020	Sore throat	All ages	5	7	1	15
Koh, 2020	Shortness of breath	All ages	8	25	15	35
Koh, 2020	Abdominal	All ages	7	8	5	13
Koh, 2020	Vomiting/nausea	All ages	3	4	2	7

Review	Symptom	Age group	Number of studies included	Point estimate	Lower bound of 95% Cl	Upper bound of 95% Cl
Koh, 2020	Headache/dizziness	All ages	8	10	7	13
Koh, 2020	Expectoration	All ages	8	16	9	27
Koh, 2020	Chest pain	All ages	4	8	2	23
Lovato, 2020	Fever	All ages	5	85.6	NA	NA
Lovato, 2020	Cough	All ages	5	68.7	NA	NA
Lovato, 2020	Fatigue	All ages	5	39.4	NA	NA
Lovato, 2020	Shortness of breath	All ages	5	21.4	NA	NA
Lovato, 2020	Abdominal pain/diarrhoea	All ages	5	5.3	NA	NA
Lovato, 2020	Vomiting/nausea	All ages	5	6.8	NA	NA
Lovato, 2020	Headache/dizziness	All ages	5	11.4	NA	NA
Ma, 2020	Fever	Children	12	46	36	56
Ma, 2020	Cough	Children	9	42	29	57
Ma, 2020	Fatigue	Children	4	8	5	12
Ma, 2020	Abdominal pain/diarrhoea	Children	6	10	7	14
Ma, 2020	Vomiting/nausea	Children	7	8	5	11
Ma, 2020	Nasal congestion	Children	6	12	6	23
Manabe, 2020	Fever	All ages	13	82.46	69.62	95.3
Manabe, 2020	Cough	All ages	13	62.36	55.67	69.05
Manabe, 2020	Fatigue	All ages	6	41.11	25.08	57.13
Manabe, 2020	Sore throat	All ages	8	12.71	8.95	16.47
Manabe, 2020	Shortness of breath	All ages	10	21.06	13.41	28.71
Manabe, 2020	Abdominal pain/diarrhoea	All ages	10	6.25	4.06	8.44
Manabe, 2020	Headache/dizziness	All ages	12	10.05	6.72	13.39
Manabe, 2020	Expectoration	All ages	8	26.09	14.68	37.51
Meena, 2020	Asymptomatic	Children	17	23	17	30
Meena, 2020	Fever	Children	23	49	41	58
Meena, 2020	Cough	Children	23	45	39	51
Meena, 2020	Fatigue	Children	6	10	1	18
Meena, 2020	Sore throat	Children	15	14	7	21
Meena, 2020	Abdominal pain/diarrhoea	Children	15	9	6	13
Meena, 2020	Vomiting/nausea	Children	13	6	4	9
Meena, 2020	Headache/dizziness	Children	6	10	1	19
Meena, 2020	Tachypnea	Children	10	11	6	17
Meena, 2020	Hypoxemia	Children	6	2	1	3
Parasa, 2020	Abdominal pain/diarrhoea	All ages	19	7.4	4.3	12.2
Parasa, 2020	Vomiting/nausea	All ages	17	3.9	2.1	7.2
Pinzon, 2020	Fatigue	All ages	25	19.2	15.4	23.2
Pinzon, 2020	Vomiting/nausea	All ages	13	4.6	3.17	6.27
Pinzon, 2020	Headache/dizziness	All ages	21	10.9	8.62	13.51
Pinzon, 2020	Impaired consciousness	All ages	2	3.8	0.16	12.04
Pormohammad, 2020	Fever	All ages	18	87	73	93
Pormohammad, 2020	Cough	All ages	18	68	55.5	74

Review	Symptom	Age group	Number of studies included	Point estimate	Lower bound of 95% Cl	Upper bound of 95% Cl
Pormohammad, 2020	Fatigue	All ages	9	24	14	43
Pormohammad, 2020	Rhinorrhoea	All ages	6	7	3	12
Pormohammad, 2020	Sore throat	All ages	9	14	7.8	17
Pormohammad, 2020	Shortness of breath	All ages	11	24	12.6	32
Pormohammad, 2020	Abdominal pain/diarrhoea	All ages	18	8	4.6	11.4
Pormohammad, 2020	Vomiting/nausea	All ages	6	6.5	2.7	13
Pormohammad, 2020	Headache/dizziness	All ages	16	14	8.3	18
Pormohammad, 2020	Expectoration	All ages	9	31	19	39
Qiu, 2020	Fever	All ages	15	NA	70.6	100
Qiu, 2020	Cough	All ages	15	NA	22.4	78
Qiu, 2020	Fatigue	All ages	15	NA	2.78	33.3
Qiu, 2020	Sore throat	All ages	15	NA	2.4	4.7
Qiu, 2020	Shortness of breath	All ages	15	NA	38.89	85.7
Qiu, 2020	Abdominal pain/diarrhoea	All ages	15	NA	3.5	5
Qiu, 2020	Vomiting/nausea	All ages	15	NA	2.4	4.7
Qiu, 2020	Headache/dizziness	All ages	15	NA	4.7	23.8
Qiu, 2020	Expectoration	All ages	15	NA	22.2	57.1
Qiu, 2020	Anorexia	All ages	15	NA	23.4	56.5
Qiu, 2020	Chest pain	All ages	15	NA	2.4	4.9
Rodriguez-Morales, 2020	Fever	All ages	15	88.7	84.5	92.9
Rodriguez-Morales, 2020	Cough	All ages	15	57.6	40.8	74.4
Rodriguez-Morales, 2020	Fatigue	All ages	11	29.4	19.8	39
Rodriguez-Morales, 2020	Sore throat	All ages	5	11	2.8	19.2
Rodriguez-Morales, 2020	Shortness of breath	All ages	8	45.6	10.9	80.4
Rodriguez-Morales, 2020	Abdominal pain/diarrhoea	All ages	6	6.1	2.4	9.7
Rodriguez-Morales, 2020	Headache/dizziness	All ages	9	8	5.7	10.2
Rodriguez-Morales, 2020	Expectoration	All ages	6	28.5	10.8	46.3
Rodriguez-Morales, 2020	Fever	Adults	13	92.8	89.4	96.2
Rodriguez-Morales, 2020	Cough	Adults	13	63.4	48	78.8
Rodriguez-Morales, 2020	Fever	Children	2	43.9	28.2	59.6
Rodriguez-Morales, 2020	Cough	Children	2	22	0	52.9
Rokkas, 2020	Abdominal pain/diarrhoea	All ages	35	10.4	7.7	13.9
Rokkas, 2020	Vomiting/nausea	All ages	22	37.7	4.8	12.1
Suresh Kumar, 2020	Abdominal pain/diarrhoea	Adults	17	7.8	NA	NA
Suresh Kumar, 2020	Vomiting/nausea	Adults	8	5.6	NA	NA
Suresh Kumar, 2020	Anorexia	Adults	3	27.1	NA	NA
Tahvildari, 2020	Fever	All ages	68	62	NA	NA
Tahvildari, 2020	Cough	All ages	39	50	NA	NA
Tahvildari, 2020	Fatigue	All ages	38	28	NA	NA
Tahvildari, 2020	Rhinorrhoea	All ages	13	11	NA	NA
Tahvildari, 2020	Sore throat	All ages	20	29	NA	NA
Tahvildari, 2020	Shortness of breath	All ages	30	28	NA	NA

Review	Symptom	Age group	Number of studies included	Point estimate	Lower bound of 95% Cl	Upper bound of 95% Cl
Tahvildari, 2020	Abdominal pain/diarrhoea	All ages	14	22	NA	NA
Tahvildari, 2020	Vomiting/nausea	All ages	8	20	NA	NA
Tahvildari, 2020	Headache/dizziness	All ages	11	25	NA	NA
Tahvildari, 2020	Expectoration	All ages	14	25	NA	NA
Wan, 2020	Fever	All ages	13	80	74	87
Wan, 2020	Cough	All ages	12	53	33	72
Wan, 2020	Fatigue	All ages	6	21	15	26
Wan, 2020	Abdominal pain/diarrhoea	All ages	9	7	4	10
Wang, 2020	Asymptomatic	Children	17	19	14	23
Wang, 2020	Fever	Children	22	48	39	56
Wang, 2020	Cough	Children	20	39	30	48
Wang, 2020	Fatigue	Children	10	8	5	12
Wang, 2020	Rhinorrhoea	Children	9	9	6	12
Wang, 2020	Sore throat	Children	10	6	2	10
Wang, 2020	Shortness of breath	Children	6	9	0	19
Wang, 2020	Abdominal pain/diarrhoea	Children	10	7	5	9
Wang, 2020	Vomiting/nausea	Children	8	6	4	9
Wang, 2020	Headache/dizziness	Children	7	4	1	6
Wang, 2020	Expectoration	Children	4	19	0	44
Wang, 2020	Nasal congestion	Children	6	6	3	9
Wang, 2020	Fatigue	All ages	13	33.2	23.1	43.3
Wang, 2020	Shortness of breath	All ages	16	26.9	19.2	34.6
Wang, 2020	Vomiting/nausea	All ages	11	5.1	3.3	6.8
Wang, 2020	Headache/dizziness	All ages	4	10	5.9	14.2
Wang, 2020	Anorexia	All ages	4	30	23.2	36.9
Yasuhara, 2020	Asymptomatic	Children	44	15.2	NA	NA
Yasuhara, 2020	Fever	Children	44	64.2	NA	NA
Yasuhara, 2020	Cough	Children	44	34.8	NA	NA
Yasuhara, 2020	Rhinorrhoea	Children	44	16.1	NA	NA
Yasuhara, 2020	Sore throat	Children	44	8.9	NA	NA
Yasuhara, 2020	Shortness of breath	Children	44	10.7	NA	NA
Yasuhara, 2020	Abdominal pain/diarrhoea	Children	44	13.4	NA	NA
Yasuhara, 2020	Vomiting/nausea	Children	44	6.3	NA	NA
Yasuhara, 2020	Headache/dizziness	Children	44	4.5	NA	NA
Yasuhara, 2020	Rash	Children	44	10.7	NA	NA
Yasuhara, 2020	Expectoration	Children	44	2.7	NA	NA
Zhu, 2020	Asymptomatic	All ages	5	11.9	2.9	25.8
Zhu, 2020	Fever	All ages	35	80.4	73	86.9
Zhu, 2020	Cough	All ages	36	63.1	57.9	68.2
Zhu, 2020	Fatigue	All ages	26	46	38.2	54
Zhu, 2020	Sore throat	All ages	10	13.1	7.4	20.3
Zhu, 2020	Shortness of breath	All ages	14	33.9	24.2	44.3

Review	Symptom	Age group	Number of studies included	Point estimate	Lower bound of 95% Cl	Upper bound of 95% Cl
Zhu, 2020	Abdominal pain/diarrhoea	All ages	24	12.9	8.9	17.41
Zhu, 2020	Vomiting/nausea	All ages	10	10.2	5.4	16.3
Zhu, 2020	Headache/dizziness	All ages	24	15.4	11.6	19.6
Zhu, 2020	Expectoration	All ages	17	41.8	33.9	50
Zhu, 2020	Anorexia	All ages	6	38.8	14.1	67.1
Zhu, 2020	Chest pain	All ages	2	28.3	1	72.9

CI = confidence interval; NA = not available.

### Text S1. Search strategy of the review on the performance of COVID-19 surveillance based on existing flu surveillance

#### Strategy A

SARI OR GISRS OR "global influenza" OR sentinel OR ((mh:"mass screening" OR ti:surveill\* OR ab:surveill\* OR mh: "population surveillance" OR network\* OR monitor\* OR "early warning" ) AND (h1n1 OR mh:"respiratory tract infection" OR mh:"respiratory tract disease" OR mh:"respiratory distress syndrome" OR influenza OR influensa OR flu OR grippe OR ILI OR "acute respiratory infection" OR "acute respiratory infection"))

#### Strategy B

(SARI OR GISRS OR "global influenza" OR sentinel OR mh: "mass screening" OR ti:surveill\* OR ab:surveill\* OR mh: "surveillance" OR network\* OR monitor\* OR "early warning" OR mh: "respiratory tract infection" OR mh: "respiratory tract disease" OR mh: "respiratory distress syndrome" OR influenza OR influensa OR flu OR grippe OR ILI OR "acute respiratory infection" OR "acute respiratory infection") AND (sensitiv\* OR specific\*)