## Impact of COVID-19 on routine immunisation in South-East Asia and Western Pacific: disruptions and solutions

## **Online appendix**

**Supplementary Figure 1:** Countries that participated in the survey are shown in green. Map created with Mapchart.net.





Supplementary Figure 2: Number of vaccines impacted in each country

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Note that South Korea appears cut off from mainland Asia, as North Korea was not included in the survey. Countries not participating in the survey are not included in the map.

Supplementary Figure 3: Total all-age population (millions) in countries reporting each vaccine impacted.



It should be noted that the represented populations do not account for ages targeted for routine vaccination, nor do they account for the age groups reported as impacted. The intention is to provide an indication of the relative scale of the population potentially at risk if declines in vaccination coverage rates were to lead to increases in transmission of vaccine preventable diseases.



Supplementary Figure 4: Number of antigens impacted in the public and private healthcare settings. Antigens were counted individually for each age group and each country

BCG, bacillus Calmette-Guérin; HiB, Haemophilus influenzae B; HPV, human papilloma virus; IPV, inactivated polio vaccine; OPV, oral polio vaccine

Supplementary Table 1: Impact of COVID-19 on Routine Immunisation Practices questionnaire as circulated to countries

Section 1: Country Information									
Country (please fill o	ut one form per cou	intry)							
Population size (2019	, in millions, e.g. 2.4	(3)							
Annual birth cohort	(2019, full number, e	e.g. 340,200)							
Early infancy (0–8 week adolescents (7–17 years)	ts), infants and toddl ), and adults and elde	ers (9 weeks to 23 m erly	onths; subsequently r	eferred to as 'infancy	y'), preschool and schoo	ol-entry age (2–6 years	s; subsequently referred	to as 'school-entry age'),	children and
		*	Sec	ction 2: Vaccines wi	ith COVID-related dis	ruption			
* If delivered as part of a combination vaccine, please fill all relevant rows for the antigens in that vaccine	Have the following immunization practices been impacted by COVID disruptions in your country? By 'impacted' we mean a change in the number of people receiving the vaccine during COVID-19 even relatively small disruptions are relevant, the scale of disruption will be captured in the next section. Please fill in all boxes; if not used in a given age group in your country, please select 'not applicable'.Is this vaccine usuallyWas this vaccine prioritised according to government policy?What proportion of the public/ private market split for this vaccine is been i						Has the public or private or both markets been impacted for this vaccine?		
	Early infancy (0 to 8weeks)	Infants and toddlers (9w to <24m)	Pre-school and school-entry age (2y to <7y)	Children and adolescents (7 to <18y)	Adults and elderly (18y+)				
BCG									
Diphtheria *									
Tetanus *									
Pertussis *									
Hepatitis B *									
Polio (IPV) *									
Polio (OPV) *									
HiB *									
Pneumococcal									
Rotavirus									
Measles*									
Mumps*									

Rubella*								
HPV								
Meningococcal B								
Meningococcal ACWY								
Seasonal influenza								
Other (please add):								
Other (please add):								
Please indicate which DTP-combination vaccines are in use in your country (delete those not in use):			Hexavalent (DTaP- Hexavalent (DTwF Pentavalent (DTwF Pentavalent (DTaP	-HepB-Hib-IPV) P-HepB-Hib-IPV) P-HepB-Hib) -IPV-Hib)	Tdap Tdap-IPV DT Td			
<b>[Optional]:</b> Further details are not essential, but please share additional information here <i>only if</i> there is information about your programme that are <i>needed to understand the data shared above</i> (e.g. differences in vaccines used for the same disease in public vs private sector, an increase in uptake during COVID, seasonality of vaccination programmes):								

	Section 3: Vaccine Coverage Rate (VCR) Details							
	What was the BAS	ELINE VCR for eac numbers, NO RANGE	<b>h vaccine before CO</b> ES please), enter 'INA	<b>DVID-19 disruptions</b> A', if info not availabl	Please indicate whether this is estimated or reported	<u>If reported</u> , please paste links/references to any reported data. <u>If estimated</u> , please indicate (where possible) if any information this was based on (e.g. sales data, clinician interactions, etc)		
Cell will grey-out if 'not applicable' or 'info not available' answered to Section 2	Early infancy (0 to 8weeks)	Infants and toddlers (9w to <24m)	Pre-school and school-entry age (2y to <7y)	Children and adolescents (7 to <18y)	Adults and elderly (18y+)			
	Same list of antigens as in Section 2							

What was the VCR during the PEAK of COVID-related disruptions? (in % terms, whole numbers, NO RANGES please), enter 'INA' if info not available.						If <u>reported</u> , please paste links/ references to data. If	Have the public/ private	Please briefly describe any differences	Were there any geographical/	If yes, please briefly describe how they differed (e.g.	Has the VCR
Early infancy (0 to 8weeks)	Infants and toddlers (9w to <24m)	Pre-school and school- entry age (2y to <7y)	Children and adolescents (7 to <18y)	Adults and elderly (18y+)	whether this is estimated or reported	estimated, pleasem.indicate (whereindicate (wherepossible) anysininformation thisaffwas based oninformation	markets been similarly affected?	in disruptions in public vs private market	differences in the impact on VCR?	impacted than rural, a particular province more impacted)	normal as of 1st June 2020?
Some list of antisone as in Section 2											
 Same list of anugens as in Section 2											

Section 4: Reasons for Disruption						
	Please indicate which of the below were a reason for disruption of the coverage of routine immunisation?	Please rank these reasons in order of importance/relevance				
Supply-chain disruption						
Travel/movement restrictions by Government						
Consumers' fear of infection						
Consumers' priority change						
Accessibility to healthcare system/HCPs						
Affordability issues						
Consumers' lack of awareness						
Government deprioritisation of the vaccine						
Lack of guidelines on catch-up/delayed immunization						
Others, please list:						

Section 5: Measures to reduce va	accination disruption		
Please share examples of measures undertaken by different stakeholders to minimise vaccination disruption	Has this measure been implemented already?	Has the impact of this measure been evaluated?	Where impact has been evaluated, please share the summarised results of the evaluation.
Please share examples of public health measures undertaken by the Government or public health bodies to minimize vaccination disruption (e.g. policy, programmes). Please focus on examples that were successful, and provide a summary of the measure taken, and indicate any key characteristics of the measure that were important to its success.			
Please share examples of private health sector initiatives to minimize vaccination disruption (e.g. patient journey innovation such as vaccination drive throughs in Philippines). Please focus on examples that were successful, and provide a summary of the measure taken, and indicate any key characteristics of the measure that were important to its success.			
Please share examples of measures undertaken by the Sanofi Pasteur team (or other vaccine companies) to minimize vaccination disruption (e.g. Bilateral ZOOM meeting between CH & PH; Medical 360 by DE; Vaccines Confidence Initiative by ES). Please focus on examples that were successful, and provide a summary of the measure taken, and indicate any key characteristics of the measure that were important to its success.			
If you have any examples of measures taken that were unsuccessful in minimising disruption, please provide a short description, and any key characteristics that may have contributed to the lack of success.			

Section 6: Other information of relevance				
Please feel free to share any other information of importance/relevance to the subject of this questionnaire				

**Supplementary Table 2:** Modified Ng and de Colombani's framework<sup>1</sup> for assessing the fitness to purpose of proposed solutions

Category	Criterion	Question	Yes	No	
Context		Is this initiative relevant to the COVID-related situation? (Based on top three reasons for disruption)	1	0	
	Relevant	Is this initiative relevant to the setting of the jurisdictions during COVID-related situation? (income level, geographical barriers, etc)	1	0	
	Community	Have the members of the community been involved? (Public and private side)			
	participation   Was the synergy with community participation considered during programme development and implementation?			0	
	Does it bring tangible benefits outweighing the risk of not doing it? 1   Bishteens Dees it demonstrate respect for individual outcoment and privacy?		1	0	
Process	Righteous Does it demonstrate respect for individual autonomy and privacy? Have the vulnerable groups been considered?	1	0		
		Have the vulnerable groups been considered?	1	0	
	Replicable	Is this initiative generalisable to other settings/jurisdictions?	1	0	
	Timeliness	Can the initiative be implemented within a period of 1 month?	1	0	
	Effective	Can the direct impact be measured for this initiative?	1	0	
	Did it achieve desirable outcomes?		1	0	
Outcomes	Did the initiative use locally accessible resources?		1	0	
	Efficient	Does this initiative use currently existing resources?	1	0	
		Does it have the potential to continue through local ownership after pandemic?	1	0	
	Sustainable	Is it financially viable in the long term (run on its own)?	1	0	

<sup>1</sup> Ng E, de Colombani P. Framework for Selecting Best Practices in Public Health: A Systematic Literature Review. *J Public Health Res* 2015;4(3):577

Supplementary Table 3: Vaccines in use in each country.

Country	Population (thousands)	Vaccines in routine use
Australia	25 398	Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Meningococcal B, Mumps, Pertussis, Pneumococcal, Polio (IPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Brunei	445	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Cambodia	16 716	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus, Japanese Encephalitis, Rabies
China	1 425 200	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Hong Kong	7 548	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Meningococcal B, Mumps, Pertussis, Pneumococcal, Polio (IPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
India	1 383 198	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Indonesia	272 223	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rubella, Seasonal Influenza, Tetanus, Hepatitis A, Typhoid, Japanese Encephalitis
Japan	126 496	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus, Japanese Encephalitis, Varicella
Malaysia	32 869	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Myanmar	54 808	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Nepal	30 260	BCG, Diphtheria, Hepatitis B, HiB, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rubella, Seasonal Influenza, Tetanus, Hepatitis A, Typhoid
New Zealand	4 834	Diphtheria, Hepatitis B, HPV, Measles, Mumps, Pertussis, Pneumococcal, Polio (IPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus, Varicella
Pakistan	208 362	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus, Hepatitis A, Typhoid
Philippines	109 703	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Singapore	5 935	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Meningococcal B, Mumps, Pertussis, Pneumococcal, Polio (IPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus, Varicella
South Korea	51 507	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus
Taiwan	23 818	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Mumps, Pertussis, Pneumococcal, Polio (IPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus, Hepatitis A, Japanese Encephalitis
Thailand	69 411	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rubella, Seasonal Influenza, Tetanus, Japanese Encephalitis
Vietnam	98 360	BCG, Diphtheria, Hepatitis B, HiB, HPV, Measles, Meningococcal ACWY, Meningococcal B, Mumps, Pertussis, Pneumococcal, Polio (IPV), Polio (OPV), Rotavirus, Rubella, Seasonal Influenza, Tetanus, Japanese Encephalitis, Rabies