

Effects of Decreased Immunization Coverage for Hepatitis B Virus Caused by COVID-19 in World Health Organization Western Pacific and African Regions, 2020

Appendix

Appendix Table 1. Prevalence of hepatitis B virus seromarkers used in the mathematical model to determine effects of decreased immunization coverage for hepatitis B virus caused by COVID-19 in World Health Organization Western Pacific and African Regions, 2020*

Country name	HBsAg prevalence among women of childbearing age (%)	HBeAg prevalence among women of childbearing age (%)	Anti-HBcAg prevalence at 5 y of age (%)	Anti-HBcAg prevalence at ≥30 y of age (%)	References
Africa Region					
Algeria	1.6	15	25	77.5	(1,2)
Angola	11.5	15	25	77.5	(2)
Benin	15.5	11.4	25	77.5	(2,3)
Botswana	11.84	15	25	77.5	(2)
Burkina Faso	8.1	21.2	25	77.5	(2,3)
Burundi	11.84	15	25	77.5	(2)
Cabo Verde	11.5	15	25	77.5	(2)
Cameroon	6	12.1	25	77.5	(2–4)
Central African Republic	11.84	15	25	77.5	(2)
Chad	11.5	15	25	77.5	(2)
Comoros	11.5	15	25	77.5	(2)
Congo	11.84	15	25	77.5	(2)
Côte d'Ivoire	8	14.5	25	77.5	(2,3)
The Democratic Republic of the Congo	11.84	15	25	77.5	(2)
Equatorial Guinea	11.5	15	25	77.5	(2)
Eritrea	11.84	15	25	77.5	(2)
Eswatini	11.84	15	25	77.5	(2)
Ethiopia	3.6	12.5	25	77.5	(2,3,5)
Gabon	9.2	10.1	25	77.5	(2,3)
Gambia	11.5	15	25	77.5	(2)
Ghana	12	15	25	77.5	(2,3)
Guinea	11.5	15	25	77.5	(2)
Guinea-Bissau	11.5	15	25	77.5	(2)
Kenya	9.3	8.8	25	77.5	(2,3)
Lesotho	11.84	15	25	77.5	(2)
Liberia	11.5	15	25	77.5	(2)
Madagascar	1.9	5	25	77.5	(2,3)
Malawi	11.84	15	25	77.5	(2)
Mali	11.8	15	25	77.5	(2,3)
Mauritania	10.7	15	25	77.5	(2,3)
Mauritius	11.5	15	25	77.5	(2)
Mozambique	11.84	15	25	77.5	(2)
Namibia	11.84	15	25	77.5	(2)
Niger	16.2	15	25	77.5	(2,3)
Nigeria	6.1	28.5	25	77.5	(2,3,6)
Rwanda	1.3	15	25	77.5	(2,7)
Sao Tome and Principe	11.84	15	25	77.5	(2)
Senegal	11.5	15	25	77.5	(2)
Seychelles	11.5	15	25	77.5	(2)
Sierra Leone	9.8	9.3	25	77.5	(2,8)
South Africa	3.9	17.1	25	77.5	(2,3)

Country name	HBsAg prevalence among women of childbearing age (%)	HBeAg prevalence among women of childbearing age (%)	Anti-HBcAg prevalence at 5 y of age (%)	Anti-HBcAg prevalence at ≥30 y of age (%)	References
South Sudan	11.5	15	25	77.5	(2)
Togo	11.5	15	25	77.5	(2)
Uganda	3	14.9	25	77.5	(2,3,9)
United Republic of Tanzania	3.7	12	25	77.5	(2,3,10)
Zambia	4.1	15	25	77.5	(2,11)
Zimbabwe	14.2	3.3	25	77.5	(2,3)
Western Pacific Region					
American Samoa	2.55	15	26	49	(2,12,13)
Australia	1.28	29	0.6	11.9	(14,15,16)
Palau	13	40	48	58	(17)
Brunei Darussalam	1.1	20	25	77.5	(2,18)
Cambodia	4.39	30	25	77.5	(2,19)
China	5.44	30	32	55	(20,21)
Cook Islands	1.1	15	0.64	5.5	(2)
Fiji	6.6	30	25	77.5	(2,22)
French Polynesia	1.1	15	0.64	5.5	(2)
Guam	1.1	15	0.64	5.5	(2)
Hong Kong SAR, China	3.4	30	25	77.5	(2,23)
Japan	0.23	15	0.64	5.5	(2,24)
Kiribati	9.2	30	25	77.5	(2,25)
Republic of Korea	2.34	30	25	77.5	(2,26)
Lao People's Democratic Republic	3.53	30	25	77.5	(2,27)
Malaysia	4	20	25	77.5	(2,28)
Macao SAR, China	3.4	30	25	77.5	(2,23)
Federated States of Micronesia	6.8	15	10	56.8	(2,29)
Mongolia	9.7	30	25	77.5	(2,30)
Marshall Islands	9.5	30	25	77.5	(2,29)
New Caledonia	3.3	30	25	77.5	(2,31)
New Zealand	1.1	15	0.64	5.5	(2)
Niue	1.1	15	0.64	5.5	(2)
Mariana Islands	1.1	15	0.64	5.5	(2)
Nauru	1.1	15	0.64	5.5	(2)
Philippines	18.1	20	25	77.5	(2,32)
Papua New Guinea	12.81	30	25	77.5	(2,33)
Singapore	3.7	20	25	77.5	(2,34)
Samoa	11.83	30	25	77.5	(2)
Solomon Islands	13.8	36.7	25	77.5	(2,35)
Tokelau	1.1	15	0.64	5.5	(2)
Tonga	18.6	47.5	25	77.5	(2,22)
Tuvalu	11.83	30	25	77.5	(2)
Vanuatu	7	30	25	77.5	(2,36)
Viet Nam	12.6	42.1	25	77.5	(2,37)
Wallis and Futuna	11.83	30	25	77.5	(2)

*HBcAg, hepatitis B c antigen; HBeAg, hepatitis B e antigen; HBsAg, hepatitis B surface antigen

Appendix Table 2. Number of chronic hepatitis B infections and-related deaths by country in 2019 compared with model estimates for children born in 2020 after decreased HBV immunization coverage caused by COVID-19 in the World Health Organization Western Pacific Region*

Countries and areas	Baseline	10% decrease in HepB- BD		20% decrease in HepB-BD		10% decrease in HepB3		20% decrease in HepB3		
	Infections	HBV-related deaths	Excess infections	Excess deaths	Excess infections	Excess deaths	Excess infections	Excess deaths	Excess Infections	Excess deaths
American Samoa	34	5	1 (2%)	0 (0%)	1 (4%)	0 (0%)	9 (27%)	1 (27%)	18 (54%)	3 (54%)
Australia†	1,440	344	–	–	–	–	209 (14%)	54 (16%)	417 (29%)	107 (31%)
Brunei Darussalam	39	7	1 (4%)	0 (0%)	3 (8%)	1 (7%)	61 (155%)	11 (155%)	121 (310%)	22 (310%)
Cambodia	5,277	924	396 (8%)	66 (7%)	792 (15%)	133 (14%)	3,122 (59%)	551 (60%)	6,244 (118%)	1,101 (119%)
China	123,186	25,077	24,422 (20%)	4,887 (19%)	48,844 (40%)	9,773 (39%)	157,468 (128%)	32,185 (128%)	314,935 (256%)	64,371 (257%)
Cook Islands	0	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Fiji	129	20	34 (27%)	5 (26%)	69 (54%)	10 (51%)	169 (131%)	27 (133%)	338 (263%)	54 (265%)
French Polynesia	2	0	1 (41%)	0 (0%)	2 (81%)	0 (0%)	2 (77%)	0 (0%)	3 (153%)	1 (158%)
Guam	2	0	1 (23%)	0 (0%)	1 (46%)	0 (0%)	1 (37%)	0 (0%)	2 (74%)	0 (0%)
Hong Kong, China	897	224	76 (9%)	18 (8%)	152 (17%)	37 (17%)	754 (84%)	189 (84%)	1,508 (168%)	378 (169%)
Japan‡	666	144	–	–	–	–	399 (60%)	90 (62%)	798 (120%)	180 (125%)
Kiribati	37	7	8 (22%)	1 (21%)	16 (44%)	3 (42%)	27 (72%)	5 (72%)	53 (144%)	10 (145%)
Lao People's Democratic Republic	6,560	1,122	90 (1%)	15 (1%)	179 (3%)	29 (3%)	1,048 (16%)	180 (16%)	2,095 (32%)	361 (32%)
Macao SAR, China	52	13	7 (13%)	2 (12%)	13 (25%)	3 (25%)	65 (124%)	16 (124%)	130 (248%)	32 (249%)
Malaysia	4,576	846	466 (10%)	83 (10%)	931 (20%)	165 (20%)	5,026 (110%)	932 (110%)	10,053 (220%)	1,864 (220%)
Mariana Islands	1	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (51%)	0 (0%)
Marshall Islands	31	5	4 (12%)	1 (11%)	7 (23%)	1 (22%)	10 (32%)	2 (32%)	20 (64%)	3 (65%)
Micronesia (Federated States of)	39	5	2 (6%)	0 (0%)	5 (12%)	1 (11%)	11 (28%)	2 (29%)	22 (56%)	3 (57%)
Mongolia	630	107	200 (32%)	33 (31%)	401 (64%)	65 (61%)	650 (103%)	112 (104%)	1,299 (206%)	223 (209%)
Nauru	0	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
New Caledonia	44	9	4 (8%)	1 (8%)	7 (16%)	1 (15%)	34 (78%)	7 (79%)	69 (157%)	15 (157%)
New Zealand‡	109	22	–	–	–	–	21 (20%)	5 (21%)	43 (39%)	9 (41%)
Niue	0	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Palau	3	0	1 (38%)	0 (0%)	2 (76%)	0 (0%)	3 (102%)	0 (0%)	5 (205%)	1 (205%)
Papua New Guinea	20,888	3,147	212 (1%)	31 (1%)	425 (2%)	61 (2%)	701 (3%)	108 (3%)	1,402 (7%)	216 (7%)
Philippines	122,717	20,260	4,310 (4%)	687 (3%)	8,620 (7%)	1,374 (7%)	12,121 (10%)	2,045 (10%)	24,241 (20%)	4,091 (20%)
Republic of Korea	2,892	696	224 (8%)	52 (8%)	448 (15%)	105 (15%)	3,466 (120%)	837 (120%)	6,933 (240%)	1,675 (241%)
Samoa	264	49	11 (4%)	2 (4%)	21 (8%)	4 (8%)	24 (9%)	5 (9%)	49 (18%)	9 (19%)
Singapore	513	114	37 (7%)	8 (7%)	75 (15%)	16 (14%)	471 (92%)	105 (92%)	942 (184%)	210 (184%)
Solomon Islands	592	115	65 (11%)	12 (11%)	130 (22%)	25 (22%)	170 (29%)	34 (30%)	341 (58%)	68 (59%)
Tokelau	0	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Tonga	23	5	19 (80%)	4 (78%)	37 (159%)	7 (155%)	18 (79%)	4 (81%)	37 (157%)	7 (161%)
Tuvalu	4	1	1 (24%)	0 (0%)	2 (47%)	0 (0%)	2 (57%)	0 (0%)	5 (115%)	1 (116%)
Vanuatu	165	28	14 (9%)	2 (8%)	29 (17%)	5 (17%)	73 (44%)	13 (45%)	146 (89%)	25 (90%)
Viet Nam	40,359	8,921	5,730 (14%)	1,238 (14%)	11,460 (28%)	2,476 (28%)	11,662 (29%)	2,630 (29%)	23,323 (58%)	5,260 (59%)
Wallis and Futuna	9	2	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (22%)	0 (0%)	4 (44%)	1 (45%)
Grand total, WPR	332,179	62,222	36,342 (11%)	7,149 (11%)	72,684 (22%)	14,299 (23%)	197,797 (60%)	40,151 (65%)	395,595 (119%)	80,301 (129%)

*Values are numbers for 2019 baseline data or number (%) of infections or deaths for children born in 2020 that were in excess of 2019 values. HBV, hepatitis B virus; HepB-BD, hepatitis B birth dose vaccination; HepB3, third-dose hepatitis B vaccination.

†Australia provides HepB-BD to all newborn infants but did not report HepB-BD coverage for 2019 to the World Health Organization.

‡Japan and New Zealand provide HepB-BD only to infants born to mothers who are positive for hepatitis B surface antigen; therefore, HepB-BD coverage in 2020 was not calculated for these countries.

Appendix Table 3. Number of chronic hepatitis B infections and-related deaths by country in 2019 compared with model estimates for children born in 2020 after decreased HBV immunization coverage caused by COVID-19 in the World Health Organization African Region*

Countries and areas	Baseline	10% decrease in HepB-BD		20% decrease in HepB-BD		10% decrease in HepB3		20% decrease in HepB3		
	Infections	HBV-related deaths	Excess infections	Excess deaths	Excess infections	Excess deaths	Excess infections	Excess deaths	Excess infections	Excess deaths
Central Africa										
Angola	72,045	9,228	1,579 (2%)	190 (2%)	3,157 (4%)	379 (4%)	6,051 (8%)	785 (9%)	12,102 (17%)	1,570 (17%)
Burundi†	14,985	1,873	–	–	–	–	3,684 (25%)	486 (26%)	7,368 (49%)	972 (52%)
Cameroon†	40,685	4,812	–	–	–	–	5,519 (14%)	665 (14%)	11,039 (27%)	1,330 (28%)
Chad†	45,628	5,067	–	–	–	–	2,831 (6%)	325 (6%)	5,662 (12%)	650 (13%)
Equatorial Guinea	2,617	316	40 (2%)	4 (1%)	79 (3%)	9 (3%)	207 (8%)	25 (8%)	414 (16%)	51 (16%)
Gabon†	3,159	424	–	–	–	–	434 (14%)	59 (14%)	867 (27%)	119 (28%)
Sao Tome and Principe	78	12	14 (18%)	2 (17%)	28 (36%)	4 (34%)	58 (75%)	9 (76%)	117 (149%)	18 (151%)
Central African Republic†	11,907	1,222	–	–	–	–	665 (6%)	70 (6%)	1,330 (11%)	141 (12%)
Democratic Republic of the Congo†	227,219	30,169	–	–	–	–	17,493 (8%)	2,391 (8%)	34,986 (15%)	4,783 (16%)
Republic of the Congo†	8,163	1,067	–	–	–	–	1,250 (15%)	169 (16%)	2,501 (31%)	338 (32%)
Total	426,486	54,189	1,632 (0%)	196 (0%)	3,264 (1%)	392 (1%)	38,193 (9%)	4,986 (9%)	76,386 (18%)	9,971 (18%)
East and southern Africa										
Botswana	890	135	89 (10%)	13 (10%)	178 (20%)	26 (19%)	477 (54%)	74 (55%)	953 (107%)	148 (110%)
Eritrea†	3,330	451	–	–	–	–	892 (27%)	126 (28%)	1,783 (54%)	252 (56%)
Eswatini†	1,066	119	–	–	–	–	236 (22%)	28 (23%)	473 (44%)	55 (47%)
Ethiopia†	150,025	21,683	–	–	–	–	23,240 (15%)	3,391 (16%)	46,479 (31%)	6,783 (31%)
Kenya†	39,233	5,151	–	–	–	–	12,816 (33%)	1,742 (34%)	25,632 (65%)	3,483 (68%)
Lesotho†	2,112	203	–	–	–	–	420 (20%)	43 (21%)	839 (40%)	85 (42%)
Madagascar†	24,719	3,240	–	–	–	–	6,810 (28%)	898 (28%)	13,620 (55%)	1,795 (55%)
Malawi†	20,369	2,664	–	–	–	–	5,441 (27%)	747 (28%)	10,882 (53%)	1,494 (56%)
Mauritius‡	384	64	–	–	–	–	114 (30%)	20 (31%)	229 (60%)	40 (62%)
Mozambique†	43,150	5,223	–	–	–	–	8,900 (21%)	1,127 (22%)	17,800 (41%)	2,254 (43%)
Namibia	1,523	197	123 (8%)	15 (8%)	246 (16%)	30 (15%)	550 (36%)	72 (37%)	1,100 (72%)	145 (73%)
Rwanda†	3,799	575	–	–	–	–	3,781 (100%)	580 (101%)	7,561 (199%)	1,161 (202%)
Seychelles†	44	7	–	–	–	–	14 (32%)	2 (34%)	29 (65%)	5 (67%)
South Africa†	41,050	5,357	–	–	–	–	8,596 (21%)	1,138 (21%)	17,193 (42%)	2,277 (43%)
South Sudan†	27,061	3,252	–	–	–	–	1,632 (6%)	202 (6%)	3,263 (12%)	403 (12%)
Uganda†	28,670	3,766	–	–	–	–	14,564 (51%)	1,956 (52%)	29,127 (102%)	3,913 (104%)
United Republic of Tanzania†	46,481	6,283	–	–	–	–	18,036 (39%)	2,485 (40%)	36,073 (78%)	4,970 (79%)
Zambia†	15,601	2,071	–	–	–	–	5,363 (34%)	727 (35%)	10,725 (69%)	1,455 (70%)
Zimbabwe†	12,758	1,319	–	–	–	–	3,557 (28%)	384 (29%)	7,114 (56%)	768 (58%)
Comoros†	920	124	–	–	–	–	215 (23%)	30 (24%)	431 (47%)	60 (49%)
Total	463,185	61,884	212 (0%)	28 (0%)	424 (0%)	56 (0%)	115,654 (25%)	15,772 (25%)	231,307 (50%)	31,545 (51%)
West Africa										
Algeria	14,083	2,652	391 (3%)	70 (3%)	781 (6%)	141 (5%)	8,827 (63%)	1,664 (63%)	17,655 (125%)	3,327 (125%)
Benin	21,516	2,782	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2,778 (13%)	375 (13%)	5,556 (26%)	750 (27%)
Burkina Faso†	24,212	3,273	–	–	–	–	6,215 (26%)	879 (27%)	12,430 (51%)	1,758 (54%)

Countries and areas	Baseline	10% decrease in HepB-BD		20% decrease in HepB-BD		10% decrease in HepB3		20% decrease in HepB3		
	Infections	HBV-related deaths	Excess infections	Excess deaths	Excess infections	Excess deaths	Excess infections	Excess deaths	Excess infections	Excess deaths
Cabo Verde	99	16	21 (21%)	3 (20%)	42 (43%)	7 (41%)	93 (93%)	15 (94%)	185 (186%)	31 (188%)
Côte d'Ivoire	29,963	3,353	116 (0%)	12 (0%)	233 (1%)	25 (1%)	6,915 (23%)	802 (24%)	13,830 (46%)	1,604 (48%)
Gambia	2,711	344	66 (2%)	8 (2%)	132 (5%)	16 (5%)	706 (26%)	93 (27%)	1,412 (52%)	186 (54%)
Ghana†	26,983	3,458	–	–	–	–	7,686 (28%)	1,041 (30%)	15,372 (57%)	2,082 (60%)
Guinea†	33,928	4,380	–	–	–	–	1,919 (6%)	254 (6%)	3,838 (11%)	507 (12%)
Guinea-Bissau†	2,681	303	–	–	–	–	489 (18%)	58 (19%)	978 (36%)	116 (38%)
Liberia†	8,044	1,102	–	–	–	–	1,065 (13%)	151 (14%)	2,130 (26%)	301 (27%)
Mali†	37,884	4,715	–	–	–	–	5,403 (14%)	702 (15%)	10,806 (29%)	1,403 (30%)
Mauritania§	6,338	884	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1,090 (17%)	157 (18%)	2,179 (34%)	315 (36%)
Nigeria	384,442	47,258	6,402 (2%)	725 (2%)	12,804 (3%)	1,450 (3%)	37,659 (10%)	4,704 (10%)	75,318 (20%)	9,408 (20%)
Senegal	9,051	1,328	952 (11%)	134 (10%)	1,905 (21%)	268 (20%)	4,700 (52%)	703 (53%)	9,400 (104%)	1,406 (106%)
Sierra Leone†	5,968	591	–	–	–	–	2,123 (36%)	223 (38%)	4,245 (71%)	446 (76%)
Togo†	10,810	1,336	–	–	–	–	1,971 (18%)	255 (19%)	3,942 (36%)	509 (38%)
Niger†	56,304	7,321	–	–	–	–	7,539 (13%)	1,031 (14%)	15,078 (27%)	2,062 (28%)
Total	675,017	85,096	7,949 (1%)	953 (1%)	15,897 (2%)	1,906 (2%)	97,177 (14%)	13,106 (15%)	194,354 (29%)	26,211 (31%)
Grand Total, African Region	1,564,688	201,170	9,792 (1%)	1,177 (1%)	19,585 (1%)	2,355 (1%)	251,023 (16%)	33,864 (17%)	502,047 (32%)	67,727 (34%)

*Values are numbers for 2019 baseline data or number (%) of infections or deaths for children born in 2020 that were in excess of 2019 values. HBV, hepatitis B virus; HepB-BD, hepatitis B birth dose vaccination; HepB3, third-dose hepatitis B vaccination.

†These countries do not provide HepB-BD; therefore, coverage was not applicable.

‡Mauritius provides HepB-BD only to infants born to mothers who are positive for hepatitis B surface antigen; therefore, HepB-BD coverage in 2020 was not calculated for these countries.

§Mauritania provides HepB-BD to all newborn infants; however, no coverage was reported for HepB-BD vaccinations within the first 24 h after birth in 2019.

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