

Evaluation of the Impact of Malaria Control Interventions on All-Cause Mortality in Children under Five Years of Age in Rwanda, 2000-2010

Annexes

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Table of Contents

Annex A	1
General Survey Information and Data Availability for Rwanda 2000-2010.....	1
RBM Malaria Control and Impact Indicators	7
Data and Indicators on ITN coverage.....	8
Calculating Indicators.....	9
Potential Biases.....	10
Data and Indicators on IRS.....	11
Data and Indicators on Preventing Malaria in Pregnancy (IPTp and ITN use)	11
Calculating Indicators.....	12
Potential Biases.....	13
Data and Indicators on Case Management.....	13
Calculating Indicators.....	14
Data and Indicators on malaria morbidity	15
Calculating Indicators.....	16
Parasitemia	16
Severe Anemia	16
Potential Biases.....	17
Data and Indicators on all-cause under-five mortality	17
Calculating Indicators.....	17
Potential Biases.....	18
Annex B: Models	19
A.2.1 Lives Saved Tool (LiST Model).....	19
LiST Model methods	19
Mortality & Cause-Specific Mortality Profile	19
Intervention Coverage	19
Malaria Control Intervention Coverage	19
Malaria Intervention Protective Efficacy	20
Uncertainty Limits	20
LiST Model References.....	20
Intervention coverage indicators & values used in LiST analysis.....	21
A.2.2 Decomposition Analysis.....	24

Annex C	28
A.3.1 Climate Analyses.....	28
Meteorological data.....	28
Enhanced National Climate Services (ENACTS).....	28
Meteo Rwanda Maproom.....	28
Vegetation Indices	31
The Climate analysis tool	31
The Climate Suitability for Malaria Transmission Tool	32
Dry and Wet years against a pre-intervention baseline: WASP.....	34
A.3.2 Summary.....	35
A.3.3 Climate References.....	35
Annex D	37
Survey Data Availability for Standard Indicators	37
Indicators Summary Table	38
Table H2: Household Possession of insecticide-treated nets.....	39
Table H3: Universal Access of ITNs	40
Table H4: Use of insecticide-treated nets by children.....	41
Table H5: Household vector control measures.....	43
Table H6: Antimalarial treatment received by children with fever	44
Table H7: Timing of antimalarial treatment received by children with fever	46
Table H8: Diagnostic tests in children with fever	48
Table H9: Use of insecticide-treated nets by pregnant women	49
Table H10: Use of Intermittent preventive treatment during pregnancy women.....	51
Table H11: Prevalence of severe anemia (Hemoglobin <8g/dl) in children	53
Table H12: Trends in anemia by malaria risk area	55
Table H13: Trends in malaria prevalence in children 6-23 months by malaria risk area.....	55
Table H14: Prevalence of malaria in children	56
Table H15: Age-specific childhood mortality	58
Table H16: Early childhood mortality	59
Table H17: Prevalence of anemia and parasitaemia in children (via Microscopy).....	60
Table H18: Prevalence of anemia and parasitaemia in children (via RDT).....	62
Table H19: Prevalence of fever in children.....	64

Table H20: Prevalence of fever and parasitaemia in children (via microscopy).....	66
Table H21: Prevalence of fever and parasitaemia in children (via RDT).....	68
Table H22: Trends in mortality by malaria risk area	70
Table H23: Contextual Factors.....	71

Annex A

General Survey Information and Data Availability for Rwanda 2000-2010

	DHS 2000	MICS 2000	DHS 2005	Interim DHS 2007-08	DHS 2010
Sample design					
Sampling frame	1997 census list from Ministry of Finance and Economic Planning (MINECOFIN)	DHS 2000 sample frame	2002 General Population and Housing Census (RGPH)	2002 General Population and Housing Census (RGPH)	Preparatory frame for the 2012 Rwanda General Population and Housing Census (RGPH)
Sampling distribution	Two-stage 1. EAs 2. HH within EAs	Two-stage 1. EAs 2. HH within EAs	Two-stage 1. EAs 2. HH within EAs	Two-stage 1. EAs 2. HH within EAs	Two-stage 1. EAs 2. HH within EAs
Number of cluster (census enumeration areas/sampling points)	445 clusters Probability proportional to size (PPS) by province and urban/rural, urban	325 clusters Probability proportional to size (PPS) by province and urban/rural, urban	462 clusters PPS by province and urban/rural, and urban areas oversampled	250 clusters selected, but 249 surveyed due to a refugee camp in one cluster. PPS by province and urban/rural, and urban areas oversampled	492 clusters PPS by province and urban/rural, and urban areas oversampled

	DHS 2000	MICS 2000	DHS 2005	Interim DHS 2007-08	DHS 2010
	areas oversampled.	areas oversampled.		Systematic (random) sampling	Systematic (random) sampling
Number of household/cluster			20 HH/ urban cluster; 24 HH/ rural cluster	30 HH/ cluster	26 HH / cluster
Sample weights	Weighted to provide representative estimates at the national level, by urban/rural, and by province (12).	Weighted to provide representative estimates at the national level, and for urban Kigali, urban (excluding Kigali), and rural Rwanda, separately.	Weighted to provide representative estimates at the national and provincial level (5 provinces), and by urban/rural.	Weighted to provide representative estimates at the national and provincial level (5 provinces), and by urban/rural.	Weighted to provide representative estimates at the national and provincial level (5 provinces), and by urban/rural.
Sampling errors/Design effect	See Final Report Appendix B	No appendix available	See Final Report Appendix B	See Final Report Appendix B	Report Appendix B
Representativeness	National	National	National	National	National
(designed to provide estimates for)	Urban and rural areas separately Provinces (12)	Regions (3: urban Kigali, urban non-Kigali, and rural Rwanda)	Urban and rural areas separately Provinces (structured to provide representative estimates for the 12 old provinces, but also	Urban and rural areas separately Provinces (5)	Urban and rural areas separately Provinces (5)

	DHS 2000	MICS 2000	DHS 2005	Interim DHS 2007-08	DHS 2010
			adequate for providing representative estimates for the 5 newly defined provinces)		
Month(s) survey conducted	June 2000-November 200	July 2000	February 2005 – July 2005	Dec 2007-April 2008	Sept 2010-March 2011
Biomarkers	n/a	n/a	Hemoglobin (every 2nd household)	Hemoglobin and parasitemia (all eligible women 15-49, all <5)	Hemoglobin and parasitemia (every 2nd household)
Malaria microscopy	n/a	n/a	n/a	Thick, examined at PNILP lab	Thick and thin
Rapid Malaria Diagnosis (brand of RDT)	n/a	n/a	n/a	Available, collected by NMCP technical team	Available, collected using First Response kits
Hemoglobin values	n/a	n/a	Available for children<5, women 15-49, and men 15-59 (HemoCue system)	Available for children<5 and women 15-49 (HemoCue system)	Available for children 6-59 months and women 15-49 (HemoCue system)
Under-five mortality	Direct method	n/a (child mortality	Direct method	Direct method	Direct method

	DHS 2000	MICS 2000	DHS 2005	Interim DHS 2007-08	DHS 2010
estimate	(complete birth history)	module excluded due to recent DHS)	(complete birth history)	(complete birth history)	(complete birth history)
ITN ownership	No direct question regarding number of nets owned in household; does include specific questions regarding use and source of net for women and children <5.	n/a	Yes, a complete net roster was included (number of nets, treatment history of each net, brand, who used each the previous night, duration of ownership (in months, up to 3 years before survey), and source and cost for nets bought within 6 months).	Yes, a complete net roster was included (number of nets, treatment history of each net, brand, who used each the previous night, duration of ownership (in months, up to 3 years before survey), and source and cost for nets bought within 6 months).	Yes, a complete net roster (number of nets, treatment history of each net (with more detail than previous surveys), brand, who used each the previous night, duration of ownership, source and cost for all nets, and condition of net (holes, etc).
ITN use	Available for all interviewed women, and for children <5; at HH level, net use data is available but not ITN use.	Available for children <5.	Yes, using the complete net roster.	Yes, using the complete net roster.	Yes, using the complete net roster.
IRS	n/a	n/a	n/a	Available only for those who live in Kigali. They are asked: Between August and October 2007, did someone come to spray the walls of your home against	n/a

	DHS 2000	MICS 2000	DHS 2005	Interim DHS 2007-08	DHS 2010
Wealth Index	Water source, toilet type, floor type, cooking fuel, electricity, radio, television, refrigerator, bicycle, motorcycle/scooter, car/truck, telephone.	Person's sleeping room, type of floor, roof, walls, cooking fuel, other assets. Other assets can include electricity, radio, tv, mobile phone, landline, refrigerator, computer, internet connection, watch, bicycle, moto/scooter, cart, car/truck, motorboat, land, animals.	Water source, toilet type, floor, cooking fuel, owns land, cell phone/land line, electricity, radio, television, refrigerator, bicycle, motorcycle/scooter, car/truck.	mosquitoes? Water source, toilet type, floor, cooking fuel, electricity, radio, television, refrigerator, bicycle, motorcycle/scooter, car/truck.	Water source, toilet type (and if shared), electricity, cooking and lighting fuel type; floor, wall, and roof type; presence of domestic servants in household; number of members per sleeping room; ownership of a dwelling, radio, TV, fridge, bicycle, motorcycle/ scooter, car/truck, animal drawn cart, boat, cellphone/landline, computer, boat, stove, plow, farm animals, agricultural land, and amount of agricultural land owned *Note survey used a new wealth calculation technique that calculates separately for rural/urban areas then creates a combined score

Survey Response Rate

	DHS 2000	MICS 2000	DHS 2005	Interim DHS 2007-08	DHS 2010
Households sampled	10,206	4,589	10,644	7,469	12,792
Households occupied	9,744	4,425	10,307	7,415	12,570
Households interviewed	9,696	4,205	10,272	7,377	12,540
Household response rate (%)	99.5	95.0	99.7	99.5	99.8
Individual interviews					
Number of women	10,622	862**	11,539	7,528	13,790
Number of women interviewed	10,421	748	11,321	7,313	13,671
Eligible woman rate (%)	98.1	86.8	98.1	97.1	99.1

*2000 MICS: This questionnaire did not include core MICS modules on child mortality, contraceptive use, HIV, maternal mortality, because these data were covered in the 2000 DHS.

** Note on coverage for children <5: eligible: 3,168; mother/caretaker interviewed: 3,154; response rate: 99.6%

RBM Malaria Control and Impact Indicators

Intervention	Indicator Description
Prevention	
Vector Control via ITN and IRS	1. Proportion of households with at least one ITN
	2. Proportion of households with at least one ITN for every two people (NEW)
	3. Proportion of population with access to an ITN within their household (NEW)
	4. Proportion of population who slept under an ITN the previous night
	5. Proportion of children under 5 years old who slept under an ITN the previous night
	6. Proportion of pregnant women who slept under an ITN the previous night
	7. Proportion of households with at least one ITN and/or sprayed by IRS in the last 12 months
Intermittent Preventive Treatment	8. Proportion of women who received intermittent preventive treatment for malaria during ANC visits during their last pregnancy
Case Management	
Diagnosis	9. Proportion of children under 5 years old with fever in the last 2 weeks who had a finger or heel stick
Treatment	10. Proportion of children under 5 years old with fever in the last 2 weeks for whom advice or treatment was sought (NEW)
	11. Proportion receiving first line treatment, among children under five years old with fever in the last two weeks who received any antimalarial drugs (NEW)
Impact Measure	Indicator Description
Mortality Indicator	12. All-cause under 5 mortality rate (5q0).
Morbidity Indicators	13. Parasitemia Prevalence: proportion of children aged 6-59 months with malaria infection.
	14. Anemia Prevalence: proportion of children aged 6-59 months with a hemoglobin measurement of <8 g/dL

Data and Indicators on ITN coverage

RBM Intervention	Indicator Description	Numerator	Denominator	Data Availability*
Insecticide-treated nets (ITNs)	Proportion of households with at least one ITN.	Number of households surveyed with at least one ITN	Total number of households surveyed	2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of households with at least one ITN for every two people	Number of households with at least one ITN for every two people	Total number of households surveyed	2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of population with access to an ITN within their household	Total number of individuals who could sleep under an ITN if each ITN in the household is used by two people	Total number of individuals who spent the previous night in surveyed households	2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of individuals who slept under an ITN the previous night.	Number of individuals who slept under an ITN the previous night	Total number of individuals who slept in surveyed households the previous night	2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of children under 5 years old who slept under an ITN the previous night.	Number of children under 5 who slept under an ITN the previous night	Total number of children under 5 who spent the previous night in surveyed households	2000 MICS 2000 DHS 2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of pregnant women who slept under an ITN the previous night.	Number of pregnant women aged 15-49 who slept under an ITN the previous night	Total number of pregnant women aged 15-49 who spent the previous night in surveyed households	2000 DHS 2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of children under five years old sleeping in households with ITNs who slept under an ITN the previous night	Number of children under 5 who slept under an ITN the previous night	Total number of children under 5 who spent the previous night in surveyed households owning at least one ITN	2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of pregnant women sleeping in households with ITNs who slept under an ITN the previous night.	Number of pregnant women aged 15-49 who slept under an ITN the previous night	Total number of pregnant women aged 15-49 who spent the previous night in surveyed households owning at least one ITN	2005 DHS 2007-08 RIDHS 2010 DHS

Calculating Indicators

Data used to produce estimates of ITN ownership and use come from DHS, MICS and MIS surveys. The specific questions and methods used to calculate the indicators are outlined in the table and text below. Although more recently, attempts have been made to standardize questionnaires across surveys, the questions and methods required to calculate ITN indicators vary somewhat between these surveys.

In the 2000 DHS the respondents were asked whether the household has a mosquito net that one could sleep under (y/n), and whether all or some of the <5 children slept under it in the previous night (all, some, none). In the women's questionnaire in the child health section, women are asked if they slept under a mosquito net the night before, and if so, where they bought it, how long ago, and if it is treated. Similarly, the woman was asked if each child under five usually sleeps under a net and if the child slept under a net last night. If the child slept under a net, the mother was asked questions about the specific net used: source, duration of ownership (up to 7 years), treatment of net, and timing of treatment. Thus, ITN use can be determined for children under five of interviewed women if we assume that pretreated nets were not available (an ITN is defined as a net that has been treated in the past 12 months). With the same assumption we can estimate ITN use for interviewed women, for interviewed pregnant women, and for interviewed men. (Also, if we assume that the proportion of households with at least one ITN within households that have at least one child under 5 is comparable to the overall household population in ITN ownership (which may not be a valid assumption, as households with children under 5 may be more likely to have an ITN) we could estimate the proportion of households with at least one ITN in 2000).

The 2000 MICS did not contain net information in the household module. Caretakers of children less than five years of age were asked if the child slept under a bednet the previous night, whether the net was ever treated, and how long ago the net was last treated.

The 2005 DHS contained a complete net roster including questions on the brand of net, treatment and timing of treatment, usage the previous two nights, and length of time since the household net was obtained. Source (including how/when obtained) and price information was asked for nets obtained within 6 months.

In the 2007-08 RIDHS, a full net roster including brand of net, usage the previous two nights, and length of time since household net was obtained was asked. Source (including how obtained (i.e. during immunization campaign, during ANC visit, volunteer of malaria program)) and price information was asked for nets obtained within the previous 6 months. The roster did not directly ask about treatment or timing of treatment of net, but this information was drawn (in a DHS recode) from the brand of net, and each net was classified as permanently pretreated, pretreated requiring retreatment, or unknown/missing in the DHS recode. We do not know whether pretreated nets obtained >12 months ago have been retreated; thus, nets that were treated but require future treatment and were bought >12 months previously were coded as untreated. Since respondents were not asked whether nets were treated after being bought, our estimate for ITNs should be conservative; however, there was no "untreated" option in Q112, so it is also possible that there was some misclassification of net brand, leading to an inflated ITN estimate.

The 2010 DHS also included a complete net roster including brand, treatment and timing of treatment, usage previous two nights, and length of time since household net was obtained. Also, the questionnaire asked how the net was obtained (during immunization campaign, ANC visit, from a community health worker, etc.), condition of net (i.e. holes), and shape of net.

Available Information on Nets					
	2000 DHS	2000 MICS	2005 DHS	2007-8 RIDHS	2010 DHS
Brand	n/a	n/a	Permanently Treated Bednet Tuzanet Mamanet Other Treated Bednet Supanet Other Other	Permanet Olyset Then, in a more detailed question: Permanent Tuzanet Mamanet Treated Original Other	Long-Lasting Insecticide-Treated Net (LLIN) Permanet Mamanet Tuzanet Olyset Net Protect Other LLIN DK Brand Pretreated net but not permanent Other
Duration of ownership	Monthly 0-84 month, 84+	n/a	Monthly 0-36 37+	Monthly 0-36 37+	Monthly 0-36 37+
Treated/dipped with insecticide since it was obtained	yes	yes	yes	n/a	yes
Timing of last treatment	Monthly 0-84 months, 84+	Monthly 0-99	Monthly 0-36, 37+	n/a	Monthly 0-24, 25+

Potential Biases

Some limitations may affect the validity of the indicators to correctly measure parameters of interest. Correct specification of a net as an ITN requires information on the kind of net owned or used which might not be accurately reported if interviewers were not allowed to view the net. It also requires information on treatment of nets (the timing and the substance used to treat) which is subject to recall bias. The true protection offered by ITNs requires proper use: The timing of sleep under an ITN, the condition of the net (without holes, etc), and proper net installation, are all important factors that were not measured in these surveys. For more information on RBM indicators including calculations, strengths and limitations see the “Household Survey Indicators for Malaria Control, June 2013.”

In addition, the denominators are not strictly the same across surveys. Net use was asked of all persons who slept in the household the previous night in the 2005 and 2010 DHS and in the 2007-8 RIDHS but not in the 2000 DHS or the 2000 MICS. Net use in the 2000 DHS was asked of interviewed women and men and of children of interviewed women, 2000 MICS was asked of all children in a household (via

interview of mothers or care-givers). Finally, the 2000 DHS and the 2007-8 RIDHS did not have all of the necessary questions to be able to determine ITN status without some assumptions.

Data and Indicators on IRS

Standard RBM indicators on use of indoor residual spraying for the prevention and control of malaria were used in this report. The standard vector control coverage indicator is outlined below.

RBM Intervention	Indicator Description	Numerator	Denominator	Data Availability*
Indoor Residual Spraying (IRS)	Proportion of households whose interior walls were sprayed in the 12 months preceding the survey.	Number of households whose interior walls were sprayed in the 12 months preceding the survey.	Total number of households surveyed.	2007-08 RIDHS

*2007-08 RIDHS: IRS questions were only asked in households living in Kigali

Data and Indicators on Preventing Malaria in Pregnancy (IPTp and ITN use)

Standard RBM indicators on use of interventions to prevent and control malaria in pregnant women were used in this report. These indicators are outlined below.

RBM Intervention	Indicator Description	Numerator	Denominator	Data Availability*
Prevention and control of malaria in pregnant women	Proportion of pregnant women who slept under an ITN the previous night.	Number of pregnant women who slept under an ITN the previous night	Total number of pregnant women within surveyed households	2000 DHS 2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of women who received intermittent preventive treatment for malaria during ANC visits during their	Number of women who received 2 or more doses of SP to prevent	Total number of women surveyed who delivered a live baby within the last 2 years	2005 DHS 2007-08 RIDHS

	last pregnancy.	malaria at least once during ANC visit during her last pregnancy that led to a live birth in the last 2 years		
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*2000 DHS and 2007 and 2011 MIS did not ask about receiving SP during an ANC visit. IPTp was discontinued as a national malaria control policy after the 2005 DHS.

Calculating Indicators

Data used to estimate these indicators come from the 2000, 2005 and 2010 DHS and the 2007-8 RIDHS. In these surveys, all women aged 15-49 from selected households were asked to participate in an interview. In the course of this interview each woman was asked if she was pregnant. This information along with the responses from the household questionnaire on ITN ownership and use was used to estimate the proportion of pregnant women who slept under an ITN the previous night. As mentioned previously, the ITN questions were somewhat different across surveys. In the 2000 DHS, ITN use can be determined for pregnant women if it is assumed that pretreated nets were not available (an ITN is defined as a net that has been treated in the past 12 months). Also, note that the denominator “total number of pregnant women within surveyed households” may not be strictly comparable to the population from which the numerator is derived (the total number of pregnant women with completed surveys). Thus, it may be preferable to use the number of pregnant women with completed surveys as the denominator.

Typically in a DHS or MIS, interviewed women reporting a live birth in the two years prior to interview are also asked to provide information about use of antenatal care (ANC) services and other malaria prevention behaviors. This information was used to estimate the proportion of these women who received at least two doses of SP for prevention of malaria during her last pregnancy which led to a live birth, at least one of which was received during an ANC visit. In the 2000 DHS, women were asked if during their pregnancy they were given or bought drugs in order to prevent getting malaria, and if so, which drug they took. Dosage and source of medications was not recorded. The 2010 DHS asked women with live births in the past five years if they took any antimalarial drugs during the most recent pregnancy (Coartem, Quinine, Other) and asked the source of the medication (Public sector: ref. hospital, district hospital, health center, health post, outreach, community health worker, other; Private medical sector: polyclinic, clinic, dispensary, pharmacy, other private medical facility; Other source: kiosk, traditional practitioner, church, friend/relative). However, they were not asked about the number of doses, and were not asked specifically whether it was given via ANC, and it is not specified whether the medication was prophylactic (versus wording in 2007-8 “did you take any medication to prevent

getting a fever”). At the time of the 2010 DHS, IPTp was no longer part of the national malaria control strategy in Rwanda.

Potential Biases

The IPTp indicator is dependent on recall by interviewed women over the two year period preceding the survey. Women were asked to remember not only whether or not they took medication for malaria prevention but also the type of medication, the number of doses and the source of these doses. Accurate information for all of these parameters is necessary for construction of the IPTp indicator. In addition, these questions were asked only of women whose most recent pregnancy ended in a live birth in the two years preceding the survey. This excludes stillbirths and miscarriages. As birth outcomes are known to be affected by malaria and IPTp is known to reduce the risk of malaria, the results may not be representative of the general population and may bias the observed relationships. In addition, the data for this indicator come from interviews with live women: Women that died in childbirth or from malaria acquired during pregnancy are not included. Thus, the indicator may not be truly representative of the population as some selection bias may be present.

Data and Indicators on Case Management

The following RBM indicators measuring case management of malaria were used in this report:

RBM Intervention	Indicator Description	Numerator	Denominator	Data Availability*
Prompt and effective treatment	Proportion of children under 5 years old with fever in last 2 weeks who sought treatment from an appropriate provider.	Number of children under 5 who had a fever in previous 2 weeks who sought treatment from an appropriate provider.	Total number of children under 5 who had a fever in previous 2 weeks	2000 MICS 2000 DHS 2005 DHS 2007-08 RIDHS 2010 DHS
	Among children under 5 years old with fever in last 2 weeks who received antimalarial treatment, proportion who received ACTs.	Number of children under 5 who had a fever in previous 2 weeks who received ACTs.	Total number of children under 5 who had a fever in previous 2 weeks who received any antimalarial.	2000 DHS 2005 DHS 2007-08 RIDHS 2010 DHS
Diagnostics	Proportion of children under 5 years old with fever in last 2 weeks who received a finger or heel stick.	Number of children under 5 years old with fever in last 2 weeks who received a	Total number of children under 5 who had a fever in previous 2 weeks	2010 DHS

		finger or heel stick.		
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In addition, several supplemental case management indicators were calculated. These are historical case management indicators which have been replaced by the RBM-MERG. Due to the retrospective nature of the evaluation, these historical indicators were referenced.

RBM Intervention	Indicator Description	Numerator	Denominator	Data Availability*
Prompt and effective treatment	Proportion of children under 5 years old with fever in last 2 weeks who received any antimalarial treatment.	Number of children under 5 who had a fever in previous 2 weeks who received any antimalarial treatment	Total number of children under 5 who had a fever in previous 2 weeks	2000 DHS 2000 MICS 2005 DHS 2007-08 RIDHS 2010 DHS
	Proportion of children under 5 years old with fever in last 2 weeks who received antimalarial treatment according to national policy within 24 hours from onset of fever.	Number of children under 5 who had a fever in previous 2 weeks who received recommended antimalarial treatment according to national policy <24 hours from fever onset	Total number of children under 5 who had a fever in previous 2 weeks	2000 DHS 2005 DHS 2007-08 RIDHS 2010 DHS

Calculating Indicators

Data used to calculate these indicators came from the MICS, DHS, and RIDHS surveys from 2000-2010. Mothers were asked whether or not they sought treatment for their child's fever and, if so, where care

was sought and what treatments were received. The timing of this treatment in relation to onset of fever was also asked in all but the 2000 MICS. The question about whether blood was taken from the child’s finger or heel for testing was only asked in the 2010 DHS. Interpretation of trends in these case management indicators is challenging as the treatment options and the recommended treatments changed over the course of the evaluation period. The treatment options included in each survey are summarized in the table below.

Antimalarial Drugs Taken for Treatment of Fever				
2000 DHS	2000 MICS	2005 DHS	2007-8 RIDHS	2010 DHS
Chloroquine Fansidar Quinine	Chloroquine Fansidar Quinine Paracetamol	SP/Fansidar Amodiaquine Quinine	SP/Fansidar Quinine Quartem Primo Other Antimalarial	Coartem Primo Quinine Other Antimalarial (specify)

Note on ACTs: Of the drug options detailed above, Primo and Coartem (and its alternate spelling, Quartem) are ACTs.

Note on first-line treatment timeline: As of 2000, Chloroquine was still the first-line antimalarial treatment in Rwanda. In December 2001, the first-line therapy shifted from CQ to SP/AQ. In 2006, the first-line therapy changed again, to the ACT AL (Quartem and Primo are both brand names for AL).

One potentially useful indicator that is less affected by changing drug recommendations is the proportion of all antimalarial treatments that are first-line. This gives an indication of whether or not the recommended antimalarials are being dispensed.

To determine whether or not the antimalarial medication given to children with fever was “prompt” mothers were asked when the child first took the medication. Responses of “Same Day” or “Next Day” following fever onset were considered “prompt” and were included in the calculation of the second treatment indicator.

The more recent surveys included a question whether or not a child with fever had a finger or heel stick. This was used to estimate the proportion of children with fever who were given diagnostic tests for malaria.

Data and Indicators on malaria morbidity

Morbidity indicators measured for this report include parasitemia and severe anemia prevalence in children under five years. The details of these indicators are outlined below.

RBM Impact Measures	Indicator Description	Numerator	Denominator	Data Availability*
Morbidity Indicator	Parasitemia Prevalence: proportion of children aged 6-59 months with malaria infection.	Number of children 6-59 months with malaria infection detected by microscopy	Total number of children aged 6-59 months tested for malaria parasites by microscopy	2007-08 RIDHS 2010 DHS
	Anemia Prevalence: proportion of children aged 6-59 months with a hemoglobin measurement of <8 g/dL.	Number of children 6-59 months with a hemoglobin measurement of <8g/dL	Total number of children 6-59 months who had hemoglobin measurements obtained during household survey	2005 DHS 2007-08 RIDHS 2010 DHS

*RDT and microscopy results are available for both surveys.

Calculating Indicators

The data used to calculate these indicators come from the DHS and the MIS. In the DHS these biomarkers were measured for all children older than 6 months and less than 60 months of age, for whom permission was granted, in selected households. In the MIS, biomarker data were collected for all children less than five years of age and for all other age groups in every fourth household. Parasitemia was measured using both microscopy and rapid diagnostic tests (RDT).

Parasitemia

Infection with *Plasmodium falciparum* and *Plasmodium vivax* parasites was measured in all children aged less than 60 months who slept in a selected household the night before the survey, for whom parental permission was granted, and for all household members in every fourth household. Blood was taken from a finger or heel stick using a cuvette. Thick and thin blood smears were prepared for microscopy. A rapid diagnostic blood test for *Plasmodium falciparum* antigens was then performed (using ParaScreen in the 2007 MIS and CareStart™ in the 2011 MIS). Parasitemia is defined as a positive result for any *Plasmodium* species via microscopy for the purposes of these analyses.

Severe Anemia

Severe anemia, defined as less than 8 grams of hemoglobin per deciliter of blood, in children aged 6-59 months who slept in a selected household the night before the survey is another outcome of interest. Hemoglobin levels were measured using the HemoCue® system (a light photometer) and samples of

capillary blood from finger or heel sticks. Hemoglobin quantities resulting from this test were adjusted for altitude according to the standard methodology used by the DHS.

The adjustment is made with the following formulas:

$$\text{adjust} = -0.032 * \text{alt} + 0.022 * \text{alt}^2$$

$$\text{adjHg} = \text{Hg} - \text{adjust (for adjust > 0)},$$

where *adjust* is the amount of the adjustment, *alt* is altitude in feet (convert from meters by multiplying by 3.3), *adjHg* is the adjusted hemoglobin level, and *Hg* is the measured hemoglobin level in grams per deciliter. No adjustment is made for altitudes below 1,000 meters.

Potential Biases

Measuring parasitemia for use in comparative studies can be challenging as parasite prevalence in the population is influenced by a multitude of factors including temperature and rainfall. Thus the timing of data collection plays an important role in ensuring comparability of data, especially in areas with seasonal patterns of malaria transmission. The analyses presented in this report only include parasitemia data from high transmission season during two survey years (2007 and 2011). Another measurement issue arises due to the different methods available for diagnosing *Plasmodium* spp. infection. The current RBM recommendation is to report microscopy results; however, obtaining good quality microscopy data is often challenging due to logistic constraints. In this case, diagnosis was determined via microscopy and rapid diagnostic tests. Comparing RDT results with those obtained via microscopy may not produce valid results as RDTs measure parasite antigens whereas microscopy measures actual parasites. RDTs have been shown to have lower sensitivity than high quality microscopy in areas of low parasitemia. False positive RDT results can also occur when parasites have recently been cleared from the body via effective treatment.

Severe anemia is not a very specific proxy for malaria as there are many other potential etiologies. Anemia data are dependent on valid hemoglobin readings from the HemoCue® machine which can be affected by the skill of the technician drawing blood and on the number of blood tests being conducted with the same sample. This varied by survey. Severe anemia prevalence is also subject to seasonal variation to the extent that it is a result of malaria infection or other time-varying factors.

Data and Indicators on all-cause under-five mortality

RBM Impact Measures	Indicator Description	Data Availability
Mortality Indicator	All-cause under 5 mortality rate (5q0).	2000 DHS 2005 DHS 2007-08 RIDHS 2010 DHS

Calculating Indicators

Estimates of mortality require significant amounts of data, as death is a fairly rare event; thus, mortality rates for Malawi were estimated using data from the birth histories from DHS interviews. The DHS

calculates these estimates using information collected from birth histories of each interviewed woman. Women are asked the dates of each live birth, regardless of the current survival status of the child. For any death, child age at death is recorded. There is no time limit on this birth history, so every live birth a woman ever had during her lifetime should be recorded. With this information, 5-year mortality rates, approximating a point estimate of mortality rates approximately 2.5 years before the survey, are calculated using a synthetic cohort life table approach similar to that described in detail in the “DHS Guide to Statistics” (<http://www.measuredhs.com/help/Datasets/index.htm>). Mortality rates are calculated for ages 0 months, 1-2, 3-5, 6-11, 12-23, 24-35, 36-47, and 48-60 months using a Stata program. Each rate is calculated with a generalized linear model with binomial error, log link, and an appropriate offset for risk. Adjustments are made for the survey design using svyset. Stata produces robust standard errors and 95% confidence intervals for the log of each rate. These confidence intervals are mapped onto confidence intervals for the standard set of under-five mortality rates. The rates agree exactly with the CSPro program used by DHS and the confidence intervals differ only slightly from the results of the jackknife procedure used by DHS.

Potential Biases

As birth history information was collected from interviewed women in the DHS, the mortality of children whose mothers have died is missing from the estimate. Children whose mothers have died are known to have worse survival, which may lead to mortality being underestimated. Other potential biases include under-reporting of deaths and misreported age at death. These issues and the measures taken to avoid erroneous data are discussed in depth in the Guide to DHS Statistics (<http://www.measuredhs.com/help/Datasets/index.htm>).

Annex B: Models

A.2.1 Lives Saved Tool (LiST Model)

LiST Model methods

The Lives Saved Tool (LiST model) is a computer-projection model that runs through the Spectrum demographic program developed by the Futures Institute [1]. The Spectrum program links together the LiST module containing maternal and child health interventions, the family planning module that accounts for changes in fertility and the AIDS Impact Module (AIM) that provides information on HIV/AIDS prevalence and interventions [1]. The LiST model projections and information are available from www.jhsph.edu/dept/ih/IIP/list/. The analysis was performed with Spectrum version 5.03. Unless otherwise indicated, the values in the standard projection for Rwanda were used.

Mortality & Cause-Specific Mortality Profile

The baseline mortality values for 2000 were obtained from the IGME estimates for 2000 midyear (accessed 1/8/15). The values (deaths per 1000 live births) are neonatal (42.7), infant (108.0) and under five (181.9).

The cause-specific mortality profile for children 1-59 months old was obtained from the standard projection, with the exception that the malaria-specific mortality value from Rowe *et al.* [2,3] was applied. Rowe shows 4.6% (4.3 – 5.0%) of under-five mortality (including neonates) in Rwanda in 2000 was due to malaria. According to Bryce *et al.* [4], 26% of the under-five mortality occurs in the neonatal period in Africa. Therefore we removed neonatal mortality by adjusting the 4.6% by 26%, resulting in 6.22% (5.81 – 6.76%) of mortality in 1–59 month old children being due to malaria. The LiST model calculates AIDS mortality directly (5.63%). Holding the malaria and AIDS mortality values fixed, the cause-specific mortality values from the standard projection were adjusted proportionally to total 100%.

Intervention Coverage

The intervention coverage levels for indicators were obtained from the Rwanda DHS 2000, 2005, 2010 and the interim DHS in 2007-08. For the years between surveys, the values were linearly interpolated. Several of the interventions are currently in the model as place holders until the ideal indicators are developed and the model is updated.

Malaria Control Intervention Coverage

The % of households owning an ITN was used as the vector control intervention in the model, given that the combined ITN/IRS indicator was only available from the 2007-08 interim DHS. The LiST model has one indicator representing use of IPTp by pregnant women or the use of ITNs the night before the survey by pregnant women. Given that IPTp is no longer policy in Rwanda, the ITN use indicator was used. It was assumed that most malaria-attributable deaths are in the rural areas, where the coverage of malaria interventions is lower than in urban areas. Therefore, the rural value for the percentage of households owning at least one ITN and the percentage of pregnant women who slept under an ITN were used to conservatively calculate the malaria-specific deaths prevented by vector control and malaria in pregnancy measures in all of Rwanda.

Malaria Intervention Protective Efficacy

The protective effect of vector control methods (household ownership of ITNs or IRS) for preventing deaths in children 1-59 months due to malaria is estimated to be 55% (ranging from 49-60%) based on a review of trials and studies [6]. The protective effect of malaria control measures (ITN use by pregnant women or use of IPTp) during pregnancy is estimated to be 35% (95% confidence interval (CI) 23-45%) during the first two pregnancies based on a review of related trials [6]. The effect of preventing malaria in pregnancy is thought to be through decreasing low birth weight by preventing IUGR and therefore can affect deaths of children 0-59 months of age [6].

Uncertainty Limits

The uncertainty bounds around the number of malaria deaths prevented are based on the uncertainty surrounding the three primary model parameters: percentage of deaths due to malaria [4,5], the estimated protective effect of the malaria control interventions [6] and the malaria intervention coverage estimates from the DHS and MICS survey sets.

LiST Model References

- [1] Stover J, McKinnon R and Winfrey B. Spectrum: a model platform for linking maternal and child survival interventions with AIDS, family planning and demographic projections. *International Journal of Epidemiology*, 2010, 39:i7-i10.
- [2] Oestergaard MZ, Inoue M, Yoshida S, Mahanani WR, Gore FM, Cousens S, Lawn JE, Mathers CD; United Nations Inter-Agency Group for Child Mortality Estimation and the Child Health Epidemiology Reference Group. Neonatal mortality levels for 193 countries in 2009 with trends since 1990: a systematic analysis of progress, projections, and priorities. *PLoS Med*. 2011 Aug;8(8).
- [3] Bryce J et al. WHO estimates of the causes of death in children. *The Lancet*, 2005, 365(9465):1147-52.
- [4] Rowe AK et al. The burden of malaria mortality among African children in the year 2000. *International Journal of Epidemiology*, 2006, 35(3):691-704.
- [5] Rowe AK et al. Estimates of the burden of mortality directly attributable to malaria for children under five years of age in Africa for 2000. Complete report is available at: http://rbm.who.int/partnership/wg/wg_monitoring/docs/CHERG_final_report.pdf
- [6] Eisele TP, Larsen D, Steketee RW. Protective efficacy of interventions for preventing malaria mortality in children in *Plasmodium falciparum* endemic areas. *International Journal of Epidemiology*, 2010, 39(Suppl 1):i88-101.

Intervention coverage indicators & values used in LiST analysis

Intervention^a	2000	2005	2008	2010	Data Sources/Indicator Information
Periconceptual					
All interventions	n/a	n/a	n/a	n/a	data not available
Pregnancy					
Antenatal Care	10.3	13.3	23.9	35.4	% of women with a live birth in the five years preceding the survey who had 4+ ANC visits for the most recent birth (DHS, iDHS)
Tetanus toxoid	see yearly values under data sources				WHO-UNICEF ^b /% children protected at birth (pab): '00-'10: 81, 71, 79, 77,77,79,82,82,85,85,85
Pregnant women protected via IPT or sleeping under an ITN	1.2	15.5	59.9	70.8	% of pregnant women sleeping under an ITN the night before the survey, rural (DHS, iDHS)
Nutritional interventions	n/a	n/a	n/a	n/a	use defaults calculated by LiST
Case management interventions	n/a	n/a	n/a	n/a	use defaults calculated by LiST
Case management of malaria	n/a	n/a	n/a	n/a	data not available
Other (FGR)	n/a	n/a	n/a	n/a	use defaults calculated by LiST
Childbirth					
Skilled birth attendance (SBA)	31.3	38.6	52.1	69	% of live births assisted by a skilled birth attendant [doctor, clinical officer, nurse/midwife, MCH aide], (DHS, iDHS)
Institutional delivery (clinic and hospital)	26.5	28.2	45.2	68.9	% of live births delivered at a health facility (public, voluntary/religious, private) (DHS, iDHS)
Place and level of delivery	n/a	n/a	n/a	n/a	use defaults calculated by LiST
Delivery interventions	n/a	n/a	n/a	n/a	use defaults calculated by LiST
Breastfeeding					
<1 month					
Exclusive	99.57	94.1	n/a	93.6	% distribution of youngest children under 3 years living with the mother by breastfeeding status (retabulated DHS, MIS) (for 6-11 months and 12-23 months all types of breastfeeding were combined to generate any breastfeeding)
Predominant	0	2.1	n/a	2.4	
Partial	0.43	3.8	n/a	4	
Not	0	0	n/a	0	
1-5 months					
Exclusive	81.49	87.8	n/a	84.3	

Predominant	2.85	3	n/a	2.3	
Partial	15.23	8.8	n/a	12.8	
Not	0.43	0.4	n/a	0.7	
6-11 months					
Any	99.02	98.1	n/a	97.8	
Not	0.98	1.9	n/a	2.2	
12-23 months					
Any	86.71	87.7	n/a	89.9	
Not	13.29	12.3	n/a	10.1	
Preventative After Birth					
Preventative Postnatal Care	2.9	2.5	n/a	14.5	% of women whose child's first postnatal checkup was 0-2 days after delivery, denominator is births outside of health facility (DHS)
Chlorhexidine	n/a	n/a	n/a	n/a	data not available
Complementary Feeding-education only	78.9	69.2	n/a	68.9	% of 6-9mo breastfeeding and consuming complementary foods (DHS)
Complementary Feeding-education & supplementation	78.9	69.2	n/a	68.9	% of 6-9mo breastfeeding and consuming complementary foods (DHS)
Vitamin A supplementation	see yearly values under data sources				UNICEF ^d percentage of 6-59 mo receiving 2 doses of vitamin A: '00-'10: 0,0,0,8,93,99,78,76,85,94,92
Zinc supplementation	n/a	n/a	n/a	n/a	data not available
Use of improved water source within 30 minutes	see yearly values under data sources				% households with improved source of drinking water (JMP) ^c : '00-'10: 70.1,60.3,67.5,X,X,57.1,71.0,X,60.1,X,74.1
Use of water connection in the home	see yearly values under data sources				% of households with water piped into the dwelling/yard/plot (JMP) ^c : '00-'10: 5.5,4.6,3.1,3.5X,2.9,2.6,X,3.8,X,5.6
Improved excreta disposal (latrine/toilet)	see yearly values under data sources				% of households with access to flush toilet/vip latrine (JMP) ^e : '00-'10: 54.5,49.1,53.9,63.9,X,61.9,X,X,74.7,X,75.1
Hand washing with soap	17	17	17	17	Global value
Hygienic Disposal of children's stools	83	84.8	85.9	86.6	use values in Rwanda standard LiST projection
Insecticide treated materials or indoor residual spraying	2.9	11.8	53.8	81.6	% households owning at least 1 ITN, rural (DHS, iDHS)
Vaccines					

Rotavirus	n/a	n/a	n/a	n/a	data/vaccine not available
Measles	see yearly values under data sources				MCV1: WHO-UNICEF ^b '00-'10: 74,69,69,90,84,89,95,94,92,95,95
Hib	see yearly values under data sources				Hib3: WHO-UNICEF ^b '00-'10: 0,0,88,96,89,95,99,97,97,97,97
Pneumococcal	n/a	n/a	n/a	97	PCV3: WHO-UNICEF ^b '10: 97
DPT	see yearly values under data sources				DPT3: WHO-UNICEF ^b '00-'10: 90,77,88,96,89,95,99,97,97,97,97
Polio	see yearly values under data sources				Polio3: WHO-UNICEF ^b '00-'10: 90,76,85,96,89,95,99,98,97,93,93
BCG	see yearly values under data sources				BCG: WHO-UNICEF ^b '00-'10: 81,74,81,88,86,91,98,89,93,99,99
<u>Curative after birth</u>					
Maternal sepsis case management	n/a	n/a	n/a	n/a	data not available
KMC-Kangaroo mother care	n/a	n/a	n/a	n/a	data not available
Oral antibiotics: case management of severe neonatal infection	3.2	3.2	3.2	3.2	data from default Rwanda LiST projection
Injectable antibiotics: case management of severe neonatal infection	n/a	n/a	n/a	n/a	data not available
Full supportive care: case management of severe neonatal infection	2.65	2.82	9.04	34.45	% of live births delivered at a health facility * 0.5 (DHS,MIS)
ORS	13.6	11.6	21.3	29.1	% of children with diarrhea given ORS packets (DHS,MIS)
Antibiotics for dysentery	11.2	11.2	11.2	11.2	data from default Rwanda LiST projection
Zinc for treatment	n/a	n/a	n/a	n/a	data not available
Case management of pneumonia (oral antibiotics)	15.5	27.9	12.8	50.2	data from default Rwanda LiST projection
Vitamin A for measles treatment	see yearly values under data sources				same values as Vitamin A above, (national): '00-'10: 0,0,0,8,93,99,78,76,85,94,92
Antimalarials	n/a	n/a	n/a	n/a	not running the LiST model with this intervention (efficacy still being worked out for changing antimalarials)
Therapeutic feeding-for severe wasting	n/a	n/a	n/a	n/a	data not available
Treatment for moderate acute malnutrition	n/a	n/a	n/a	n/a	data not available

Fertility Risks	Age & birth order, birth intervals	data from default Rwanda LiST projection
^a It is important to note that the LiST model calculates lives saved compared to the baseline year, therefore a <i>change</i> in intervention coverage is required to see lives saved.		
^b WHO-UNICEF (http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswucoveragemcv.html)		
^d UNICEF: ChildInfo 2000-2004,2008 & SOWC 2008, 2009, 2011, 2012; 2000-2004 from LiST default values		
^e WHO/UNICEF Joint Monitoring Program for Water and Sanitation (http://www.wssinfo.org/documents-links/documents/)		

A.2.2 Decomposition Analysis

Table A.2.2.a: Trends in selected health and socioeconomic indicators that could have influenced child mortality, Rwanda, 2000-2010

		Percent		Number	
		2000	2010	2000	2010
Sex of the child	Male	50.3	51	8,188	9,137
	Female	49.7	49	8,188	9,137
Multiple birth	Single	97.5	97.1	8,188	9,137
	Multiple	2.5	2.9	8,188	9,137
Child birth order	1-2	38.8	44.3	8,188	9,136
	3	14.9	14.8	8,188	9,136
	4+	46.3	40.9	8,188	9,136
Preceding birth interval	First born	20.2	25	8,174	9,105
	<2 years	18.9	15	8,174	9,105
	2 years	29.1	29.4	8,174	9,105
	3+ years	31.8	30.6	8,174	9,105
Size at birth	Average or larger	88.8	84.6	8,130	9,084
	Smaller than average	11.2	15.4	8,130	9,084
Prenatal care provider	Health professional	58	68.7	8,187	9,137
	No/not health professional	42	31.3	8,187	9,137
Tetanus immunization during pregnancy	2+ doses	19	23.9	8,188	9,137
	1 dose	21.7	29.7	8,188	9,137
Delivery assistance	None	59.3	46.4	8,188	9,137
	Medical professional	26.7	69	8,188	9,137
	No assistant/not profess/other	73.3	31	8,188	9,137
Childhood	Low	64.1	11.4	8,187	9,137

immunization coverage	High	35.9	88.6	8,187	9,137
Maternal age at birth	18-34	73.4	78.6	8,187	9,137
	<18 and >34	26.6	21.4	8,187	9,137
Marital status of mother	Never married/not in union	16.8	14.4	8,188	9,137
	Currently in union	83.2	85.6	8,188	9,137
Mother's education	None	34	19.2	8,188	9,137
	Primary	55.8	72	8,188	9,137
	Secondary +	10.2	8.8	8,188	9,137
Contraceptive Use	Currently using	12.7	49.7	8,187	9,137
	Ever used	23.9	15.4	8,187	9,137
	Never used	63.3	34.9	8,187	9,137
Residence	Urban	14.8	12	8,188	9,137
	Rural	85.2	88	8,188	9,137
Household wealth	Low	50	33.7	8,188	9,137
	Medium	23.5	33.9	8,188	9,137
	High	26.6	32.4	8,188	9,137
Number of household members	1-4	35.3	37.2	8,188	9,136
	5	18.9	19.4	8,188	9,136
	6	15.4	16.7	8,188	9,136
	7	11.5	12.2	8,188	9,136
	8+	18.9	14.5	8,188	9,136
Source of drinking water	Safe sources	40.3	71	8,184	9,137
	Unsafe sources	59.7	29	8,184	9,137
Type of toilet facility	Improved toilet	8.9	71.9	8,187	9,137
	Rudimentary/no facility	91.1	28.1	8,187	9,137
Have mosquito bed net for sleeping	No	91.8	6.5	8,170	9,137
	Yes	8.2	93.5	8,170	9,137
Mother's ITN Use	No net use	95.3	23.3	8,188	9,137
	Used ITN	4.7	76.7	8,188	9,137

Table A.2.2.b: Univariate and Multivariate regression models of child survival (Weibull Hazard function)

	2000				2010			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	HR	p-value	HR	p-value	HR	p-value	HR	p-value
Sex of the child								
Male	1.0		1.0		1.0		1.0	
Female	0.873	0.038	0.874	0.045	0.853	0.078	0.829	0.036
Multiple birth								
Single	1.0		1.0		1.0		1.0	
Multiple	2.668	0.000	2.979	<0.0005	4.111	<0.0005	3.101	<0.0005
Preceding birth interval								
First born	1.0		1.0		1.0		1.0	
<2 years	1.382	0.001	1.314	0.005	1.477	0.003	1.552	0.001
2 years	0.835	0.058	0.784	0.014	0.724	0.013	0.724	0.031
3+ years	0.734	0.001	0.685	<0.0005	0.838	0.151	0.826	0.171
Prenatal care provider								
Health professional	1.0		1.0		1.0		1.0	
No/not health professional	2.106	<0.0005	1.936	<0.0005	3.056	<0.0005	2.836	<0.0005
Tetanus immunization during pregnancy								
2+ doses	1.0		1.0		1.0		1.0	
1 dose	1.191	0.195	1.196	0.165	0.768	0.126	0.796	0.206
None	2.025	<0.0005	1.107	0.477	2.253	<0.0005	0.934	0.723
Delivery assistance								
Medical professional	1.0		1.0		1.0		1.0	
No assistant/not profess/other	1.209	0.012	1.134	0.142	1.285	0.006	1.101	0.387
Childhood immunization coverage								
Low	1.0		1.0		1.0		1.0	
High (>80%)	0.931	0.318	0.934	0.427	0.984	0.914	1.068	0.666
Maternal age at birth								
18-34	1.0		1.0		1.0		1.0	
<18 and >34	0.943	0.435	1.054	0.512	1.189	0.096	1.508	<0.0005
Mother's education								
None	1.0		1.0		1.0		1.0	
Primary+	0.785	<0.0005	0.821	0.005	0.776	0.021	0.928	0.502
Residence								
Urban	1.0		1.0		1.0		1.0	
Rural	1.456	<0.0005	1.273	0.135	1.055	0.699	0.882	0.429
Household wealth								
Low	1.0		1.0		1.0		1.0	
Medium	0.998	0.981	1.002	0.985	0.932	0.507	1.046	0.723

High	0.809	0.009	0.913	0.338	0.810	0.060	0.942	0.692
Source of drinking water								
Safe sources	1.0		1.0		1.0		1.0	
Unsafe sources	1.017	0.796	0.925	0.324	1.223	0.034	1.144	0.222
Type of toilet facility								
Improved toilet	1.0		1.0		1.0		1.0	
Rudimentary/no facility	1.381	0.014	1.137	0.394	1.174	0.098	1.101	0.441
Household owns bednet								
No	1.0		1.0		1.0		1.0	
Yes	0.758	0.036	0.981	0.928	0.478	<0.0005	0.541	0.002
Mother's ITN Use								
No net use	1.0		1.0		1.0		1.0	
Used ITN	0.737	0.070	0.957	0.862	0.718	0.001	0.887	0.382
Total	7829				8,920			

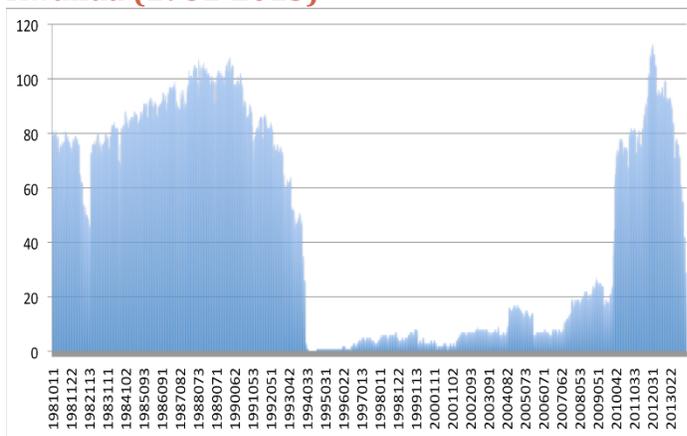
Annex C

A.3.1 Climate Analyses

Meteorological data

Obtaining accurate rainfall and temperature data for Rwanda is particularly challenging. The routine recording and collation of national ground observations from meteorological stations, owned and managed by Meteo Rwanda, was virtually destroyed immediately following the traumatic events of 1994 and the subsequent years of turmoil. Only after 2009 were national observing stations re-instigated to levels comparable to the period 1981-1993 (Figure 1).

Figure 1 Number of operational meteorological stations reporting rainfall by year in Rwanda (1981-2013)



Initial work to replace ground observations with satellite data was unsuccessful. Very poor relationships between standard rainfall estimate products and observed rainfall in Rwanda were found.

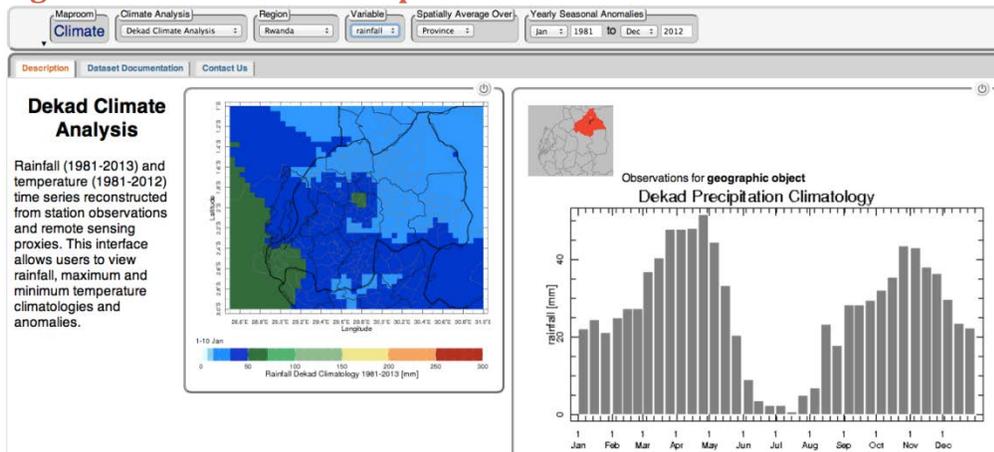
Enhanced National Climate Services (ENACTS)

A major effort to reconstruct Rwanda's climate from limited ground observations, satellite data, reanalysis data and a digital elevation model has been successfully undertaken [1]. The country now has the benefit of a high resolution quality assessed climatology for every 10km, every 10 days going back 30 years. It can be used to assess the spatial and temporal distribution of climate related malaria risk. The climate products and services developed using this approach (called Enhanced National Climate Services; ENACTS) have been tried and tested in a number of countries including Ethiopia [2] and Tanzania [3] where they have been used to explore climate related malaria risks [4]. Here we present their use in the assessment of the impact of malaria interventions in Rwanda.

Meteo Rwanda Maproom

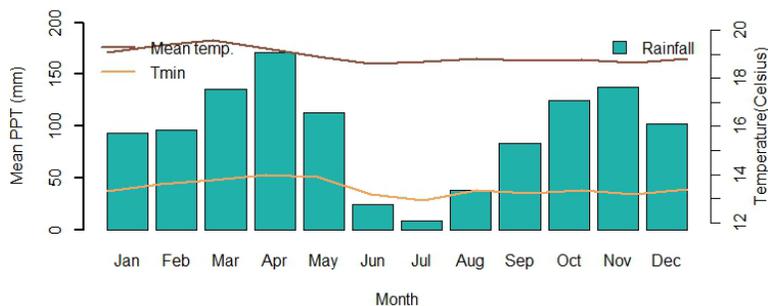
Information products derived from this climatology are available on Meteo Rwanda website in the "Climate Maprooms: <http://maproom.meteorwanda.gov.rw/maproom/>. This new climatology is managed, analysed, visualized and disseminated via the IRI Data Library and specific products of relevance to malaria impact assessment have been created (Figure 2).

Figure 1 Meteo Rwanda Maproom



Malaria is a climate sensitive disease and the spatial and seasonal patterns of cases are, in the absence of effective control, strongly influenced by climatic factors. This is because rainfall is necessary for creating mosquito breeding sites, humidity is important for adult mosquito survival and temperature is critical to the rate of development of mosquito and parasite, including the intrinsic incubation period [5].

Figure 2 Seasonal changes in rainfall and temperature based on ENACTS climatology



Note that the peak in mean temperature precedes the peak in minimum temperature. The latter has its lowest value in the main dry season.

Figure 3 Average rainfall 2000-2012

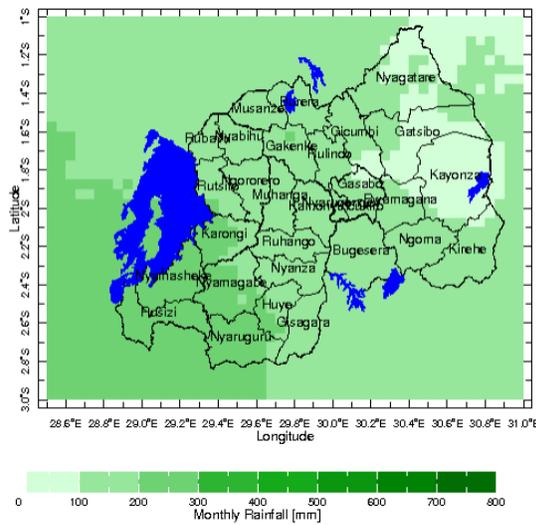
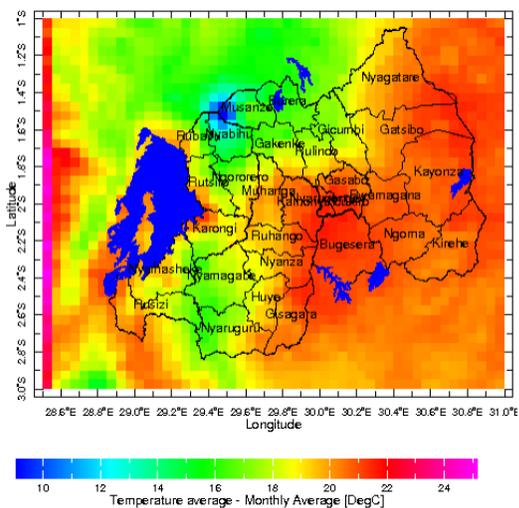


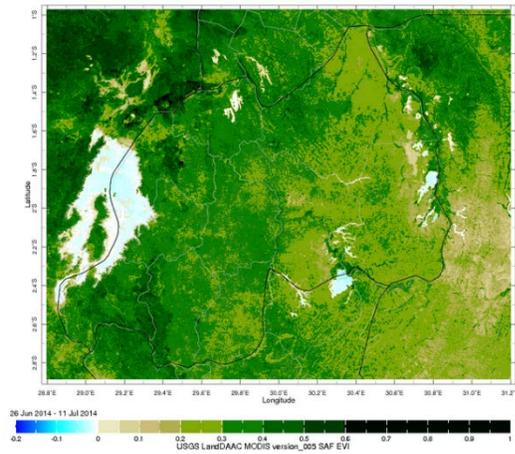
Figure 5 Average min temperature 2000-2013



According to the climate analysis rainfall is more prevalent in the South-West of the country where temperatures are cooler due to higher altitudes. Most malaria is found in the Eastern and southern lowlands where, despite shorter rainy seasons the higher temperatures and extensive breeding sites facilitate rapid development of vector and parasite populations.

Vegetation Indices

Figure 6 Enhanced Vegetation Index

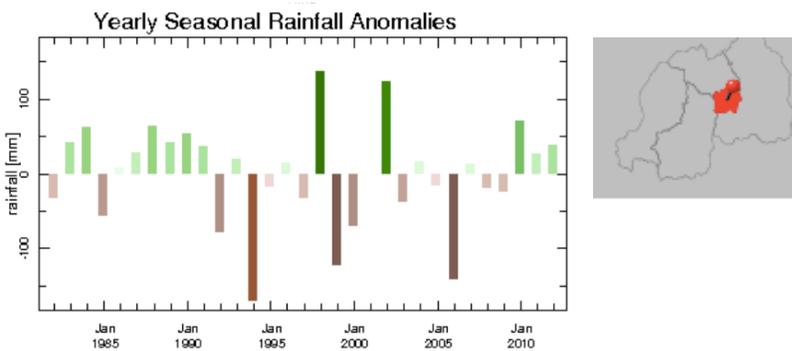


The impact of rainfall across the country can be seen in this high resolution image (250m² from NASA's MODIS (Moderate Resolution Imaging Spectroradiometer) satellite sensor (Figure 6). The darker green areas indicates denser, greener vegetation – an indication of greater rainfall (or run-off in lowland areas). The satellite image also provides a good indication of the presence of large water bodies [6].

The Climate analysis tool

The climate analysis tool permits provincial or district level anomalies in climate variables for specific months (or the entire year) to be presented. Below the anomalies in annual rainfall and temperature (minimum and maximum for Jan-Mar only) for Byumba are presented. The rainfall analysis indicates the intense rainfall that fell in Rwanda following the 1997/1998 El Nino while the depth of the 2000 and 2012 drought are clearly indicated.

Figure 7 Sep-Feb (short rains) rainfall anomalies for Kigali Province



The temperature analysis indicates the upward trend in both minimum and maximum temperatures which are observed across Rwanda during the first part of the year. No trends are observed during the July-December period. Unusually high temperatures are also observed during the period associated with the 1997/1998 El Nino.

Figure 8 Jan-Jun Seasonal Min and Max Temperature Anomalies Kigali Province

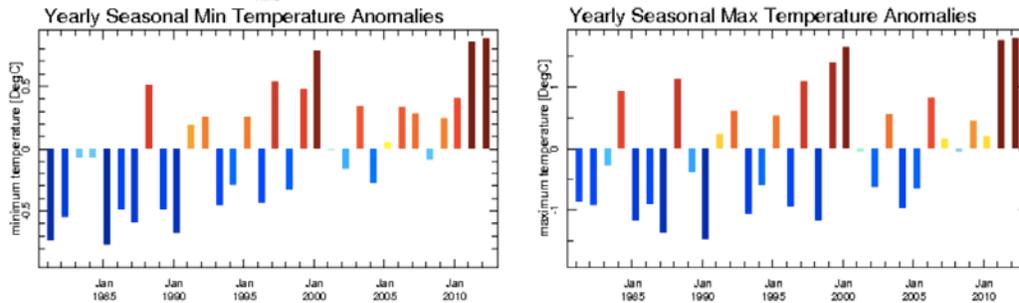
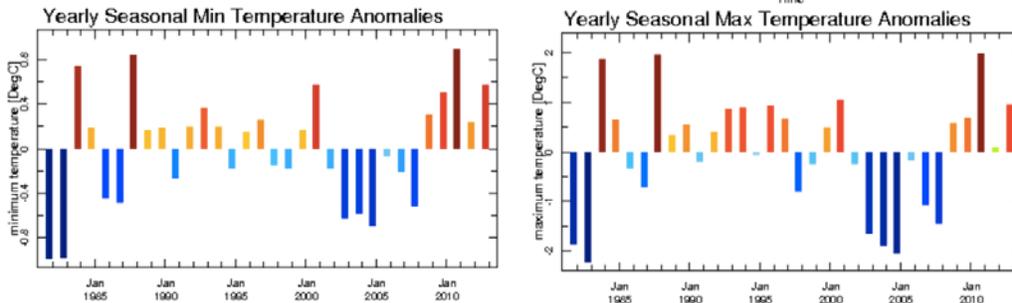


Figure 9 Jul-Dec Min and Max Temperature Anomalies for Kigali Province



Evidence of warming across Rwanda over the last 30 years during the first half of the year is compelling and is broadly in line with experienced in neighbouring countries and large scale tropical land and sea surface temperature. Note the strong response to the 1997/1998 El Niño in the Jan – Jun period.

The Climate Suitability for Malaria Transmission Tool

The Climate Suitability for Malaria Transmission (CSMT) [7], is a tool designed to identify the number of months at any location deemed climatologically suitable for malaria transmission. The tool is based on a simple series of climate thresholds and uses the historic 30 year climate ENACTS database for Rwanda. If there is coincidence of rainfall accumulation greater than 80 mm, average temperature between 18°C and 32°C, and relative humidity greater than 60% the location is deemed suitable for transmission for the particular month and year which can be represented as a probability distribution given that in some places transmission suitability might vary from year to year depending on climate variability.

Figure 10 Climate Suitability for Malaria Transmission

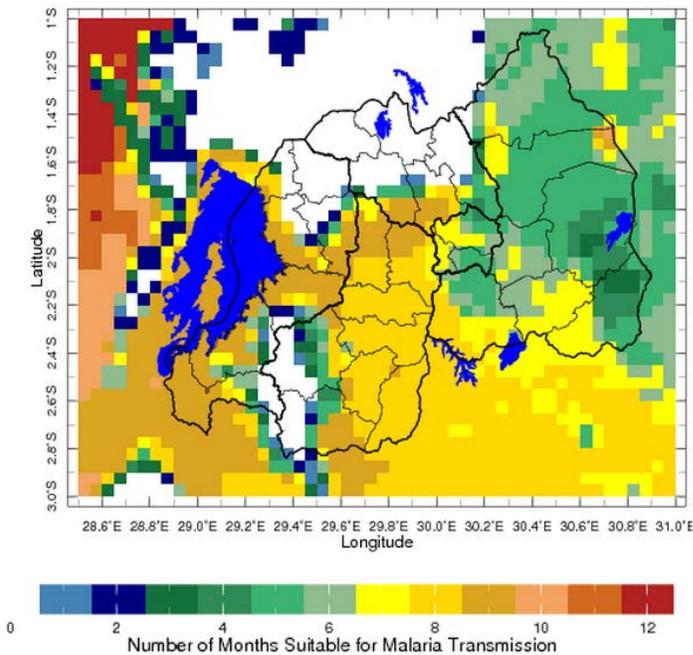


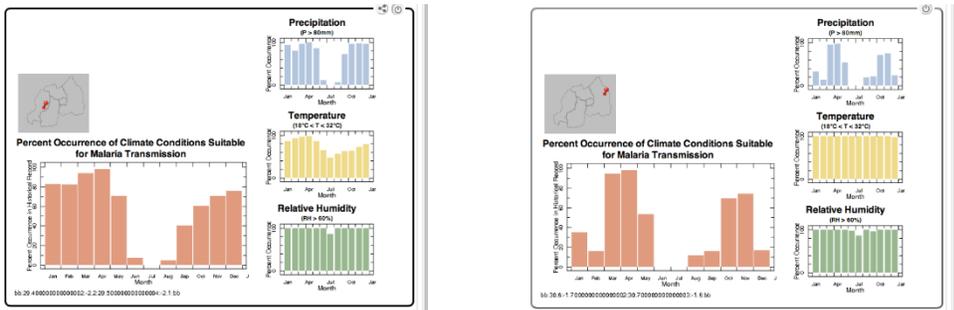
Figure 10 indicates the average total months over Rwandas' two malaria seasons when the thresholds are crossed but does not indicate how intense transmission might be for any given positive month.

The north Eastern region has less than 6 months transmission (green areas) throughout both seasons of the year while the central and southern region has 6-8 months excepting those areas which border zones where transmission is unlikely - due to low temperatures associated with high altitudes (white areas on map).

When clicking on an individual point the CSMT tool indicates the probability of the area having a suitable climate for transmission based on the monthly climate over the historic 30 year period. Figure 11 indicates that the site in the highland region has a longer season (9 months) where rainfall meets the threshold criteria in most of the prior 30 years but in some of months of some years the temperature threshold is not met. In the lowland region (Figure 12) the temperature threshold is always met but the threshold for rainfall is met during two short rainy seasons.

Figure 11 CSMT for a highland

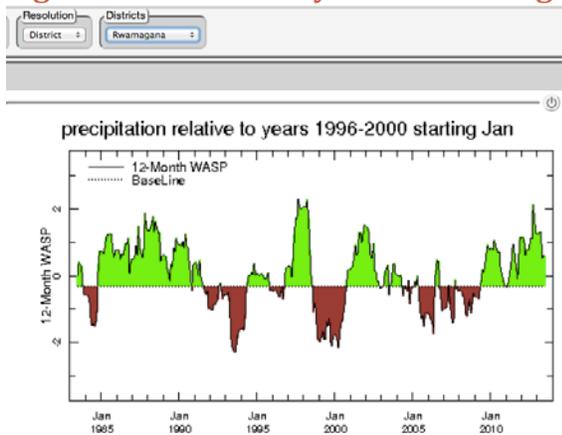
i



Dry and Wet years against a pre-intervention baseline: WASP

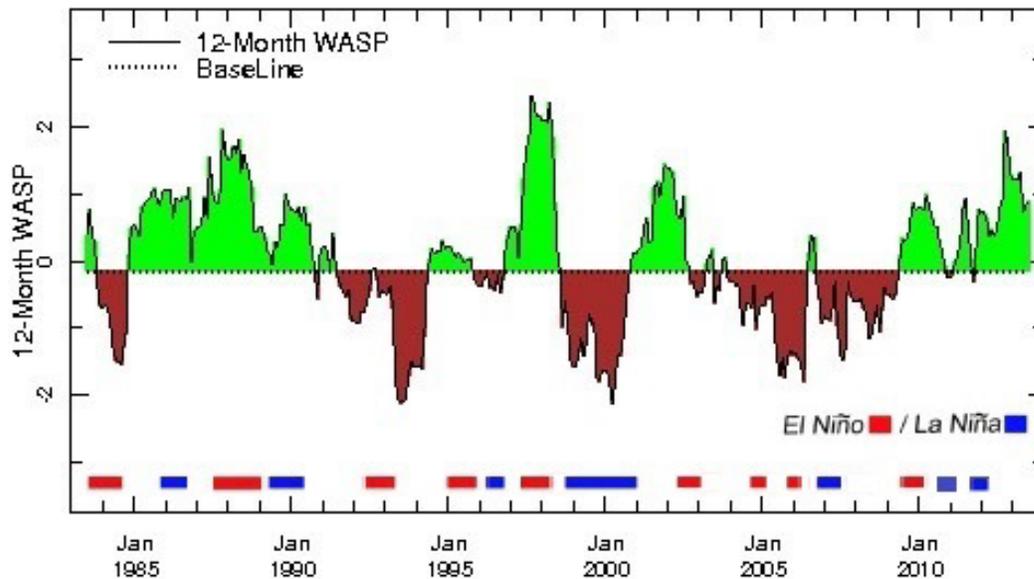
Figure 13 and 14 show the time series of 12-month Weighted Anomaly Standardization Precipitation (WASP) index relative to a baseline period (1996-2000) for Rwamagama district. The purpose of this tool is to provide a simple visual means of relating averaged precipitation to a reference period of interest. To compute the WASP index, monthly rainfall departures from the long-term (30-year) average are obtained and then standardized by dividing by the standard deviation of monthly rainfall. The standardized monthly anomalies are then weighted by multiplying by the fraction of the average annual rainfall for the given month. These weighted anomalies are then summed over a 12-month time period.

Figure 13 WASP Analysis for Rwamagama District



WASP index values are derived from precipitation estimates from the ENACTS merged rainfall dataset. A baseline period of 1996-2000 was applied. For WASP index values above (below) the baseline, the area between the index and the baseline value is shaded in green (brown). A baseline above (below) 0 indicates the selected year or period recorded precipitation above (below) the long-term average.

Figure 14 National WASP using a 1996-2000 baseline with El Nino and La Nina years indicated



Rainfall in Rwanda responds to the influences of the El Nino Southern Oscillation as can be seen in Figure 14 where a WASP index (used to assess the regions drought experience[8]) indicates a significant peak in the October-March rainfall during the 1997/98 event. A period immediately followed by a major drought.

A.3.2 Summary

Climate is an important driver of malaria transmission in Rwanda where the rainy season is bimodal and most intense in the western province and the varied topography impacts local temperatures. Temperatures have significantly increased during the first half of the year (Jan-Jun) over last three decades putting higher elevations at risk of transmission during this time of year. No evidence for trends in warming in the July-December period is found.

Both rainfall and temperature respond to ENSO forcing indicating that 2014 (a likely El Nino year) is likely to have an increased malaria risk. The pre intervention period (1996-2000) included the 1997/98 El Nino whereas the intervention decade (2001-2010) included two major drought periods which are likely to have aided the control efforts.

Most recently (2011-2012) there was an elevated risk from both high rainfall and unusually high temperatures (especially in the first half of the year. Success in maintaining control during 2014 would be indicative of a climate resilient control strategy.

A.3.3 Climate References

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8. Lyon, B., *The strength of El Niño and the spatial extent of tropical drought*. *Geophysical Research Letters*, 2004. **31**(L21204).

Annex D

Survey Data Availability for Standard Indicators

	DHS 2000	DHS 2005	IDHS 2007/08	DHS 2010
Vector Control				
Households with at least 1 ITN		X	X	X
De facto household population who could sleep under an ITN if each ITN in the household is used by two people		X	X	X
Children under 5 who slept under an ITN the previous night	X	X	X	X
Households with at least 1 ITN and/or sprayed by IRS in the last 12 months			X	
Treatment and Diagnosis (Children under 5 with fever in the last 2 weeks who received treatment/diagnostic test)				
Any antimalarial treatment	X	X	X	X
Antimalarial treatment according to national policy within 24 hours from onset of fever	X	X		X
Finger or heel stick				X
Malaria in Pregnancy				
Pregnant women who slept under an ITN the previous night	X	X	X	X
Women who received IPTp during ANC visits during their last pregnancy		X	X	
Parasitemia and Anemia				
Severe Anaemia		X	X	X
Infection with Plasmodium			X	X
Severe Anaemia and parasitaemia			X	X
Fever				
Fever	X	X	X	X
Fever and parasitaemia			X	X
Fever and blood test				X
Mortality				
Age-specific all cause mortality (per 1,000 live births) for five-year periods preceding the survey	X	X	X	X
X indicates that data is available for the indicator				

Indicators Summary Table

	DHS 2000					DHS 2005					IDHS 2007/08					DHS 2010				
	%	LCI	UCI	SE	WN*	%	LCI	UCI	SE	WN*	%	LCI	UCI	SE	WN*	%	LCI	UCI	SE	WN*
Vector Control																				
Households with at least 1 ITN** (Table H2)						14.7	13.6	15.8	0.6	10,272	55.6	53.8	57.4	0.9	7,377	82.0	81.0	82.9	0.5	12,540
De facto household population who could sleep under an ITN if each ITN in the household is used by two people (Table H2_A)						8.6	7.9	9.4	0.4	46,490	38.1	36.7	39.5	0.7	31,501	64.2	63.1	65.3	0.6	55,292
Children under 5 who slept under an ITN the previous night (Table H3)	4.3	3.4	5.4	0.5	7,033	12.6	11.4	13.9	0.6	8,105	56.5	54.3	58.7	1.1	5,412	69.6	68.2	71.0	0.7	8,942
Households with at least 1 ITN and/or sprayed by IRS in the last 12 months (Table H4)											56.6	54.8	58.5	0.9	7,377					
Treatment and Diagnosis***																				
Any antimalarial treatment (Table H5)						12.3	10.6	14.1	0.9	2,046	5.6	4.3	7.4	0.8	1,124	10.8	9.2	12.7	0.9	1,355
Antimalarial treatment according to national policy within 24 hours from onset of fever (Table H6)^	2.7	2.0	3.7	0.4	2,126	pending										7.5	6.2	9.1	0.7	1,355
Finger or heel stick (Table H7)																21.0	18.6	23.6	1.3	1,355
Malaria in Pregnancy																				
Pregnant women who slept under an ITN the previous night (Table H8)	4.4	3.1	6.0	0.7	945	17.2	14.7	20.1	1.4	894	60.3	56.3	64.2	2.0	673	72.2	69.1	75.1	1.5	952
Women who received IPTp^^ during ANC visits during their last pregnancy (Table H9)						0.2	0.1	0.4	0.1	3,436	17.2	15.2	19.4	1.1	2,267					
Parasitemia and Anemia																				
Severe Anaemia (Table H10)						5.4	4.6	6.4	0.5	3,537	1.6	1.2	2.0	0.2	4,752	1.3	1.0	1.7	0.2	4,037
Infection with Plasmodium† (Table H12)											2.6	1.9	3.5	0.4	4,659	1.4	1.0	1.9	0.2	4,046
Severe Anaemia and parasitaemia (Table H16)											0.3	0.2	0.6	0.1	4,630	0.2	0.1	0.4	0.1	4,036
Fever																				
Fever (Table H17)	30.2	28.7	31.8	0.8	7,033	26.2	24.8	27.7	0.7	7,797	21.4	19.9	23.1	0.8	5,241	15.8	14.9	16.7	0.5	8,605
Fever and parasitaemia (Table H18)											0.8	0.5	1.3	0.2	4,277	0.3	0.1	0.6	0.1	3,737
Mortality																				
Neonatal (NN)	43.9	38.7	49.7			37.0	32.7	41.8			28.0	23.0	34.0			27.0	23.6	31.0		
Postneonatal (PnN)	63.4	59.6	73.0			49.1	45.4	56.5			34.3	29.6	40.9			22.8	20.1	26.7		
Infant (1q0)	107.3	99.1	115.5			86.1	79.2	93.0			62.3	54.6	69.9			49.8	44.9	54.7		
Child (4q1)‡	99.4	91.4	107.4			72.4	65.7	79.0			43.0	36.0	49.9			27.2	23.7	30.7		
Under 5 mortality (5q0)	196.0	185.7	206.3			152.3	143.4	161.0			102.6	92.7	112.3			75.7	69.8	81.5		

* WN = Weighted number of cases (denominator)

** An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a pretreated net obtained within the past 12 months or (3) a net that has been soaked with insecticide within the past 12 months diagnostics.

^ This indicator uses prevalence of chloroquine use in 2000, and ACT use for all subsequent surveys.

^^IPTp: Intermittent Preventive Treatment during pregnancy is preventive treatment with two or more doses of SP/Fansidar

† Malaria infection detected by microscopy

‡Child mortality (4q1) is mortality between exact age 1 and exact age 5, per 1,000 children surviving to 12 months of age.

Table H2: Household Possession of insecticide-treated nets

Percentage of households with at least one insecticide-treated net** (ITN) by background characteristics and survey year, Rwanda

	DHS 2005					IDHS 2007/08					DHS 2010				
	%	LCI	UCI	SE	WN*	%	LCI	UCI	SE	WN*	%	LCI	UCI	SE	WN*
Residence															
Urban	31.6	28.8	34.6	1.5	1,510	65.3	62.1	68.5	1.6	1,145	84.5	82.1	86.6	1.2	1,759
Rural	11.8	10.6	13.0	0.6	8,762	53.8	51.7	55.8	1.0	6,232	81.6	80.4	82.7	0.6	10,781
Region															
City of Kigali	32.2	26.9	38.0	2.8	864	66.8	62.0	71.3	2.4	638	86.5	83.8	88.7	1.2	1,284
South	16.0	13.8	18.5	1.2	2,722	57.1	53.6	60.4	1.7	1,880	82.9	81.1	84.5	0.9	3,136
West	14.0	11.6	16.9	1.3	2,522	48.5	45.1	51.9	1.7	1,890	79.0	76.6	81.2	1.2	2,967
North	7.9	6.1	10.2	1.0	1,946	49.0	44.2	53.9	2.5	1,315	70.2	67.1	73.1	1.5	2,120
East	13.0	11.2	15.0	1.0	2,218	62.9	58.8	66.8	2.0	1,654	90.4	88.7	91.8	0.8	3,033
Wealth Quintile															
Lowest	4.8	3.7	6.1	0.6	2,217	43.3	40.4	46.3	1.5	1,614	73.0	70.8	75.0	1.1	2,838
Second	11.1	9.5	12.9	0.8	1,907	51.8	48.4	55.2	1.7	1,342	78.9	77.0	80.6	0.9	2,600
Middle	8.8	7.4	10.3	0.7	2,119	54.4	51.3	57.4	1.5	1,712	84.4	82.5	86.2	0.9	2,448
Fourth	14.5	12.8	16.4	0.9	2,105	65.2	62.1	68.2	1.6	1,269	88.1	86.5	89.5	0.8	2,287
Highest	36.5	33.7	39.3	1.4	1,925	65.7	62.8	68.5	1.5	1,441	87.8	86.2	89.1	0.7	2,367
Household Size															
<4	10.6	9.4	12.0	0.7	3,438	40.9	38.6	43.2	1.2	2,841	71.5	69.8	73.0	0.8	4,458
4 to 5	14.2	12.9	15.7	0.7	3,515	60.3	57.6	63.0	1.4	2,445	86.4	85.1	87.6	0.6	4,289
6 to 7	17.3	15.6	19.2	0.9	2,216	68.8	65.8	71.7	1.5	1,444	88.3	86.8	89.6	0.7	2,662
8 to 9	21.6	18.5	25.0	1.7	860	72.5	67.8	76.7	2.3	496	91.3	89.2	92.9	0.9	926
10+	30.6	24.8	37.1	3.1	243	73.4	64.9	80.4	4.0	151	94.8	90.7	97.1	1.6	205
Child under 5															
No	9.9	8.9	11.0	0.5	4,433	35.3	32.8	37.8	1.3	3,357	68.8	67.1	70.5	0.8	5,449
Yes	18.3	16.9	19.9	0.8	5,839	72.5	70.5	74.5	1.0	4,020	92.1	91.3	92.8	0.4	7,091
Total	14.7	13.6	15.8	0.6	10,272	55.6	53.8	57.4	0.9	7,377	82.0	81.0	82.9	0.5	12,540

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

Table H3: Universal Access of ITNs

Percentage of the de facto household population who could sleep under an insecticide-treated net** (ITN) if each ITN in the household is used by two people, by background characteristics and survey year, Rwanda

	DHS 2005				IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Residence												
Urban	20.9	18.5	23.3	7,139	49.0	46.9	51.0	4,914	71.3	68.2	74.5	7,424
Rural	6.4	5.7	7.2	39,352	36.1	34.5	37.7	26,587	63.1	61.9	64.4	47,868
Region												
City of Kigali	23.3	19.1	27.6	3,916	50.8	46.7	55.0	2,658	75.7	72.6	78.9	5,456
South	8.8	7.4	10.3	12,110	38.9	36.3	41.4	8,004	64.7	63.0	66.3	13,400
West	7.7	6.1	9.4	11,875	32.6	29.9	35.2	8,170	59.1	56.5	61.6	13,522
North	4.4	3.0	5.7	8,905	31.9	28.2	35.5	5,658	50.6	47.4	53.8	9,375
East	7.6	6.4	8.7	9,684	43.8	40.5	47.2	7,011	73.7	71.8	75.6	13,540
Wealth Quintile												
Lowest	2.4	1.8	3.0	9,496	26.1	23.8	28.3	4,603	55.6	53.7	57.6	10,980
Second	5.2	4.4	6.0	8,892	33.2	31.3	35.2	8,673	58.9	57.2	60.6	11,065
Middle	4.3	3.5	5.1	9,438	37.2	34.8	39.7	6,166	64.0	62.2	65.9	11,018
Fourth	7.7	6.6	8.7	9,362	42.5	39.9	45.1	5,888	67.9	66.3	69.5	11,088
Highest	23.7	21.6	25.9	9,302	50.6	48.3	52.8	6,172	74.5	72.6	76.3	11,141
Household Size												
<4	9.0	7.9	10.2	7,739	36.4	34.5	38.4	6,297	66.8	65.3	68.4	10,149
4 to 5	8.4	7.5	9.2	15,331	40.5	38.4	42.5	10,648	69.5	68.1	70.8	18,759
6 to 7	8.3	7.3	9.3	13,822	38.8	36.7	41.0	9,002	61.3	59.8	62.8	16,676
8 to 9	8.6	7.2	10.0	7,045	35.1	32.0	38.3	4,019	56.8	54.7	58.9	7,544
10+	11.4	8.5	14.3	2,553	32.0	26.9	37.2	1,535	54.5	51.0	58.0	2,165
Under Fives in Household												
0	7.1	6.3	8.0	14,872	27.7	25.5	29.9	10,631	59.5	57.8	61.3	18,418
1	9.4	8.5	10.2	31,619	43.4	41.9	44.9	20,870	66.5	65.5	67.6	36,875
Total	8.6	7.9	9.4	46,490	38.1	36.7	39.5	31,501	64.2	63.1	65.3	55,292

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a pretreated net obtained within the past 12 months or (3) a net that has been soaked with insecticide within the past 12 months.

Table H4: Use of insecticide-treated nets by children

	DHS 2000				DHS 2005				IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age (in years)																
<1	4.8	3.7	6.2	1,731	16.3	14.3	18.5	1769	63.9	60.2	67.4	1031	72.1	69.6	74.4	1577
1	5.3	4.0	7.0	1,330	15.5	13.4	17.8	1649	62.2	58.7	65.6	1234	76.2	74.0	78.3	1632
2	4.4	3.2	6.2	1,232	11.7	10.1	13.5	1792	55.7	52.0	59.3	981	71.9	69.6	74.1	1881
3	3.6	2.6	4.9	1,297	10.2	8.5	12.3	1440	52.5	49.0	56.0	1130	66.1	63.5	68.5	1861
4	3.2	2.2	4.6	1,443	8.3	6.7	10.2	1456	47.7	44.1	51.3	1036	63.4	61.0	65.8	1991
Sex																
Male	4.2	3.2	5.4	3,510	12.2	10.9	13.7	4,096	57.6	54.9	60.2	2,706	68.6	66.9	70.3	4,563
Female	4.4	3.5	5.6	3,522	12.9	11.5	14.5	4,009	55.5	52.5	58.4	2,706	70.6	68.9	72.3	4,379
Residence																
Urban	20.8	17.2	25.0	1,082	25.1	21.5	29.0	1,171	61.9	58.1	65.6	773	75.3	71.6	78.8	1,060
Rural	1.3	0.8	2.0	5,951	10.5	9.2	11.9	6,934	55.6	53.1	58.1	4,639	68.8	67.3	70.3	7,882
Region																
City of Kigali	23.1	17.3	30.0	569	23.4	18.4	29.2	596	61.3	55.2	67.1	407	75.9	71.6	79.8	826
South	2.0	1.0	3.8	1,630	15.7	12.9	18.9	2,008	57.0	52.5	61.4	1,385	68.6	66.0	71.1	2,171
West	2.2	1.0	4.7	1,908	12.0	9.6	14.9	2,149	57.8	53.0	62.5	1,350	69.8	67.0	72.6	2,235
North	1.9	0.9	3.8	1,565	7.1	5.2	9.7	1,622	52.5	47.1	57.9	952	65.3	61.6	68.9	1,388
East	5.0	3.1	8.0	1,315	11.1	9.1	13.5	1,729	56.1	51.8	60.4	1,319	70.7	67.6	73.5	2,323
Missing	2.6	0.9	7.3	45	0.0	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Wealth Quintile																
Lowest	0.9	0.4	2.0	881	4.4	3.2	5.9	1,680	49.7	46.0	53.5	1,112	62.4	59.6	65.1	2,069
Second	0.1	0.0	0.5	1,647	10.0	8.1	12.2	1,631	52.3	48.3	56.4	1,249	65.4	62.7	67.9	1,925
Middle	1.3	0.7	2.2	1,334	7.9	6.3	9.9	1,692	57.6	53.6	61.5	1,067	71.6	69.0	74.1	1,775
Fourth	1.2	0.6	2.5	1,744	12.7	10.6	15.3	1,618	62.6	58.7	66.3	1,054	74.3	71.6	76.8	1,673
Highest	17.8	14.9	21.0	1,424	29.9	26.5	33.6	1,484	62.2	58.3	66.0	930	77.5	74.6	80.1	1,499
Missing	0.0	0.0	0.0	2	0.0	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Mother's Education																
None	0.8	0.5	1.5	2,330	6.5	5.1	8.3	2,107	52.0	47.8	56.0	1,255	62.1	59.2	64.9	1,582
Primary	3.0	2.3	4.0	3,930	12.8	11.4	14.3	4,721	60.4	57.7	63.0	3,336	72.1	70.6	73.7	5,962
<i>Primary Incomplete</i>	2.3	1.5	3.4	2,614	12.2	10.7	13.8	3,912	59.5	56.4	62.5	2,431	71.2	69.4	72.8	4,762
<i>Primary Complete</i>	4.6	3.3	6.3	1,316	15.7	12.7	19.2	810	62.7	58.4	66.8	905	76.1	73.1	78.9	1,200
Secondary +	20.9	16.9	25.6	772	35.7	30.9	40.7	655	64.9	58.7	70.6	372	79.3	75.8	82.5	725
Missing	0.0	0.0	0.0	0	7.1	5.1	9.9	621	33.9	28.9	39.2	449	54.5	50.2	58.7	673
Birth Order																
1	5.0	3.9	6.3	1,396	17.0	14.8	19.4	1,297	61.7	58.0	65.2	1,001	73.4	71.2	75.5	1,981
2	5.4	4.0	7.2	1,293	15.0	12.9	17.4	1,282	58.4	54.5	62.1	899	73.9	71.5	76.2	1,595

3+	3.7	2.8	4.9	4,344	11.5	10.2	12.9	4,905	54.6	52.1	57.1	3,512	68.7	66.9	70.4	4,692
Missing	0.0	0.0	0.0	0	7.1	5.1	9.9	621	0.0	0.0	0.0	0	54.5	50.2	58.7	673
Household Size																
<4	1.7	1.0	2.8	925	14.5	11.9	17.5	867	59.4	55.1	63.5	740	77.8	75.2	80.3	1,225
4 to 5	2.9	2.1	4.1	2,716	12.2	10.7	13.9	3,100	57.7	54.5	60.9	2,165	71.0	69.1	72.9	3,674
6 to 7	5.4	4.0	7.1	1,985	12.0	10.3	13.9	2,555	56.1	52.3	59.9	1,644	66.0	63.6	68.3	2,693
8 to 9	5.4	3.7	7.8	1,041	13.2	10.8	15.9	1,199	52.7	47.8	57.5	650	66.7	63.2	70.1	1,050
10+	11.9	7.6	18.1	365	13.5	9.5	18.7	384	49.3	39.9	58.6	214	61.6	54.2	68.6	300
Number of Household ITNs																
None					0.0	0.0	0.0	6,515	0.0	0.0	0.0	1,403	0.0	0.0	0.0	654
1					58.5	55.2	61.7	1,123	68.4	65.7	70.9	1,975	65.9	63.7	68.1	2,259
2					74.4	68.1	79.9	320	84.8	82.2	87.1	1,484	76.8	74.9	78.6	3,567
3+					84.9	78.1	89.8	147	81.9	77.3	85.7	551	81.1	79.1	83.0	2,462
Total	4.3	3.4	5.4	7,033	12.6	11.4	13.9	8,105	56.5	54.3	58.7	5,412	69.6	68.2	71.0	8,942

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

Table H5: Household vector control measures

Percentage of households with at least one insecticide-treated net** (ITN) and/or indoor residual spraying (IRS) in the last 12 months, by background characteristics and survey year, Rwanda

	IDHS 2007/08			
	%	LCI	UCI	WN*
Residence				
Urban	72.1	68.7	75.3	1,145
Rural	53.8	51.7	55.8	6,232
Region				
City of Kigali	79.0	72.8	84.1	638
South	57.1	53.6	60.4	1,880
West	48.5	45.1	51.9	1,890
North	49.0	44.2	53.9	1,315
East	62.9	58.8	66.8	1,654
Wealth Quintile				
Lowest	43.5	40.6	46.5	1,614
Second	51.9	48.5	55.3	1,342
Middle	54.7	51.7	57.7	1,712
Fourth	65.7	62.6	68.6	1,269
Highest	70.0	67.0	72.8	1,441
Household Size				
<4	42.4	40.1	44.8	2,841
4 to 5	60.9	58.2	63.6	2,445
6 to 7	69.5	66.5	72.3	1,444
8 to 9	73.7	69.1	77.8	496
10+	75.8	67.1	82.7	151
Total	56.6	54.8	58.5	7,377

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

1	10.7	7.4	15.2	373	11.9	8.6	16.1	391	5.7	3.4	9.5	241	12.2	9.1	16.3	388
2	8.6	6.0	12.2	384	15.0	11.2	19.7	347	5.7	3.0	10.5	213	9.4	6.2	14.0	269
3+	10.2	8.4	12.4	1,369	11.7	9.8	13.9	1,308	5.6	3.9	8.0	670	10.6	8.5	13.1	699
Household Size																
<4	11.5	8.1	16.1	341	12.1	8.5	16.7	278	6.7	4.0	11.2	209	11.5	7.9	16.3	240
5-6	10.3	7.9	13.2	853	12.9	10.4	15.9	796	5.2	3.2	8.3	439	13.0	10.2	16.5	567
7-8	8.7	6.4	11.8	554	11.2	8.6	14.4	622	6.9	4.3	11.0	327	9.9	7.2	13.6	361
9-10	9.4	6.3	13.8	292	12.7	8.6	18.4	277	3.8	1.4	10.0	107	4.2	2.0	8.6	156
10+	11.7	5.7	22.4	86	14.1	7.4	25.3	74	0.0			42	10.1	2.1	36.6	32
Source of Treatment																
None	Pending				1.6	0.9	3.1	803	1.0	0.5	1.9	620	0.6	0.2	1.6	667
Public					28.3	24.2	32.8	492	14.0	10.5	18.5	361	24.5	20.9	28.5	546
Private					19.0	14.8	23.9	399	8.1	3.6	17.4	69	12.1	6.1	22.5	75
Other					6.5	4.1	10.2	352	1.3	0.2	8.4	73	0.0	0.0	0.0	68
Total	10.0	8.5	11.8	2,126	12.3	10.6	14.1	2,046	5.6	4.3	7.4	1,124	10.8	9.2	12.7	1,355

* WN = Weighted number of cases (denominator)

Table H7: Timing of antimalarial treatment received by children with fever

Among children under age five with fever in the two weeks preceding the survey, the percentage who received antimalarial treatment according to national policy within 24 hours from onset of fever, by background characteristics and survey year, Rwanda

	DHS 2000				DHS 2005				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age in years	CQ				#PENDING				ACT			
<1	2.5	1.4	4.2	660					2.9	1.5	5.5	300
1	3.5	1.9	6.3	514					9.0	6.4	12.4	353
2	2.7	1.4	5.2	367					7.3	4.8	11.0	282
3	1.7	0.7	4.1	293					8.7	5.6	13.2	237
4	2.8	1.4	5.7	292					11.1	7.4	16.3	184
Sex of child												
Male	2.5	1.5	3.9	1,069	7.2	5.4	9.5	722				
Female	3.0	2.1	4.3	1,057	7.8	6.0	10.2	634				
Residence												
Urban	1.3	0.5	2.9	216	6.5	3.7	11.3	172				
Rural	2.9	2.1	4.0	1,910	7.7	6.2	9.4	1,183				
Region												
City of Kigali	2.4	1.0	6.0	139	5.0	2.3	10.3	144				
South	3.0	1.9	4.7	581	12.0	9.0	15.9	367				
West	1.9	1.0	3.8	562	5.8	3.7	9.1	378				
North	1.8	0.5	6.2	379	1.4	0.4	4.2	229				
East	4.1	2.3	7.2	452	10.7	7.4	15.1	237				
Missing	9.1	3.1	23.6	13				0				
Wealth Quintile												
Lowest	3.5	1.6	7.5	335	8.2	5.4	12.4	355				
Second	1.1	0.5	2.5	515	4.6	2.7	7.5	313				
Middle	1.9	0.9	4.0	450	9.0	6.1	13.1	264				
Fourth	3.2	1.9	5.3	520	7.2	4.3	11.7	190				
Highest	5.0	2.7	8.9	306	9.0	5.8	13.6	234				
Mother's Education												
None	2.2	1.1	4.1	750	7.3	4.6	11.5	228				
Primary	3.1	2.2	4.4	1,231	7.9	6.4	9.9	1,008				
<i>Primary Incomplete</i>	2.6	1.7	4.1	837	7.5	5.9	9.6	817				
<i>Primary Complete</i>	4.0	2.3	6.9	394	9.7	6.1	15.1	191				
Secondary +	2.4	0.8	6.6	145	4.2	1.8	9.7	119				
Birth Order												
1	2.1	1.0	4.3	373	7.6	5.3	10.8	388				
2	2.2	1.1	4.4	384	7.2	4.6	11.1	269				
3+	3.0	2.1	4.4	1,369	7.6	5.7	9.9	699				
Household Size												
<4	2.3	1.1	4.7	341	6.9	4.1	11.1	240				
5-6	3.3	2.2	5.0	853	9.9	7.6	12.7	567				
7-8	2.2	1.2	3.9	554	6.3	4.1	9.6	361				
9-10	2.7	1.1	6.2	292	2.2	0.8	5.9	156				
10+	2.3	0.6	8.7	86	10.1	2.1	36.6	32				
Source of Treatment												
None	Pending								0.1	0.0	0.8	667
Public									17.6	14.6	21.1	546
Private									6.8	2.9	15.2	75
Other									0.0			68
Total	2.7	2.0	3.7	2,126	#PENDING				7.5	6.2	9.1	1,355

* WN = Weighted number of cases (denominator)

†There was an issue with collection of timing data - only asked for one drug response (denominator of 3) - unfortunately not useable.
‡Note on first-line treatment: As of 2000, chloroquine was the first-line antimalarial treatment in Rwanda. In December 2001, first-line therapy shifted to SP/AQ. SP/AQ and chloroquine were not included as response options in the 2005 DHS survey – we can discuss how the team would like to define first-line treatment in 2005. In 2006, first-line therapy shifted to the ACT artemether-lumefantrine (AL).

Table H8: Diagnostic tests in children with fever

Among children under age five with fever in the two weeks preceding the survey, the percentage who had a finger or heel stick, by background characteristics and survey year, Rwanda

	DHS 2010			
	%	LCI	UCI	WN*
Age in years				
<1	18.8	14.6	23.8	300
1	26.9	22.6	31.6	353
2	21.5	16.9	26.9	282
3	15.8	11.5	21.3	237
4	19.0	13.9	25.3	184
Sex of child				
Male	22.8	19.7	26.3	722
Female	18.9	15.7	22.5	634
Residence				
Urban	39.3	31.0	48.3	172
Rural	18.3	16.0	20.9	1,183
Altitude				
<1600m	28.4	24.0	33.2	515
1600m+	16.4	13.8	19.4	840
Region				
City of Kigali	42.0	33.6	50.8	144
South	19.7	15.3	25.0	367
West	17.4	13.2	22.6	378
North	11.8	8.1	16.7	229
East	24.8	19.7	30.7	237
Wealth Quintile				
Lowest	13.6	10.1	18.0	355
Second	13.2	9.5	18.0	313
Middle	17.8	13.3	23.3	264
Fourth	26.8	20.6	34.2	190
Highest	41.5	35.0	48.2	234
Mother's Education				
None	14.9	10.5	20.6	228
Primary	19.4	16.8	22.3	1,008
<i>Primary Incomplete</i>	17.7	15.0	20.8	817
<i>Primary Complete</i>	26.6	20.3	34.0	191
Secondary +	46.3	37.2	55.6	119
Birth Order				
1	23.7	19.1	29.0	388
2	19.4	15.0	24.8	269
3+	20.1	17.0	23.5	699
Household Size				
<4	23.5	18.2	29.8	240
5-6	20.7	17.2	24.8	567
7-8	19.8	15.7	24.6	361
9-10	17.1	12.0	23.8	156
10+	38.0	23.8	54.7	32
ITN				
0	14.5	11.3	18.3	432
1	23.9	20.9	27.2	908
Total	21.0	18.6	23.6	1,355

* WN = Weighted number of cases (denominator)

Table H9: Use of insecticide-treated nets by pregnant women

Percentage of pregnant women who slept under an insecticide-treated net** (ITN) the previous night by background characteristics and survey year, Rwanda

	DHS 2000				DHS 2005				IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Residence																
Urban	22.0	16.2	29.2	144	28.6	22.1	36.2	118	63.1	54.4	71.0	93	80.2	73.7	85.3	149
Rural	1.2	0.6	2.3	801	15.5	12.8	18.6	776	59.9	55.4	64.2	580	70.8	67.3	74.0	803
Region																
City of Kigali	16.9	11.7	23.8	76	22.5	15.1	32.3	76	61.8	49.9	72.5	68	80.3	72.0	86.6	114
South	2.7	0.9	7.7	208	19.1	13.5	26.4	224	53.3	44.7	61.6	172	74.1	67.3	79.9	198
West	2.4	0.9	6.3	273	16.4	11.6	22.6	221	63.6	55.6	70.8	161	67.6	61.2	73.4	241
North	4.4	1.9	9.7	207	11.7	7.6	17.6	161	59.2	50.1	67.7	113	66.6	58.5	73.8	148
East	4.1	2.0	8.4	174	18.4	13.7	24.4	212	64.9	57.0	72.0	159	74.8	68.5	80.2	251
Missing	0.0	0.0	0.0	7	0.0	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Wealth Quintile																
Lowest	1.4	0.3	5.5	127	7.6	4.6	12.4	203	50.3	41.1	59.5	130	67.1	59.2	74.1	197
Second	0.0	0.0	0.0	215	16.8	11.9	23.3	178	63.7	55.1	71.5	156	65.5	58.4	72.1	194
Middle	0.0	0.0	0.0	188	12.1	7.8	18.1	170	60.6	51.5	69.0	137	76.6	69.5	82.5	200
Fourth	2.2	0.9	5.0	254	18.7	13.5	25.3	207	63.1	53.0	72.2	135	75.9	69.0	81.7	186
Highest	21.1	15.6	27.8	161	36.3	28.8	44.5	136	63.5	54.2	72.0	114	76.4	69.9	81.9	176
Education																
None	1.3	0.5	3.2	290	8.8	5.5	13.9	223	51.1	41.9	60.3	140	63.7	55.9	70.8	153
Primary	3.4	2.1	5.5	555	17.4	14.3	20.9	605	62.8	58.1	67.2	468	74.0	70.2	77.4	702
<i>Primary Incomplete</i>	2.2	1.1	4.3	368	15.6	12.5	19.2	503	<i>n/a</i>				71.4	67.1	75.4	565
<i>Primary Complete</i>	5.7	3.0	10.8	187	26.2	18.1	36.3	103	<i>n/a</i>				84.7	77.7	89.8	137
Secondary +	18.6	12.3	27.2	100	45.1	33.3	57.4	65	62.8	50.1	73.9	64	73.1	63.7	80.8	97
Household Size																
<4	1.5	0.7	3.4	344	14.3	10.4	19.5	305	58.2	52.1	64.1	299	75.6	70.5	80.1	374
4 to 5	5.3	3.2	8.6	342	16.9	13.2	21.3	341	60.2	52.9	67.0	226	75.3	70.3	79.7	338
6 to 7	6.6	3.8	11.2	179	21.5	15.8	28.5	159	66.8	56.3	75.9	108	63.9	56.4	70.8	165
8 to 9	7.1	2.8	17.0	65	22.1	14.1	32.8	77	59.3	40.4	75.9	31	59.8	46.9	71.4	62
10+	10.7	2.8	32.8	15	14.4	3.6	43.3	12	59.8	31.0	83.1	8	61.0	30.0	85.1	13
Number of Household ITNs																
None					0.0	0.0	0.0	703	0.0	0.0	0.0	194	0.0	0.0	0.0	103
1					80.1	72.9	85.8	150	81.5	76.3	85.7	288	74.6	69.0	79.4	302
2					79.5	59.5	91.1	28	87.7	81.5	92.1	143	83.9	79.0	87.8	352
3+					88.3	64.9	96.8	13	96.4	85.3	99.2	47	85.7	79.8	90.1	196

Age																	
15-19	1.4	0.4	4.2	72	9.9	3.0	27.8	28	43.1	24.2	64.4	25	63.8	48.9	76.4	45	
20-24	4.0	1.9	8.2	231	17.3	12.9	22.9	248	54.5	47.4	61.4	213	66.6	60.5	72.2	272	
25-29	5.9	3.5	9.7	272	17.4	13.3	22.4	254	62.8	55.9	69.2	218	78.5	73.6	82.7	315	
30-34	5.7	3.0	10.3	182	19.6	14.5	25.9	185	66.6	55.1	76.4	99	74.4	67.0	80.6	185	
35-39	3.6	1.6	7.7	123	14.3	8.9	22.3	119	66.5	55.3	76.0	81	65.6	54.0	75.6	86	
40-44	0.6	0.1	4.3	55	14.0	6.6	27.3	51	68.6	49.3	83.1	31	73.2	58.4	84.1	43	
45-49	0.0	0.0	0.0	10	36.7	12.9	69.3	11	15.3	1.9	62.6	5	82.3	35.0	97.6	6	
Total	4.4	3.1	6.0	945	17.2	14.7	20.1	894	60.3	56.3	64.2	673	72.2	69.1	75.1	952	

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

Table H10: Use of Intermittent preventive treatment during pregnancy women

Percentage of women age 15-49 with a live birth in the two years preceding the survey who received Intermittent Preventive Treatment (IPTp)** for malaria during ANC visits during their last pregnancy, by background characteristics and survey year, Rwanda

	DHS 2005				IDHS 2007/08			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Residence								
Urban	0.4	0.1	1.5	456	20.2	15.8	25.4	318
Rural	0.2	0.1	0.4	2,980	16.7	14.5	19.1	1,949
Region								
City of Kigali	0.7	0.2	2.8	245	18.4	12.3	26.6	173
South	0.3	0.1	1.3	820	21.0	16.5	26.3	580
West	0.0	0.0	0.0	920	17.9	14.3	22.3	581
North	0.2	0.0	1.4	671	9.3	6.3	13.5	374
East	0.2	0.0	0.7	780	17.3	13.6	21.9	559
Wealth Quintile								
Lowest	0.0	0.0	0.0	733	12.5	9.0	17.1	481
Second	0.2	0.0	1.3	711	11.8	8.6	16.0	420
Middle	0.2	0.0	1.3	716	15.5	12.5	19.1	542
Fourth	0.2	0.0	0.7	713	25.5	20.3	31.4	435
Highest	0.6	0.2	1.8	562	21.8	17.5	26.8	390
Education								
None	0.2	0.0	1.1	931	12.1	8.9	16.1	544
Primary	0.1	0.0	0.5	2,236	19.1	16.6	21.8	1,541
Primary Incomplete	0.1	0.0	0.5	1,858	18.3	15.7	21.3	1,152
Primary Complete	0.3	0.0	2.5	378	21.3	16.9	26.3	389
Secondary +	0.9	0.3	2.7	269	16.4	11.2	23.5	182
Household Size								
<4	0.2	0.0	1.5	607	22.4	18.6	26.5	478
4 to 5	0.1	0.0	0.4	1,290	14.7	11.9	18.0	876
6 to 7	0.2	0.1	0.8	972	17.8	14.5	21.8	605
8 to 9	0.3	0.0	2.2	432	16.6	11.9	22.7	237
10+	1.0	0.1	7.1	136	9.5	4.4	19.3	72
Age								
15-19	0.0	0.0	0.0	73	18.2	9.3	32.5	49
20-24	0.3	0.1	1.1	827	17.4	14.3	21.0	536
25-29	0.2	0.0	0.7	965	18.8	15.5	22.7	691
30-34	0.0	0.0	0.0	742	17.3	13.8	21.6	468
35-39	0.3	0.0	2.0	467	12.4	8.9	17.1	324
40-44	0.5	0.1	3.2	307	18.3	12.5	25.9	156
45-49	0.0	0.0	0.0	55	16.8	8.2	31.3	44
Parity								
1	0.4	0.1	1.4	615	21.6	17.8	26.0	479
2	0.2	0.1	0.4	2,821	16.0	13.8	18.5	1,789
3+								
Month Gestation of ANC								
<3	0.6	0.1	2.5	285	21.0	17.3	25.3	539
4	0.5	0.1	2.3	374	20.1	15.9	25.2	445
5	0.3	0.1	1.5	570	17.1	13.3	21.6	404
6	0.0	0.0	0.0	943	17.5	14.0	21.7	439
7+	0.1	0.0	0.8	1,265	9.2	6.3	13.3	440
Number of Household ITNs								
None	0.1	0.1	0.4	2,721	13.7	10.9	17.3	559

1	0.4	0.1	1.7	532	17.8	14.9	21.1	918
2	0.8	0.1	5.5	131	17.9	14.6	21.8	584
3+	0.0	0.0	0.0	52	21.7	16.3	28.2	206
Total	0.2	0.1	0.4	3,436	17.2	15.2	19.4	2,267

* WN = Weighted number of cases (denominator)

**IPTp: Intermittent Preventive Treatment during pregnancy is preventive treatment with two or more doses of SP/Fansidar

Table H11: Prevalence of severe anemia (Hemoglobin <8g/dl) in children

Percentage of children age 6-59 months with hemoglobin lower than 8.0 g/dL, by background characteristics and survey year, Rwanda

	DHS 2005				IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age (in months)												
6-11	9.1	6.5	12.5	403	4.7	3.1	7.1	514	4.2	2.6	6.6	407
12-23	9.1	7.0	11.7	796	2.4	1.6	3.5	1,201	1.8	1.1	3.0	814
24-35	5.0	3.7	6.7	898	0.8	0.4	1.6	953	1.2	0.6	2.3	944
36-47	2.7	1.7	4.3	708	1.0	0.6	1.8	1,084	0.3	0.1	0.9	943
48-59	2.5	1.5	4.0	732	0.2	0.1	0.7	1,000	0.6	0.2	1.4	929
Age												
6-23 months	9.1	7.3	11.2	1,199	3.1	2.3	4.1	1,715	2.6	1.8	3.6	1,221
24-59 months	3.5	2.8	4.4	2,338	0.7	0.4	1.1	3,037	0.7	0.4	1.1	2,815
Sex												
Male	5.3	4.2	6.7	1,741	1.8	1.3	2.4	2,373	1.5	1.1	2.1	2,037
Female	5.5	4.4	6.8	1,797	1.3	0.9	1.9	2,379	1.0	0.7	1.6	1,999
Residence												
Urban	4.8	3.3	6.8	495	1.9	1.1	3.1	666	1.9	1.0	3.6	475
Rural	5.5	4.6	6.6	3,042	1.5	1.1	2.0	4,086	1.2	0.9	1.6	3,562
Altitude												
<1600m	8.1	6.5	10.0	1,341	2.4	1.7	3.3	1,965	1.8	1.2	2.6	1,659
1600m+	3.8	2.9	4.8	2,196	1.0	0.6	1.4	2,787	0.9	0.6	1.4	2,378
Region												
City of Kigali	7.1	3.9	12.7	226	1.5	0.8	2.8	340	2.1	1.1	4.2	365
South	6.0	4.3	8.4	908	1.9	1.2	3.0	1,243	1.4	0.9	2.3	986
West	2.9	2.0	4.3	933	0.9	0.4	1.9	1,191	0.4	0.2	1.1	1,003
North	4.1	2.5	6.5	729	0.6	0.2	1.6	835	0.7	0.3	1.9	656
East	8.5	6.6	10.9	741	2.6	1.8	3.9	1,143	2.0	1.2	3.1	1,027
Wealth Quintile												
Lowest	4.8	3.2	7.0	721	1.9	1.2	3.0	966	1.3	0.8	2.3	901
Second	6.2	4.6	8.3	755	1.7	1.0	2.8	1,100	1.1	0.6	2.0	881
Middle	6.0	4.2	8.5	733	1.5	0.9	2.6	949	0.9	0.4	1.9	812
Fourth	6.3	4.7	8.4	740	1.4	0.8	2.5	928	1.3	0.7	2.4	788
Highest	3.2	1.9	5.2	588	1.1	0.6	2.0	809	1.9	1.1	3.3	655
Mother's Education												
None	5.0	3.6	6.9	897	1.8	1.1	3.1	1,124	0.9	0.4	1.9	729
Primary	5.8	4.7	7.0	2,108	1.5	1.1	2.1	2,913	1.3	0.9	1.8	2,687
<i>Primary Incomplete</i>	5.9	4.0	8.5	528	1.5	1.1	2.2	2,106	1.3	0.9	1.9	2,168
<i>Primary Complete</i>	6.3	4.4	9.0	549	1.4	0.8	2.7	807	1.3	0.6	2.7	519
Secondary +	5.0	4.1	6.1	2,210	1.2	0.5	2.9	323	2.2	1.1	4.6	313
	5.4	4.6	6.4	3,537	1.6	1.2	2.0	4,752	1.3	1.0	1.7	4,037
Birth Order												
1	5.9	4.0	8.5	528	1.8	1.1	2.9	865	1.1	0.6	2.2	886
2	6.3	4.4	9.0	549	1.6	0.9	2.8	785	1.3	0.7	2.5	704
3+	5.0	4.1	6.1	2,210	1.5	1.1	2.1	3,102	1.4	0.9	2.0	2,139
	5.4	4.6	6.4	3,537	1.6	1.2	2.0	4,752	1.3	1.0	1.7	4,037
Household Size												
<4	7.6	5.0	11.5	368	2.4	1.3	4.2	618	1.5	0.7	3.1	568
4 to 5	6.1	4.8	7.8	1,329	1.4	0.9	2.1	1,917	1.0	0.6	1.6	1,639
6 to 7	4.8	3.6	6.3	1,124	1.4	0.9	2.2	1,459	1.3	0.8	2.2	1,182
8 to 9	3.8	2.4	6.2	552	1.7	1.0	3.1	573	1.3	0.6	2.8	500
10+	4.0	1.8	8.8	164	1.4	0.5	4.2	185	3.2	1.4	7.2	147
Slept Under and ITN** Last Night												
No	5.5	4.6	6.6	3,122	1.8	1.3	2.6	2,080	1.6	1.1	2.5	1,255
Yes	4.3	2.6	7.0	415	1.4	1.0	1.9	2,673	1.1	0.8	1.6	2,782

Number of Household ITNs												
None	5.7	4.8	6.9	2,847	2.0	1.3	3.0	1,233	2.1	0.9	4.5	282
1	4.2	2.6	6.7	488	1.5	1.0	2.3	1,700	1.0	0.5	1.8	1,014
2	3.2	1.3	8.0	144	1.0	0.5	1.8	1,316	1.1	0.7	1.8	1,639
3+	4.1	1.5	10.7	58	2.1	1.1	3.9	503	1.5	1.0	2.4	1,101
Total	5.4	4.6	6.4	3,537	1.6	1.2	2.0	4,752	1.3	1.0	1.7	4,037

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

This variable can also be stratified by malaria risk area (high, medium, low) and age range: Neonatal, 1-5 months, 2-23 months, 24-59 months. Additional altitude breakdowns of below/above 1600m can be used.

Table H12: Trends in anemia by malaria risk area

Percentage of children age 6-59 months with hemoglobin lower than 8.0 g/dL, by malaria risk strata and survey year, Rwanda

	DHS 2005				IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Malaria Risk Strata												
Low Risk	4.5	2.7	7.3	527	0.4	0.1	1.3	674	0.4	0.1	1.4	610
Moderate Risk	2.8	1.4	5.3	425	0.5	0.2	1.4	526	0.4	0.1	1.7	423
High Risk	4.2	3	5.9	1,229	1	0.6	1.7	1,568	1.4	0.8	2.2	1,215
Highest Risk	7.7	6.1	9.7	1,356	2.6	1.9	3.6	1,983	1.7	1.2	2.4	1,789
Total	5.4	4.6	6.4	3,537	1.6	1.2	2.0	4,752	1.3	1.0	1.7	4,037

Table H13: Trends in malaria prevalence in children 6-23 months by malaria risk area

Percentage of children age 6-23 months hemoglobin lower than 8.0 g/dL, by malaria risk strata and survey year, Rwanda

	DHS 2005				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Malaria Risk Strata								
Low Risk	8.2	4.1	15.6	173	1.1	0.3	4.3	194
Moderate Risk	4.3	2	9.1	146	1.3	0.3	5	146
High Risk	6.6	4.5	9.5	406	3	1.6	5.7	333
Highest Risk	13.3	10	17.6	474	3.2	2.1	5	548
Total	9.2	7.4	11.3	1,199	2.6	1.8	3.6	1,221

Table H14: Prevalence of malaria in children

Percentage of children age 6-59 months with malaria infection, by background characteristics and survey year, Rwanda

	IDHS 2007/8								DHS 2010							
	Microscopy				RDT				Microscopy				RDT			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age (in months)																
6-11	2.0	1.0	3.8	497	2.0	1.0	3.8	499	0.5	0.1	2.0	411	0.7	0.2	2.1	407
12-23	2.0	1.3	3.2	1,184	1.6	1.0	2.8	1,184	1.2	0.6	2.2	816	2.7	1.7	4.3	804
24-35	2.0	1.1	3.6	939	1.8	0.9	3.5	940	1.4	0.8	2.3	945	2.4	1.6	3.7	938
36-47	2.9	1.9	4.4	1,059	2.2	1.4	3.5	1,060	1.8	1.1	3.0	944	3.1	2.0	4.8	925
48-59	3.7	2.5	5.4	979	3.1	2.1	4.6	979	1.5	0.9	2.5	931	2.9	2.0	4.1	924
Age																
6-23 months	2.0	1.3	3.1	1,681	1.7	1.1	2.7	1,683	1.0	0.5	1.7	1,227	2.0	1.3	3.1	1,211
24-59 months	2.9	2.0	4.0	2,978	2.4	1.7	3.4	2,980	1.6	1.1	2.1	2,819	2.8	2.1	3.7	2,786
Sex																
Male	2.6	1.9	3.8	2,327	2.1	1.4	3.2	2,328	1.5	1.0	2.2	2,045	2.6	1.9	3.4	2,023
Female	2.5	1.7	3.6	2,332	2.2	1.5	3.1	2,334	1.2	0.8	1.9	2,001	2.6	1.8	3.6	1,974
Residence***																
Urban	1.9	0.9	4.2	640	1.5	0.7	3.5	640	0.8	0.3	2.2	475	0.7	0.2	2.4	473
Rural	2.7	1.9	3.7	4,019	2.2	1.6	3.2	4,022	1.4	1.0	2.0	3,571	2.8	2.2	3.6	3,525
Altitude																
<1600m	4.7	3.3	6.7	1,908	4.1	2.9	5.8	1,909	2.6	1.8	3.7	1,662	4.9	3.7	6.5	1,654
1600m+	1.1	0.6	1.9	2,751	0.8	0.4	1.6	2,754	0.5	0.3	1.0	2,384	0.9	0.6	1.5	2,343
Region***																
City of Kigali	1.9	0.8	4.4	321	1.2	0.3	4.2	322	0.2	0.0	1.6	365	0.7	0.2	2.8	364
South	3.0	1.8	4.8	1,225	2.5	1.5	4.2	1,225	1.4	0.6	3.2	986	3.3	1.9	5.8	976
West	0.6	0.2	1.6	1,181	0.4	0.1	1.5	1,182	0.5	0.2	1.5	1,009	1.3	0.7	2.6	995
North	1.2	0.5	3.1	813	1.1	0.4	3.0	813	0.0			656	0.2	0.0	1.5	634
East	5.3	3.3	8.6	1,119	4.6	2.8	7.4	1,120	3.4	2.5	4.8	1,031	5.2	3.9	6.9	1,029
Wealth Quintile																
Lowest	2.5	1.5	4.1	956	2.0	1.1	3.7	956	2.1	1.1	3.9	902	4.9	3.1	7.5	895
Second	3.0	2.0	4.5	1,074	2.7	1.8	4.2	1,075	1.7	1.0	2.8	884	1.9	1.2	3.2	869
Middle	3.1	1.8	5.4	943	2.5	1.4	4.5	944	0.7	0.3	1.6	817	1.8	1.0	3.0	797
Fourth	2.2	1.3	3.6	913	1.6	0.8	3.0	913	1.2	0.6	2.2	788	2.1	1.2	3.6	784
Highest	1.8	1.0	3.4	774	1.7	0.9	3.3	774	1.0	0.4	2.3	656	1.8	1.0	3.3	653
Mother's Education																
None	2.9	1.9	4.3	1,101	2.8	1.9	4.2	1,101	1.6	0.9	2.9	730	3.8	2.5	5.8	721
Primary	2.6	1.8	3.6	2,868	2.0	1.4	3.0	2,870	1.0	0.7	1.5	2,695	1.9	1.4	2.7	2,662

<i>Primary Incomplete</i>	3.1	2.2	4.5	2,073	2.4	1.6	3.6	2,074	1.2	0.8	1.8	2,171	2.2	1.6	3.2	2,142
<i>Primary Complete</i>	1.0	0.4	2.4	796	1.0	0.4	2.4	796	0.2	0.0	1.1	523	0.6	0.2	2.0	519
Secondary +	2.0	0.7	5.3	307	2.0	0.7	5.3	307	1.1	0.4	3.2	313	1.7	0.7	4.2	311
Missing	2.3	1.1	4.4	382	1.5	0.6	3.6	384	4.2	2.4	7.3	309	6.0	3.4	10.1	304
Birth Order																
1	1.6	0.9	2.9	847	1.4	0.7	2.6	849	0.9	0.4	1.9	889	1.7	1.0	2.8	875
2	3.4	2.2	5.2	772	2.9	1.8	4.7	772	1.3	0.7	2.6	705	2.1	1.3	3.6	696
3+	2.6	1.8	3.8	3,041	2.2	1.5	3.2	3,042	1.2	0.8	1.8	2,144	2.6	1.8	3.6	2,123
Missing	0.0	0.0	0.0	0	0.0	0.0	0.0	0	4.2	2.4	7.3	309	6.0	3.4	10.1	304
Household Size																
<4	2.6	1.5	4.7	607	2.6	1.4	4.7	609	1.4	0.7	2.8	569	2.3	1.3	4.0	562
4 to 5	2.7	1.9	3.9	1,863	2.2	1.5	3.3	1,864	1.5	0.9	2.4	1,642	3.2	2.2	4.4	1,617
6 to 7	2.9	1.9	4.4	1,441	2.2	1.4	3.6	1,442	0.9	0.5	1.7	1,185	1.7	1.1	2.7	1,175
8 to 9	1.8	0.8	3.6	562	1.6	0.7	3.5	562	1.4	0.6	2.9	503	2.3	1.0	4.9	498
10+	0.7	0.1	4.6	187	0.7	0.1	4.6	187	3.6	1.5	8.3	147	4.9	2.2	10.6	144
Slept Under and ITN** Last Night																
No	3.2	2.3	4.4	2,034	2.9	2.0	4.1	2,036	1.8	1.2	2.7	1,257	3.8	2.8	5.3	1,237
Yes	2.1	1.4	3.2	2,625	1.6	1.0	2.5	2,626	1.2	0.8	1.7	2,789	2.0	1.5	2.7	2,760
HH Ownership of ITN																
No	3.5	2.5	5.1	1,204	3.4	2.3	4.9	1,205	2.7	1.3	5.4	284	4.1	2.2	7.3	278
Yes	2.2	1.5	3.2	3,455	1.7	1.2	2.6	3,457	1.3	0.9	1.8	3,763	2.5	1.9	3.2	3,720
Total	2.6	1.9	3.5	4,659	2.1	1.5	3.0	4,662	1.4	1.0	1.9	4,046	2.6	2.0	3.3	3,997

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

Table H15: Age-specific childhood mortality

Age-specific all-cause mortality (per 1,000 live births) for five-year periods preceding the survey, Rwanda

	DHS 2000			DHS 2005			IDHS 2007/08			DHS 2010		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
Age Group												
1-59 months	159.2	149.4	168.8	119.7	111.5	127.9	76.7	68.0	85.4	50.0	45.2	54.7
6-59 months	130.6	121.5	139.5	97.1	89.3	104.7	60.3	52.4	68.2	39.3	34.9	43.6
6-23 months	76.5	69.2	83.6	56.2	50.0	62.3	35.9	29.9	41.9	23.7	20.3	27.0
24-59 months	58.6	52.1	65.0	43.3	38.1	48.5	25.3	19.8	30.8	16.0	13.2	18.8
Neonatal (NN)	43.9	38.7	49.7	37.0	32.6	41.9	28.0	23.1	33.9	27.0	23.6	31.0
Postneonatal (PNN)	63.4	59.6	73.1	49.1	45.4	56.6	34.3	29.6	40.9	22.8	20.0	26.7
Infant (1q0)	107.3	99.0	115.5	86.1	79.1	93.0	62.3	54.6	69.8	49.8	44.9	54.7
Child (4q1)**	99.4	91.3	107.4	72.4	65.7	79.1	43.0	36.0	50.0	27.2	23.7	30.8
Under 5 mortality (5q0)	196.0	185.7	206.3	152.3	143.3	161.1	102.6	92.7	112.3	75.7	69.8	81.5

* WN = Weighted number of cases (denominator)

**Child mortality (4q1) is mortality between exact age 1 and exact age 5, per 1,000 children surviving to 12 months of age.

Table H16: Early childhood mortality

All-cause under-five mortality (per 1,000 live births) for five-year periods preceding the survey, by background characteristics and survey year, Rwanda

	DHS 2000			DHS 2005			IDHS 2007/08			DHS 2010		
	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI	%	LCI	UCI
Sex												
Male	206.9	192.4	221.3	151.8	140.1	163.4	115.2	101.3	129.0	78.0	69.7	86.2
Female	185.2	170.9	199.3	152.7	140.3	164.9	89.5	76.8	102.0	73.3	65.3	81.2
Residence												
Urban	141.4	118.5	163.7	91.9	76.4	107.1	64.5	48.6	80.1	66.1	48.5	83.4
Rural	205.0	193.5	216.3	162.2	152.2	172.2	108.8	97.6	119.9	76.9	70.7	83.2
Region												
City of Kigali	174.8	143.8	204.7	113.0	83.9	141.2	80.8	46.6	113.7	56.0	36.4	75.2
South	171.4	152.1	190.2	143.1	124.8	160.9	98.5	77.1	119.4	69.6	57.9	81.2
West	181.3	160.1	202.0	139.7	123.4	155.8	90.6	72.6	108.3	70.5	59.1	81.7
North	190.8	166.7	214.2	125.4	107.7	142.7	80.6	56.5	104.0	78.9	63.3	94.1
East	254.1	230	277.5	216.3	192.8	239.0	143.4	120.2	166.1	90.8	78.0	103.5
Wealth Quintile												
Lowest	240.6	211.9	268.3	179.6	159.1	199.5	117.7	94.9	140.0	85.3	71.8	98.6
Second	196.5	173.8	218.6	148.3	129.6	166.6	123.0	98.5	146.9	77.6	64.5	90.6
Middle	204.4	180.9	227.2	143.2	123.6	162.3	90.6	72.3	108.5	79.9	66.3	93.3
Fourth	194.3	174.6	213.6	180.6	159.4	201.2	111.9	88.4	134.8	75.9	61.4	90.1
Highest	156.8	135.8	177.3	103.6	86.8	120.1	68.0	47.3	88.2	54.9	41.7	67.8
Mother's Education												
None	223.8	205.9	241.3	177.1	160.7	193.2	124.6	103.0	145.7	93.6	79.2	107.7
Primary	192.7	178.8	206.3	151.2	139.6	162.6	100.1	88.5	111.5	72.7	65.9	79.5
Secondary +	110.0	83.0	136.3	75.2	51.2	98.7	43.1	19.7	66.0	58.3	38.9	77.3
Birth Order												
1	203.7	182.0	224.7	176.6	155.2	197.5	114.5	92.7	135.8	78.3	66.5	90.0
2	204.7	180.6	228.1	144.1	125.0	162.8	106.4	81.2	130.8	86.1	71.5	100.4
3+	191.0	177.9	203.9	147.5	136.7	158.2	97.4	85.4	109.2	71.4	63.9	78.8
Household Size												
<4	391.0	356.5	423.7	376.8	337.6	413.6	226.9	185.7	266.0	149.5	125.8	172.5
4 to 5	211.6	194.2	228.6	170.3	155.4	185.0	103.0	87.5	118.1	72.8	63.9	81.6
6 to 7	141.5	124.5	158.2	107.9	94.2	121.3	81.0	65.5	96.2	61.0	51.0	70.8
8 to 9	124.7	99.3	149.4	70.6	54.2	86.6	49.8	27.0	72.1	56.3	41.0	71.4
10+	85.8	49.5	120.7	43.9	16.8	70.3	46.0	-8.1	97.3	30.5	3.6	56.6
Number of HH ITNs												
0	n/a			160.4	150.4	170.4	122.1	101.9	141.9	131.8	99.6	162.8
1	n/a			133.2	110.5	155.3	117.0	99.2	134.5	92.1	78.8	105.3
2	n/a			93.6	56.7	129.1	87.5	70.7	104.0	64.7	56.1	73.2
3+	n/a			53.6	0.3	104.1	46.6	17.0	75.3	62.4	52.2	72.4
Total	196.0	185.7	206.3	152.3	143.3	161.1	102.6	92.7	112.3	75.7	69.8	81.5

***Child mortality (4q1) is mortality between exact age 1 and exact age 5, per 1,000 children surviving to 12 months of age.

Table H17: Prevalence of anemia and parasitaemia in children (via Microscopy)
 Percentage of children age 6-59 months with hemoglobin lower than 8.0 g/dl and malaria infection (via Microscopy), by background characteristics and survey year, Rwanda

	IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age (in months)								
<12	0.7	0.2	2.3	494	0.0	0.0	0.0	407
12-23	0.4	0.2	1.2	1,176	0.2	0.0	1.2	814
24-35	0.1	0.0	0.9	935	0.5	0.2	1.3	943
36-47	0.5	0.2	1.1	1,051	0.0	0.0	0.0	943
48-59	0.1	0.0	0.4	974	0.1	0.0	1.0	929
Age (in months)								
6-23 months	0.5	0.2	1.1	1,671	0.1	0.0	0.8	1,221
24-59 months	0.2	0.1	0.5	2,960	0.2	0.1	0.5	2,814
Sex								
Male	0.3	0.2	0.7	2,307	0.2	0.1	0.6	2,037
Female	0.4	0.2	0.7	2,323	0.1	0.0	0.5	1,998
Residence								
Urban	0.4	0.1	1.4	637	0.0	0.0	0.0	475
Rural	0.3	0.2	0.6	3,993	0.2	0.1	0.4	3,561
Altitude								
<1600m	0.7	0.4	1.3	1,897	0.4	0.2	0.9	1,659
1600m+	0.1	0.0	0.3	2,733	0.0	0.0	0.2	2,377
Region								
City of Kigali	0.0	0.0	0.0	319	0.0	0.0	0.0	365
South	0.6	0.2	1.3	1,216	0.0	0.0	0.0	985
West	0.0	0.0	0.0	1,175	0.1	0.0	0.8	1,003
North	0.1	0.0	0.9	807	0.0	0.0	0.0	656
East	0.7	0.3	1.5	1,114	0.6	0.2	1.4	1,027
Wealth Quintile								
Lowest	0.5	0.2	1.4	951	0.3	0.1	1.1	900
Second	0.6	0.3	1.3	1,067	0.1	0.0	0.8	881
Middle	0.1	0.0	1.0	933	0.2	0.0	1.3	812
Fourth	0.2	0.1	1.0	911	0.1	0.0	0.7	788
Highest	0.1	0.0	1.1	768	0.2	0.0	1.4	655
Mother's Education								
None	0.5	0.2	1.1	1,096	0.0	0.0	0.0	729
Primary	0.3	0.1	0.6	2,853	0.2	0.1	0.5	2,686
<i>Primary Incomplete</i>	0.4	0.2	0.9	2,060	0.2	0.1	0.6	2,168
<i>Primary Complete</i>	0.0	0.0	0.0	793	0.2	0.0	1.1	518
Secondary +	0.0	0.0	0.0	303	0.4	0.1	2.9	313
	0.3	0.2	0.6	4,630	0.2	0.1	0.4	4,036
Birth Order								
1	0.3	0.1	1.3	840	0.1	0.0	1.0	886
2	0.1	0.0	0.5	766	0.2	0.0	1.5	704
3+	0.4	0.2	0.7	3,025	0.2	0.0	0.5	2,138
Missing	0.0	0.0	0.0	0	0.3	0.0	2.3	308
Household Size								
<4	0.3	0.0	2.0	606	0.2	0.0	1.6	568
4 to 5	0.5	0.2	1.0	1,851	0.1	0.0	0.5	1,639
6 to 7	0.1	0.0	0.4	1,430	0.2	0.0	0.8	1,182
8 to 9	0.8	0.3	2.0	561	0.3	0.0	2.1	500
10+	0.0	0.0	0.0	182	0.6	0.1	3.9	147
Slept Under an ITN ** Last Night								
No	0.6	0.3	1.1	2,017	0.4	0.1	1.1	1,254
Yes	0.2	0.1	0.4	2,613	0.1	0.0	0.3	2,782

Household owns at least one ITN								
No	0.6	0.3	1.4	1,198	0.5	0.1	3.2	282
Yes	0.2	0.1	0.5	3,433	0.2	0.1	0.4	3,753
Number of Household ITNs								
None	0.6	0.3	1.4	1,198	0.5	0.1	3.2	282
1	0.2	0.1	0.6	1,652	0.0	0.0	0.0	1,014
2	0.4	0.1	1.0	1,294	0.1	0.0	0.5	1,638
3+	0.0	0.0	0.0	486	0.3	0.1	1.1	1,101
Total	0.3	0.2	0.6	4,630	0.2	0.1	0.4	4,036

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

Table H18: Prevalence of anemia and parasitaemia in children (via RDT)

Percentage of children age 6-59 months with hemoglobin lower than 8.0 g/dl and malaria infection (via RDT) by background characteristics and survey year, Rwanda

	IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age (in months)								
<12	0.7	0.2	2.3	496	0.2	0.0	1.2	404
12-23	0.4	0.2	1.2	1,176	0.3	0.1	1.2	802
24-35	0.1	0.0	0.9	936	0.5	0.2	1.3	937
36-47	0.4	0.2	1.0	1,051	0.1	0.0	0.9	924
48-59	0.1	0.0	0.4	974	0.1	0.0	1.0	922
Age (in months)								
6-23 months	0.5	0.2	1.1	1,672	0.2	0.1	0.8	1,206
24-59 months	0.2	0.1	0.5	2,960	0.2	0.1	0.6	2,782
Sex								
Male	0.3	0.2	0.7	2,309	0.3	0.1	0.7	2,015
Female	0.3	0.1	0.7	2,324	0.2	0.1	0.5	1,973
Residence								
Urban	0.4	0.1	1.4	637	0.1	0.0	1.0	473
Rural	0.3	0.2	0.6	3,996	0.3	0.1	0.5	3,515
Altitude								
<1600m	0.7	0.4	1.2	1,898	0.5	0.3	1.1	1,651
1600m+	0.1	0.0	0.3	2,735	0.0	0.0	0.3	2,337
Region								
City of Kigali	0.0	0.0	0.0	319	0.2	0.0	1.3	364
South	0.6	0.2	1.3	1,216	0.1	0.0	0.8	975
West	0.0	0.0	0.0	1,177	0.1	0.0	0.8	990
North	0.1	0.0	0.9	807	0.0	0.0	0.0	634
East	0.6	0.3	1.4	1,115	0.7	0.3	1.5	1,025
Wealth Quintile								
Lowest	0.4	0.1	1.3	951	0.5	0.2	1.4	892
Second	0.6	0.3	1.3	1,067	0.1	0.0	0.8	868
Middle	0.1	0.0	1.0	935	0.2	0.0	1.3	793
Fourth	0.2	0.1	1.0	911	0.1	0.0	0.7	784
Highest	0.1	0.0	1.1	769	0.3	0.1	1.3	652
Mother's Education								
None	0.5	0.2	1.1	1,096	0.2	0.0	1.1	720
Primary	0.3	0.1	0.6	2,854	0.2	0.1	0.5	2,654
<i>Primary Incomplete</i>	0.4	0.2	0.9	2,061	0.2	0.1	0.6	2,139
<i>Primary Complete</i>	0.0	0.0	0.0	793	0.2	0.0	1.1	515
Secondary +	0.0	0.0	0.0	303	0.6	0.1	2.7	311
	0.3	0.2	0.6	4,633	0.2	0.1	0.5	3,988
Birth Order								
1	0.3	0.1	1.3	841	0.3	0.1	1.1	873
2	0.1	0.0	0.5	766	0.3	0.1	1.3	695
3+	0.4	0.2	0.7	3,026	0.2	0.1	0.6	2,118
Missing	0.0	0.0	0.0	0	0.3	0.0	2.3	303
Household Size								
<4	0.3	0.0	2.0	608	0.2	0.0	1.6	562
4 to 5	0.5	0.2	1.0	1,852	0.2	0.1	0.6	1,614
6 to 7	0.1	0.0	0.4	1,430	0.3	0.1	0.9	1,172
8 to 9	0.6	0.2	1.9	561	0.3	0.0	2.1	495
10+	0.0	0.0	0.0	182	0.6	0.1	3.9	144
Slept Under an ITN ** Last Night								
No	0.5	0.3	1.0	2,019	0.6	0.3	1.3	1,234

Yes	0.2	0.1	0.4	2,614	0.1	0.0	0.3	2,754
Household owns at least one ITN**								
No	0.5	0.2	1.3	1,199	0.9	0.2	3.5	276
Yes	0.2	0.1	0.5	3,433	0.2	0.1	0.4	3,712
Number of Household ITNs**								
None	0.5	0.2	1.3	1,199	0.9	0.2	3.5	276
1	0.2	0.1	0.6	1,653	0.1	0.0	0.7	998
2	0.4	0.1	1.0	1,294	0.2	0.1	0.5	1,625
3+	0.0	0.0	0.0	486	0.3	0.1	1.1	1,089
Total	0.3	0.2	0.6	4,633	0.2	0.1	0.5	3,988

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a net that has been soaked with insecticide within the past 12 months.

Table H19: Prevalence of fever in children

Percentage of children under age five (0-59 months) with fever in the two weeks preceding the survey, by background characteristics and survey year, Rwanda

	DHS 2000				DHS 2005				IDHS 2007/8				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age in years																
<1	38.1	35.3	41.0	1,731	28.9	26.5	31.4	1,720	23.4	20.3	26.7	1,028	19.1	17.0	21.3	1,573
1	38.6	35.7	41.7	1,330	36.9	34.1	39.8	1,626	25.5	22.8	28.5	1,226	21.9	19.8	24.0	1,616
2	29.8	27.0	32.8	1,232	24.0	21.7	26.5	1,732	23.1	20.2	26.3	959	15.4	13.8	17.3	1,824
3	22.6	20.0	25.5	1,297	20.8	18.7	23.2	1,373	18.8	16.3	21.6	1,066	13.6	12.0	15.4	1,741
4	20.2	17.9	22.7	1,443	18.4	16.1	20.9	1,346	15.4	13.0	18.2	963	9.9	8.6	11.4	1,850
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Sex																
Male	30.5	28.6	32.4	3,510	26.5	24.7	28.3	3,959	21.7	19.8	23.6	2,623	16.5	15.4	17.8	4,364
Female	30.0	28.0	32.1	3,522	26.0	24.3	27.8	3,839	21.2	19.3	23.3	2,618	14.9	13.7	16.2	4,241
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Residence																
Urban	19.9	16.8	23.5	1,082	25.3	22.5	28.3	1,144	19.1	16.9	21.5	763	16.7	13.7	20.1	1,033
Rural	32.1	30.5	33.7	5,951	26.4	24.8	28.1	6,653	21.8	20.1	23.7	4,479	15.6	14.7	16.6	7,572
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Altitude																
<1600m					28.8	26.3	31.3	2,982	20.9	18.4	23.6	2,185	14.3	12.8	15.8	3,611
1600m+					24.7	22.8	26.6	4,815	21.9	19.9	23.9	3,056	16.8	15.7	18.1	4,993
Total					26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Region																
City of Kigali	24.4	20.3	29.1	569	25.2	21.0	29.9	599	17.7	13.6	22.6	400	17.4	14.3	20.9	830
South	35.6	32.5	38.9	1,630	29.5	26.4	32.8	1,909	20.6	17.9	23.6	1,340	17.9	16.0	20.0	2,049
West	29.5	26.4	32.7	1,908	23.6	21.1	26.3	2,075	23.5	20.7	26.5	1,312	17.5	15.7	19.5	2,159
North	24.2	21.2	27.5	1,565	22.9	19.7	26.5	1,571	18.7	15.0	23.0	925	17.1	15.0	19.3	1,342
East	34.4	31.2	37.6	1,315	29.3	26.1	32.8	1,644	23.4	20.0	27.2	1,263	10.7	9.3	12.2	2,225
Missing	28.9	28.6	29.3	45												
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Wealth Quintile																
Lowest	38.0	34.3	41.9	881	27.8	25.1	30.7	1,612	21.9	18.6	25.5	1,090	17.8	15.7	20.1	1,992
Second	31.3	28.7	34.0	1,647	24.8	22.2	27.6	1,605	23.0	19.7	26.6	985	16.9	15.2	18.8	1,852
Middle	33.7	30.6	37.0	1,334	25.8	23.0	28.9	1,620	21.8	18.8	25.0	1,244	15.4	13.8	17.2	1,709
Fourth	29.8	27.3	32.6	1,744	27.5	24.7	30.5	1,525	22.3	19.4	25.5	993	11.9	10.3	13.6	1,598
Highest	21.4	18.5	24.7	1,424	25.2	22.7	27.8	1,436	18.0	15.2	21.2	930	16.1	14.1	18.4	1,454
Missing	0.0	0.0	0.0	2	0.0	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605

Mother's Education																
None	32.2	29.9	34.6	2,330	28.3	25.8	31.0	2,172	22.7	19.8	25.9	1,321	14.0	12.2	16.0	1,629
Primary	31.3	29.4	33.3	3,930	26.0	24.4	27.7	4,938	21.2	19.5	23.1	3,523	16.2	15.2	17.4	6,214
<i>Primary Incomplete</i>	32.0	29.7	34.4	2,614	26.5	24.7	28.3	4,087	21.1	19.1	23.2	2,573	16.5	15.3	17.7	4,961
<i>Primary Complete</i>	29.9	27.0	33.0	1,316	23.8	20.3	27.7	852	21.7	18.4	25.4	950	15.2	13.1	17.6	1,252
Secondary +	18.8	15.5	22.5	772	21.0	17.7	24.9	687	19.2	15.2	23.8	397	15.6	13.2	18.4	762
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Birth Order																
1	26.7	24.0	29.7	1,396	27.7	25.1	30.6	1,408	21.8	19.2	24.7	1,106	18.1	16.5	19.8	2,141
2	29.7	26.9	32.7	1,293	25.6	23.1	28.2	1,356	22.4	19.7	25.4	949	16.2	14.2	18.4	1,663
3+	31.5	29.6	33.5	4,344	26.0	24.4	27.7	5,033	21.0	19.1	23.1	3,186	14.5	13.5	15.7	4,801
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Household Size																
<4	36.9	33.5	40.4	925	31.6	28.2	35.2	879	27.1	23.6	31.0	770	19.2	16.9	21.6	1,250
5-6	31.4	29.2	33.7	2,716	26.4	24.4	28.5	3,021	20.8	18.8	23.1	2,105	15.9	14.5	17.4	3,559
7-8	27.9	25.3	30.7	1,985	25.6	23.5	27.9	2,425	20.8	18.4	23.4	1,571	14.3	12.9	15.8	2,523
9-10	28.0	24.7	31.6	1,041	24.7	21.7	28.0	1,120	17.7	14.5	21.5	606	15.6	13.4	18.2	999
10+	23.4	19.0	28.6	365	21.0	16.6	26.2	351	22.4	14.4	33.0	190	11.7	7.8	17.0	274
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Slept under ITN																
No	30.5	29.0	32.1	6,732	26.4	24.8	28.0	6,577	21.7	19.6	23.9	1,880	18.2	16.3	20.2	1,969
Yes	23.8	17.9	30.8	301	25.5	22.7	28.5	1,220	21.3	19.5	23.3	3,361	15.0	14.1	16.0	6,636
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605
Total	30.2	28.7	31.8	7,033	26.2	24.8	27.7	7,797	21.4	19.9	23.1	5,241	15.8	14.9	16.7	8,605

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a pretreated net obtained within the past 12 months or (3) a net that has been soaked with insecticide within the past 12 months.

Table H20: Prevalence of fever and parasitaemia in children (via microscopy)

Percentage of children under age five (aged 6-59 months) with fever in the two weeks preceding the survey and malaria infection (via microscopy) by background characteristics and survey year, Rwanda

	IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age in years								
<1	0.5	0.2	1.8	488	0.2	0.0	1.7	407
1	1.0	0.5	1.8	1,150	0.3	0.1	1.2	795
2	1.1	0.4	2.8	860	0.3	0.1	1.2	884
3	0.6	0.2	1.7	939	0.3	0.0	1.9	827
4	0.6	0.3	1.4	840	0.3	0.1	1.1	824
Age in months								
6-23 months	0.9	0.4	1.6	1,637	0.3	0.1	0.8	1,202
24-59 months	0.8	0.4	1.4	2,639	0.3	0.1	0.7	2,535
Sex of child								
Male	0.8	0.4	1.5	2,132	0.3	0.1	0.9	1,900
Female	0.8	0.5	1.3	2,145	0.2	0.1	0.6	1,838
Residence								
Urban	0.9	0.4	2.3	587	0.2	0.0	1.4	427
Rural	0.8	0.4	1.4	3,690	0.3	0.1	0.7	3,310
Altitude								
<1600m	1.3	0.7	2.4	1,750	0.7	0.3	1.5	1,531
1600m+	0.5	0.2	1.1	2,527	0.0	0.0	0.0	2,206
Region								
City of Kigali	0.7	0.2	2.6	292	0.3	0.0	1.8	334
South	1.2	0.5	2.8	1,123	0.5	0.1	2.3	891
West	0.3	0.1	0.9	1,093	0.0	0.0	0.0	946
North	0.1	0.0	0.9	754	0.0	0.0	0.0	616
East	1.5	0.7	3.1	1,015	0.5	0.2	1.4	950
Wealth Quintile								
Lowest	0.9	0.4	2.1	888	0.6	0.1	2.5	834
Second	0.4	0.2	1.1	977	0.4	0.1	1.2	821
Middle	1.6	0.8	3.2	864	0.2	0.0	1.4	758
Fourth	0.6	0.3	1.3	840	0.0	0.0	0.0	726
Highest	0.5	0.2	1.3	708	0.1	0.0	1.0	597
Mother's Education								
None	1.1	0.6	2.2	1,101	0.0	0.0	0.0	730
Primary	0.7	0.4	1.2	2,868	0.3	0.2	0.7	2,695
<i>Primary Incomplete</i>	0.8	0.4	1.4	2,073	0.4	0.2	0.9	2,171
<i>Primary Complete</i>	0.5	0.2	1.4	796	0.0	0.0	0.0	523
Secondary +	0.4	0.1	2.7	307	0.4	0.1	2.5	313
Missing	0.0	0.0	0.0	0	0.0	0.0	0.0	309
Birth Order								
1	0.4	0.2	1.1	847	0.4	0.1	1.2	889
2	0.9	0.3	2.3	770	0.5	0.2	1.6	705
3+	0.9	0.5	1.7	2,659	0.2	0.0	0.6	2,144
Missing	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Household Size								
<4	1.1	0.4	3.0	549	0.4	0.1	1.7	519
5-6	0.9	0.5	1.8	1,719	0.3	0.1	1.0	1,530
7-8	0.8	0.4	1.6	1,341	0.1	0.0	0.7	1,087
9-10	0.2	0.0	1.4	510	0.5	0.1	2.1	472
10+	0.8	0.1	5.4	158	0.0	0.0	0.0	129

Slept under ITN									
No	1.1	0.6	1.8	1,784	0.4	0.2	1.2	1,108	
Yes	0.6	0.3	1.2	2,493	0.2	0.1	0.6	2,629	
Household owns at least one ITN									
No	1.1	0.6	2.0	1,046	0.6	0.1	3.8	232	
Yes	0.7	0.4	1.3	3,231	0.3	0.1	0.6	3,505	
Number of Household ITNs									
None	1.1	0.6	2.0	1,046	0.6	0.1	3.8	232	
1	0.5	0.2	1.2	1,545	0.3	0.1	1.0	943	
2	1.2	0.6	2.2	1,234	0.3	0.1	1.0	1,545	
3+	0.0	0.0	0.0	452	0.1	0.0	1.0	1,017	
Total	0.8	0.5	1.3	4,277	0.3	0.1	0.6	3,737	

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a pretreated net obtained within the past 12 months or (3) a net that has been soaked with insecticide within the past 12 months.

Table H21: Prevalence of fever and parasitaemia in children (via RDT)

Percentage of children under age five (aged 6-59 months) with fever in the two weeks preceding the survey and malaria infection (via RDT) by background characteristics and survey year, Rwanda

	IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*
Age in years								
<1	0.5	0.2	1.8	489	0.4	0.1	1.7	403
1	0.8	0.4	1.6	1,150	0.5	0.2	1.4	783
2	0.9	0.3	2.8	860	0.5	0.2	1.4	878
3	0.6	0.2	1.7	939	1.0	0.4	2.6	811
4	0.5	0.2	1.3	840	0.5	0.2	1.3	818
Age in months								
6-23 months	0.7	0.4	1.4	1,639	0.5	0.2	1.1	1,187
24-59 months	0.7	0.4	1.3	2,639	0.7	0.3	1.3	2,507
Sex of child								
Male	0.6	0.3	1.2	2,133	0.6	0.3	1.2	1,881
Female	0.8	0.5	1.3	2,145	0.6	0.3	1.2	1,813
Residence								
Urban	0.8	0.3	2.2	587	0.4	0.1	1.4	425
Rural	0.7	0.4	1.2	3,691	0.6	0.3	1.2	3,269
Altitude								
<1600m	1.1	0.6	2.1	1,750	1.1	0.5	2.4	1,523
1600m+	0.4	0.2	1.0	2,529	0.2	0.1	0.7	2,170
Region								
City of Kigali	0.3	0.0	2.3	292	0.5	0.1	1.8	333
South	1.1	0.5	2.5	1,123	1.7	0.7	3.9	882
West	0.2	0.0	0.9	1,095	0.2	0.1	0.9	933
North	0.1	0.0	0.9	754	0.0	0.0	0.0	598
East	1.3	0.6	2.9	1,015	0.4	0.1	1.2	948
Wealth Quintile								
Lowest	0.9	0.4	2.1	888	2.0	0.9	4.3	829
Second	0.4	0.2	1.1	977	0.0	0.0	0.0	807
Middle	1.3	0.6	2.8	866	0.6	0.2	1.6	741
Fourth	0.5	0.2	1.2	840	0.0	0.0	0.0	722
Highest	0.4	0.1	1.0	708	0.3	0.1	1.0	594
Mother's Education								
None	1.1	0.5	2.1	1,101	0.7	0.3	2.0	721
Primary	0.6	0.3	1.1	2,870	0.5	0.2	1.2	2,662
<i>Primary Incomplete</i>	0.6	0.3	1.2	2,074	0.7	0.3	1.5	2,142
<i>Primary Complete</i>	0.5	0.2	1.4	796	0.0	0.0	0.0	519
Secondary +	0.4	0.1	2.7	307	0.9	0.3	2.8	311
Missing	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Birth Order								
1	0.4	0.1	1.0	849	0.5	0.2	1.4	875
2	0.9	0.3	2.3	770	0.9	0.4	2.0	696
3+	0.8	0.4	1.4	2,659	0.5	0.3	1.1	2,123
Missing	0.0	0.0	0.0	0	0.0	0.0	0.0	0
Household Size								
<4	1.1	0.4	3.0	550	0.6	0.2	2.0	513
5-6	0.7	0.4	1.6	1,719	0.7	0.3	1.5	1,509
7-8	0.7	0.3	1.5	1,341	0.6	0.2	1.4	1,077
9-10	0.2	0.0	1.4	510	0.5	0.1	2.1	469
10+	0.8	0.1	5.4	158	0.0	0.0	0.0	126
Slept under ITN								

No	1.0	0.5	1.7	1,785	1.2	0.6	2.4	1,092
Yes	0.5	0.2	1.1	2,493	0.4	0.2	0.8	2,601
Household owns at least one ITN								
No	1.1	0.6	1.9	1,048	1.6	0.5	4.8	229
Yes	0.6	0.3	1.2	3,231	0.5	0.3	1.0	3,464
Number of Household ITNs								
None	1.1	0.6	1.9	1,048	1.6	0.5	4.8	229
1	0.3	0.1	1.0	1,545	0.9	0.4	2.0	927
2	1.1	0.5	2.1	1,234	0.6	0.3	1.3	1,532
3+	0.0	0.0	0.0	452	0.1	0.0	1.0	1,006
Total	0.7	0.4	1.2	4,278	0.6	0.3	1.1	3,694

* WN = Weighted number of cases (denominator)

**An insecticide-treated net (ITN) is (1) a factory-treated net that does not require any further treatment (LLIN) or (2) a pretreated net obtained within the past 12 months or (3) a net that has been soaked with insecticide within the past 12 months.

Table H22: Trends in mortality by malaria risk area

All cause under five mortality (per 1,000 live births) for five-year periods preceding the survey, by malaria risk strata and survey year, Rwanda

	2001-2005			2006-2010		
	5q0	LCI	UCI	5q0	LCI	UCI
Malaria Risk Strata						
Low Risk	124.3	102.7	145.5	81.7	66.5	96.6
Moderate Risk	143	119.0	166.3	63.4	45.2	81.3
High Risk	136.1	122.5	149.5	68.4	68.4	68.4
Highest Risk	180.3	164.0	196.3	81.3	72.0	90.4
Total	152.3	143.3	161.1	75.7	69.8	81.5

Table H23: Contextual Factors

	DHS 2000				DHS 2005				IDHS 2007/08				DHS 2010			
	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*	%	LCI	UCI	WN*
HOUSEHOLD ENVIRONMENT																
Improved source of drinking water*	40.4	37.1	43.7	9,696	33.9	31.3	36.5	10,272	41.5	37.8	45.3	7,377	73.8	71.4	76.0	12,540
Drinking water <15 min round-trip	25.6	23.3	28.0	9,696	30.3	28.5	32.1	10,272	31.5	29.1	34.1	7,377	26.4	24.7	28.2	12,540
Household water piped into dwelling/yard/plot	5.4	4.0	7.4	9,696	2.5	2.0	3.1	10,272	3.4	2.5	4.5	7,377	4.5	3.7	5.5	12,540
Access to improved toilet**	6.0	5.0	7.2	9,696	23.4	22.0	24.8	10,272	47.7	45.6	49.9	7,377	57.6	56.3	59.0	12,540
Household flush toilet/VIP latrine***	8.5	7.1	10.2	9,696	28.5	27.0	30.0	10,272	56.3	53.9	58.7	7,377	74.3	72.9	75.5	12,540
Household roof not grass thatch or mud	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Household floor material not earth, sand or dung	13.6	11.4	16.1	9,696	13.0	11.9	14.2	10,272	14.7	12.9	16.7	7,377	18.2	16.7	19.8	12,540
Household has electricity	6.2	4.7	8.1	9,696	4.8	4.1	5.6	10,272	6.0	4.9	7.4	7,377	9.7	8.4	11.2	12,540
Household has telephone (landline or mobile)	1.1	0.8	1.7	9,696	4.8	4.2	5.5	10,272	13.2	11.5	15.1	7,377	40.3	38.8	41.8	12,540
*Improved water sources include: piped water into dwelling/yard/plot; public tap/standpipe; tubewell/borehole; protected dug well; protected spring; rainwater; bottled water; as per DHS VI Standard Tab plan.																
** Improved, Not Shared Toilet Facility includes: flush/pour flush to piped sewer system; flush/pour flush to septic tank; flush/pour flush to a pit latrine; ventilated improved pit (VIP) latrine; Pit latrine with a slab; Composting toilet; and does not include any toilets that are shared with other households, as per DHS VI Standard Tabs.																
***Household flush toilet/VIP latrine is the toilet indicator for the LiST model. Note: for 2010, this includes pit latrine with slab - n=8,951																
HYGIENE																
Proportion of mothers whose youngest child under five's stools are contained	81.7	80.0	83.2	7,725	-	-	-	-	-	-	-	-	84.7	83.6	85.8	8,501
% washing hands with soap after toilet or after cleaning child after toilet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOCIODEMOGRAPHIC FACTORS																
Proportion of women 15-49 with at least a primary school education	27.9	26.0	29.9	10,421	20.2	19.1	21.4	11,321	29.1	27.1	31.2	7,313	30.1	28.7	31.5	13,671
Proportion of women 15-49 literate	66.1	64.4	67.7	10,421	70.3	69.1	71.5	11,321	-	-	-	-	76.9	75.8	78.0	13,671
Proportion of women 15-49 married	48.5	47.2	49.8	10,421	48.7	47.5	49.8	11,321	53.2	51.4	54.9	7,313	50.5	49.4	51.5	13,671
FERTILITY-RELATED RISKS																
High risk birth*	59.6	58.1	61.0	8,188	60.8	59.5	62.0	8,715	56.8	55.1	58.5	5,656	53.3	52.1	54.5	9,137
Avoidable risk birth**	58.8	57.4	60.2	8,188	59.8	58.5	61.1	8,715	55.7	54.0	57.4	5,656	52.1	50.9	53.3	9,137
Unavoidable risk birth***	18.3	17.4	19.2	8,188	17.1	16.3	18.0	8,715	19.9	18.7	21.1	5,656	23.5	22.6	24.5	9,137
Birth intervals <24 months	18.8	17.7	20.0	8,188	18.9	17.9	19.9	8,715	17.1	16.0	18.3	5,656	14.9	14.1	15.7	9,137
Fourth or higher birth	46.3	44.6	48.0	8,188	48.1	46.7	49.6	8,715	44.1	42.2	46.1	5,656	40.9	39.6	42.2	9,137
Mother age <18 years or >34 years	27.3	26.0	28.7	8,188	25.4	24.1	26.7	8,715	24.4	22.9	25.9	5,656	22.1	21.0	23.3	9,137
*A high risk birth is defined as any birth to a birth interval <24 months, a multiple birth, birth order <3, or any birth to a woman younger than 18 or older than 34 years.																
**An avoidable high risk birth is a birth to a woman <18 or >34 years, a birth interval <24 months, or a birth order >3																
*** An unavoidable high risk birth is a first birth born to a women between ages 18-34																
IMMUNIZATION COVERAGE*																
BCG	97.0	95.8	97.9	1,330	96.5	94.6	97.7	1,626	95.5	93.8	96.7	1,226	99.1	98.6	99.5	1,616
DPT3	86.2	83.7	88.3	1,328	87.0	84.7	89.0	1,626	89.8	87.3	91.8	1,226	96.8	95.6	97.7	1,616
polio3	88.0	85.8	90.0	1,323	84.3	81.8	86.5	1,626	85.5	82.5	88.1	1,226	93.3	91.7	94.6	1,616
measles	86.9	84.6	88.9	1,330	85.6	83.1	87.8	1,626	90.4	88.1	92.3	1,226	95.0	93.7	96.1	1,616
Fully vaccinated	76.0	73.0	78.8	1,330	75.2	72.3	77.8	1,626	80.4	77.1	83.4	1,226	90.1	88.3	91.7	1,616
* Proportion of children 12-23 months with the recommended immunizations																

OTHER CHILDHOOD ILLNESS																
Suspected ARI (cough with rapid breathing) in past 2 weeks	-	-	-	-	-	-	-	-	15.2	13.7	16.8	5,241	3.7	3.3	4.3	8,605
Suspected ARI (old definition) in past 2 weeks	21.2	19.8	22.7	7,033	17.1	15.9	18.3	7,797	18.5	16.8	20.4	5,241	10.0	9.3	10.8	8,605
Diarrhea in past 2 weeks	16.9	15.8	18.0	7,033	14.1	13.2	15.1	7,797	13.7	12.5	15.0	5,241	13.2	12.3	14.1	8,605
IMCI COVERAGE																
Care seeking for suspected ARI*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Care seeking for diarrhea**	30.2	27.5	33.1	1,186	31.9	28.9	35.1	1,103	39.1	34.5	43.8	719	48.1	44.7	51.5	1,132
ORS for diarrhea	13.6	11.6	16.0	1,186	11.6	9.6	13.8	1,103	21.3	17.5	25.6	719	29.1	26.3	32.1	1,132
*Respondent sought treatment for child's fever/cough.																
**Child was given more to drink than usual, oral rehydration, or recommended home solution.																
NUTRITIONAL STATUS																
Small or very small at birth (mother's report)	11.1	10.2	12.1	8,188	12.9	11.9	13.9	8,715					15.3	14.5	16.2	9,137
Low birth weight (<2500 g)	2.2	1.9	2.6	8,188	1.7	1.4	2.1	8,715					6.2	5.6	6.9	6,196
Stunting	48.3	46.7	50.0	6,514	51.1	49.3	52.9	3,870					44.2	42.5	46.0	4,356
Underweight	19.5	18.3	20.7	6,514	17.5	16.1	18.9	3,870					11.4	10.4	12.5	4,356
Wasting	8.3	7.5	9.1	6,514	4.7	3.9	5.5	3,870					2.8	2.3	3.4	4,356
MICRONUTRIENTS																
Vitamin A supplementation	68.9	66.9	70.9	6,245	84.1	82.6	85.5	6,907	92.0	90.5	93.4	3,538	92.9	92.1	93.6	7,873
ANC COVERAGE																
Antenatal Care (≥4 visits)	10.3	9.2	11.5	5,141	13.3	12.2	14.6	5,425	23.9	21.9	26.1	3,658	35.4	33.9	37.0	6,405
At least 1 dose of tetanus toxoid during pregnancy	64.8	63.1	66.5	5,141	63.4	61.8	64.9	5,425	70.1	68.1	72.1	3,658	76.5	75.3	77.7	6,405
At least 2 doses of tetanus toxoid during pregnancy	30.2	28.6	31.8	5,141	22.3	21.0	23.6	5,425	30.7	28.5	33.0	3,658	34.1	32.8	35.5	6,405
Postnatal vitamin A supplementation	13.9	12.7	15.1	5,141	33.5	31.8	35.2	5,425	-	-	-	-	52.2	50.8	53.7	6,405
Delivery in a health facility*	26.5	24.3	28.9	8,188	28.2	26.5	30.0	8,715	45.2	42.6	47.8	5,656	68.9	67.3	70.5	9,137
Skilled attendant at birth**	31.3	29.0	33.7	8,188	38.6	36.8	40.5	8,715	52.1	49.5	54.6	5,656	69.0	67.4	70.6	9,137
Postnatal checkup <2days after delivery in those w non-facility birth	2.9	2.4	3.4	5,141	2.5	2.0	3.1	5,425	-	-	-	-	14.5	13.6	15.5	6,405
*Health facility includes all public and private place of delivery response options.																
**Skilled provider includes doctor, nurse, trained birth attendant, medical assistant, midwife.																
BREASTFEEDING																
<1 month**																
Exclusive	99.6	97.0	99.9	79	94.1	86.5	97.6	101	-	-	-	-	(93.6)	83.1	97.7	49
Predominant	0.0	0.0	0.0	79	2.1	0.5	8.2	101	-	-	-	-	(2.4)	0.6	9.2	49
Partial	0.4	0.1	3.1	79	3.8	1.2	11.2	101	-	-	-	-	(4)	1.0	15.3	49
Not	0.0	0.0	0.0	79	0.0	0.0	0.0	101	-	-	-	-	(0)	0.0	0.0	49
1-5 months**																
Exclusive	81.5	78.1	84.5	697	87.8	85.0	90.2	783	-	-	-	-	84.3	81.1	87.0	669
Predominant	2.9	1.8	4.5	697	3.0	1.9	4.8	783	-	-	-	-	2.3	1.3	3.8	669
Partial	15.2	12.5	18.4	697	8.8	6.9	11.2	783	-	-	-	-	12.8	10.4	15.8	669
Not	0.4	0.1	1.7	697	0.4	0.1	1.3	783	-	-	-	-	0.7	0.2	1.8	669
6-11 months**																
Exclusive	12.8	10.5	15.4	936	13.8	11.5	16.4	823	-	-	-	-	11.2	9.0	13.8	833
Predominant	0.9	0.4	1.9	936	2.1	1.4	3.3	823	-	-	-	-	1.4	0.8	2.5	833
Partial	85.4	82.6	87.8	936	82.1	79.4	84.5	823	-	-	-	-	85.1	82.3	87.6	833
Not	1.0	0.5	1.9	936	1.9	1.2	3.1	823	-	-	-	-	2.2	1.4	3.5	833

12-23 months**																	
Exclusive	0.6	0.3	1.3	1,251	0.9	0.5	1.6	1,539	-	-	-	-	0.4	0.2	0.9	1,541	
Predominant	0.6	0.2	1.3	1,251	1.3	0.8	2.0	1,539	-	-	-	-	0.1	0.0	0.5	1,541	
Partial	85.5	82.9	87.8	1,251	85.5	83.5	87.2	1,539	-	-	-	-	89.4	87.7	90.9	1,541	
Not	13.3	11.0	15.9	1,251	12.3	10.7	14.1	1,539	-	-	-	-	10.1	8.6	11.8	1,541	
Early initiation of breastfeeding (within 1 hour of birth)*	48.1	45.9	50.3	7,950	41.0	39.8	42.2	8,464	44.2	42.4	46.1	5,542	49.9	48.8	50.9	8,990	
Exclusive breastfeeding <6 months**	83.3	80.3	86.0	776	88.6	85.9	90.8	885	-	-	-	-	84.9	82.0	87.5	718	
% of 6-9 months breastfeeding and consuming complementary foods	78.9	75.3	82.1	631	69.2	64.9	73.2	547	-	-	-	-	68.9	73.0	2.2	553	
*The denominator includes all children under five ever breastfed.																	
**Denominator is restricted to last born children living with the mother.																	