Appendix 1. Coverage values and sources used in the Lives Saved Tool (LiST) Analysis

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This appendix describes choices made for LiST modelling in Burkina Faso. LiST default values represent Burkina Faso in 2008 (the projection baseline for the analysis). We reviewed and updated default values and tailored the model to the sub-National level to represent the Sahel region in 2008.

1. National Level

1.1 Demographic projection

Data required for the demographic projection (population age and sex, fertility, mortality, and migration) were based on Burkina Faso's Demographic and Health survey and the most recent national census. For fertility, mortality and migration rates, we used SPECTRUM default data based on UN Population Division figures. National sources generally state lower mortality rates than those from international sources used in SPECTRUM default values; we chose to explore these differences explicitly in LiST scenarios rather than modifying values in the demographic projection. We also used default values for international migration, as more recent data were unavailable. Tables 1 to 3 provide a summary of default LiST values and national estimates, and identify values used in the analysis.

Table 1. Population structure by age and sex

Population	Default Values[1] (Used)		Values from National Sources[2]	
Age categories	Males	Females	Males	Females
0-4	1 353 360	1 305 680	1 230 610	1 206 303
5-9	1 106 660	1 069 040	1 176 473	1 139 237
10-14	953 960	922 060	900 103	846 485
15-19	822 020	796 960	710 323	764 962
20-24	696 960	683 020	530 425	654 953
25-29	574 020	573 620	448 431	560 854
30-34	450 560	462 700	363 408	431 412
35-39	352 820	376 120	298 236	358 588
40-44	267 520	301 060	250 143	299 144
45-49	198 100	240 000	195 016	232 723
50-54	142 520	188 840	166 281	192 529
55-59	119 540	161 060	132 254	141 309
60-64	88 440	126 580	111 176	127 786
65-69	59 860	91 000	80 542	83 067
70-74	36 920	58 180	63 727	72 555
75-79	19 220	30 360	37 186	39 927
80+	18 400	29 100	40 643	55 964
Total	7 260 880	7 415 380	6 734 977	7 207 798

[1] Spectrum and LiST(1, 2)
[2] RGPH data (3)

Table 2: Fertility, Mortality and Migration

Default Values[1] (Used in the analysis)							Values from National Sources						
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**Source**
Synthetic fertility index	6,03	5,99	5,93	5,89	5,85	5,81	6,2	6,15	6,1	6,05	6	5,95	(4, 5)
Male life expectancy	54,1	54,4	51,8	52,0	52,1	52,3	54,1	54,4	54,6	54,8	55,0	55,2	(4, 5)
Female life expectancy	56,7	57,0	54,1	54,2	54,4	54,5	56,7	57,0	56,8	57,0	57,2	57,3	(4, 5)
Total life expectancy	55,4	55,7	53,0	53,1	53,3	53,4	55,5	55,7	55,8	55,9	56,1	56,3	(4, 5)
Infant mortality rate	84,2	82,8	92,6	92,6	92,6	92,6	84,2	82,8	65,0	64,5	64,1	64,1	(4, 5)
Under-5 mortality rate	135,2	132,6	176,2	176,2	176,2	176,2	135,2	132,6	129,0	128,4	128,0	127,9	(4, 5)

[1] Spectrum and LiST(1, 2)

Table 3: Migration

	Default Values[1]					
	2006	**2007**	**2008**	**2009**	**2010**	**2011**
Hommes	-16 380	-16 380	-16 380	-16 380	-16 380	-16 380
Femmes	-8 620	-8 620	-8 620	-8 620	-8 620	-8 620
Total	-25 000	-25 000	-25 000	-25 000	-25 000	-25 000

[1] Spectrum and LiST(1, 2)

1.2 LiST Configuration

The base coverage year is 2008; we analyse results after the first year of the intervention program (2009). The majority of indicators for baseline health status (2008), intervention coverage at baseline (2008) and intervention coverage at the end of year 1 of the user fee elimination intervention (2009) were taken from country data such as Burkina Faso's Demographic and Health Survey (DHS) 2010 and the health statistics from Burkina's Ministry of Health[1]. In some cases, we also used values from the scientific literature or UN agency reports. Where a superior source was not identified, LiST default values were used.(2) For each indicator, the following tables describe the LiST defaults and document values and sources where indicators were modified.

1.3 Health Status, Mortality and Economic Status

Baseline child health status
The intervention population is vitamin A deficient, Zinc deficient, and sleeping under an ITN is recommended.

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[1] Health statistics are compiled annually using data from health facilities and administrative structures of the health system of the country.

Variables	LiST value	Modified Value	Source/Reason*
% women exposed to falciparum	100		
% of newborns with IUGR	11.44		
% severely wasted			
<1 month	14.5	4.6	DHS 2010(5)
1-5 month	14.5	4.6	
6-11 month	18.2	10.2	
12-23 month	13.6	10.4	
24-59 month	5.5	6.8	
% stunted			DHS 2010(5)
<1 month	12.1	10.6	
1-5 month	12.1	10.6	
6-11 month	19.1	18.9	
12-23 month	48.8	36.2	
24-59 month	51.9	41	
Incidence of diarrhoea			
<1 month	4.7		
1-5 month	4.7		
6-11 month	7.9		
12-23 month	6.4		
24-59 month	3.2		

*Where no source is listed, LiST default values were used.(2)

Baseline child mortality
The impact of alternative (LiST default and alternative) values for child mortality was explored in scenarios (described in section 1.5 below).

Variable	LiST value	Alternative Value	Source/ Reason
Neonatal mortality rate*	36,5	28	RGPH/DHS/MS**(5-7)
Infant mortality rate*	92,6	65	
Under 5 mortality rate*	176,2	129	
MDG goal for under 5 mortality*	70		

*Rates per 1000 live births
** MS=Ministère de la Santé
LiST default values for distribution of deaths by proximate causes were maintained in both the neonatal and post neonatal period.

Baseline maternal mortality
The impact of alternative (LiST default and alternative) values for maternal mortality was explored in scenarios (described in section 1.5 below).

Variable	LiST value	Alternative Value	Source/ Reason
Maternal mortality ratio*	700	307,3	RGPH data(6)

*Maternal deaths per 100 000 births

For percent of maternal deaths by proximate causes, LiST default values were maintained.

Abortion
LiST default values were maintained.

Stillbirths

Variable	LiST value	Modified Value	Source/ Reason
Stillbirth rate*	100	26.3	(8)

*Rate per 1000

Economic Status

Variable	LiST value (2008)	Modified Value	Source/ Reason
% of population living below $1 per day	44,6	43,9	(9)

*Rate per 1000

In the absence of data, the percentage of population living below $ 1 per day is used by LiST to capture the effect of food insecurity. We examined the sensitivity of this measurement by introducing the Multidimensional Poverty Index (MPI), which measures the proportion of the population that is multidimensionally poor, adjusted by the intensity of deprivations (10). In Burkina Faso, 53,6% of the population is multidimentionally poor(10).

1.4 Coverage (Category 1 variables)

We categorised interventions into two groups: Category (1) consists of interventions that were not a target of the user fee elimination intervention (UFE). Values for these interventions were generally modelled as constant pre-intervention (2008) and post- intervention (2009 and beyond); exceptions are documented. Some Category 1 interventions are possibly affected by the user fee elimination intervention (e.g. rates of breastfeeding, vaccination) but data to measure these effects are unavailable. This is a limitation of our analysis and lends a conservative bias to our results. Category (2) consists of interventions directly targeted by the user fee elimination intervention. For these interventions, coverage data pre- and post-intervention reflect results from the UFE study evaluation.

Values for Category 1 variables are given below. For variables classified as Category 2, a detailed presentation of values and their derivation is provided in Appendix 2.

Periconceptual

Variable	LiST value (2008)	Modified Value	Source/ Reason
Contraceptive use	--		(Variable not required in LiST)
Folic acid supplementation	0		
Safe abortion services	0	0,2	MS*(7)
Post abortion case management	0		
Ectopic pregnancy case management	0	0,4	Health statistics(11)

* MS=Ministère de la Santé

Pregnancy

We chose to calculate the components of antenatal care from the % of women who have 4 or more ANC visits during pregnancy.

Variable	LiST value (2008)	Modified Value	Source/ Reason
% women attending 4 or more ANC visits during pregnancy*	17,6	18 (2008), 20.5 (2009), and 22.3 (2010-2011)	(11, 12) NB although this variable is influenced by the intervention we have classified it as Category 1 (due to the fact that data are not available from the UFE study)
TT – Tetanus toxoid vaccination	85		
IPTp – Pregnant women protected by intermittent preventive treatment of malaria during pregnancy or by sleeping under an ITN	1,3		
Multiple micronutrient supplementation	0		
Balanced energy supplementation	0		
Malaria case management	0	2.2 (2008) 2.4 (2009), 2.2 (2010-2011)	(11, 13)
HIV pMTCT	No data available		

*According to official estimates from the Ministry of Health, the percentage of women receiving 4 or more prenatal visits was 18 in 2008, 20.5 in 2009, and 22.3 in 2010. (11, 12)

Childbirth

We chose to calculate the % coverage for levels of delivery and childbirth interventions from birth survey data.

Variable	LiST value (2008)	Modified Value	Source/Reason
Skilled birth attendance[1]	53,5		Category 1
Facility delivery (clinic and hospital)[2]	38,5	See §3.2	Category 2

[1] According to official estimates, the percentage of women receiving skilled birth attendance was 62.7 in 2008, 70.7 in 2009, and 76 in 2010(12, 13)

Breastfeeding

Breastfeeding data were entered by promotion.

Variables	LiST value (2008)	Modified Value	Source/ Reason
<1mois			DHS data(5)
Exclusive breastfeeding	18,2	41,1	
Predominant breastfeeding	70,1	49,9	
Partial breastfeeding	10,4	1	
No breastfeeding	1,3	8	
1-5mois			DHS data (5)
Exclusive breastfeeding	16,1	12,5	
Predominant breastfeeding	68,5	69,4	
Partial breastfeeding	15,4	10,6	
No breastfeeding	0	7,5	
6-11mois			DHS data (5)
Any breastfeeding	99,8	98,6	
No breastfeeding	0,2	1,4	
12-23mois			DHS data (5)
Any breastfeeding	94,6	83,9	
No breastfeeding	5,4	16,1	

Preventive

Variable	LiSTvalue (2008)	Modified Value				Source/ Reason
		2008	2009	2010	2011	
Preventive postnatal care	20,5	39,9	43,1	46	46	(11, 12)
Complementary feeding – education only	51,5					
Complementary feeding – supplementation & education	51,5					
Vitamin A supplementation	100					
Zinc supplementation	0					
Improved water source	79	75	77	79	79	(15)
Water connection in the home	6					
Improved sanitation	17	16	17	17	17	(15)
Handwashing with soap	17					
Hygienic disposal of children's stools	19,8					
ITN/ IRS – ownership of insecticide treated nets	23,3					

[1] According to official estimates, the percentage of women receiving preventive postnatal care was 39.9 in 2008, 43.1 in 2009, and 46 in 2010. (11, 12) See Section 1.5.

Vaccines
Vaccination coverage may be affected by the user fee elimination intervention; however, data are unavailable from the UFE study. These interventions are hence considered as Category 1. Coverage for pentavalent vaccines was entered directly.

Variable	LiST value (2008)	Modified Value	Source/ Reason
BCG	99	92	WHO(16)
Polio	94	84	WHO(16)
DPT	95	82	WHO(16)
Hib	95	81	WHO(16)
HepB	95	81	WHO(16)
Pneumococcal	0	0	WHO(16)
Rotavirus	0	0	WHO(16)
Measles	95	75	WHO(16)

Vaccines data is taken from the WHO-UNICEF coverage estimates rather than from country sources. WHO-UNICEF estimates of vaccination coverage are considered to be more reliable than administrative estimates alone and are validated by countries.

Curative - neonatal
Data on interventions for neonates was generally not available from the UFE study. Although likely to be affected by the user fee elimination intervention, these interventions are hence considered as Category 1.

Variable	LiST value (2008)	Modified Value	Source/ Reason
Maternal sepsis case management	No data available		
KMC – Kangaroo mother care	0		
Oral antibiotics	7,8		
Injectable antibiotics	0		
Full supportive care	7,7		
Case management of neonatal infection	15,6		

Curative –children greater than 1 month and less than 5 years of age
Data on the following interventions were drawn where possible from the UFE study. For interventions classified as Category 1, LiST default values were used.

Variable	LiST (2008)	Modified Value	Source/ Reason
KMC – Kangaroo mother care	0		Category 1
Cotrimoxazole	0		Category 1
Child ART	0		Category 1
Diarrhoea			
ORS- oral rehydration solution	21,2	See §3.2	Category 2
Antibiotics – for treatment of dysentery	7,9		Category 1 (information not available)
Zinc – for treatment of diarrhoea	0		Category 1 (information not available)
Other infectious diseases			

Oral antibiotics: case management of pneumonia in children	31,4	See §3.2	Category 2
Vitamin A for treatment of measles	100		Category 1 (information not available)
Antimalarials – artemesinin for malaria	41	See §3.2	Category 2
Therapeutic Feeding – for severe wasting	0		Category 1

1.5 Sensitivity analysis (Category 1 variables)

We conducted univariate sensitivity analyses to explore the effects of choices where values from other data sources differ importantly (rule of thumb: difference exceeds 10%) from the default values contained in LiST. These include: child mortality, maternal mortality, prenatal care, assistance of births by skilled health personnel, delivery in a health facility, prevalence of breastfeeding and postnatal care. We also considered two different poverty measures (Multidimensional Poverty Index, Percentage of population living on less than $ 1 per day).

Variables identified for sensitivity analysis

Variable	LiST value	Alternative value
Neonatal mortality rate*	36,5	28
Infant mortality rate*	92,6	65
Under 5 mortality rate*	176,2	129
Maternal mortality ratio*	700	307,3
% of population living below $1 per day	45	43,9
% of population multidimensionally poor	-	53,6
Skilled birth attendance[1]	54	62.7 (2008), 70.7 (2009), 76 (2010-2011)
Facility delivery (clinic and hospital)[2]	38	56.9 (2008-2011)
Breastfeeding	See Section 1.4 Breastfeeding table for detailed data	
Preventive postnatal care	20,5	39,9 (2008), 43,1 (2009), 46 (2010-2011)

*Mortality variable used by LiST to establish the envelope of mortality

We next created two scenarios describing alternative mortality envelopes and modelled the effects of the variations in the other parameters under each scenario.

Scenario 1 – LiST values for Neonatal, Infant, Under 5 and Maternal Mortality

Variable	LiST value	Modified value	Projected difference in rates* 2008 to 2010			Absolute difference in # deaths 2008 to 2010**			
			NMR	IMR	U5MR	2008	2009	2010	2011
% of population living below $1 per day	44,6	43,9	0	0	0	0	0	0	
% of population multidimensionally poor	-	53,6	0	0	0	0	0	0	
Skilled birth attendance (SBA)[1]	53,5	62.7 (2008), 70.7 (2009), 76 (2010-2011)	1	1	0	0	-275	-545	-448
Breastfeeding	See table for detailed data		0	0	0	0	0	0	
Preventive postnatal care	20,5	39,9 (2008), 43,1 (2009), 46 (2010-2011)	1	1	0	0	-111	-211	-208
% of severely wasted and stunted	See table for detailed data		0	0	0	0	0	0	
Stillbirth	100	26,3	0	0	0	0	0	0	
Vaccine	See table for detailed data		0	0	0	0	0	0	

*NMR = neonatal mortality rate, IMR = infant mortality rate, U5MR = Under 5 mortality rate. All rates expressed per 1000 live births.

** Difference calculated as (deaths projected using modified value – deaths projected using LiST value)

Scenario 2 – Modified values for Neonatal, Infant, Under 5 and Maternal Mortality

Variable	LiST value	Modified value	Projected difference in rates* 2008 to 2010			Absolute difference in # deaths 2008 to 2010**			
			NMR	IMR	U5MR	2008	2009	2010	2011
% of population living below $1 per day	44,6	43,9	0	0	0	0	0	0	
% of population multidimensionally poor	-	53,6	0	0	0	0	0	0	
Skilled birth attendance (SBA)[1]	53,5	62.7 (2008), 70.7 (2009), 76 (2010)	1	1	0	0	-209	-348	-346
Breastfeeding	See table for detailed data		0	0	0	0	0	0	
Preventive postnatal care	20,5	39,9 (2008), 43,1 (2009), 46 (2010)	0	0	0	0	-84	-161	-161
% of severely wasted and stunted	See table for detailed data		0	0	0	0	0	0	
Stillbirth	100	26,3	0	0	0	0	0	0	
Vaccine	See table for detailed data		0	0	0	0	0	0	

*NMR = neonatal mortality rate, IMR = infant mortality rate, U5MR = Under 5 mortality rate. All rates expressed per 1000 live births.
** Deaths projected using modified value – deaths projected using LiST value

Mortality summary (Burkina)

Variable	Projected rates*, all non-mortality variables modified simultaneously (2010)		
	NMR	IMR	U5MR
Scenario 1 mortality	35	91	175
Scenario 2 mortality	27	64	128

*NMR = neonatal mortality rate, IMR = infant mortality rate, U5MR = Under 5 mortality rate. All rates expressed per 1000 live births.

Choices for skilled birth attendance rates and preventive postnatal care had an important effect on projected rates. Due to concerns about data quality from administrative sources and potential differences in definitions, we used default LiST values rather than national data for these variables values were also judged to be more appropriate for the Sahel.

Default child mortality estimates used in LiST cohere with values from international agencies. LiST mortality values are based on the United Nations Inter-agency Group for Child Mortality Estimation (IGME) estimates. For under-5 mortality, IGME estimated 178 for Burkina Faso in 2010 and 146 (13 183) for Burkina Faso in 2011.(17) These values are very close to IHME estimates for under-5 morta (164.7 (140.4, 190.9) in 2008; 157.6 (126.9, 193.2) in 2009. (18) The central LiST (IGME) value for 2 thus falls within IHME confidence intervals for the same year.

National data based on Burkina Faso's 2010 DHS & MICS household survey yield substantially lowe mortality estimates.(See 1.3 above and (5)) As choices concerning mortality rates have an importa impact on projections of lives saved, we decided that all analyses for the national level in Burkina F would be done using both mortality scenarios.

1.51 Mortality scenarios used in analyses for the national level in Burkina Faso

Variable	Scenario 1: LiST values	Scenario 2: Alternative values
Neonatal mortality rate*	34,96	28
Infant mortality rate*	92,09	65
Under 5 mortality rate*	168,7	129
Maternal mortality ratio*	700	307,3

Neonatal, infant and under- 5 mortality expressed per 1000 live births. Maternal mortality is per 10 births.

2. Sahel Level

The Sahel region generally reports poorer performance in maternal and child health as compared to the national average. As shown in the most recent DHS survey data, the Sahel figures among the worst performing of Burkina Faso's 13 administrative regions for key interventions such as rates of antenatal care, childhood vaccinations, and interventions for diarrhoea.(5) It reports among the highest prevalence of childhood anaemia (severe anaemia 11% nationally; 20% Sahel), malaria (laboratory confirmed parasite 65.9% nationally; 73.6% Sahel), malnutrition, and diarrhoea.(5) The literacy rate among those over age 15 is 10% in the Sahel (54% in urban areas and 7% in rural areas). Overall, 15% of men in the Sahel are literate, and 6% of women.(3)

Of the districts (Dori, Sebba) in which the UFE was introduced, Sebba was viewed by the study team as somewhat atypical in terms of its human geography (distances) and the unusually high quality of health infrastructure. Dori was perceived to be most representative of rural Burkina Faso.

2.1 Model parameters for the Sahel

We have information specific to the Sahel for the following variables; the rest of the values used to parameterise the model are identical to those for the national level.

Variable	Value		Source
Population of the Sahel (and breakdown by age and sex)	968 442 (7.0 % of Burkina Faso total)		(3)
Synthetic fertility index	7.1 %		(3)
Poverty rates	36.4%		(14)
Protected against neonatal tetanus	79.9%		(5)
% severely wasted	<1 month	9.0	Calculated from DHS 2010 (5)
	1-5 month	9.0	
	6-11 month	20	
	12-23 month	20.3	
	24-59 month	13.3	
% stunted	<1 month	14.2	Calculated from DHS 2010 (5)
	1-5 month	14.2	
	6-11 month	25.1	
	12-23 month	48.2	
	24-59 month	54.6	

Poverty data for the Sahel dates from 2003.(14) In LiST, poverty functions as a proxy for food insecurity. Since 2012, the Sahel is struggling with catastrophic levels of food insecurity caused by drought that have pushed the region into a full-fledged humanitarian crisis. This was not represented in the model but should be considered in interpreting results.

Vaccines

Vaccination coverage may be affected by the user fee elimination intervention; however, data are unavailable from the UFE study. These interventions are hence considered as belonging to Category 1. Coverage for pentavalent vaccines was entered directly. Vaccination rates for the Sahel were taken from 2010 DHS/ MICS; the Sahel has the worst performance in terms of vaccination rates of all regions of Burkina Faso.(5)

Burkina Faso National   **Sahel**

Variable	LiST value (2008)	Modified Value	Source/ Reason	Sahel (2010)	Source/Reason
BCG	99	92	WHO(16)	88	(5)
Polio	94	84	WHO(16)	85	(5)
DPT	95	82	WHO(16)	74	(5)
Hib	95	81	WHO(16)	74	-
HepB	95	81	WHO(16)	74	-
Pneumococcal	0	0	WHO(16)	0	-
Rotavirus	0	0	WHO(16)	0	-
Measles	95	75	WHO(16)	70	(5)

Other key variables for the analysis

The following variables are useful for understanding of the Sahel context and in interpreting results. Rates for the Sahel were taken from 2010 DHS/ MICS; the Sahel has the worst performance on these variables of all regions of Burkina Faso.(5)

Variable	Burkina Faso (2010)	Sahel (2010)	Source
Maternal mortality rate per 100 000	700 (2006)	840 (2006)	(19)
Birth in a health facility	66.3	35.4	(5)
% of children with symptoms of acute respiratory infection in two weeks preceding survey	2	-	(5)
Stunting (% children under 5 with height-for-age less than -2 Z-scores)[1]	34.6	46.1	(5)
Underweight (% children under 5 with weight-for-age less than -3 Z-scores)[1]	7.6	14.7	(5)
% of children with symptoms of acute respiratory infection in two weeks preceding survey who sought medical care from a health professional	56	33.4	(5)
% of children with fever in two weeks preceding survey	21	-	(5)
% of children with fever in two weeks preceding survey who sought medical care from a health professional	47.6	30.4	(5)
% of children with diarrhoea in two weeks preceding survey	15	-	(5)
% of children with diarrhoea in two weeks preceding survey who received ORS (sachet or premixed)	21.2	10.1	(5)

[1] Stunting and underweight scores are included for comparison. They were used to parameterise the model to the Sahel.

2.2 Mortality scenario used in analyses for the Sahel level in Burkina Faso

All analyses for childhood interventions in the Sahel were modelled in a mortality envelope based on results from the 2010 DHS-MICS survey. The maternal mortality rate was updated using the most recent external source with data specific to the Sahel. No data from international agencies (IHME, IGME) is available specifically for the Sahel.

Available mortality data for the Sahel, including national estimates for comparison

Variable	National	Sahel	Source
Neonatal mortality rate	28	42	DHS 2010
Infant mortality rate	65	119	DHS 2010
Under-5 mortality rate (0-59 months)	129	235	DHS 2010
Maternal mortality ratio	700	840	(19)

Neonatal, infant and under-5 mortality rates expressed per 1000 live births. The maternal mortality ratio is per 100 000 births.

Mortality scenarios used in analyses for the Sahel

Variable	Sahel mortality scenario
Neonatal mortality rate*	42
Infant mortality rate*	119
Under-5 mortality rate*	235
Maternal mortality ratio*	840

Neonatal, infant and under-5 mortality rates expressed per 1000 live births. The maternal mortality ratio is per 100 000 births.

At the national level in Burkina Faso, estimates from national sources such as DHS-MICS surveys were substantially lower than international estimates for mortality from IGME and IHME. Use of DHS-MICS mortality estimates at the Sahel level should thus represent a lower estimate and lend a conservative bias to our results.

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