

# THE LANCET

## Global Health

### Supplementary appendix 3

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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## **Supplementary material**

### **Effect of COVID-19 pandemic response on intrapartum care and stillbirth and neonatal mortality outcomes in Nepal: prospective cohort observational study**

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**Supplementary table 1. Search strategy**

Search number	Query	Sort By	Filters	Search Details	Results	Time	Date
2	((COVID-19) AND (utilization of health services)) AND (quality of intrapartum care)) AND (mortality)		in the last 5 years	(( ("COVID-19"[All Fields] OR "COVID-2019"[All Fields] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept] OR "severe acute respiratory syndrome coronavirus 2"[All Fields] OR "2019-nCoV"[All Fields] OR "SARS-CoV-2"[All Fields] OR "2019nCoV"[All Fields] OR ("Wuhan"[All Fields] AND ("coronavirus"[MeSH Terms] OR "coronavirus"[All Fields])) AND (2019/12[PDAT] OR 2020[PDAT])) ) AND ( "statistics and numerical data"[Subheading] OR ("statistics"[All Fields] AND "numerical"[All Fields] AND "data"[All Fields]) OR "statistics and numerical data"[All Fields] OR "utilization"[All Fields] OR "utilisation"[All Fields] OR "utilisations"[All Fields] OR "utilise"[All Fields] OR "utilised"[All Fields] OR "utilises"[All Fields] OR "utilising"[All Fields] OR "utilities"[All Fields] OR "utility"[All Fields] OR "utilizations"[All Fields] OR "utilize"[All Fields] OR "utilized"[All Fields] OR "utilizer"[All Fields] OR "utilizers"[All Fields] OR "utilizes"[All Fields] OR "utilizing"[All Fields] of "health services"[MeSH Terms] OR ("health"[All Fields] AND "services"[All Fields]) OR "health services"[All Fields] ) ) AND ( "qualities"[All Fields] OR "quality"[All Fields] OR "quality's"[All Fields] of intrapartum care ) ) AND ( "mortality"[MeSH Terms] OR "mortality"[All Fields] OR "mortalities"[All Fields] OR "mortality"[Subheading] )	0	13:42:02 CST	05.07.2020

**Supplementary table 2. Number of doctors and nurse working in labour-delivery room and annual births**

Province	Hospital	Nurses	Doctors	Number of annual birth
Province 1	Koshi Provincial Hospital	16	14	5,464
Province 2	Janakpur Provincial Hospital	13	10	14,300
Bagmati Pradesh	Bharatpur Hospital	23	10	11,006
Gandaki Pradesh	Pokhara Academy of Health Sciences	19	14	8,610
Province 5	Lumbini Provincial Hospital	14	12	8,649
	Bheri Hospital	12	5	4,132
Karnali Pradesh	Surkhet Provincial Hospital	18	6	3,847
Sudurpashchim Pradesh	Seti Provincial Hospital	11	5	6,277
	Dadeldhura Hospital	9	4	3,112

**Supplementary table 3. Weekly institutional birth, weekly rate of change, preterm birth, caesarean birth, low birth weight, institutional stillbirth and neonatal mortality**

Week	Day	Period	total births (N)	Weekly rate of change (%)	Total change between week 1 and week 21 (%)	Preterm (<37 weeks) (N)	Caesarean birth (N)	Low birth weight babies (<2500 gram) (N)	Institutional stillbirth (N)	Institutional neonatal mortality (N)
1	0-6	Pre-COVID-19 LD	1330			226	129	152	16	2
2	7-13	Pre-COVID-19 LD	1187	10.8%		208	126	115	19	0
3	14-20	Pre-COVID-19 LD	1134	4.5%		192	123	120	24	1
4	21-27	Pre-COVID-19 LD	1221	-7.7%		216	107	161	21	3
5	28-34	Pre-COVID-19 LD	1181	3.3%		185	91	127	14	2
6	35-41	Pre-COVID-19 LD	1061	10.2%		172	119	99	9	0
7	42-48	Pre-COVID-19 LD	1179	-11.1%		190	124	108	13	2
8	49-55	Pre-COVID-19 LD	1027	12.9%		155	113	98	15	1
9	56-62	Pre-COVID-19 LD	1145	-11.5%		169	129	109	20	2
10	63-69	Pre-COVID-19 LD	972	15.1%		166	84	128	8	3
11	70-76	Pre-COVID-19 LD	1176	-21.0%		146	108	133	16	1
12.5	77-83	Pre-COVID-19 LD	576	51.0%		91	53	78	4	1
12.5	84-90	COVID-19 LD	420	27.1%		49	38	39	4	1
13	91-97	COVID-19 LD	673	-60.2%		70	47	64	12	0
14	98-104	COVID-19 LD	806	-19.8%		89	54	93	19	3
15	105-111	COVID-19 LD	700	13.2%		95	59	79	23	0
16	112-118	COVID-19 LD	670	4.3%		64	61	64	15	2
17	119-125	COVID-19 LD	789	-17.8%		86	81	77	14	3
18	126-132	COVID-19 LD	789	0.0%		114	67	106	16	6
19	133-139	COVID-19 LD	732	7.2%		154	62	63	13	4
20	140-146	COVID-19 LD	685	6.4%		154	56	69	14	2
21	147-153	COVID-19 LD	633	7.6%	-52.4%	137	64	86	15	2

**Supplementary table 4. Change in number of births before and during LD using the linear regression**

	$\beta$	SE	P-value
<b>Weekly number of birth at beginning of observation period</b>	1262.1	66.1	0.000
<b>Difference in average number of births between pre and during COVID period</b>	-197.7	92.3	0.0462
<b>Average weekly change in number of births in pre-COVID period</b>	-19.7	9.0	0.0419
<b>Average weekly change in number of births during COVID-19 LD</b>	-9.1	14.9	0.5492

**Supplementary Table 5. Participants pre-and during COVID-19 lockdown in terms of demographic, obstetric and neonatal characteristics (N-20,354)**

	Pre-COVID-19 LD		COVID-19 LD		p-value
	n-13,189	% (95% CI)	n-7165	% (95% CI)	
<b>Ethnicity</b>					
<b>Dalit (n-2610)</b>	1652	12.5% (12.0-13.1)	958	13.4% (12.6-14.2)	0.087
<b>Janajati (n-6057)</b>	3920	29.7% (28.9-30.5)	2137	29.8% (28.8-30.9)	0.885
<b>Madhesi (n-4068)</b>	2840	21.5% (20.8-22.2)	1228	17.1% (16.3-18.0)	<0.001
<b>Muslim (n-889)</b>	588	4.5% (4.1-4.8)	301	4.2% (3.8-4.7)	0.409
<b>Brahmin, Chhetri-Hill (n-6484)</b>	4055	30.7% (30.0-31.5)	2429	33.9% (32.8-35.0)	<0.001
<b>Brahmin, Tarai (n-246)</b>	134	1.0% (0.9-1.2)	112	1.6% (1.3-1.9)	0.001
<b>Age (Mean±SD)</b>		24.1±4.4		24.3±4.5	
<b>Age category</b>					
<b>18 years or less (n-1132)</b>	766	5.8% (5.4-6.2)	366	5.1% (4.6-5.6)	0.038
<b>19-24 years (n-10,588)</b>	6946	52.7% (51.8-53.5)	3642	50.8% (49.7-52.0)	0.013
<b>25-29 years (n-5,863)</b>	3715	28.2% (27.4-28.9)	2148	30.0% (28.9-31.1)	0.006
<b>30-34 years (n-2,158)</b>	1373	10.4% (9.9-10.9)	785	11.0% (10.3-11.7)	0.233
<b>35 years or above (n-613)</b>	389	2.9% (2.7-3.3)	224	3.1% (2.7-3.6)	
<b>Parity</b>					
<b>No previous birth (n-7,237)</b>	4624	35.1% (34.3-35.9)	2613	36.6% (35.4-37.7)	0.041
<b>One previous birth (n-7951)</b>	5236	39.8% (38.9-40.6)	2715	38.0% (36.9-39.1)	0.014
<b>Two or more previous birth (n-5130)</b>	3310	25.1% (24.4-25.9)	1820	25.5% (24.3-26.7)	0.612
<b>Complication during admission (n-1,471)</b>	884	6.7% (6.3-7.1)	587	8.2% (7.6-8.9)	0.01
<b>Induction of labour (n-4,540)</b>	2258	17.1% (16.5-17.8)	2282	31.8% (30.8-32.9)	<0.001
<b>Augmentation of labour (n-7,615)</b>	5288	40.1% (39.3-40.9)	2327	32.5% (31.4-33.6)	<0.001
<b>Mode of delivery</b>					
<b>Spontaneous vaginal birth (n-14,614)</b>	9581	72.6% (71.9-73.4)	5060	70.6% (69.6-71.7)	0.002
<b>Assisted vaginal birth (n-600)</b>	374	2.8% (2.6-3.1)	226	3.2% (2.8-3.6)	0.224
<b>Caesarean birth (n-5,113)</b>	3234	24.5% (23.8-25.3)	1879	26.2% (25.2-27.3)	0.007
<b>Birth weight in gram (Mean±SD)</b>		2942.4±492.4		2953.0±518.5	
<b>Low birth weight* (Birth weight less than 2500 gram)</b>					
<b>No (n-17,708)</b>	11316	88.9% (88.3-89.4)	6392	89.5% (88.6-90.3)	
<b>Yes (n-2202)</b>	1429	11.1% (10.6-11.7)	773	10.5% (9.7-11.4)	0.371
<b>Gestational age in weeks (Mean±SD)</b>		38.6±1.7		38.6±2.4	
<b>Preterm* (Gestational age less than 37 weeks)</b>					
<b>No (n-16,443)</b>	10621	83.3% (82.6-83.9)	5822	80.0% (78.9-81.1)	
<b>Yes (n-3,467)</b>	2125	16.7% (16.1-17.4)	1342	20.0% (18.9-21.1)	<0.001
<b>Sex of baby</b>					
<b>Boy (n-11,244)</b>	7362	55.6% (54.7-56.4)	3882	54.2% (52.9-55.6)	.055
<b>Girl (n-9,101)</b>	5820	44.4% (43.5-45.3)	3281	45.7% (44.4-47.1)	
<b>Ambiguous (n-9)</b>	7	0.1% (0.03-0.1)	2	0.04% (0.01-0.1)	

\* missing value-444 red signifies significant change, negative health impact

**Supplementary table 6. Poisson regression on the change in the risk before COVID-19 LD and during LD**

	Induction of labour		Augmentation of labour		Caesarean birth		Low birth weight	
	$\beta$ (95% CI)	p-value	$\beta$ (95% CI)	p-value	$\beta$ (95% CI)	p-value	$\beta$ (95% CI)	p-value
Risk at the beginning of the observation period	0.16 (0.14-0.17)	<0.001	0.41 (0.39-0.43)	<0.001	0.10 (0.090-0.11)	<0.001	0.11 (0.95-0.12)	<0.001
Risk ratio in post COVID period compared to pre COVID period	0.95 (0.84-1.08)	0.405	0.83 (0.75-0.91)	<0.001	0.80 (0.65-0.98)	0.0302	0.92 (0.77-1.10)	0.373
Risk ratio for a between any consecutive weeks during pre COVID period	1.02 (1.00-1.03)	0.011	1.00 (0.99-1.00)	0.27	1.00 (0.98-1.01)	0.648	1.00 (0.99-1.02)	0.701
Risk ratio for a between any consecutive weeks during post COVID period	1.11 (1.09-1.13)	<0.001	1.01 (0.99-1.02)	0.46	1.02 (0.99-1.06)	0.2483	1.01 (0.98-1.04)	0.415



**Supplementary table 7. Total number of observations and health worker's performance on a weekly basis**

Week	Day	Period	Total observation (N)	hand washing practice (n, %)		Use of gloves and gown for child birth (n,%)		Preparation for essential equipment for childbirth(n,%)		Health worker greets mothers (n, %)		Companion during labour (n,%)		FHR monitoring every half an hour (n,%)		Cord clamping after 1min (n,%)		Newborn kept Skin to skin with mother (n,%)		Breast feeding within 1hour (n,%)	
				n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	0-6	Before LD	885	283	32.0%	844	95.4%	665	75.1%	280	31.6%	778	87.9%	422	47.7%	505	57.1%	31	3.5%	229	25.9%
2	7-13	Before LD	703	231	32.9%	668	95.0%	529	75.2%	225	32.0%	565	80.4%	363	51.6%	456	64.9%	38	5.4%	178	25.3%
3	14-20	Before LD	679	179	26.4%	654	96.3%	531	78.2%	228	33.6%	611	90.0%	349	51.4%	415	61.1%	37	5.4%	207	30.5%
4	21-27	Before LD	801	225	28.1%	752	93.9%	619	77.3%	249	31.1%	700	87.4%	409	51.1%	522	65.2%	47	5.9%	365	45.6%
5	28-34	Before LD	718	205	28.6%	678	94.4%	621	86.5%	243	33.8%	628	87.5%	379	52.8%	442	61.6%	36	5.0%	360	50.1%
6	35-41	Before LD	679	147	21.6%	646	95.1%	542	79.8%	207	30.5%	582	85.7%	348	51.3%	428	63.0%	72	10.6%	385	56.7%
7	42-48	Before LD	823	233	28.3%	776	94.3%	684	83.1%	262	31.8%	726	88.2%	435	52.9%	532	64.6%	82	10.0%	432	52.5%
8	49-55	Before LD	621	164	26.4%	595	95.8%	513	82.6%	231	37.2%	542	87.3%	339	54.6%	423	68.1%	94	15.1%	342	55.1%
9	56-62	Before LD	722	221	30.6%	684	94.7%	617	85.5%	264	36.6%	644	89.2%	412	57.1%	492	68.1%	157	21.7%	439	60.8%
10	63-69	Before LD	620	169	27.3%	592	95.5%	519	83.7%	213	34.4%	531	85.6%	343	55.3%	406	65.5%	150	24.2%	335	54.0%
11	70-76	Before LD	711	217	30.5%	675	94.9%	585	82.3%	260	36.6%	603	84.8%	338	47.5%	485	68.2%	186	26.2%	409	57.5%
12.5	77-83	Before LD	266	76	28.6%	254	95.5%	221	83.1%	86	32.3%	223	83.8%	132	49.6%	185	69.5%	75	28.2%	137	51.5%
12.5	84-90	During LD	219	80	36.5%	205	93.6%	173	79.0%	64	29.2%	184	84.0%	94	42.9%	159	72.6%	64	29.2%	89	40.6%
13	91-97	During LD	51	15	29.4%	49	96.1%	45	88.2%	22	43.1%	43	84.3%	13	25.5%	33	64.7%	10	19.6%	16	31.4%
14	98-104	During LD	131	41	31.3%	118	90.1%	101	77.1%	31	23.7%	113	86.3%	29	22.1%	77	58.8%	30	22.9%	30	22.9%
15	105-111	During LD	155	69	44.5%	146	94.2%	128	82.6%	39	25.2%	118	76.1%	56	36.1%	96	61.9%	43	27.7%	44	28.4%
16	112-118	During LD	179	78	43.6%	168	93.9%	135	75.4%	48	26.8%	148	82.7%	77	43.0%	110	61.5%	35	19.6%	39	21.8%
17	119-125	During LD	250	95	38.0%	230	92.0%	199	79.6%	75	30.0%	193	77.2%	114	45.6%	151	60.4%	60	24.0%	84	33.6%
18	126-132	During LD	254	101	39.8%	234	92.1%	207	81.5%	76	29.9%	212	83.5%	135	53.1%	155	61.0%	65	25.6%	76	29.9%
19	133-139	During LD	316	121	38.3%	282	89.2%	253	80.1%	108	34.2%	264	83.5%	136	43.0%	189	59.8%	74	23.4%	147	46.5%
20	140-146	During LD	289	133	46.0%	268	92.7%	248	85.8%	94	32.5%	247	85.5%	134	46.4%	146	50.5%	44	15.2%	142	49.1%
21	147-153	During LD	253	122	48.2%	238	94.1%	220	87.0%	84	33.2%	197	77.9%	134	53.0%	125	49.4%	54	21.3%	134	53.0%

**Supplementary Table 8. Weekly birth rate in 9 hospitals January-May 2019 and January-May 2020**

Week	Day	2019 (January-May)	2020 (January-May)
1	0-6	1207	1330
2	7-13	1281	1187
3	14-20	1347	1134
4	21-27	1111	1221
5	28-34	1202	1181
6	35-41	1203	1061
7	42-48	1141	1179
8	49-55	1129	1027
9	56-62	914	1145
10	63-69	1145	972
11	70-76	1196	1176
12	77-83	1161	996
13	91-97	1147	673
14	98-104	1159	806
15	105-111	1106	700
16	112-118	1057	670
17	119-125	1137	789
18	126-132	1002	789
19	133-139	981	732
20	140-146	1101	685
21	147-153	1028	633

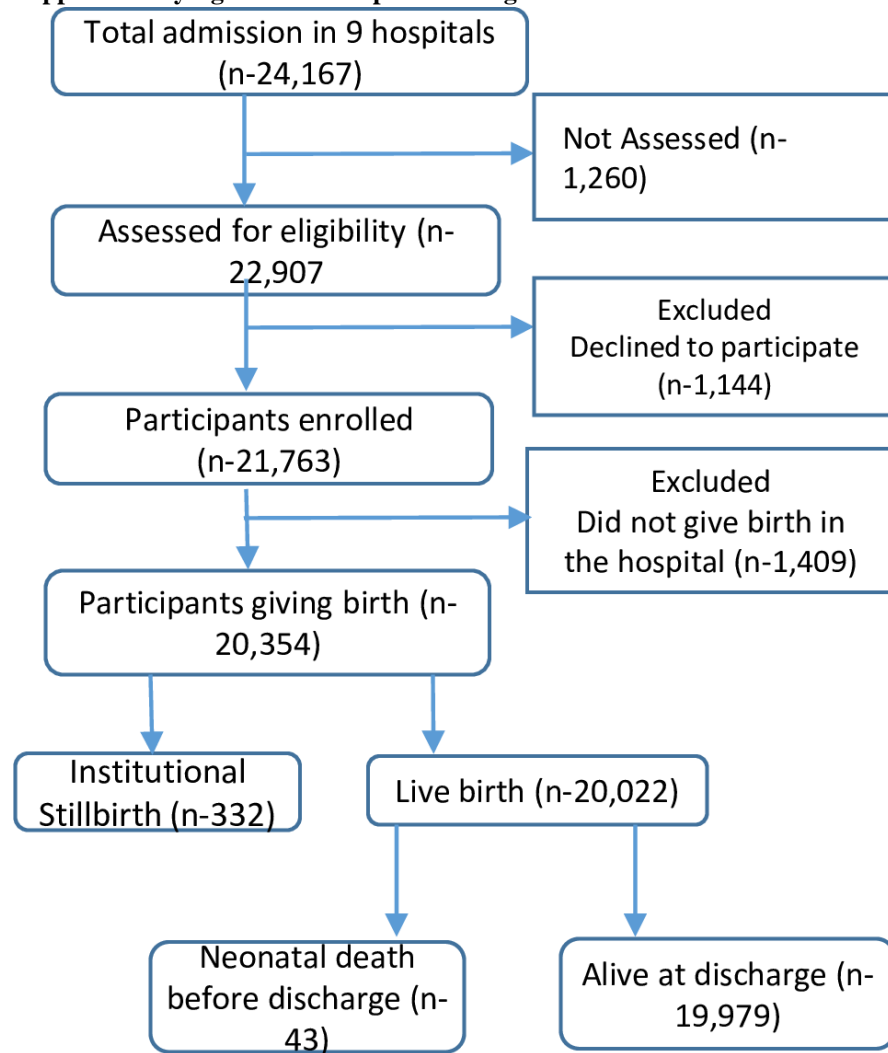
**Supplementary Table 9. The hospital-wise random intercept for caesarean birth, preterm birth, institutional stillbirth and neonatal mortality**

Hospital	Caesarean birth	Pre-term birth	Institutional stillbirth	Institutional neonatal mortality
1	-3.831	-3.111	-5.964	-8.552
2	-2.661	-2.834	-5.925	-8.924
3	-3.625	-2.757	-6.393	-9.163
4	-3.183	-3.054	-5.836	-9.205
5	-3.500	-3.308	-6.491	-9.164
6	-2.377	-3.311	-6.343	-8.572
7	-3.103	-2.323	-6.479	-9.210
8	-2.702	-2.473	-6.237	-8.958
9	-3.143	-3.167	-6.135	-8.862
<b>Standard deviation</b>	<b>0.481</b>	<b>0.355</b>	<b>0.247</b>	<b>0.258</b>

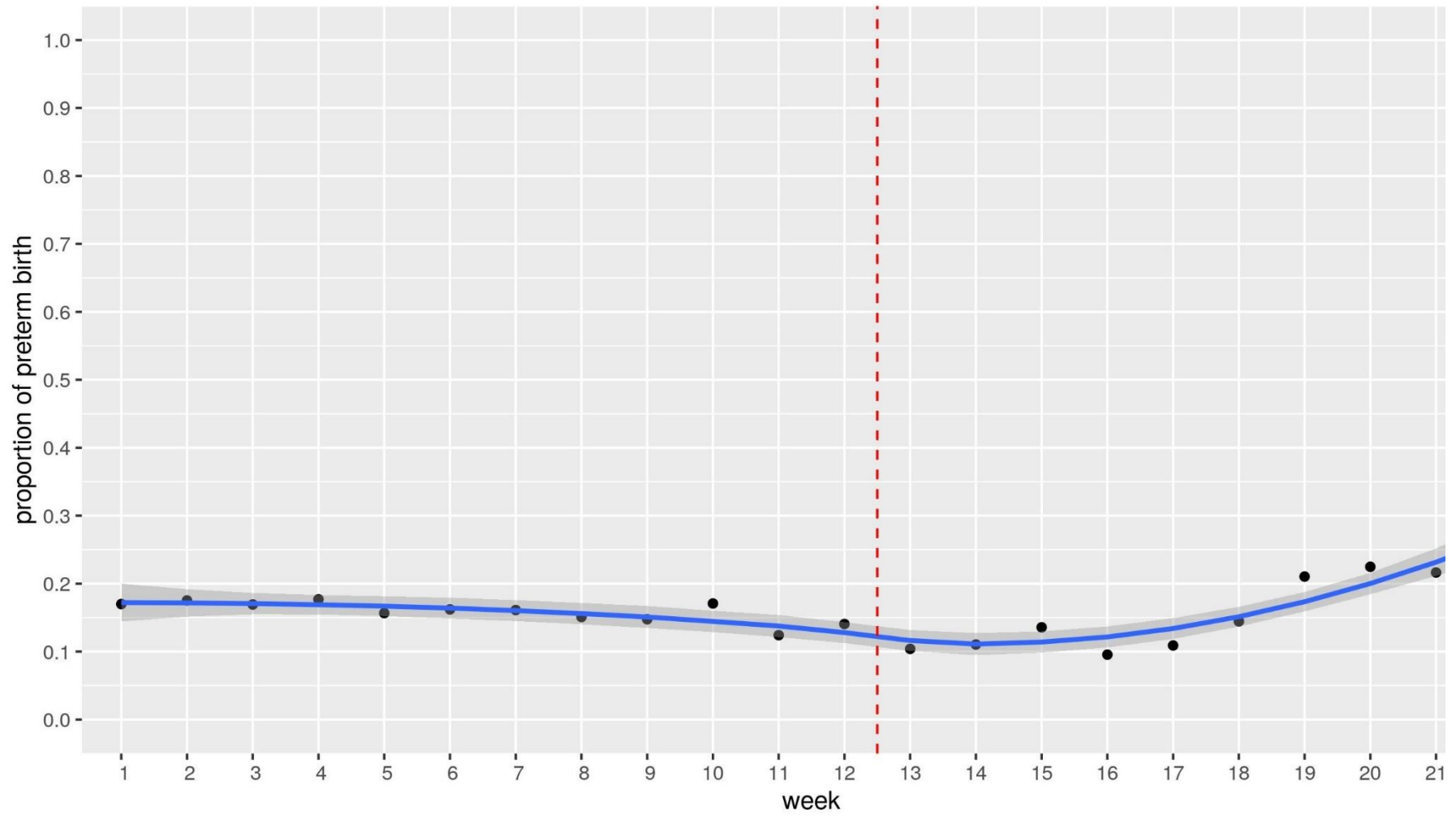
Supplementary figure 1. Map of Nepal and location of hospitals



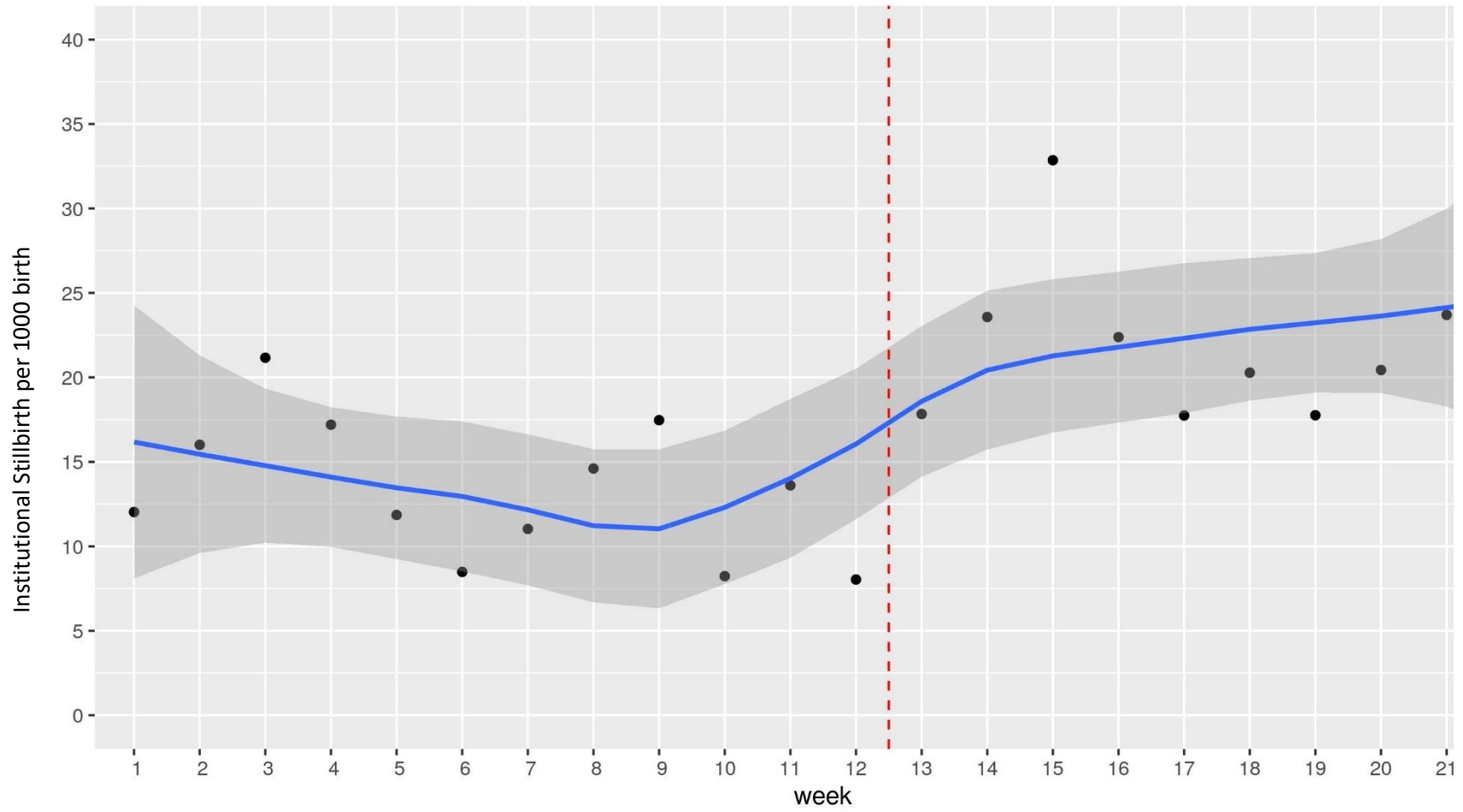
Supplementary figure 2. Participant flow figure



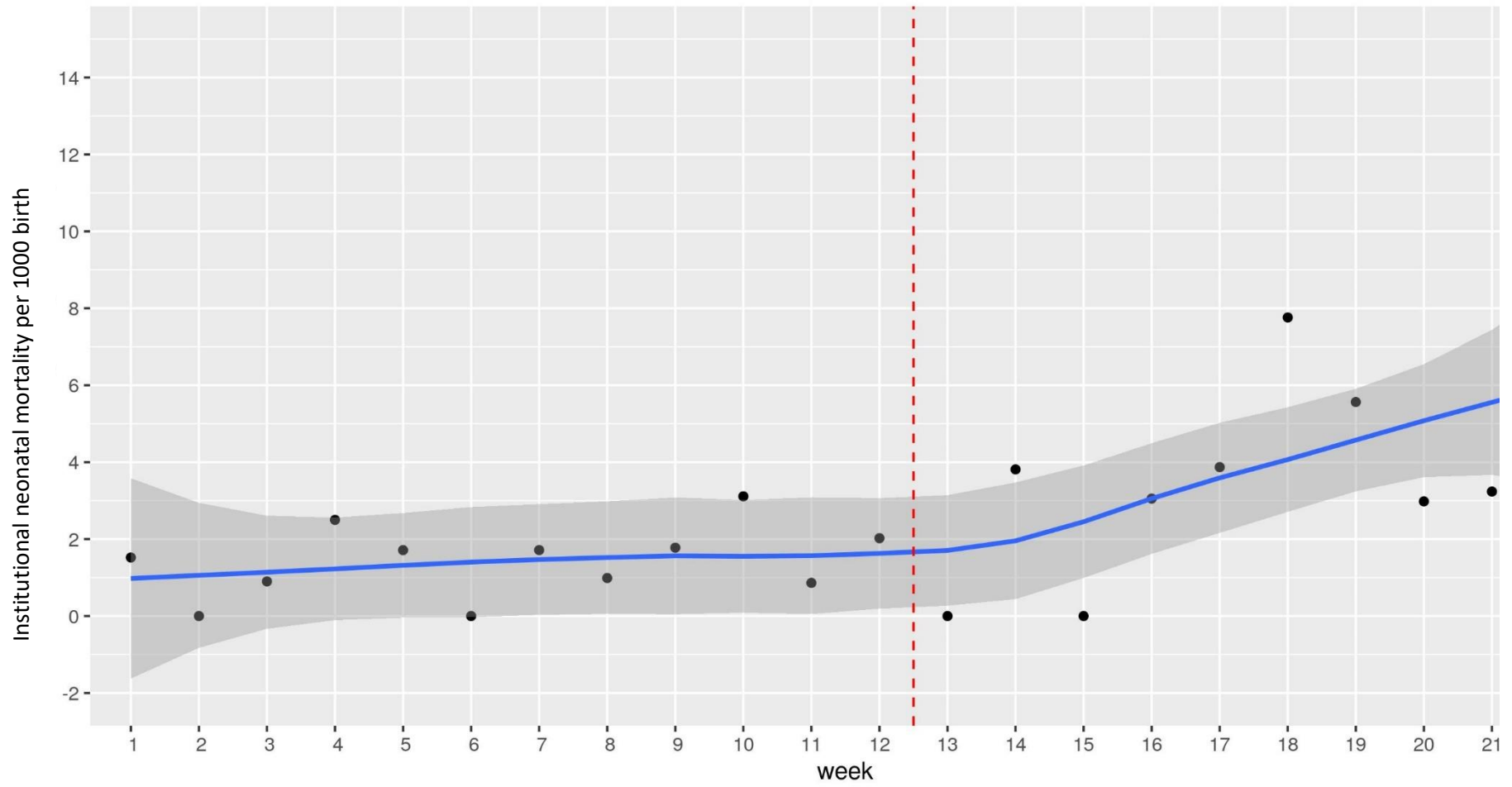
Supplementary figure 3. Weekly change in preterm birth rate before and during COVID-19 LD



Supplementary 4. Weekly change in the institutional stillbirth rate before and during COVID-19 LD

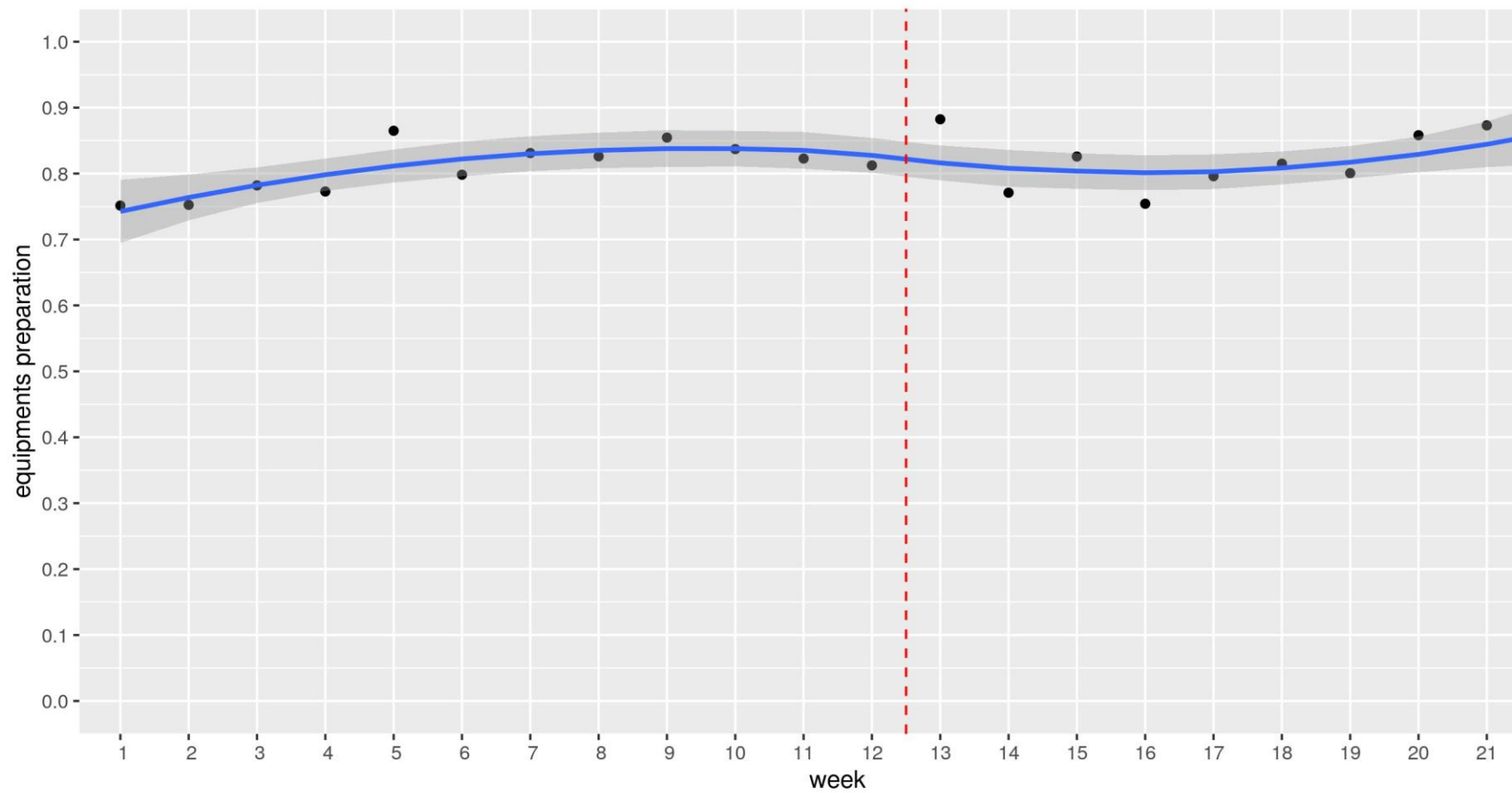


Supplementary figure 5. Weekly change in the institutional neonatal mortality rate before and after COVID-19 LD

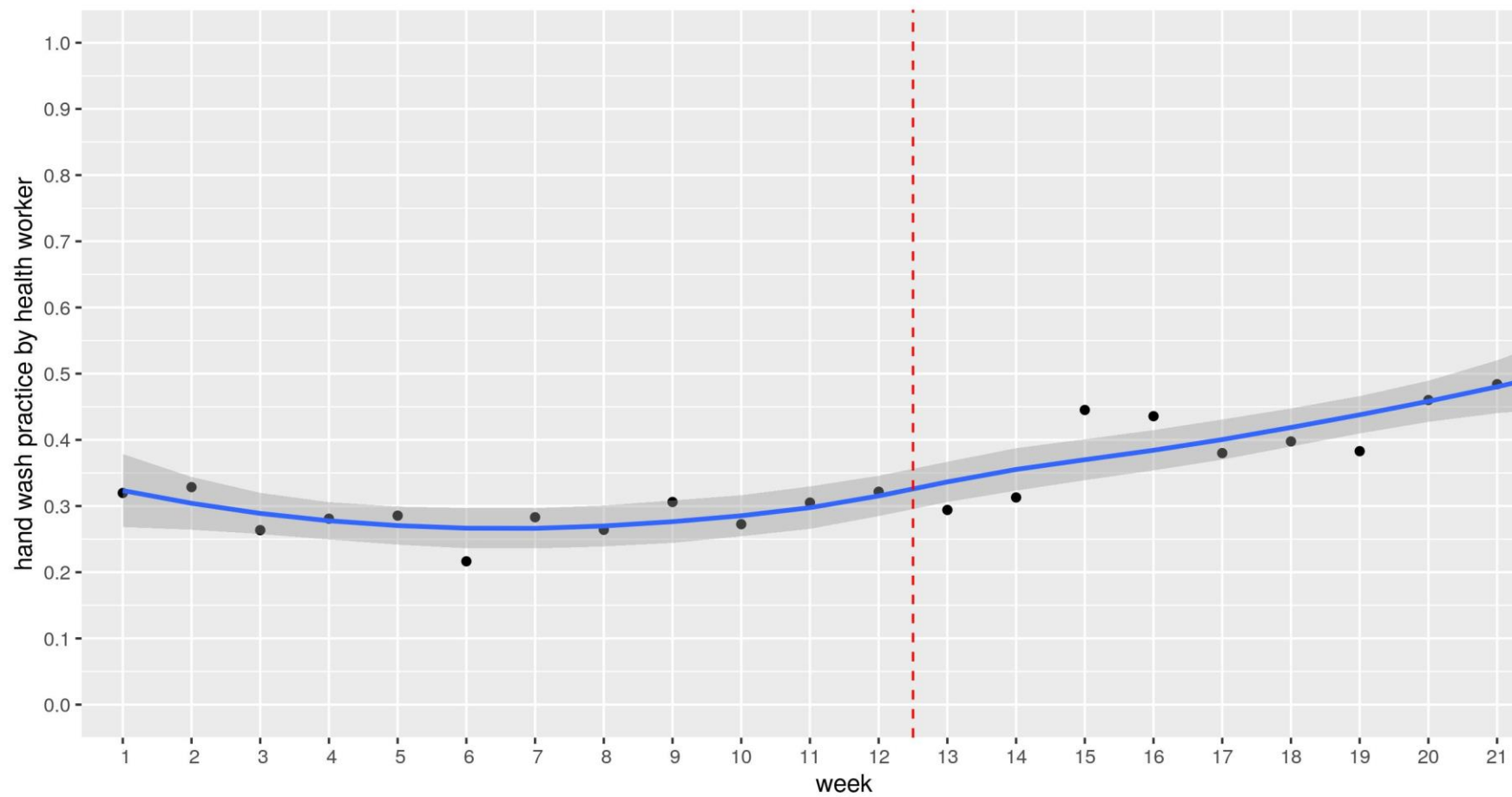




Supplementary figure 6a. Health worker's infection prevention practice, preparation of equipment during childbirth, and changes after Nepal national lockdown (red dotted line)



Supplementary figure 6b. Health worker's infection prevention practice, hand washing as per WHO standard, and changes after Nepal national lockdown (red dotted line)



Supplementary figure 6c. Health worker's infection prevention practice, use of gown and gloves during childbirth, and changes after Nepal national lockdown (red dotted line)

