

# THE LANCET

## Infectious Diseases

### Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

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26 **Methods**

27 *Study setting*

28 Soweto is a low-middle income setting and the majority (~90%) of the population does not have private  
 29 medical insurance.<sup>1</sup> Surveillance for respiratory pathogens has been ongoing at Chris Hani Baragwanath  
 30 Academic Hospital (CHBAH), an academic secondary-tertiary facility in Soweto, South Africa since 2006 and  
 31 at Bheki Mlangeni District Hospital (BMDH) since its opening in 2014. CHBAH and BMDH are the only two  
 32 public hospitals which cater for hospitalization of children in Soweto, particularly those without private medical  
 33 insurance. Health-care for children is provided at no cost in South Africa at all public-health facilities.

34 *Summary of COVID-19 alert levels*

35 Specific details of non-pharmaceutical interventions (NPIs) adopted during the five different alert levels of the  
 36 COVID-19 epidemic in South Africa are included in Supplementary Table S1.<sup>2</sup> In summary, Level 5 (27 March  
 37 to 30 April 2020) was the strictest lockdown with a stay-at-home order and no domestic or international travel  
 38 permitted. During Level 4 restrictions, a limited number of businesses were allowed to operate and movement  
 39 for purposes of exercise, work, shopping or medical care were permitted during certain hours. Schools and a  
 40 further number of businesses re-opened from Level 3. Inter-provincial and restricted international travel was  
 41 permitted during Level 2 along with the re-opening of almost all businesses. International travel and opening of  
 42 all business sectors were permitted in Level 1. From 29 December 2020, the country moved through adjusted  
 43 stages of Levels 1 through 4.

44 **Supplementary Table-S1: Lockdown restrictions**

Dates	Level	Summary of restrictions
27 March 2020 to 30 April 2020	Level 5	Stay-at-home order except for obtaining essential goods or services (medical care, food, or collection of social grants) Closure of businesses except for essential goods or services Closure of all borders of South Africa Closure of schools Alcohol and cigarettes sales prohibited Gatherings prohibited (except for funerals) Funerals restricted to close family (night vigils and after-funeral gathering prohibited)
1 May 2020 to 31 May 2020	Level 4	Curfew (20:00 to 05:00) Mandatory face mask in public spaces Extension of businesses allowed to operate (Bars, conference and convention centers, entertainment venues, cinemas, theatres remained closed) Closure of all borders of South Africa Closure of schools Alcohol and cigarettes sales prohibited Gatherings prohibited (except for funerals) Funerals restricted to close family (night vigils and after-funeral gathering prohibited)
1 June 2020 to 17 August 2020	Level 3	Curfew (22:00 to 04:00) Mandatory face mask in public spaces Retail businesses and restaurants for takeaway only are permitted (Bars, conference and convention centers, entertainment venues, cinemas, theatres remained closed) Interprovincial travel allowed Schools open with health and social distancing protocols Alcohol sales permitted Monday – Thursday (prohibition re-instated 12 July 2020) Gatherings prohibited (except for funerals) Funerals restricted to 50 people (night vigils and after-funeral gathering prohibited)
18 August 2020 to 20 September 2020	Level 2	Curfew (22:00 to 04:00) Mandatory face mask in public spaces

		Reopening of almost all business sectors (with space limitations) Interprovincial travel permitted (no international travel) Schools open with health and social distancing protocols Alcohol sales permitted (Monday-Thursday 9:00-17:00) Gatherings limited to 100 people indoors, 250 outdoors Funerals restricted to 50 people (night vigils and after-funeral gathering prohibited)
21 September 2020 to 28 December 2020	Level 1	Curfew (24:00-04:00) Mandatory face mask in public spaces Reopening of all business sectors International travel permitted Alcohol sales permitted (Monday-Friday 9:00-17:00) Gatherings limited to 250 people indoors, 500 outdoors Funerals restricted to 100 people (night vigils and after-funeral gathering prohibited)
29 December 2020 to 28 February 2021	Level 3 (adjusted)	Curfew (21:00 – 06:00 adjusted on 1 February 2021 to 23:00 – 04:00) Mandatory face mask in public spaces Restaurants, museums and gyms allowed 50% capacity and maximum 50 people indoor and 100 people outdoor Public recreational spaces closed Schools closed Alcohol sales prohibited (permitted on 1 February 2021) Gatherings prohibited (except for funerals) Funerals restricted to 50 people and two-hour limit (night vigils and after-funeral gathering prohibited)
1 March 2021 to 30 May 2021	Level 1 (adjusted)	Curfew (24:00-04:00) Mandatory face mask in public spaces Alcohol sales permitted Gatherings limited to 50% capacity with maximum 100 people indoors, 250 outdoors Funerals restricted to 100 people (night vigils and after-funeral gathering prohibited)
31 May 2021 to 15 June 2021	Level 2 (adjusted)	Curfew (23:00-04:00) Mandatory face mask in public spaces Alcohol sales permitted Gatherings limited to 50% capacity with maximum 100 people indoors, 250 outdoors Funerals restricted to 100 people (night vigils and after-funeral gathering prohibited)
16 June 2021 to 27 June 2021	Level 3 (adjusted)	Curfew (22:00-04:00) Mandatory face mask in public spaces Alcohol sales permitted (Monday-Thursday 10:00-18:00) Gatherings limited to 50% capacity with maximum 50 people indoors, 100 outdoors Funerals restricted to 50 people and two-hour limit (night vigils and after-funeral gathering prohibited)
28 June 2021 to 25 July 2021	Level 4 (adjusted)	Curfew (21:00-04:00) Mandatory face mask in public spaces Restaurants, museums and gyms allowed 50% capacity and maximum 50 people indoor and 100 people outdoor Schools closed Alcohol sales prohibited Gatherings prohibited Funerals restricted to 50 people and two-hour limit (night vigils and after-funeral gathering prohibited)
27 July 2021 to 12 September 2021	Level 3 (adjusted)	Curfew (22:00-04:00) Mandatory face mask in public spaces Restaurants, museums and gyms allowed 50% capacity and maximum 50 people indoor and 100 people outdoor Schools reopen Alcohol sales permitted (Monday-Thursday 10:00-18:00) Gatherings limited to 50% capacity with maximum 50 people indoors, 100 outdoors Funerals restricted to 50 people and two-hour limit (night vigils and after-funeral gathering prohibited)
13 September 2021 to 30 September 2021	Level 2 (adjusted)	Curfew (23:00-04:00) Mandatory face mask in public spaces Schools open Alcohol sales permitted Gatherings limited to 50% capacity with maximum 250 people indoors, 500 outdoors Funerals restricted to 50 people and two-hour limit (night vigils and after-funeral gathering prohibited)
1 October 2021 to 4 April 2022	Level 1 (adjusted)	Curfew (24:00-04:00) Mandatory face mask in public spaces Schools open Alcohol sales permitted International travel permitted Gatherings limited to 50% capacity with maximum 750 people indoors, 2000 outdoors Funerals restricted to 100 people and two-hour limit (night vigils and after-funeral gathering prohibited)
5 April 2022	End of lockdown	State of Disaster ended. Interim health Regulations include mandatory face mask in public spaces up until 22 June 2022.

45 *Electronic database*

46 The electronic database at the two hospitals includes hospitalization details, and final diagnoses made by  
47 attending physicians at the time of discharge or death of the child (including children who were dead upon  
48 arrival to the hospitals). The electronic database is generated using hard copies of discharge summaries which

49 are quality assessed and coded using the International Statistical Classification of Diseases and Related Health  
 50 Problems Version 10 (ICD-10) by a medical doctor (FS). ICD-10 codes used in attributing LRTI  
 51 hospitalizations are summarized in Supplementary Table S2.

52 **Supplementary Table-S2: ICD-10 codes associated with disease specific hospitalizations.**

Outcome	Associated ICD10 codes
All-cause pneumonia	B01·2, B05·2, B20·6, B25·0, B37·1, B59, J10·0, J11·0, J12·0, J12·1, J12·2, J12·8, J12·9, J13, J14, J15·0, J15·1, J15·2, J15·3, J15·4, J15·5, J15·8, J15·9, J16·0, J16·8, J17, J18·0, J18·1, J18·8, J18·9, J22, J85·1, P37·0, A49·9, P36·0, P36·1, P36·2, P36·3, P36·4, P36·8, P36·9
Neonatal sepsis	A49·9, P36·0, P36·1, P36·2, P36·3, P36·4, P36·8, P36·9
Pertussis	A37·0, A37·1, A37·8, A37·9
Tuberculosis	A15·0, A15·1, A15·2, A15·6, A16·2, A16·3, A16·5, A16·9
Other pulmonary mycobacterial infection	A31·0, A31·9
Bronchitis	J20, J20·6, J20·9
Bronchiolitis	J21·0, J21·1, J21·8, J21·9 <sup>1</sup>
IPD	A40·3, P36·8, A40, G00·1, G00·2, G00·8
COVID-19	J12·8 or U07·1 associated with LRTI
LRTI	All-cause pneumonia (includes neonatal sepsis), pertussis, tuberculosis, other pulmonary mycobacterial infection, bronchitis, or bronchiolitis

53

54 *Inclusion and exclusion criteria*

55 All admissions to the general wards from 1 January 2015 to 31 December 2022 were included in the analysis.  
 56 Admissions that are less than 24 hours are admitted to a short-stay ward and all other admissions are referred to  
 57 the general wards. If a short-stay admission is anticipated to be longer than 24 hours, the child is transferred to  
 58 the general ward. At the end of March 2020, the short-stay ward was closed and resumed operation on 1 July  
 59 2022. Due to the absence of data in the short-stay ward during the pandemic, only pediatric admissions to the  
 60 general wards (admissions  $\geq 24$  hours) were included in the study.  
 61 Neonates hospitalized immediately post-delivery, and deaths that transpired in these neonates were excluded.  
 62 Admission to hospitals was at the discretion of attending physicians. Records with a missing admission date or  
 63 date of birth were excluded from the analysis. Admissions prior to 1 January 2015 were excluded in the analysis  
 64 due to the potential impact of the implementation of the pneumococcal conjugate vaccine in the expanded  
 65 immunization program in 2009 on all-cause hospitalization and syndrome specific incidence risks.

66 *Nucleic acid amplification tests*

67 Total nucleic acids (TNA) were extracted automatically from the respiratory samples using either the NucliSens  
 68 easyMag® extraction system (BioMérieux, Marcy l'Etoile, France) or the Bioer automated extraction system  
 69 (Hangzhou Bioer Technology Co. Ltd, China) following manufacturer's instructions. The extracted TNA

70 samples were screened for RSV A, RSV B, influenza A, influenza B, hMPV and *Bordetella pertussis* as  
 71 previously described <sup>3,4</sup>. The TNA from respiratory samples collected between March 2020 and November 2021  
 72 were also screened for SARS-CoV-2 using Emergency Use Authorization assays developed by the Centres for  
 73 Diseases Control and Prevention (CDC) which target two regions within the nucleocapsid gene, and a third  
 74 assay which detects the human RNase P gene <sup>5,6</sup>. TNA from respiratory samples collected between December  
 75 2021 and December 2022 were screened for SARS-CoV-2 using the ThermoFisher TaqPath RT-QPCR assays <sup>7</sup>.

76 *Estimating the monthly number of pathogen specific hospitalizations*

77 Let  $j$  be an index representing the age group taking on values: <3months, 3 to <12 months, 12 to <24 months  
 78 and 24 to <60 months. Let  $i$  be an index representing each month for months between January 2015 and  
 79 October 2022. Let  $k$  be an index representing pathogen for pathogens: RSV A, RSV B, RSV A or B, influenza  
 80 A, influenza B, influenza A or B, hMPV and *Bordetella pertussis*. Let  $N_{ij}$  be the total number of LRTI  
 81 hospitalizations for month  $i$  and age-group  $j$ . Let  $p_{ijk}$  be the proportion of positive NAAT results for month  $i$ .  
 82 age-group  $j$ , and pathogen  $k$ . The estimated number of hospitalizations for month  $i$  and age-group  $j$  associated  
 83 with pathogen  $k$  is:  $p_{ijk} * N_{ij}$ .

84 *Polymicrobial infections*

85 Admissions that were associated with multiple organisms contributed to the positivity rate of each organism.  
 86 For example, an LRTI associated hospitalization where the patient tested positive for both SARS-CoV-2 and  
 87 RSV, would contribute to the numerator for the calculations of both the incidence for COVID and the positivity  
 88 rate for RSV.

89 *Denominators for incidence rate calculations*

90 Population denominators used in the calculation of LRSTI- and all-cause hospitalization rates are summarized in  
 91 Supplementary Table S3. These are annual Gauteng Department of Health population estimates for the sub-  
 92 districts in the catchment area of Chris Hani Baragwanath Academic Hospital and Bheki Mlangeni District  
 93 Hospital.

94 **Supplementary Table-S3: Annual population estimates for the sub-districts in the catchment area of the**  
 95 **hospitals by age-group.**

Year	<12 months	12-<24 months	24-<60 months	<60 months
2015	36,128	35,779	104,503	176,410
2016	36,546	36,249	106,305	179,100
2017	37,018	36,628	108,113	181,759
2018	37,429	36,985	109,579	183,993
2019	38,120	38,109	110,923	187,152

<b>2020</b>	38,757	38,788	113,137	190,682
<b>2021</b>	39,380	39,287	115,439	194,106
<b>2022</b>	39,726	39,665	117,304	196,695

96

97 *Stratification of age-groups*

98 All analyses were performed overall for children <5 years of age and stratified by age-groups chosen based on  
99 known risk difference in incidence as well as possible implications for targeted interventions.

100 *Sensitivity analysis*

101 A sensitivity analysis was performed including admissions to the short-stay ward.

102 **Supplemental Results**

103 *Age-group stratified analysis of all-cause LRTI hospitalizations*

104 The significantly lower incidence for all-cause LRTI hospitalization in 2020 and 2021 compared with the pre-  
105 pandemic period was evident across all age-groups, except for <3 months age-groups in 2021. Similar  
106 percentage reductions in all-cause LRTI hospitalization incidence were observed compared with the pre-  
107 pandemic period in the 3 to <12, 12 to <24 and 24 to <60 months age-groups in 2020 (40% [IRR: 0·60, 95% CI:  
108 0·54-0·66], 39% [IRR 0·61, 95%CI 0·53-0·69], and 24% [IRR: 0·76, 95% CI: 0·66-0·87], respectively) and  
109 2021 (21% [IRR 0·79, 95%CI 0·73-0·87], 28% [IRR 0·72, 95%CI 0·64-0·81], and 20% [IRR: 0·80, 95%CI  
110 0·70-0·92], respectively); Supplementary Table-S5. The risk reduction for all-cause-LRTI in the <3 months age-  
111 group (or suspected sepsis in this age-group) was more modest in 2020 (IRR 0·82, 95%CI 0·76-0·88), and not  
112 significantly different in 2021 (IRR 1·03, 95%CI 0·96-1·11) compared with the pre-pandemic period;  
113 Supplementary Table-S5.

114 *All-cause pneumonia*

115 Trends in all-cause pneumonia from 2006 to 2014 have been previously reported, whereby we reported that  
116 following the introduction of 7-valent pneumococcal conjugate vaccine (PCV) in 2009 and subsequent change  
117 to 13-valent PCV in 2011, there was a temporal 48% reduction in all-cause pneumonia hospitalization by 2014  
118 in Soweto<sup>8</sup>. The incidence (per 100,000 child years) of all-cause pneumonia in children under-5 years  
119 fluctuated between 2015 and 2019; being lower in 2017 (877 per 100,000 children) and 2018 (967 per 100,000  
120 children) compared with 2015 (1,174 per 100,000 children), 2016 (1,000 per 100,000 children) and 2019 (1,046  
121 per 100,000 children); Supplementary Table-S4 and Figure-S1h.

122 Overall, there was a 30% and 20% lower incidence of all-cause pneumonia hospitalization in 2020 (IRR 0·70,  
123 95%CI 0·66-0·74) and 2021 (IRR: 0·80, 95%CI 0·76-0·84), respectively, compared with the pre-pandemic

124 period; Supplementary Table-S5. Hospitalization incidence for all-cause pneumonia in 2022 were similar to the  
125 pre-pandemic period.

126 Stratified by age-group, compared with pre-pandemic period, the incidence of all-cause pneumonia in the <3  
127 months age-group was 14% lower in 2020 (IRR: 0.86, 95%CI 0.79-0.93), however, similar in 2021 and 2022.

128 All-cause pneumonia hospitalization incidence were lower in the 3 to <12 month, 12 to <24 month and 24 to  
129 <60 months age groups in 2020 (IRR 0.53 [95%CI: 0.46-0.60], 0.54 [95%CI: 0.45-0.63], and 0.76 [95%CI  
130 0.66-0.88], respectively) and in 2021 (IRR: 0.64 [95%CI 0.57-0.72], 0.65 [95%CI 0.56-0.75], and 0.79  
131 [95%CI 0.69-0.91], respectively) compared with the pre-pandemic period; Supplementary Table-S5. The  
132 incidence of all-cause pneumonia hospitalization in 2022 compared with the pre-pandemic period was higher in  
133 the 24 to <60 months age-group (IRR 1.30 [95%CI: 1.16-1.45]), but did not differ in the other age-groups.

#### 134 *Bronchiolitis*

135 From 2015 to 2019, yearly incidence for bronchiolitis associated hospitalizations in children <24 months  
136 increased; Supplementary Table-S4 and Figure-S1i. The 3 to <12 month age-group had the highest incidence  
137 (per 100,000 children) of bronchiolitis between 2015-2019 (671, 95%CI 634-709), followed by the <3 month  
138 (343, 95%CI 317-371) and the 12 to <24 month (268, 95%CI 245-292) age-groups. Compared with the pre-  
139 pandemic period, there was a lower incidence of bronchiolitis in 2020 in the <3 month (IRR: 0.56; 95%CI:  
140 0.44-0.72) and 3 to <12 month (IRR: 0.74; 95%CI: 0.63-0.86) age-groups, with similar trends in the 12 to <24  
141 month age-group (IRR: 0.81; 95%CI: 0.63-1.02); Supplementary Table-S5. Comparing 2021 with the pre-  
142 pandemic period, the IRR was higher in the <3 month age-group (1.45; 95%CI:1.23-1.71) while similar in  
143 children 3 to <12 and 12 to <24 months (1.11 [95%CI 0.97-1.26] and 0.95 [95%CI 0.76-1.18], respectively).  
144 In 2022, we observed an increase in incidence in all age-groups compared to the pre-pandemic period, with the  
145 highest increase in the <3 month age-group (IRR: 1.83; 95%CI: 1.57-2.12) followed by the 3 to <12 month age-  
146 group (IRR: 1.61; 95%CI: 1.44-1.79) and the 12 to <24 age-group (IRR: 1.56; 95% CI: 1.30-1.87);  
147 Supplementary Table-S5.

#### 148 *Circulating RSV strains throughout the surveillance period*

149 In the pre-pandemic period, RSV A was dominant in 2015 (71%; 175/245), 2016 (79%; 161/203), 2019 (78%;  
150 175/225), RSV B was dominant in 2017 (86%; 128/149) and strains were equally identified in 2018 (50% for  
151 each, 119/232 and 116/232). During the pandemic years, RSV A dominated in 2020 (64%; 76/119), while both  
152 strains were equally identified in 2021 (50% for each, 216/423 and 211/423) and RSV B contributed to a  
153 slightly higher percentage in 2022 (54% 255/473).



154 *Influenza virus strains identified throughout the surveillance period*  
155 Influenza A was dominant strain in each of the pre-pandemic years accounting for 83% (24/29), 56% (14/25),  
156 77% (17/22), 72% (31/43), and 96% (22/23) in 2015, 2016, 2017, 2018 and 2019, respectively. Influenza A was  
157 also dominant throughout the pandemic years, including 100% (2/2), 88% (53/60) and 79% (69/88) in 2020,  
158 2021 and 2022, respectively.

159 *Sensitivity analysis including hospitalizations <24 hours*

160 As a sensitivity analysis, we repeated all analyses including hospitalizations admitted to the short-stay ward  
161 (<24 hours). Incidence rates during the study period were similar to when we excluded the short-stay ward for  
162 all-cause death, invasive pneumococcal disease, pulmonary tuberculosis, neonatal sepsis, hMPV-associated  
163 LRTI, and *Bordetella pertussis*-associated LRTI.

164 For all-cause hospitalization, all-cause LRTI, all-cause pneumonia, and RSV-associated LRTI, incidence rates  
165 (per 100,000 children) during 2020, 2021 and 2022 were lower compared to the pre-pandemic period overall  
166 and by age-group except for in the <3 month age-group where incidence rates in 2022 was similar to pre-  
167 pandemic period for all-cause LRTI, all-cause pneumonia, and RSV-associated LRTI. Incidence rates for  
168 influenza-associated LRTI were lower in 2020 and 2021 compared to pre-pandemic years (overall and by age-  
169 group). In 2022, incidence rates in <3 month age-group were higher compared to the pre-pandemic period  
170 (IRR: 2·0, 95%CI: 1·14-3·40), similar for the 3 to <12 month age-group (IRR: 0·90, 95%CI: 0·68-1·18), and  
171 lower for the 12 to <24 month (IRR: 0·36, 95%CI: 0·23-0·54) and 24 to <60 month age-group (IRR: 0·64,  
172 95%CI: 0·44-0·89).

173  
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**Supplementary Table-S4: Total number and incidence rates (IR) between 2015 to 2019 for all cause hospitalizations, all-cause deaths, all-cause lower-respiratory tract infections (LRTI), all-cause LRTI deaths, LRTI associated with respiratory syncytial virus (RSV A or B), RSV A, RSV B, influenza A or B, influenza A, influenza B, human Metapneumovirus (HMPV), *Bordetella pertussis*, pulmonary tuberculosis, neonatal sepsis, all-cause pneumonia, and bronchiolitis in children <5 years of age.**

Outcome	2015		2016		2017		2018		2019	
	n	IR (95% CI)	n	IR (95% CI)	n	IR (95% CI)	n	IR (95% CI)	n	IR (95% CI)
All-cause hospitalizations										
<3 months	2,231	6,175 (5,922-6,437)	1,951	5,338 (5,104-5,581)	1,985	5,362 (5,129-5,603)	2,126	5,680 (5,441-5,927)	2,205	5,784 (5,545-6,031)
3 to <12 months	1,482	4,102 (3,896-4,316)	1,285	3,516 (3,326-3,714)	1,142	3,085 (2,909-3,269)	1,206	3,222 (3,043-3,409)	1,262	3,311 (3,130-3,498)
12 to <24 months	1,011	2,826 (2,654-3,005)	974	2,687 (2,521-2,861)	780	2,130 (1,983-2,284)	833	2,252 (2,102-2,411)	807	2,118 (1,974-2,269)
24 to <60 months	1,171	1,121 (1,057-1,187)	1,089	1,024 (964-1,087)	1,099	1,017 (957-1,078)	1,012	924 (868-982)	954	860 (806-916)
<5 years	5,895	3,342 (3,257-3,428)	5,299	2,959 (2,880-3,039)	5,006	2,754 (2,678-2,832)	5,177	2,814 (2,738-2,891)	5,228	2,793 (2,718-2,870)
All-cause death										
<3 months	69	191 (149-242)	55	150 (113-196)	60	162 (124-209)	62	166 (127-212)	57	150 (113-194)
3 to <12 months	73	202 (158-254)	56	153 (116-199)	61	165 (126-212)	66	176 (136-224)	65	171 (132-217)
12 to <24 months	37	103 (73-143)	40	110 (79-150)	18	49 (29-78)	25	68 (44-100)	32	84 (57-119)
24 to <60 months	34	33 (23-45)	28	26 (18-38)	25	23 (15-34)	18	16 (10-26)	31	28 (19-40)
<5 years	213	121 (105-138)	179	100 (86-116)	164	90 (77-105)	171	93 (80-108)	185	99 (85-114)
All-cause LRTI <sup>2</sup>										
<3 months	967	2,677 (2,511-2,851)	818	2,238 (2,087-2,397)	746	2,015 (1,873-2,165)	888	2,372 (2,219-2,534)	1,058	2,775 (2,611-2,948)
3 to <12 months	849	2,350 (2,195-2,514)	714	1,954 (1,813-2,102)	626	1,691 (1,561-1,829)	706	1,886 (1,750-2,031)	746	1,957 (1,819-2,103)
12 to <24 months	422	1,179 (1,070-1,298)	426	1,175 (1,066-1,292)	337	920 (824-1,024)	381	1,030 (929-1,139)	391	1,026 (927-1,133)
24 to <60 months	320	306 (274-342)	280	263 (233-296)	313	290 (258-323)	282	257 (228-289)	278	251 (222-282)
<5 years	2,558	1,450 (1,394-1,507)	2,238	1,250 (1,198-1,302)	2,022	1,112 (1,064-1,162)	2,257	1,227 (1,177-1,278)	2,473	1,321 (1,270-1,375)
All-cause LRTI deaths										
<3 months	38	105 (74-144)	28	77 (51-111)	28	76 (50-109)	34	91 (63-127)	32	84 (57-119)
3 to <12 months	36	100 (70-138)	31	85 (58-120)	31	84 (57-119)	22	59 (37-89)	30	79 (53-112)
12 to <24 months	12	34 (17-59)	17	47 (27-75)	8	22 (9-43)	13	35 (19-60)	6	16 (6-34)
24 to <60 months	11	11 (5-19)	9	8 (4-16)	12	11 (6-19)	3	3 (1-8)	3	3 (1-8)
<5 years	97	55 (45-67)	85	47 (38-59)	79	43 (34-54)	72	39 (31-49)	71	38 (30-48)
RSV A/B LRTI										
<3 months	288	797 (708-895)	197	539 (466-620)	129	348 (291-414)	300	802 (713-898)	319	837 (748-934)
3 to <12 months	237	656 (575-745)	186	509 (438-588)	122	330 (274-394)	222	593 (518-676)	196	514 (445-591)
12 to <24 months	82	229 (182-284)	49	135 (100-179)	53	145 (108-189)	68	184 (143-233)	61	160 (122-206)
24 to <60 months	0	0 (0-4)	19	18 (11-28)	21	19 (12-30)	5	5 (1-11)	41	37 (27-50)
<5 years	607	344 (317-373)	451	252 (229-276)	325	179 (160-199)	595	323 (298-350)	617	330 (304-357)
RSV A LRTI										
<3 months	197	545 (472-627)	149	408 (345-479)	11	30 (15-53)	155	414 (351-485)	256	672 (592-759)

3 to <12 months	170	471 (402-547)	148	405 (342-476)	31	84 (57-119)	109	291 (239-351)	146	383 (323-450)
12 to <24 months	69	193 (150-244)	42	116 (84-157)	6	16 (6-36)	33	89 (61-125)	53	139 (104-182)
24 to <60 months	0	0 (0-4)	15	14 (8-23)	0	0 (0-3)	5	5 (1-11)	41	37 (27-50)
<5 years	436	247 (224-271)	354	198 (178-219)	48	26 (19-35)	302	164 (146-184)	496	265 (242-289)
<b>RSV B LRTI</b>										
<3 months	92	255 (205-312)	45	123 (90-165)	119	321 (266-385)	150	401 (339-470)	69	181 (141-229)
3 to <12 months	68	188 (146-239)	38	104 (74-143)	90	243 (196-299)	113	302 (249-363)	50	131 (97-173)
12 to <24 months	13	36 (19-62)	7	19 (8-40)	47	128 (94-171)	35	95 (66-132)	7	18 (7-38)
24 to <60 months	0	0 (0-4)	5	5 (2-11)	21	19 (12-30)	0	0 (0-3)	0	0 (0-3)
<5 years	173	98 (84-114)	95	53 (43-65)	277	152 (135-171)	298	162 (144-181)	126	67 (56-80)
<b>Influenza A/B LRTI</b>										
<3 months	11	30 (15-54)	12	33 (17-57)	6	16 (6-35)	4	11 (3-27)	5	13 (4-31)
3 to <12 months	39	108 (77-148)	29	79 (53-114)	27	73 (48-106)	66	176 (136-224)	25	66 (42-97)
12 to <24 months	25	70 (45-103)	22	61 (38-92)	35	96 (67-133)	55	149 (112-194)	26	68 (45-100)
24 to <60 months	0	0 (0-4)	0	0 (0-3)	16	15 (8-24)	70	64 (50-81)	19	17 (10-27)
<5 years	75	43 (33-53)	63	35 (27-45)	84	46 (37-57)	195	106 (92-122)	75	40 (32-50)
<b>Influenza A LRTI</b>										
<3 months	11	30 (15-54)	8	22 (9-43)	6	16 (6-35)	2	5 (1-19)	4	10 (3-27)
3 to <12 months	31	86 (58-122)	14	38 (21-64)	20	54 (33-83)	46	123 (90-164)	25	66 (42-97)
12 to <24 months	18	50 (30-80)	13	36 (19-61)	30	82 (55-117)	49	132 (98-175)	26	68 (45-100)
24 to <60 months	0	0 (0-4)	0	0 (0-3)	7	6 (3-13)	58	53 (40-68)	19	17 (10-27)
<5 years	60	34 (26-44)	35	20 (14-27)	63	35 (27-44)	155	84 (72-99)	74	40 (31-50)
<b>Influenza B LRTI</b>										
<3 months	0	0 (0-10)	4	11 (3-28)	0	0 (0-10)	2	5 (1-19)	1	3 (0-15)
3 to <12 months	8	22 (10-44)	15	41 (23-68)	8	22 (9-43)	20	53 (33-83)	0	0 (0-10)
12 to <24 months	7	20 (8-40)	9	25 (11-47)	5	14 (4-32)	6	16 (6-35)	0	0 (0-10)
24 to <60 months	0	0 (0-4)	0	0 (0-3)	9	8 (4-16)	12	11 (6-19)	0	0 (0-3)
<5 years	15	9 (5-14)	28	16 (10-23)	22	12 (8-18)	40	22 (16-30)	1	1 (0-3)
<b>hMPV-LRTI</b>										
<3 months	12	33 (17-58)	11	30 (15-54)	18	49 (29-77)	22	59 (37-89)	20	52 (32-81)
3 to <12 months	28	78 (51-112)	37	101 (71-140)	47	127 (93-169)	55	147 (111-191)	18	47 (28-75)
12 to <24 months	40	112 (80-152)	14	39 (21-65)	3	8 (2-24)	27	73 (48-106)	11	29 (14-52)
24 to <60 months	0	0 (0-4)	7	7 (3-14)	38	35 (25-48)	0	0 (0-3)	13	12 (6-20)
<5 years	80	45 (36-56)	69	39 (30-49)	106	58 (48-71)	104	57 (46-68)	62	33 (25-42)
<b>Bordetella pertussis-LRTI<sup>3</sup></b>										
<3 months	46	127 (93-170)	16	44 (25-71)	14	38 (21-63)	48	128 (95-170)	34	89 (62-125)
3 to <12 months	5	14 (4-32)	4	11 (3-28)	3	8 (2-24)	18	48 (29-76)	2	5 (1-19)
<12 months	51	141 (105-186)	20	55 (33-85)	17	46 (27-74)	66	176 (136-224)	36	94 (66-131)

Pulmonary tuberculosis										
<3 months	24	66 (43-99)	12	33 (17-57)	8	22 (9-43)	5	13 (4-31)	11	29 (14-52)
3 to <12 months	166	459 (392-535)	110	301 (247-363)	67	181 (140-230)	73	195 (153-245)	78	205 (162-255)
12 to <24 months	100	279 (227-340)	92	254 (205-311)	47	128 (94-171)	59	160 (121-206)	52	136 (102-179)
24 to <60 months	51	49 (36-64)	62	58 (45-75)	43	40 (29-54)	47	43 (32-57)	36	32 (23-45)
<5 years	341	193 (173-215)	276	154 (136-173)	165	91 (77-106)	184	100 (86-116)	177	95 (81-110)
Invasive pneumococcal disease										
<3 months	6	17 (6-36)	7	19 (8-39)	4	11 (3-28)	8	21 (9-42)	2	5 (1-19)
3 to <12 months	10	28 (13-51)	9	25 (11-47)	7	19 (8-39)	8	21 (9-42)	6	16 (6-34)
12 to <24 months	2	6 (1-20)	2	6 (1-20)	0	0 (0-10)	2	5 (1-20)	4	10 (3-27)
24 to <60 months	3	3 (1-8)	2	2 (0-7)	4	4 (1-9)	2	2 (0-7)	2	2 (0-7)
<5 years	21	12 (7-18)	20	11 (7-17)	15	8 (5-14)	20	11 (7-17)	14	7 (4-13)
Neonatal sepsis <sup>4</sup>										
<1 month	480	1,329 (1,212-1,453)	473	1,294 (1,180-1,416)	381	1,029 (928-1,138)	434	1,160 (1,053-1,274)	550	1,443 (1,325-1,569)
All-cause pneumonia										
<3 months	841	2,328 (2,173-2,491)	706	1,932 (1,792-2,080)	636	1,718 (1,587-1,857)	757	2,022 (1,881-2,172)	912	2,392 (2,240-2,553)
3 to <12 months	591	1,636 (1,507-1,773)	481	1,316 (1,201-1,439)	405	1,094 (990-1,206)	454	1,213 (1,104-1,330)	481	1,262 (1,152-1,380)
12 to <24 months	321	897 (802-1,001)	327	902 (807-1,005)	246	672 (590-761)	287	776 (689-871)	288	756 (671-848)
24 to <60 months	318	304 (272-340)	277	261 (231-293)	307	284 (253-318)	281	256 (227-288)	277	250 (221-281)
<5 years	2,071	1,174 (1,124-1,226)	1,791	1,000 (954-1,047)	1,594	877 (834-921)	1,779	967 (922-1,013)	1,958	1,046 (1,000-1,094)
Bronchiolitis <sup>5</sup>										
<3 months	127	352 (293-418)	113	309 (255-372)	113	305 (252-367)	133	355 (298-421)	149	391 (331-459)
3 to <12 months	260	720 (635-813)	238	651 (571-739)	224	605 (528-690)	252	673 (593-762)	269	706 (624-795)
12 to <24 months	102	285 (232-346)	99	273 (222-333)	93	254 (205-311)	95	257 (208-314)	103	270 (221-328)
<24 months	489	680 (621-743)	450	618 (562-678)	430	584 (530-642)	480	645 (589-705)	521	683 (626-745)

<sup>1</sup>95% confidence intervals (CI) are reported in parenthesis. <sup>2</sup>LRTI includes diagnosis of suspected sepsis for children <3 months of age. <sup>3</sup>As pertussis was only diagnosed in children <12 months of age, analysis was restricted to the <12 months age-group for pertussis. <sup>4</sup>Neonatal sepsis includes diagnosis of suspected sepsis. <sup>5</sup>Analysis for bronchiolitis was limited to children <24 months old

**Supplementary Table-S5: Total number (n), incidence risk (IR) and incidence risk ratio (IRR) comparing hospitalization incidence in pandemic period to overall incidence in pre-pandemic period (2015-2019) for all hospitalizations, all deaths, all-cause lower-respiratory tract infections (LRTI), all-cause LRTI deaths, neonatal sepsis, all-cause pneumonia, all-cause bronchiolitis and bronchiolitis stratified by age-groups.**

Outcome	pre-pandemic 2015-2019 <sup>1</sup>		2020			2021			2022		
	n	IR (95%CI) <sup>2</sup>	n	IR (95%CI)	IRR (95%CI)	n	IR (95%CI)	IRR (95%CI)	n	IR (95%CI)	IRR (95%CI)
<b>All-cause hospitalizations</b>											
<3 months	10,498	5,667 (5,559-5,777)	1,768	4,562 (4,352-4,779)	0.8 (0.76-0.85)	1,835	4,660 (4,449-4,878)	0.82 (0.78-0.86)	2,070	5,211 (4,989-5,440)	0.92 (0.88-0.96)
3 to <12 months	6,377	3,443 (3,359-3,528)	1,009	2,603 (2,445-2,769)	0.76 (0.71-0.81)	1,186	3,012 (2,843-3,188)	0.87 (0.82-0.93)	1,539	3,874 (3,683-4,073)	1.13 (1.06-1.19)
12 to <24 months	4,405	2,397 (2,327-2,469)	837	2,158 (2,014-2,309)	0.90 (0.84-0.97)	860	2,189 (2,045-2,340)	0.91 (0.85-0.98)	982	2,476 (2,323-2,636)	1.03 (0.96-1.11)
24 to <60 months	5,325	987 (961-1,014)	1,080	955 (899-1,013)	0.97 (0.90-1.03)	1,037	898 (844-955)	0.91 (0.85-0.97)	1,260	1,074 (1,016-1,135)	1.09 (1.02-1.16)
<b>All-cause deaths</b>											
<3 months	303	164 (146-183)	75	194 (152-243)	1.18 (0.91-1.53)	76	193 (152-242)	1.18 (0.91-1.52)	79	199 (157-248)	1.22 (0.94-1.56)
3 to <12 months	321	173 (155-193)	68	175 (136-222)	1.01 (0.77-1.32)	78	198 (157-247)	1.14 (0.88-1.47)	86	216 (173-267)	1.25 (0.97-1.59)
12 to <24 months	152	83 (70-97)	22	57 (36-86)	0.69 (0.42-1.08)	30	76 (52-109)	0.92 (0.60-1.37)	32	81 (55-114)	0.98 (0.64-1.44)
24 to <60 months	136	25 (21-30)	20	18 (11-27)	0.70 (0.42-1.13)	26	23 (15-33)	0.89 (0.56-1.37)	31	26 (18-38)	1.05 (0.69-1.56)
<b>All-cause LRTI<sup>3</sup></b>											
<3 months	4,477	2,417 (2,347-2,489)	765	1,974 (1,836-2,119)	0.82 (0.76-0.88)	983	2,496 (2,343-2,657)	1.03 (0.96-1.11)	1,070	2,693 (2,534-2,860)	1.11 (1.04-1.19)
3 to <12 months	3,641	1,966 (1,902-2,030)	455	1,174 (1,069-1,287)	0.60 (0.54-0.66)	615	1,562 (1,441-1,690)	0.79 (0.73-0.87)	915	2,303 (2,156-2,457)	1.17 (1.09-1.26)
12 to <24 months	1,957	1,065 (1,018-1,113)	250	645 (567-730)	0.61 (0.53-0.69)	301	766 (682-858)	0.72 (0.64-0.81)	493	1,243 (1,136-1,358)	1.17 (1.06-1.29)
24 to <60 months	1,473	273 (259-287)	234	207 (181-235)	0.76 (0.66-0.87)	253	219 (193-248)	0.80 (0.70-0.92)	421	359 (325-395)	1.31 (1.18-1.47)
<b>All-cause LRTI deaths</b>											
<3 months	160	86 (74-101)	33	85 (59-120)	0.99 (0.66-1.44)	37	94 (66-130)	1.09 (0.74-1.56)	46	116 (85-154)	1.34 (0.94-1.87)
3 to <12 months	150	81 (69-95)	20	52 (32-80)	0.64 (0.38-1.02)	39	99 (70-135)	1.22 (0.84-1.75)	39	98 (70-134)	1.21 (0.83-1.73)
12 to <24 months	56	30 (23-40)	6	15 (6-34)	0.51 (0.18-1.18)	9	23 (10-43)	0.75 (0.33-1.53)	15	38 (21-62)	1.24 (0.65-2.22)
24 to <60 months	38	7 (5-10)	4	4 (1-9)	0.50 (0.13-1.39)	6	5 (2-11)	0.74 (0.25-1.76)	12	10 (5-18)	1.45 (0.69-2.84)
<b>Neonatal sepsis<sup>4</sup></b>											
<1 month	2,318	1,251 (1,201-1,303)	448	1,156 (1,051-1,268)	0.92 (0.83-1.02)	505	1,282 (1,173-1,399)	1.02 (0.93-1.13)	464	1,168 (1,064-1,279)	0.93 (0.84-1.03)

All-cause pneumonia											
<3 months	3,852	2,079 (2,014-2,146)	691	1,783 (1,652-1,921)	0-86 (0-79-0-93)	789	2,004 (1,866-2,148)	0-96 (0-89-1-04)	821	2,067 (1,928-2,213)	0-99 (0-92-1-07)
3 to <12 months	2,412	1,302 (1,251-1,355)	265	684 (604-771)	0-53 (0-46-0-6)	327	830 (743-925)	0-64 (0-57-0-72)	492	1,238 (1,131-1,353)	0-95 (0-86-1-05)
12 to <24 months	1,469	799 (759-841)	166	428 (365-498)	0-54 (0-45-0-63)	204	519 (450-596)	0-65 (0-56-0-75)	329	829 (742-924)	1-04 (0-92-1-17)
24 to <60 months	1,460	271 (257-285)	234	207 (181-235)	0-76 (0-66-0-88)	248	215 (189-243)	0-79 (0-69-0-91)	412	351 (318-387)	1-30 (1-16-1-45)
<60 months	9,193	1,012 (991-1,033)	1,356	711 (674-750)	0-70 (0-66-0-74)	1,568	808 (768-849)	0-80 (0-76-0-84)	2,054	1,044 (1,000-1,090)	1-03 (0-98-1-08)
Bronchiolitis <sup>5</sup>											
<3 months	635	343 (317-371)	75	194 (152-243)	0-56 (0-44-0-72)	196	498 (430-572)	1-45 (1-23-1-71)	249	627 (551-710)	1-83 (1-57-2-12)
3 to <12 months	1,243	671 (634-709)	192	495 (428-571)	0-74 (0-63-0-86)	293	744 (661-834)	1-11 (0-97-1-26)	428	1,077 (978-1,184)	1-61 (1-44-1-79)
12 to <24 months	492	268 (245-292)	84	217 (173-268)	0-81 (0-63-1-02)	100	255 (207-310)	0-95 (0-76-1-18)	166	419 (357-487)	1-56 (1-30-1-87)
<24 months	2,370	642 (617-669)	351	453 (407-503)	0-7 (0-63-0-79)	589	749 (689-812)	1-17 (1-06-1-28)	843	1,062 (991-1,136)	1-65 (1-53-1-79)

<sup>1</sup>Year on year incidence rates for 2015-2019 are in Supplementary Table S3. <sup>2</sup>95% confidence intervals (CI) are reported in parenthesis. <sup>3</sup>LRTI includes diagnosis of suspected sepsis for children <3 months of age. <sup>4</sup>Neonatal sepsis includes diagnosis of suspected sepsis. <sup>5</sup>Analysis for bronchiolitis was limited to children <24 months old

**Supplementary Table-S6: Percentage of all-cause LRTI hospitalizations with a NAAT test by pathogen, year, and age group**

Age group	2015	2016	2017	2018	2019	2020 <sup>1</sup>	2021	2022
<3 months	511/967 (52-84%)	421/818 (51-47%)	399/746 (53-49%)	388/888 (43-69%)	499/1,058 (47-16%)	361/765 (47-19%)	824/983 (83-83%)	844/1,070 (78-88%)
3 to <12 months	342/849 (40-28%)	318/714 (44-54%)	269/626 (42-97%)	275/706 (38-95%)	262/746 (35-12%)	204/455 (44-84%)	499/615 (81-14%)	672/915 (73-44%)
12 to <24 months	40/422 (9-48%)	90/426 (21-13%)	83/337 (24-63%)	63/381 (16-54%)	100/391 (25-58%)	105/250 (42-00%)	222/301 (73-75%)	352/493 (71-40%)
24 to <60 months	20/320 (6-25%)	18/280 (6-43%)	56/313 (17-89%)	28/282 (9-93%)	35/278 (12-59%)	63/234 (26-92%)	147/253 (58-10%)	246/421 (58-43%)
<5 years	913/2,558 (35-69%)	847/2,238 (37-85%)	807/2,022 (39-91%)	754/2,257 (33-41%)	896/2,473 (36-23%)	733/1,704 (43-02%)	1,692/2,152 (78-62%)	2,114/2,899 (72-92%)

<sup>1</sup>In 2020, the percentage of LRTI with a test for hMPV and *Bordetella pertussis* was 26-49%, 27-53%, 25-48%, 14-63%, 24-94% for age groups <3, 3 to <12, 12 to <24, 24 to <60 and <60 months, respectively.

**Supplementary Table-S7: Distribution of RSV A, RSV B, influenza A and influenza B amongst positive cases in 2015 to 2022.**

<b>Year</b>	<b>RSV A</b>	<b>RSV B</b>	<b>Influenza A</b>	<b>Influenza B</b>
<b>2015</b>	71% (175/245)	29% (70/245)	83% (24/29)	17% (5/29)
<b>2016</b>	79% (161/203)	21% (42/203)	56% (14/25)	44% (11/25)
<b>2017</b>	14% (21/149)	86% (128/149)	77% (17/22)	23% (5/22)
<b>2018</b>	51% (119/232)	50% (116/232)	72% (31/43)	28% (12/43)
<b>2019</b>	78% (175/225)	23% (52/225)	96% (22/23)	4% (1/23)
<b>2020</b>	64% (76/119)	37% (44/119)	100% (2/2)	0% (0/2)
<b>2021</b>	51% (216/423)	50% (211/423)	88% (53/60)	12% (7/60)
<b>2022</b>	48% (224/473)	54% (255/473)	79% (69/88)	21% (19/88)

**Supplementary Table-S8: Total number (n), incidence risk (IR) and incidence risk ratio (IRR) comparing incidence in pandemic period to overall incidence in pre-pandemic period (2015-2019) for lower respiratory tract infection (LRTI) hospitalization associated with respiratory syncytial virus (RSV A or B), influenza A or B, human Metapneumovirus (hMPV), *Bordetella pertussis*, pulmonary tuberculosis (TB), and invasive pneumococcal disease (IPD) for 2020, 2021 and 2022 stratified by age groups.**

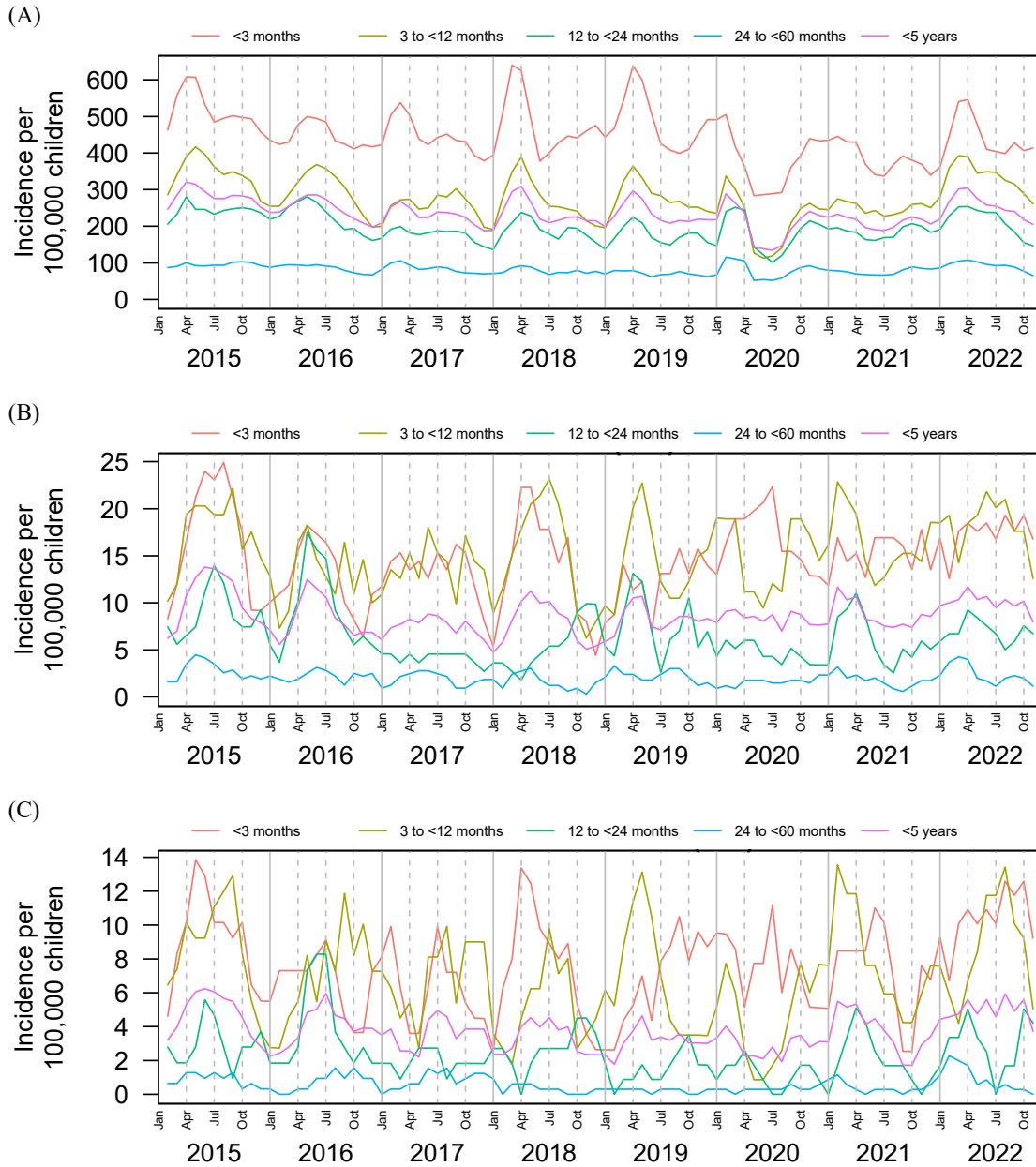
Outcome	pre-pandemic 2015-2019 <sup>1</sup>		2020			2021			2022		
	n	IR (95%CI) <sup>2</sup>	n	IR (95%CI)	IRR (95%CI)	n	IR (95%CI)	IRR (95%CI)	n	IR (95%CI)	IRR (95%CI)
<b>RSV A/B LRTI</b>											
<3 months	1,233	666 (629-704)	94	243 (196-297)	0.36 (0.29-0.45)	253	642 (566-727)	0.97 (0.84-1.11)	274	690 (610-776)	1.04 (0.91-1.18)
3 to <12 months	963	520 (488-554)	98	253 (205-308)	0.49 (0.39-0.6)	174	442 (379-513)	0.85 (0.72-1.00)	209	526 (457-602)	1.01 (0.87-1.18)
12 to <24 months	313	170 (152-190)	55	142 (107-185)	0.83 (0.61-1.11)	57	145 (110-188)	0.85 (0.63-1.13)	57	144 (109-186)	0.84 (0.62-1.12)
24 to <60 months	86	16 (13-20)	34	30 (21-42)	1.88 (1.23-2.83)	44	38 (28-51)	2.39 (1.62-3.48)	43	37 (27-49)	2.30 (1.56-3.35)
<b>Influenza A/B LRTI</b>											
<3 months	38	21 (15-28)	2	5 (1-19)	0.25 (0.03-0.97)	5	13 (4-30)	0.62 (0.19-1.57)	20	50 (31-78)	2.45 (1.35-4.32)
<3 months	186	100 (86-116)	3	8 (2-23)	0.08 (0.02-0.23)	29	74 (49-106)	0.73 (0.48-1.09)	55	138 (104-180)	1.38 (1.00-1.87)
3 to <12 months	163	89 (76-103)	0	0 (0-10)	0 (0-0.11)	26	66 (43-97)	0.75 (0.47-1.13)	20	50 (31-78)	0.57 (0.34-0.91)
12 to <24 months	105	19 (16-24)	0	0 (0-3)	0 (0-0.17)	21	18 (11-28)	0.93 (0.56-1.5)	26	22 (14-32)	1.14 (0.71-1.76)
<b>hMPV LRTI</b>											
<3 months	83	45 (36-56)	Testing not done			11	28 (14-50)	0.62 (0.30-1.17)	13	33 (17-56)	0.73 (0.37-1.32)
<3 months	185	100 (86-115)				27	69 (45-100)	0.69 (0.44-1.03)	24	60 (39-90)	0.60 (0.38-0.93)
3 to <12 months	95	52 (42-63)				21	53 (33-82)	1.03 (0.61-1.67)	25	63 (41-93)	1.22 (0.75-1.91)
12 to <24 months	58	11 (8-14)				9	8 (4-15)	0.73 (0.32-1.47)	9	8 (4-15)	0.71 (0.31-1.45)
<b><i>Bordetella pertussis</i> LRTI<sup>3</sup></b>											
<3 months	158	85 (73-100)	Testing not done			0	0 (0-9)	0 (0-0.11)	24	60 (39-90)	0.71 (0.44-1.09)
3 to <12 months	32	17 (12-24)				0	0 (0-9)	0 (0-0.57)	4	10 (3-26)	0.58 (0.15-1.64)
<b>Pulmonary tuberculosis<sup>4</sup></b>											
<3 months	24	21 (14-32)	5	13 (4-30)	0.61 (0.18-1.62)	7	18 (7-37)	0.83 (0.3-1.99)	2	5 (1-18)	0.24 (0.03-0.95)
<3 months	218	194 (169-221)	45	116 (85-155)	0.6 (0.42-0.83)	42	107 (77-144)	0.55 (0.39-0.77)	54	136 (102-177)	0.70 (0.51-0.95)
3 to <12 months	158	141 (120-165)	31	80 (54-113)	0.57 (0.37-0.83)	24	61 (39-91)	0.43 (0.27-0.67)	56	141 (107-183)	1.00 (0.72-1.36)



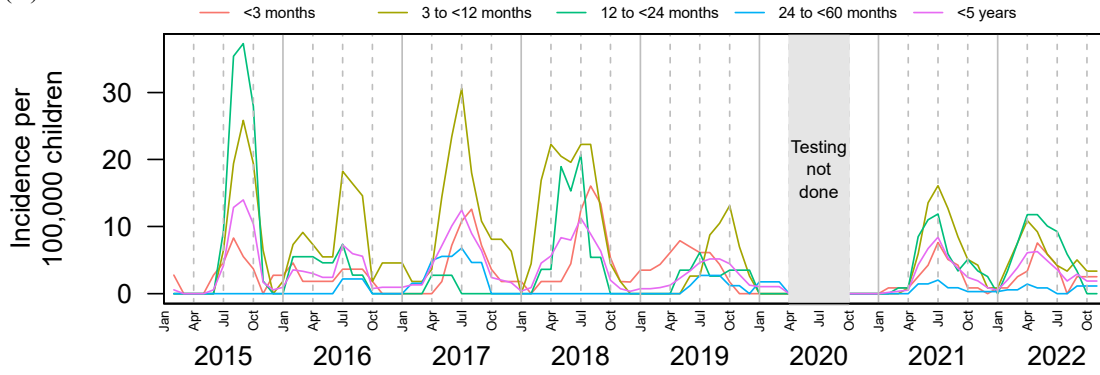
12 to <24 months	126	38 (32-46)	13	11 (6-20)	0.30 (0.16-0.53)	29	25 (17-36)	0.66 (0.42-0.99)	35	30 (21-41)	0.78 (0.52-1.14)
Invasive pneumococcal disease											
<3 months	27	15 (10-21)	1	3 (0-14)	0.18 (0.1-0.07)	1	3 (0-14)	0.17 (0.1-0.06)	1	3 (0-14)	0.17 (0.1-0.05)
<3 months	40	22 (15-29)	7	18 (7-37)	0.84 (0.32-1.89)	5	13 (4-30)	0.59 (0.18-1.49)	6	15 (6-33)	0.70 (0.24-1.66)
3 to <12 months	10	5 (3-10)	3	8 (2-23)	1.42 (0.25-5.52)	3	8 (2-22)	1.40 (0.25-5.45)	2	5 (1-18)	0.93 (0.1-4.35)
12 to <24 months	13	2 (1-4)	0	0 (0-3)	0 (0.1-5.6)	1	1 (0-5)	0.36 (0.01-2.39)	1	1 (0-5)	0.35 (0.01-2.36)

<sup>1</sup>Year on year incidence rates for 2015-2019 are in Supplementary Table S4. <sup>2</sup>95% confidence intervals (CI) are reported in parenthesis. <sup>3</sup>As pertussis was only diagnosed in children <12 months of age, analysis was restricted to the <12 months age-group for pertussis. <sup>4</sup>The incidence rates in the first column represent the overall incidence in 2017-2019 due to the drastic decline in TB incidence rates prior to 2017. See main text for details.

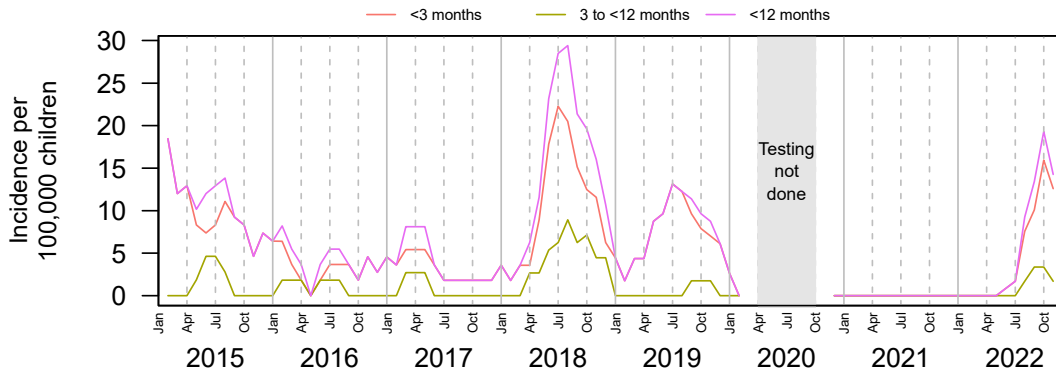
**Supplementary Figure-S1: Three-month moving average of monthly incidence risk of hospitalizations between 2015 and 2019 for children <5 years old and stratified by age-group. (A) all-cause hospitalizations. (B) All-cause death. (C) All-cause lower-respiratory tract infections (LRTI) deaths. (D) LRTI associated with human Metapneumovirus. (E) LRTI associated with *Bordetella pertussis* (<12 months). (F) Invasive pneumococcal disease. (G) Neonatal sepsis (<1 month only). (H) All-cause pneumonia. (I) Bronchiolitis (<24 months only).**



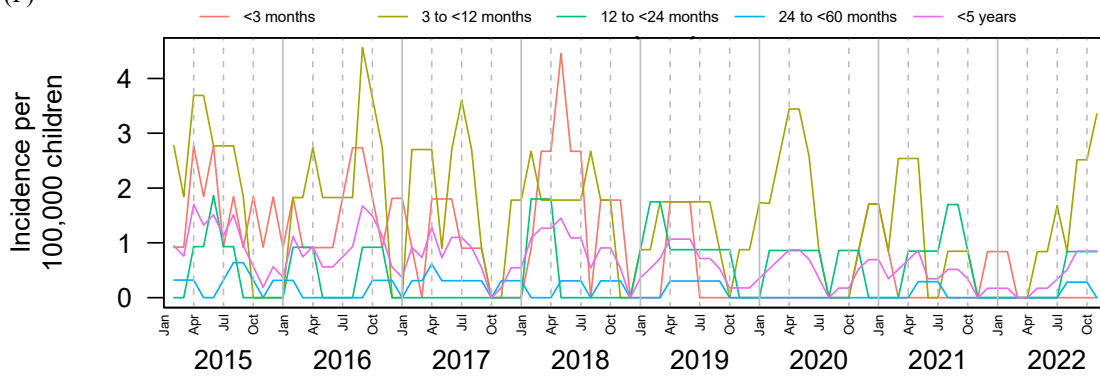
(D)



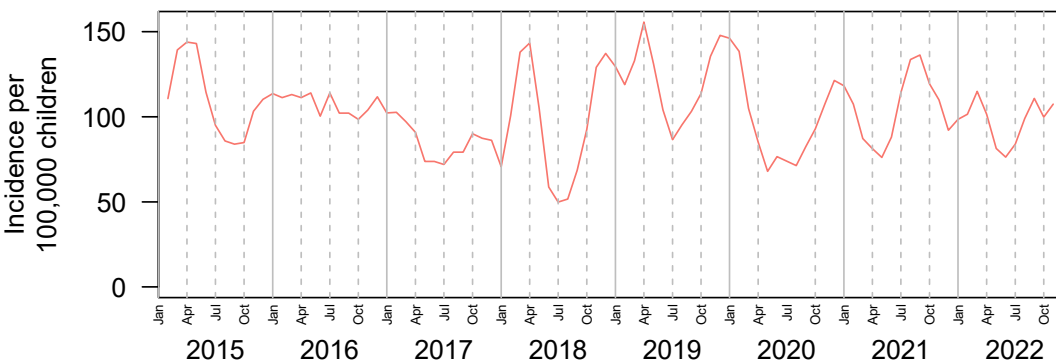
(E)



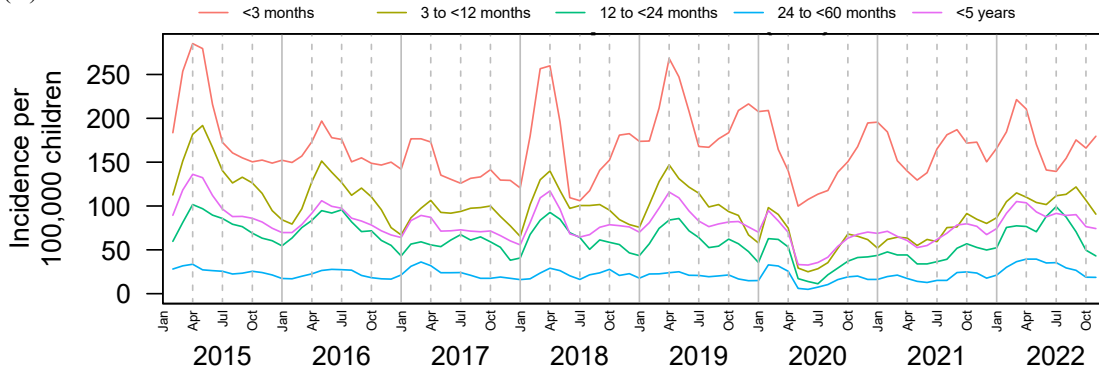
(F)



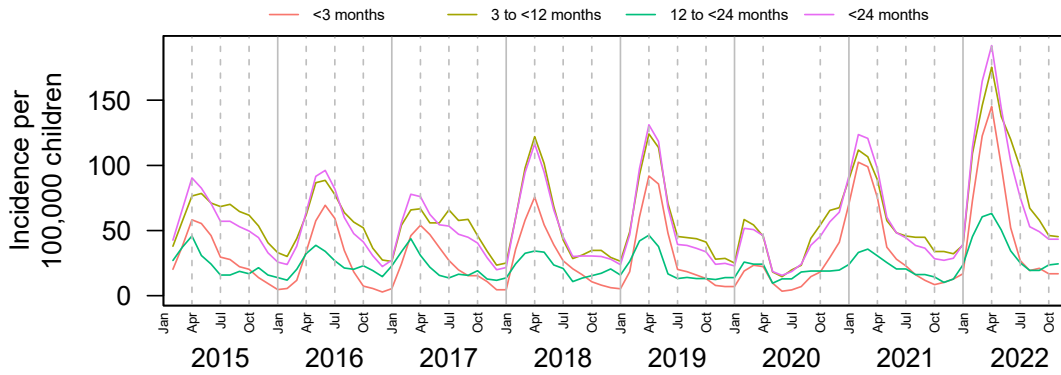
(G)



(H)



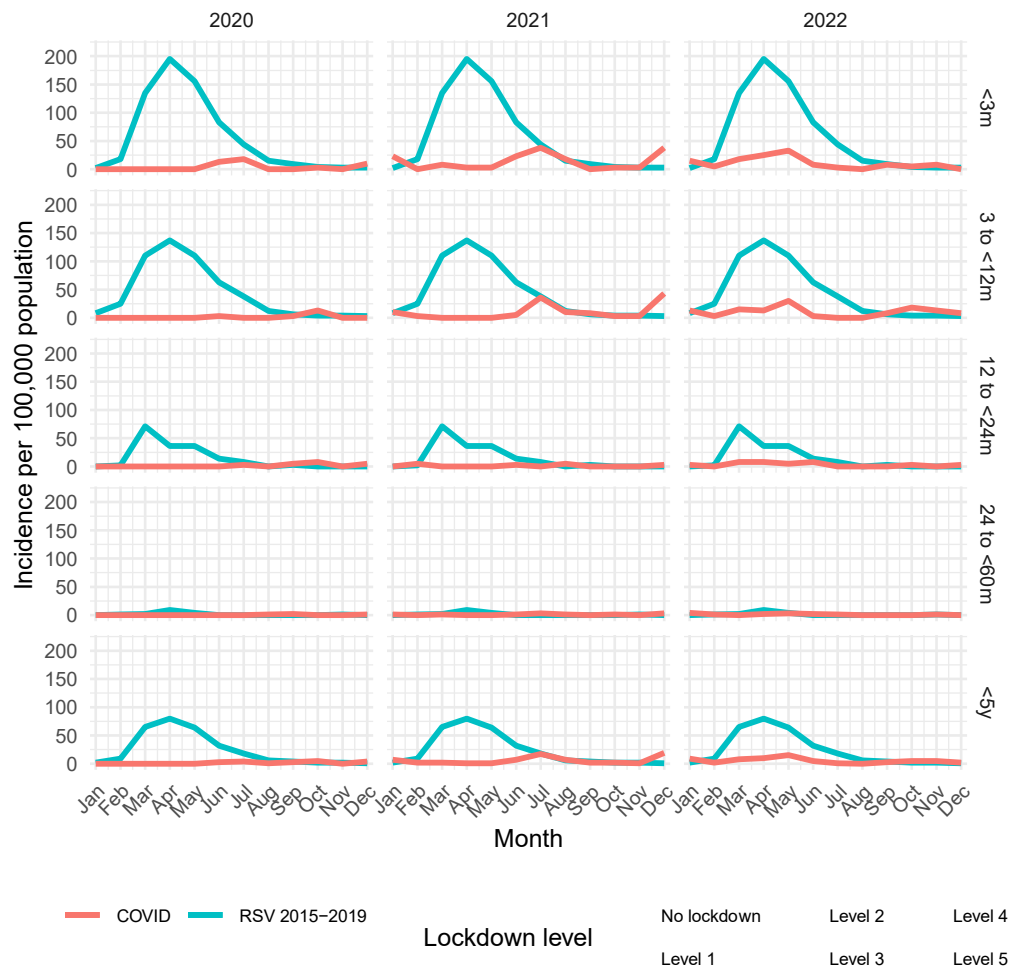
(I)



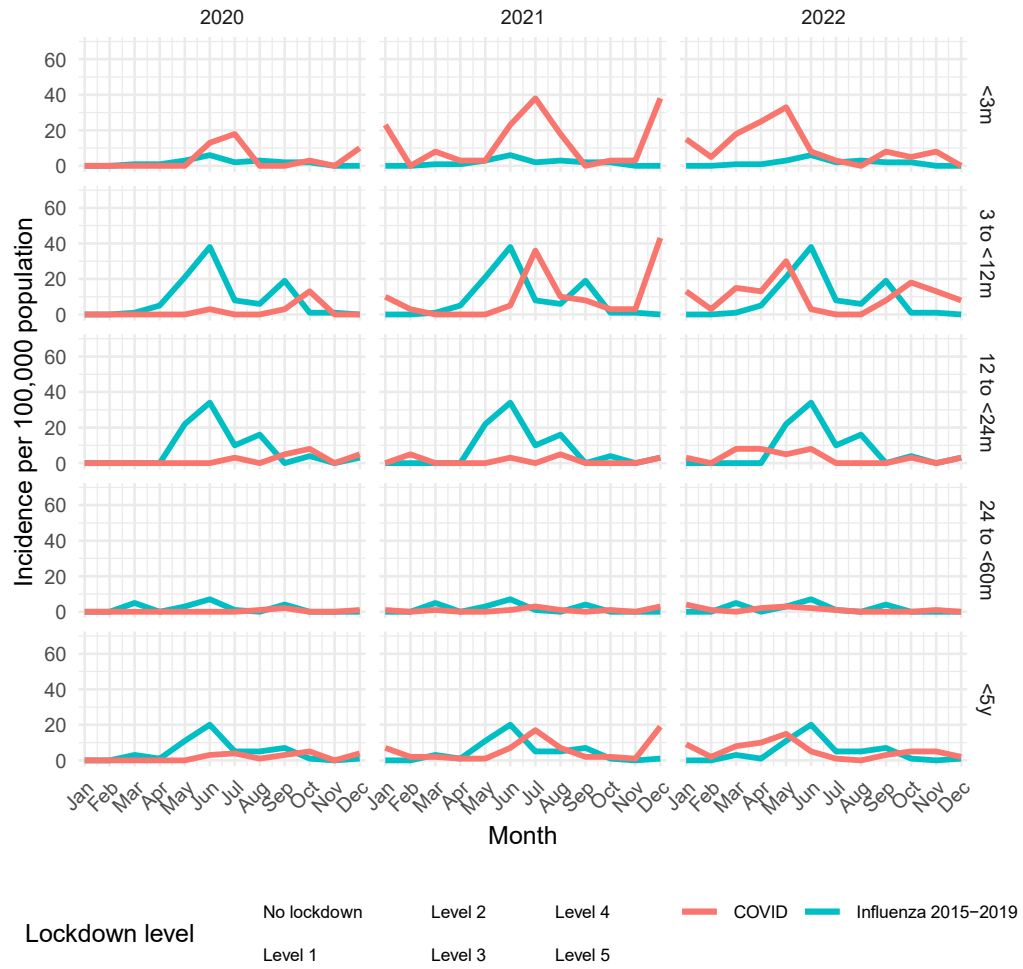
Note: The scale of the y-axis is drawn according to the minimum and maximum monthly incidence rates for each sub-figure to visualize trends.

**Supplementary Figure-S2: Monthly incidence risk of hospitalizations for COVID-19 between 2020 and 2022 by age-groups for COVID-19 along with the RSV or influenza monthly incidence for the pre-pandemic period (2015-2019). (A) RSV and (B) influenza.**

(A)



(B)



Note: The scale of the y-axis is drawn according to the minimum and maximum monthly incidence rates for each sub-figure to visualize trends.

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