

## Online Supplementary Document

### A. Additional details for the method section

**Table S1a. Individual level variables from household survey and confounders – Construction of outcome variable**

Variables from household survey	
Variable	Description
Outcome variable: Appropriate PNC score (package of postnatal care interventions received by the newborn)	Composite score constructed using 6 indicators as presented below.  PNC=1 if at least 5 out of 6 interventions were received by the newborn.  PNC=0 if less than 5 out of 6 interventions were received by the newborn.  This variable was constructed given equal weights to each of the components below. Each variable was constructed as a binary: Yes=1 No=0
6 interventions included	1)Newborn weighed at birth, 2) Newborn put to the breast during the first hour after birth, 3) Newborn not having received pre-lacteal feeds, 4) Appropriate thermal care: Baby wiped/dried immediately after birth, 5) Appropriate thermal care: Baby bathed at least 6 hours after birth, 6) Newborn having received a postnatal check at least 2 days after birth ( <i>platform for other interventions not measured</i> )
Potential confounders	
- Place of residence	1=Urban; 2=Rural
- Region	1=Southern, 2=Central, 3=Northern
- Mother's age at delivery	1=<20 years; 2=20-34 years; 3=35-49 years old
- Mother's education	Self-reported mother's highest level of education reached. 1=No education received; 2=Primary only; 3=Secondary or Higher
- Parity	Number of ever born children 1=1; 2=2-3; 3=4-5; 4>=6
- Type of delivery	1= vaginal delivery, 2= C-section
- Size of the baby at birth	1=not very small, 2=very small
- Type of facility	1=Public, 2=Private, 3=CHAM
- Household wealth	1=Poorest; 2=Second; 3=Middle; 4=Fourth; 5=Richest
- Density of high 'delivery and newborn readiness' score health facilities at district level. High is defined as above 70	Number of health facilities with a 'delivery and newborn score' above 70 in each district divided by number of women in each district Density range: [0-8.1] mean 2.98 STD 2.29 1=density below mean 2.98 0=density above mean 2.98

**Table S1b. Delivery and newborn care service readiness score**

<b>Variables from health facility survey</b>	
Facility delivery and newborn care readiness score	<p>This score was constructed following WHO SARA manual Table 4.4.1 (WHO 2013b). The score consists of 3 domains: 1) staff and training, 2) equipment and 3) medications and commodities. Indicators within each domain of service readiness were given equal weight to produce a domain score, and each domain was then weighted equally to produce a summary score for service readiness. All scores range from 0 to 100 and indicate the average percentage of tracer items that are available within the dimension. Summary scores weight each dimension equally.</p> <p>The score is then calculated as the mean score of the three domains:  <math>(\text{Domain 1} + \text{Domain 2} + \text{Domain 3}) / 3</math></p>
<b>Domain 1: Staff and training</b>	$n / 2 \times 100$ , where $n$ is the total number of items available in the domain
2 tracer indicators:	1) Guidelines for Integrated management of pregnancy and childbirth (IMPAC), 2) Staff trained in IMPAC
<b>Domain 2: Equipment and supplies</b>	$n / 12 \times 100$ , where $n$ is the total number of items available in the domain
12 tracer indicators:	<p>1) Emergency transport, 2) Sterilization equipment, 3) Examination light, 4) Delivery pack, 5) Suction apparatus (mucus extractor), 6) Manual vacuum extractor, 7) Vacuum aspirator or D&amp;C kit, 8) Neonatal bag and mask, 9) Delivery bed, 10) Blank partograph 11) Latex Gloves , 12) infant scale*</p> <p>Each item was categorized as a binary variable: 1=Available, 0=Not available                      Observed in service area or in facility (depending on the equipment)</p> <p>*Infant scale is not included in the SARA ref. manual for this domain. However, given then relevance in this analysis it has been included.</p>
<b>Domain 3: Medicines and commodities</b>	$n / 6 \times 100$ , where $n$ is the total number of items available in the domain
6 tracer indicators:	<p>1) Antibiotic eye ointment for newborn, 2) Injectable uterotonic, 3) Injectable antibiotic, 4) Magnesium sulphate (injectable), 5) Skin disinfectant 6) Intravenous solution with infusion set.</p> <p>Observed in service area OR where routinely stored; in stock with at least one</p> <p>Each item was categorized as a binary variable: 1=Available, 0=Not available</p>
<p><b>For the final model, the readiness score variable was constructed as a categorical a binary:                      1=54-62, 2=62-70, 3=&gt;70%</b></p>	

## B. Additional details for the results section

**Table S2. Percentage of health facilities that have a score higher than 70% in each domain of the ‘normal delivery and newborn care’ service readiness score. Results presented by residence, region and district.**

	Domain 1: Staff and training	Domain 2: Equipment and Supplies	Domain 3: Medicines and commodities	Readiness Score*
District/region	High >70% n (%)	High >70% n (%)	High >70% n (%)	High >70% n (%)
Urban	23 (29.8)	60(77.2)	52 (66.2)	41(52.3)
Rural	90 (20.1)	186(41.4)	236 (52.5)	145(32.3)
<u>Central region</u>				
Dedza	5 (17.2)	9(31)	15 (51.8)	8(27.6)
Dowa	9 (42.8)	12(57.1)	13 (61.9)	14(66.7)
Kasungu	2 (10.5)	9(47.3)	4 (21)	5(26.2)
Lilongwe	15 (30.6)	29(57.7)	24 (48)	19(38.4)
Mchinji	5 (35.6)	10(71.1)	8 (57.1)	8(56.8)
Nkhotakota	5 (27.8)	6(33.2)	9 (50)	4(22.2)
Ntcheu	8 (30.8)	15(57.7)	12 (46.1)	9(34.6)
Ntchisi	2 (20)	3(29.9)	2 (20)	2(20)
Salima	3 (19.9)	6(39.8)	9 (59.8)	5(33.2)
Central	53 (26.9)	97(48.9)	94 (47.5)	73(36.7)
<u>Northern Region</u>				
Chitipa	5 (55.2)	7(77.6)	4 (44.4)	5(55.2)
Karonga	2 (13.2)	6(39.5)	12 (80)	9(59.7)
Likoma (a)	1 (50.8)	1(49.2)	2 (100)	1(50.8)
Mzimba	11 (25.6)	17(39.2)	26 (60.3)	17(39.3)
Nkhata Bay	1 (5.6)	7(38.8)	12 (66.7)	4(22.1)
Rumphi	1 (6.1)	8(49.7)	7 (44)	5(31.2)
Northern	21 (20.4)	45(44.4)	62 (61.2)	40(39.6)
<u>Southern Region</u>				
Balaka	5 (45.4)	7(63.6)	9 (81.8)	8(72.7)
Blantyre	3 (11.4)	15(57.9)	12 (46.5)	7(27.1)
Chikwawa	1 (4.8)	12(56.2)	16 (75.2)	8(37.3)
Chiradzulu	1 (9.1)	4(36.3)	6 (54.5)	2(18.1)
Machinga	4 (22.2)	7(38.9)	8 (44.4)	4(22.2)
Mangochi	9 (28)	13(40.5)	11 (34.3)	8(24.9)
Mulanje	4 (18.9)	5(23.8)	15 (71.2)	5(23.7)

Mwanza	1 (24.9)	2(49.9)	2 (49.9)	1(24.9)
Neno	2 (22.2)	4(44.4)	7 (77.8)	3(33.3)
Nsanje	0 (0)	5(35.8)	7 (50.1)	5(35.8)
Phalombe	1 (8.3)	3(25.2)	9 (75.1)	3(25.2)
Thyolo	10 (39.8)	15(60.2)	17 (68.2)	16(64.2)
Zomba	0 (0)	15(50)	15 (53.4)	5(16.8)
Southern	40 (17.4)	104(45.7)	131 (57.7)	73(32)
Total	114 (21.6)	246(46.7)	288 (54.5)	186(35.3)

P-values district	<0.01	0.20	0.01	<0.01
P-values regions	0.05	0.70	0.03	0.35
P-values urban/rural	0.05	<0.01	0.02	<0.01

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\*Equal weighed score of the 3 domains.

(a) District not included in the analysis given that it was not included in the household survey MES 2014.

Table legend: Frequencies and cross-tabulations were weighted to account for the unequal probabilities of selection due to differing client volumes on the interview date. P-values from chi squared test

**Table S3. Univariate analysis of essential PNC interventions for the newborn in the postpartum period, among health facilities births across regions, N=6218**

	Northern		Central		Southern		Total		P-value(a)
	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	N	% [95% CI]	
Districts	6		9		13		28		
N. facilities	102		198		227		528		
Facility births	770		2595		3296		6660		
Newborn weighed at birth	758	98.4 [97.2,99.1]	2477	95.4 [93.0, 97.0]	3191	96.8 [96.0,97.5]	6425	96.5 [95.5,97.2]	0.034
Early initiation of breastfeeding	573	74.4 [69.3,79.0]	2071	79.8 [77.0,82.3]	2428	73.7 [71.4,75.9]	5073	76.2 [74.5,77.8]	0.002
No prelacteal feeding	749	98.8 [97.5,99.4]	2541	98.3 [97.4,98.9]	3211	98.8 [98.3,99.2]	6501	98.6 [98.2,99.0]	0.451
Newborn being wiped/dried immediately after birth	742	96.3 [94.5,97.5]	2480	95.6 [94.0,96.7]	3056	92.7 [91.3,93.9]	6277	94.2 [93.3,95.0]	0.001
Newborn bathed 6 hrs after birth or later	441	59.4 [53.2,65.4]	1803	72.7 [68.9,76.2]	1666	54.5 [51.4,57.6]	3909	62.3 [59.8,64.7]	<0.001
Newborn received PNC visit 2 days after birth	738	95.8 [94.2,97.0]	2257	87 [84.1,89.4]	2889	87.7 [85.9,89.2]	5884	88.3 [86.9,89.7]	<0.001
‘Appropriate PNC’ Newborn received at least 5 postnatal care interventions (listed above)	656	89.5 [85.5,92.6]	2165	87.7 [85.8,89.4]	2457	81.4 [79.4,83.3]	5278	84.9 [83.6,86.1]	<0.001
Newborn received all 6 postnatal care interventions (listed above)	301	41.1 [37,45.39]	1222	49.5 [46.4,52.6]	1120	37.1 [34.4,39.9]	2642	42.5 [40.6,44.5]	<0.001