APPENDIX

Table A1. Institutions and health facilities where interviews were conducted

Country	Central	Region/Province	District	Health facility
Burkina Faso	*DPV Central*	*Direction regional du centre*	*District de Bogodogo*	*CMA sector 30 DS Bogodogo*
				CMU sector 15 DS Bogodogo
				CSPS Dassagho
		DRS Sahel	*Distric Sanitaire de Dori*	*CMU de Dori*
				CSPS Seytenga
		Nord region		*CSPS Gandahol*
				CSPS Yatenga
Ghana	*Korle Bu Accra-National*	*Easter Region*	*Afram Plain district*	*Presbyterian hospital Afram Plain*
		Greater Accra	*Lekma District*	*Lekma Hospital*
		Brong Ahafo Direc.	*Techiman district*	*Holy Family hospital*
Kenya	*Ministry of Health, Unit of vaccines*	Nyanza	Siaya	*Bondo subcounty hospital*
				Rabuor Health Center
				Rota Dispensary Kisumu
				Joo teaching and referral hospital
				Wagai Health Facility Siaya County
			Kemsa Kisumu	*Kisumu county hospital*
				Nyagoko dispensary Siaya County
			EPI-Kisumu County	*Railways dispensary-Kisumu county*
				Akala Health Centre
Mozambique	Ministry of Health	*Province of Maputo*	*Manhiça district*	*Manhiça District Hospital*
				Maragra Hospital
				Palmeira
				Malavela
		Province of Gaza	*Bilene-Macia District*	*Macia District Hospital*
				Messano
				Incaia
Tanzania	*Ministry of Health Dar Es Salaam*	*Dar Es Salaam*	*Kinondoni*	*Mwananyamala Hospital*
				Magomeni Health Centre
				Sinza Health Centre
				Kimara dispensary
		Mtwara	*Tandahimba*	*Tandahimba hospital*
				Kitama dispensary
				Namikupa Health Centre
				Mahuta Health Centre

Interviews took place where institutions are highlighted

Table A2. Summary of the incremental quantities of resources needed at each health system level (per country) for the introduction of the RTS,S malaria candidate vaccine

Cost item	Unit	Burkina Faso	Ghana	Kenya	Mozambique	Tanzania
National level						
Cold room space	m3	60	55	25	-	-
Training	no. courses	3	5	2	2	2
Mobilization	USD, first 2 years	512,260	187,925	99,546	88,553	51,017
Human resources	no. people	4	3	4	9	4
Intermediate level (average across regions/provinces)						
Cold room space	m3	2	15	-	-	-
Training	no. courses	1	3.67	-	2	2
Mobilization	USD, first 2 years	5,523	12,076	-	8,485	210
Human resources	no. people	0.5	0	-	-	1
Other resources						
Vaccine carriers	no.	-	500	-	-	-
Fridges	no.	-	0	-	-	-
Motorbikes	no.	-	0	-	-	-
Shelves	no	-	4	-	-	-
Ice packs	no.	-	5,400	-	-	-
Cold boxes	no.	-	225	-	-	-
Car/truck	no.	-	-	-	-	1
Intermediate level (average across districts)						
Cold room space	m3	18.7	-	-	-	-
	m2	30	9.1	-	-	-
Training	no. courses	2	5.33	4	2.5	2
Mobilization	USD, first 2 years	3,426	27,569	53,451	1,181	350
Human resources	no. people	1	0.33	11	7	1.5
Other resources						
Vaccine carriers	no.	50	-	-	-	-
Fridges	no.	2.5	2	-	-	-
Motorbikes	no.	8	-	-	-	-
Cold boxes	no.	-	-	10	-	-
Cars	no.	-	-	2	-	-
Health facility level (average across health facilities)						
Training	no. courses	1.4	2.33	1.67	3	2
Mobilization	USD, first 2 years	828	5,595	8,563	1,527	-
Human resources	no. people	1.4	0.33	4.33	1.57	3
Other resources						
Vaccine carriers	no.	-	2.67	-	-	-
Cold boxes	no.	-	2.33	-	-	-
Fridges	no.	1.25	1.33	0.88	1	1
Motorbikes	no.	1.25	2.67	1.13	1.6	0.43
Cars	no.	0	0.67	0.5	1.22	0.57

no.: number

8 **Table A3. Number of infants to vaccinate from 2015 to 2025, district, region and national levels**

Level	Name	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Burkina Faso												
District	District de Bogodogo	30,970	30,970	30,970	30,970	30,970	33,648	33,648	33,648	33,648	33,648	33,648
District	District Sanitaire de Dor	14,063	14,063	14,063	14,063	14,063	15,279	15,279	15,279	15,279	15,279	15,279
	Total districts	45,034	45,034	45,034	45,034	45,034	48,027	48,027	48,027	48,027	48,027	48,027
Region	Direction regional de ??	102,647	102,647	102,647	102,647	102,647	111,521	111,521	111,521	111,521	111,521	111,521
Region	DRS Sahel	52,113	52,113	52,113	52,113	52,113	56,619	56,619	56,619	56,619	56,619	56,619
	Total regions	154,760	154,760	154,760	154,760	154,760	168,140	168,140	168,140	168,140	168,140	168,140
National		742,617	742,617	742,617	742,617	742,617	806,820	806,820	806,820	806,820	806,820	806,820
Ghana												
District	Techiman Municipal	7,346	7,346	7,346	7,346	7,346	7,492	7,492	7,492	7,492	7,492	7,492
District	Afram Plain Kwahu ??	7,750	7,750	7,750	7,750	7,750	7,004	7,004	7,004	7,004	7,004	7,004
District	Lekma district	8,095	8,095	8,095	8,095	8,095	8,255	8,255	8,255	8,255	8,255	8,255
	Total districts	23,191	23,191	23,191	23,191	23,191	23,652	23,652	23,652	23,652	23,652	23,652
Region	Easter Region	93,514	93,514	93,514	93,514	93,514	95,370	95,370	95,370	95,370	95,370	95,370
Region	Greater Accra	142,413	142,413	142,413	142,413	142,413	145,239	145,239	145,239	145,239	145,239	145,239
Region	Brong Ahafo Direc.	82,072	82,072	82,072	82,072	82,072	83,701	83,701	83,701	83,701	83,701	83,701
	Total regions	317,998	317,998	317,998	317,998	317,998	324,309	324,309	324,309	324,309	324,309	324,309
National		884,938	884,938	884,938	884,938	884,938	902,502	902,502	902,502	902,502	902,502	902,502
Kenya												
District	Saya	19,148	19,148	19,148	19,148	19,148	20,101	20,096	20,096	20,096	20,096	20,096
District	Kisuma	23,239	23,239	23,239	23,239	23,239	24,396	24,389	24,389	24,389	24,389	24,389
	Total districts	42,386	42,386	42,386	42,386	42,386	44,497	44,485	44,485	44,485	44,485	44,485
National		1,603,963	1,603,963	1,603,963	1,603,963	1,603,963	1,683,819	1,683,366	1,683,366	1,683,366	1,683,366	1,683,366
Mozambique												
District	Manhica district	9,909	9,909	9,909	9,909	9,909	10,821	10,821	10,821	10,821	10,821	10,821
District	Macia Bilene district	6,415	6,415	6,415	6,415	6,415	7,004	7,004	7,004	7,004	7,004	7,004
	Total districts	16,324	16,324	16,324	16,324	16,324	17,825	17,825	17,825	17,825	17,825	17,825
National		1,125,677	1,125,677	1,125,677	1,125,677	1,125,677	1,229,170	1,229,170	1,229,170	1,229,170	1,229,170	1,229,170

Level	Name	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tanzania												
District	Kinondoni	72,386	72,386	72,386	72,386	72,386	79,419	79,419	79,419	79,419	79,419	79,419
District	Tandahimba	9,278	9,278	9,278	9,278	9,278	10,179	10,179	10,179	10,179	10,179	10,179
	Total districts	81,664	81,664	81,664	81,664	81,664	89,599	89,599	89,599	89,599	89,599	89,599
Region	Dar es Salaam	177,984	177,984	177,984	177,984	177,984	195,278	195,278	195,278	195,278	195,278	195,278
Region	Mtwara	51,825	51,825	51,825	51,825	51,825	56,860	56,860	56,860	56,860	56,860	56,860
	Total regions	229,809	229,809	229,809	229,809	229,809	252,139	252,139	252,139	252,139	252,139	252,139
National		2,162,687	2,162,687	2,162,687	2,162,687	2,162,687	2,372,830	2,372,830	2,372,830	2,372,830	2,372,830	2,372,830

Notes: Number of births minus 1/2 infant mortality, assuming that 1/2 of infants who dies will not even receive one dose whereas those surviving will receive all doses.

Sources: National figures and infant mortality from United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, DVD Editions. District and regional figures from local most recent population censuses. It is assumed that the number of births at the local level is proportionally the same as at the national level.

16 **Table A4. Minimum and maximum estimates of average cost per FVC assuming vaccine price of USD 2 or 10**

Cost item	Burkina Faso		Ghana		Kenya		Mozambique		Tanzania	
	USD	% of subtotal	USD	% of subtotal	USD	% of subtotal	USD	% of subtotal	USD	% of subtotal
Non-recurrent costs										
Cold room/equipment										
Min	0,28	14,47	0,36	28,73	0,91	7,23	0,61	18,43	2,29	55,71
Max	0,29	14,60	0,40	18,34	0,91	6,62	0,64	17,04	2,75	51,04
Training										
Min	0,15	7,89	0,29	22,59	0,37	3,00	0,13	4,01	0,22	5,39
Max	016	8,16	0,90	41,89	0,86	6,28	0,17	4,70	0,32	5,90
Mobilization										
Min	0,13	6,44	0,18	14,14	0,14	1,11	0,08	2,56	0,00	0,07
Max	0,14	7,23	0,43	19,67	0,26	1,85	0,13	3,41	0,00	0,07
Human resources										
Min	1,73	90,15	0,58	46,13	13,78	109,87	2,92	87,93	2,57	62,56
Max	1,73	88,86	0,62	28,79	14,50	105,81	3,27	87,67	3,59	66,61
Between levels adjustment (-)										
Min	0,36	18,96	0,15	11,59	2,66	21,22	0,43	12,93	0,97	23,73
Max	0,36	18,84	0,19	8,68	2,82	20,56	0,47	12,82	1,27	23,62
Sub-total										
Min	1,91	100,00	1,27	100,00	12,54	100,00	3,32	100,00	4,10	100,00
Max	1,95	100,00	2,15	100,00	13,71	100,00	3,73	100,00	5,39	100,00
Recurrent costs (vaccine related)										
Vaccine										
Min	6,75	89,43	7,40	85,37	7,64	88,75	6,55	84,63	7,01	88,16
Max	33,8	89,43	37,0	85,38	38,18	88,76	32,74	84,63	35,06	88,17
Vaccine wastage										
Min	0,79	10,56	1,27	14,62	0,96	11,23	1,19	15,36	0,94	11,83
Max	3,98	10,56	6,34	14,62	4,83	11,24	5,94	15,36	4,71	11,83
Air freight										

	Burkina Faso		Ghana		Kenya		Mozambique		Tanzania	
Min	0,001	0,010	0,001	0,010	0,001	0,012	0,001	0,010	0,001	0,009
Max	0,002	0,004	0,002	0,004	0,001	0,002	0,001	0,002	0,002	0,003
Sub-total										
Min	7,55	100,00	8,68	100,00	8,60	100,00	7,73	100,00	7,95	100,00
Max	37,7	100,00	43,39	100,00	43,01	100,00	38,68	100,00	39,77	100,00
Recurrent costs (four doses at health facility)										
Labor										
Min	0,02	4,01	0,04	10,88	0,08	14,40	0,02	7,05	0,16	15,09
Max	0,24	10,31	0,25	10,62	0,09	7,43	0,17	5,19	0,23	19,93
Supplies										
Min	0,30	95,99	0,30	89,12	0,47	85,60	0,38	92,95	0,90	84,91
Max	2,02	89,69	2,08	89,38	1,03	92,57	3,21	94,81	0,90	80,07
Sub-total										
Min	0,31	100,00	0,33	100,00	0,54	100,00	0,40	100,00	1,06	100,00
Max	2,23	100,00	2,33	100,00	1,12	100,00	3,38	100,00	1,12	100,00
Total cost (four doses at health facility)										
Min	9,78		10,28		21,70		11,46		13,11	
Max	41,95		47,87		57,83		45,80		46,27	
Recurrent costs (three doses at health facility, one as outreach)										
Labor										
Min	0,07	16,83	0,18	23,64	0,14	22,69	0,25	33,22		
Max	0,97	28,58	0,74	19,22	0,23	17,73	0,38	11,29		
Supplies										
Min	0,03	7,23	0,30	39,12	0,47	76,44	0,38	51,65		
Max	0,40	11,72	2,08	54,04	1,03	81,41	2,84	85,03		
Fuel										
Min	0,30	75,94	0,29	37,24	0,01	0,87	0,11	15,14		
Max	2,03	59,71	1,04	26,74	0,01	0,86	0,12	3,68		

	Burkina Faso		Ghana		Kenya		Mozambique		Tanzania	
Sub-total										
Min	0,40	100,00	0,76	100,00	0,61	100,00	0,73	100,00		
Max	3,38	100,00	3,86	100,00	1,27	100,00	3,34	100,00		
Total cost (three doses at health facility, one as outreach)										
Min	9,87		10,71		7,64		11,79			
Max	43,08		49,40		38,18		45,75			

Table A5. Estimated time for reconstruction and administration of 1 dose needle-administered vaccine and for outreach delivery

	Average personnel time for reconstruction and administration 1 dose at the health facility level (minutes)*	Average commuting time for outreach delivery at the health facility level (minutes)**
Burkina Faso	1.53	60.22
Ghana	3.59	120
Kenya	2.00	57.5
Mozambique	4.40	85
Tanzania	4.38	NA

*This estimate was done across self reported time needed for vaccine reconstruction and administration of 1 dose across health facilities per each vaccine similar to RTS,S, that is needle administered vaccines (e.g., polio oral vaccine was not included). Average time per vaccine was, then averaged across the vaccines considered (number and type of vaccines was different across country – e.g., yellow fever was not considered in Mozambique as the country is not endemic, but it was for Burkina Faso).

**This estimate reflects the scenario in which the fourth dose is delivered in an outreach manner. These average values were calculated across health facility for each vaccine type. As for administration time, average time per vaccine was, then averaged across the vaccines considered. The reported time taken to reach the communities (and back) was then divided by an average speed of cars/motorbikes (assumed as 60km/hour), divided by the number of km per liter of gasoline and multiplied by cost of a liter of gasoline.

Questionnaire for representatives of the Expanded Programme on Immunization

Cost of implementation of malaria vaccination programmes in five select sub-Saharan African countries

(Burkina Faso, Ghana, Kenya, Mozambique, Tanzania)

Country, specify:_____

Level of interview (Ministry of Health, district, province, health facility, etc), specify:

_____

Where relevant provide your feedback specifically in the light of the level that is applying to your role and responsibility as per above information

Questionnaire #(for level specified above):_____

MONITORING, EVALUATION AND QUALITY CONTROL OF EPI

1

Name the systems of monitoring, evaluation and quality control of EPI **HIGH**

a. _____

b. _____

c. _____

VACCINES PROCUREMENT AND GENERAL INFORMATION

2

In the last 3 years, detail the formulation of each vaccine in EPI and your supplier/producers **HIGH**

Vaccine	Formulation	Producer
YF		
BCG		
OPV		
Measles		
VitaminA		
Rotavirus		
Td		

MR		
DTwPHibHepB		
Pneumo_conj		

Please, verify whether EPI schedule provided applies to your country:

YF=Yellow fever vaccine; BCG=Bacille Calmette-Guérin vaccine; OPV=Oral polio vaccine; Measles=Measles vaccine; VitaminA=Vitamin A supplementation; TT=Tetanus toxoid; Pneumo_conj=Pneumococcal conjugate vaccine; DtwPHibHepB=Diphtheria and Tetanus and Pertussis and Haemophilus influenzae and Hepatitis B; IPV=Inactivated polio vaccine; Rotavirus=Rotavirus vaccine; HPV=Human Papillomavirus vaccine

Country **(cross the countries that are not applicable)**	**Antigens**	**Schedules**	**Provide information in this column if deviating from information in previous column**	**Comments**
Burkina Faso	YF	9 months;		
	BCG	birth;		
	OPV	birth; 8, 12, 16 weeks;		
	Measles	9 months;		
	TT	1st contact pregnancy; +1 month; +1, +2, +3 years;		
	Pneumo_conj	8, 12, 16 weeks;		
	DTwPHibHepB	8, 12, 16 weeks;		
	Rotavirus	8, 12, 16 weeks;		
Ghana	YF	9 months;		
	BCG	birth;		
	OPV	birth; 6, 10, 14 weeks;		
	Measles	9, 18 months;		
	VitaminA	6, 12, 18, 24, 30, 36 months;		

	Rotavirus	6, 10 weeks;		
	Td	1st contact; +1, +6 months; +1 year;		
	MR	9 months;		
	DTwPHibHepB	6, 10, 14 weeks;		
	Pneumo_conj	6, 10, 14 weeks;		
Kenya	YF	9 months;		
	BCG	birth;		
	OPV	6, 10, 14 weeks;		
	Measles	9 months;		
	VitaminA	6-11, 12-59 months;		
	TT	1st contact pregnancy; +1, +6 months; +1, +1 year;		
	Pneumo_conj	6, 10, 14 weeks;		
	DTwPHibHepB	6,10,14 weeks;		
	IPV			
	Rotavirus			
	HPV			
Mozambique	BCG	birth;		
	OPV	6, 10, 14 weeks;		
	Measles	9 months;		
	VitaminA	6, 12, 18, 24, 30, 36 months;		
	TT	1st contact; +1, +6		

		months; +1, +1 year;		
	Pneumo_conj	6, 10, 14 weeks;		
	DTwPHibHepB	6, 10, 14 weeks;		
	HPV	10 years;		
Tanzania	BCG	birth;		
	OPV	Birth; 6, 10, 14 weeks;		
	Measles	9 months;		
	TT	1st contact; +1, +6 months; +1, +1 year;		
	Pneumo_conj	6, 10, 14 weeks;		
	DTwPHibHepB	6, 10, 14 week;		
	Rotavirus	, 10 weeks;		

In the last 3 years, what was the average frequency in supplying each vaccine?

YF: |__|__|__|__| a year **BCG**: |__|__|__|__| a year **OPV**: |__|__|__|__| a year

Measles: |__|__|__|__| a year **Vitamin A**: |__|__|__|__| a year **TT**: |__|__|__|__| a year

Pneumo conj: |__|__|__|__| a year **DTwPHibHepB**: |__|__|__|__|a year

HPV: |__|__|__|__| a year **Rotavirus:** |__|__|__|__| a year

Can you estimate the mean rate of vaccine wastage (all causes including e.g. expiry, rupture of cold chain) at all levels based on experience with current EPI programmes? Can you also provide a minimum and a maximum? ***Consider all level, from central up to local or only the level you are responsible for .***

Central level: |__|__|__|% min|__|__|__|% max |__|__|__|%

Regional level: |__|__|__|% min|__|__|__|% max |__|__|__|%

Local level: |__|__|__|% min|__|__|__|% max |__|__|__|%

In the last 3 years, which were the main funders for each type of vaccine?

Vaccine	**Funders**
YF	
BCG	
OPV	
Measles	
VitaminA	
Rotavirus	
Td	
MR	
DTwPHibHepB	
Pneumo_conj	

In the last 3 years, what was the mean share of national health budget dedicated to EPI? Can you also establish a minimum and a maximum?

|__|__|__| % over the whole national health budget min|__|__|__|% max |__|__|__|%

What is the average budget projected for the EPI for the next 5 years at the national level or the level that applies to you? If there is not such projection, can you estimate it?

|__|__|__|__|__|__|__|__|__|__| currency_____

min |__|__|__|__|__|__|__|__|__| max |__|__|__|__|__|__|__|__|__|

3 **Which are the most recent estimates on the average coverage (min and max) of each vaccine at the level that applies to you?**

YF |__|__|% min |__|__|% max |__|__|%

BCG |__|__|% min |__|__|% max |__|__|%

OPV |__|__|% min |__|__|% max |__|__|%

Measles |__|__|% min |__|__|% max |__|__|%

Vitamin A |__|__|% min |__|__|% max |__|__|%

TT |__|__|% min |__|__|% max |__|__|%

Pneumo conj |__|__|% min |__|__|% max |__|__|%

HPV |__|__|% min |__|__|% max |__|__|%

DTwPHibHepB |__|__|% min |__|__|% max |__|__|%

Rotavirus |__|__|% min |__|__|% max |__|__|%

4 **How many doses of each vaccine on average entered and many were distributed to the lower level (HIGH, MEDIUM) last year?**

YF: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

BCG: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

OPV: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

Measles: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

Vit A: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

TT: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

Pneumo conj: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

HPV: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

DtwPHibHepB: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

Rotavirus: IN |__|__|__|__|__|__|__|__| OUT|__|__|__|__|__|__|__|__|

If IN ≠ OUT please specify reason

_____

What are the current social mobilization activities in place for immunization (e.g. posters, T shirts, radio)? Can you estimate the total costs of each of them?

a. _____

cost|__|__|__|__|__|__|__|__| currency_____ min|__|__|__|__|__|__|__|__|

max|__|__|__|__|__|__|__|__|

b. _____

cost|__|__|__|__|__|__|__|__| currency_____ min|__|__|__|__|__|__|__|__|

max|__|__|__|__|__|__|__|__|

c. _____

cost|__|__|__|__|__|__|__|__| currency_____ min|__|__|__|__|__|__|__|__|

max|__|__|__|__|__|__|__|__|

d. _____

cost|__|__|__|__|__|__|__|__| currency_____ min|__|__|__|__|__|__|__|__|

max|__|__|__|__|__|__|__|__|

5 **How much additional fund can you estimate are needed for sensitization activities for the introduction of an additional vaccine (first 2 years)?**

cost|__|__|__|__|__|__|__|__| currency_____

min|__|__|__|__|__|__|__|__| max|__|__|__|__|__|__|__|__|

6 Is there a surveillance system in place for vaccine preventable diseases in the country?

□ yes, in the whole country

□ yes, in some areas only

□ no

7 Who manages the surveillance system in place?

□ Ministry of Health

□ Research institutions

□ NGOs

□ Other _____

8 Which is the annual costs of running such a surveillance system (or can you estimate how much it may cost each year?)

cost|__|__|__|__|__|__|__|__|__| currency_____

min|__|__|__|__|__|__|__|__|__| max|__|__|__|__|__|__|__|__|

CUSTOM CLEARANCE

Concerning the air freight (including insurance), what is the cost or tariff per m^3?

|__|__|__| local currency/m^3

What is the freight volume?

Small scale: |__|__|__| liters

Medium scale: |__|__|__| liters

Large scale: |__|__|__| liters

What is the number of freights a year?

Small scale: |__|__|__| freights

Medium scale: |__|__|__| freights

Large scale: |__|__|__| freights

What is the number of freights a year?

Small scale: |__|__|__| freights

Medium scale: |__|__|__| freights

Large scale: |__|__|__| freights

What is the average transit time?

|__|__|__|hours

COLD CHAIN STORAGE

What is the tariff per m^3 a month?

|__|__|__|local currency

What is the storage volume?

Small scale: |__|__|__| liters

Medium scale: |__|__|__| liters

Large scale: |__|__|__| liters

What are on the average the months of storage a year?

Small scale: |__|__|__| months

Medium scale: |__|__|__| months

Large scale: |__|__|__| months

SUPPLY CHAIN MANAGEMENT

Where is your central storage located?

_____

9 **Please describe in-bound logistics (check all that applies):**

HIGH

a. How is the central storage equipped?

□ With trucks from the airport and number |__|__|;

□ With trucks from the port and number ;

□ Every month, otherwise Every _____

What is your current capacity of the central/intermediate storage system?

HIGH/MEDIUM

b. Effective storage volume (m^3) _____ Tariff/m3 |__|__|
c. yearly average utilized capacity (%)_____
d. inventory turnover rate _____
e. OR average duration a batch of vaccines remains in the central warehouse (days)_____

10 **How many personnel work at the central/intermediate storage, by role, and how many EPI vaccines stored/handled on the average? HIGH/MEDIUM**

Role_____ Number _____ Annual salary_____ # vaccines__

Role _____ Number_____ Annual salary_____# vaccines__

Role _____ Number_____ Annual salary_____ # vaccines__

Role _____ Number_____ Annual salary_____# vaccines__

11 **Other costs (annual) at the central/intermediate storage**

HIGH/MEDIUM

Electricity _____ currency_____

Rent _____ currency_____

Maintenance _____ currency_____

Other _____ currency_____

Other _____ currency_____

12 **Would the storage system nationally or at your level be ready to accommodate an incremental vaccine with no additional resources?**

HIGH/MEDIUM

□ Yes, the estimated space capacity is _____m3

□ No, because _____

13 **If no, please detail the additional resources needed**

Personnel :

Role _____ Number_____

Role _____ Number_____

Role _____ Number_____

Role _____ Number_____

Role _____ Number_____

Durable goods:

□ More space M^2_____

□ More cold room space M^3_____

□ Other _____ Quantity_____

□ Other _____ Quantity_____

14 **How often does the distribution of vaccines from central/intermediate storage to the other country levels take place?**

HIGH/MEDIUM

□ weekly

□ monthly

□ Other, specify: _____

15 **What kind of rule regulates vaccine distribution?**

HIGH/MEDIUM

□ push (distribution happens based on predetermined rules and not depending on request from lower levels of the system)

□ pull (distribution happens upon request from lower levels of the system)

□ Other _____

16 **How does distribution to the lower levels take place?**

HIGH/MEDIUM

□ Through transportation (mean of transportation owned by the government) directly organized by the government

□ Transportation and distribution out-sourced to private companies

□ Other _____

What is your current capacity of the transportation system organized by the government? HIGH**/MEDIUM**

How many trucks/cars? |__|__|__|

Number of cold boxes |__|__|__|__|

Effective transportation volume capacity (m^3) |__|__|__|__|

17 **Which are on average (min, max) the annual transportation costs for vaccine distribution?** HIGH**/MEDIUM**

Personnel |__|__|__|__|__|__|__|__| currency____

min|__|__|__|__|__|__|__|__| max|__|__|__|__|__|__|__|__|

Fuel |__|__|__|__|__|__|__|__| currency____

min|__|__|__|__|__|__|__|__| max|__|__|__|__|__|__|__|__|

Maintenance |__|__|__|__|__|__|__|__| currency____

min|__|__|__|__|__|__|__|__| max|__|__|__|__|__|__|__|__|

Other_____ |__|__|__|__|__|__|__|__|

currency____ min|__|__|__|__|__|__|__|__| max|__|__|__|__|__|__|__|__|

What is the approximate distance between this storage place and the next level? HIGH**/MEDIUM**

Average |__|__|__|__|kilometers min |__|__|% max |__|__|%

What is the availability of cold boxes?

Average number|__|__|__|__| cold boxes min |__|__|__|__| max |__|__|__|__|

What is the estimated capacity of a cold box?

Average |__|__|__|__| liters min |__|__|__| max |__|__|__|

Actors involved in supply chain and roles (public/partnership public-private/private/non-governmental organizations)
HIGH**/MEDIUM**

Public_____

Roles_____

Partnership public-

private_____Roles_____

___

NGOs_____Roles_____

_____

HUMAN RESOURCES AT EPI FACILITY (VACCINE ADMINISTRATION)

How many employees at this level = Health facility delivering EPI?per type of role (managers, nurse, etc.)?

- How many managers? |__|__|__|__|__|
- How many nurses? |__|__|__|__|__|
- How many physicians? |__|__|__|__|__|
- Other _____ |__|__|__|__|__|
- Other _____ |__|__|__|__|__|
- Other _____ |__|__|__|__|__|

How many additional employees (roles and average salaries per role) would be needed for the introduction of the new vaccine?

- How many additional managers? |__|__|__| (EPI) |__|__|__| (outside EPI)
- yearly salary |__|__|__|__|__|__| currency _____

- How many additional nurses? |__|__|__| yearly salary |__|__|__|__|__|__| currency _____
- How many additional physicians? |__|__|__| yearly salary |__|__|__|__|__|__| currency _____
- Other_____ |__|__|__| yearly salary |__|__|__|__|__|__| currency _____
- Other_____ |__|__|__| yearly salary |__|__|__|__|__|__| currency _____
- Other_____ |__|__|__| yearly salary |__|__|__|__|__|__| currency _____

TRAINING

How many training courses organized in the last 3 years for EPI nationally or at your level) and for how many days each course on the average (min, max)? **ALL**

Courses |__|__|__|

Number of days |__|__|__| min |__|__|__| max |__|__|__|

Number of participants (and roles), resources used and costs typically in conjunction with the introduction of a new vaccine **ALL**

- |__|__|__| trainers; average cost perdiems|__|__|__|__|__| currency_____ min|__|__|__|__|__| max|__|__|__|__|__|
- |__|__|__| organizers; average cost perdiems|__|__|__|__|__| min|__|__|__|__|__| max|__|__|__|__|__| currency_____

- |__|__|__| attendants ; average hotel cost|__|__|__|__|__| currency_____

min|__|__|__|__|__| max|__|__|__|__|__|

- Average travel cost |__|__|__|__|__| currency_____

min|__|__|__|__|__| max|__|__|__|__|__|

- Average cost refreshment |__|__|__|__|__| currency_____

min|__|__|__|__|__| max|__|__|__|__|__|

- Average cost training material |__|__|__|__|__| currency_____

min|__|__|__|__|__| max|__|__|__|__|__|

- Average cost stationary |__|__|__|__|__| currency_____

min|__|__|__|__|__| max|__|__|__|__|__|

- Average cost other, specify:_____|__|__|__|__|__|

currency_____

min|__|__|__|__|__| max|__|__|__|__|__|

- Average cost other_____|__|__|__|__|__| currency_____

min|__|__|__|__|__| max|__|__|__|__|__|

How many additional training courses at this level would be needed for the introduction of a new vaccine (during the first 2 years of introduction)? **ALL**

Additional courses |__|__|__|

SPECIFIC TO HEALTH FACILITIES (LOW LEVEL)

What are your current capital resources:

- How many refrigerators? |__|__|__| spare capacity: |__|__|__|

(# doses)

- Total capacity |__|__|__|m^3
- How many vehicles used for EPI?
  - Cars |__|__|__| spare capacity: |__|__|__| (# doses) costs/car: |__|__|__|
  - Motorbikes |__|__|__| spare capacity: |__|__|__| (# doses) costs/bike: |__|__|__|

Which and how many new capital resources would be needed for the introduction of a new vaccine?

- How many additional refrigerators? |__|__|__|
- Total additional capacity |__|__|__|m^3
- How many additional vehicles used for EPI?
  - Cars |__|__|__|
  - Motorbikes |__|__|__|

What is the number of doses supplied and delivered of each vaccine last year (2014)?

Vaccine	Doses supplied	Doses delivered	Main reasons why doses supplied<doses delivered
YF			
BCG			
OPV			
Measles			
VitaminA			
Rotavirus			
Td			
MR			
DTwPHibHepB			
Pneumo_conj			

What is the approximate total catchment population of your health facility (including adults and children) if applying to your situation?

|__|__|__|__| infants |__|__|__|__| children |__|__|__|__| adults

How many personnel work at the immunization department in your health facility?

Role_____ Number _____ Annual salary_____

Role _____ Number_____ Annual salary_____

Role _____ Number_____ Annual salary_____

Role _____ Number_____ Annual salary_____

Would the health facility be ready to accommodate an incremental vaccine with no additional resources?

□ Yes □ No

If yes, what is the estimated spare capacity in terms of # doses? |__|__|__|__|

18 **If no, what is the estimated additional resourcing needed?**

Personnel :

Role _____ Number_____ (EPI) Number_____(outside EPI)

Role _____ Number_____ (EPI) Number_____(outside EPI)

Role _____ Number_____ (EPI) Number_____(outside EPI)

Role _____ Number_____ (EPI) Number_____(outside EPI)

Role _____ Number_____ (EPI) Number_____(outside EPI)

Durable goods:

□ More refrigeration space M^3_____

□ Other _____ Quantity_____

□ Other _____ Quantity_____

Can you please state which are the modalities of delivering vaccination for each type of vaccine (whether outreach or at the health facility or which percentage is outreach and which is at the health facility)?

Vaccine	**Modality**
YF	Outreach _____% Health facility _____%
BCG	Outreach _____% Health facility _____%
OPV	Outreach _____% Health facility _____%
Measles	Outreach _____% Health facility _____%
VitaminA	Outreach _____% Health facility _____%

Rotavirus	Outreach _____% Health facility _____%
Td	Outreach _____% Health facility _____%
MR	Outreach _____% Health facility _____%
DTwPHibHepB	Outreach _____% Health facility _____%
Pneumo_conj	Outreach _____% Health facility _____%

19 **Resources used and costs associated with the administration of 1 dose including reconstitution at the health facility**

Vaccine	**Resources**
YF	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____Costs_____ Wastage___% Number syringes/cold box _____ Costs _____ Other materials used, specify_____ Costs 1_____Costs 2 _____
BCG	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____Costs_____ Wastage___% Number syringes/cold box _____ Costs____ _____ Other materials used, specify_____ Costs 1_____Costs 2 _____
OPV	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ Costs 1_____Costs 2 _____
Measles	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____

	Number of Syringes used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ Costs 1_____Costs 2 _____
VitaminA	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syringes used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ _____Costs 1_____Costs 2 _____
Rotavirus	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syringes used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ _____Costs 1_____Costs 2 _____
Td	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syringes used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ _____Costs 1_____Costs 2 _____
MR	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syringes used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ _____Costs 1_____Costs 2 _____
DTwPHibHepB	Personnel: Health personnel involved _____ _____

	Minutes of administration _____ min%_____max%_____ Number of Syrings used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ Costs 1_____Costs 2 _____
Pneumo_conj	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____Costs_____ ___Wastage___% Number syringes/cold box _____ ___ Costs _____ Other materials used, specify_____ _____Costs 1_____Costs 2 _____

20 **Resources used and costs associated with the administration of 1 dose outreach including reconstitution**

Vaccine	**Resources**
YF	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
BCG	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
OPV	Personnel: Health personnel involved _____ _____

	Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
Measles	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
VitaminA	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
Rotavirus	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
Td	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____

	Average commute time _____ Min%_____max%_____
MR	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
DTwPHibHepB	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____
Pneumo_conj	Personnel: Health personnel involved _____ _____ Minutes of administration _____ min%_____max%_____ Number of Syrings used _____ _ _____Costs _____ Other material used, specify:_____Costs 1_____Costs 2_____ Average commute time _____ Min%_____max%_____

STROBE Statement—Checklist

The costs of implementing vaccination with the RTS,S malaria vaccine in five sub-Saharan African countries

Item No	Recommendation	Where

Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Abstract - Methods
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract - Results/Conclusion
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Introduction - 4 first paragraphs
Objectives	3	State specific objectives, including any prespecified hypotheses	Introduction - last paragraph
Methods			
Study design	4	Present key elements of study design early in the paper	Detailed in methods
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Methods - data collection
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Methods - data collection ; Perpective and scope
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Methods - Cost components
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Methods - Data collection; Cost components
Bias	9	Describe any efforts to address potential sources of bias	Discussion
Study size	10	Explain how the study size was arrived at	Methods - data collection
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Methods
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	NA
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA

		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	NA (cost study)
		(b) Give reasons for non-participation at each stage	NA (cost study)
		(c) Consider use of a flow diagram	NA (cost study)
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	NA (cost study)
		(b) Indicate number of participants with missing data for each variable of interest	NA (cost study)
Outcome data	15*	Report numbers of outcome events or summary measures	Results
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Results
		(*b*) Report category boundaries when continuous variables were categorized	Results
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Results
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	Discussion
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Discussion - 8th paragraph
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Discussion

Generalisability	21	Discuss the generalisability (external validity) of the study results	Discussion
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Declaration of Conflicting Interests

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.