RWANDA DEMOGRAPHIC AND HEALTH SURVEY (RDHS-V)

Protocol

Kigali, Rwanda
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MINISTRY OF FINANCE AND ECONOMIC PLANNING (MINECOFIN)

MINISTRY OF HEALTH (MOH)

NATIONAL INSTITUTE OF STATISTICS OF RWANDA (NISR)

RWANDA BIOMEDICAL CENTER (RBC), MALARIA AND OTHER PARASITIC DISEASES DIVISION
RBC/ NATIONAL REFERENCE LABORATORY DIVISION

RBC/HIV, STIs AND OBBI DIVISION

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)

ONE UNITED NATIONS (ONE UN)

WORLD VISION

PARTNERS IN HEALTH (PIH)

CENTERS FOR DISEASE CONTROL AND PREVENTION
(CDC RWANDA OFFICE)
and
ICF International, USA

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LIST OF ACRONYMS

AIDS	Acquired Immuno-deficiency Syndrome
CDC	Centers for Disease Control and Prevention
CHW	Community Health Worker
DBS	Dried Blood Spot
DFID	Department for International Development (Gov.UK)
EA	Enumeration Area
GOR	Government of Rwanda
HCT	HIV Voluntary Counseling and Testing
HIV	Human Immunodeficiency Virus
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
HMIS	Health Management Information System
IRB	Internal Review Board
MCH	Maternal and Child Health
MIGEPROF	Ministry of Gender and Family Promotion
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance and Economic Planning
MOH	Ministry of Health
MTCT	Mother to Child Transmission
MYICT	Ministry of Youth and ICT
NISR	National Institute of Statistics of Rwanda
NRL	National Reference Laboratory
NURSPH	National University of Rwanda School of Public Health
OBBI	Other Blood Borne Diseases
PBF	Performance Based Financing
PMTCT	Prevention of Mother to Child Transmission
PSU	Primary Sampling Unit
RBC	Rwanda Biomedical Center
RDHS	Rwanda Demographic and Health Survey
RDT	Rapid Diagnostic Test
RNEC	Rwanda National Ethics Committee
SC	Steering Committee
STI	Sexually Transmitted Infections
UN	United Nations
UNAIDS	Joint United Nations Program on HIV/AIDS
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
URI	Acute Upper Respiratory Infections
USA	United States of America
USA	United States of America
USAID	United States Agency for International Development
WHO	World Health Organization

A. PROJECT OVERVIEW

Protocol summary

The Government of Rwanda (GOR) with the support of its development partners and institutions interested in population and health issues is planning to undertake the Fifth Rwanda Demographic and Health Survey in 2014-15 (RDHS-V). The RDHS-V provides the opportunity to update national and international demographic and health indicators that Rwanda has committed to report on.

The RDHS-V will be implemented by the National Institute of Statistics of Rwanda (NISR) in collaboration with MOH under the guidance of a steering committee. The RDHS-V will beneficiate the technical support from ICF Macro. A consultative approach will be adopted in order to enrich the process and generate data that meets the requirements of the GOR and its stakeholders.

Investigators/collaborators/funding sources

The following partners and institutions are involved in the planning, development, and implementation of the RDHS-V:

- Government of Rwanda
    - Ministry of Finance and Economic Planning
    - Ministry of Health
    - Ministry of Local Government
    - National Institute of Statistics of Rwanda
    - RBC / HIV, STIs and OBBI Division
    - RBC / Malaria and Other Parasitic Diseases Division
    - RBC / National Reference Laboratory
- US Agency for International Development (USAID)
- US Centers for Disease Control and Prevention (CDC/GAP)
- United Nations Children's Fund (UNICEF)
- United Nations Population Fund (UNFPA)
- United Nations Women (UN Women)
- United Nations AIDS (UN AIDS)
- World Health Organisation (WHO)

The RHDS-V is being made possible by the generous funding support of the following partners and institutions:

- Government of Rwanda
- USAID
- CDC/GAP
- UNICEF
- UNFPA
- Global Fund (through RBC / Malaria and Other Parasitic Diseases, and HIV Divisions)
- World Vision
- Swiss cooperation
- Partners in Health

B. INTRODUCTION

Justification for the study

An important approach to controlling the global epidemics of communicable diseases is primary prevention based on comprehensive population-wide programs. The basis of such programs is the identification of disease as well as major, common risk factors and their prevention and control. Efforts to prevent communicable diseases include promoting healthy behaviors, expanding the use of early detection practices, reaching young people with important health messages, improving the health of communities, and supporting community-based public health interventions. Underpinning this framework is the collection of relevant data through surveys or surveillance to determine the prevalence of diseases, their risks factors and risk determinants, and to monitor the progress of prevention efforts, and, ultimately, to make timely and effective evidence-based public health decisions.

The Rwandan National Ethics Committee and the U.S. Centers for Disease Control and Prevention will provide ethical review of the protocol and must approve the protocol prior to the undertaking of the pretest. In case significant modifications would be made to the standard protocol proposed by ICF International, the Rwandan protocol would also have to be reexamined by the IRB of ICF International. All IRBs will ensure that the new protocol respects international ethical recommendations on both medical research and human subjects. Samples of **Informed Consent Forms** are provided in questionnaires in Appendix D.

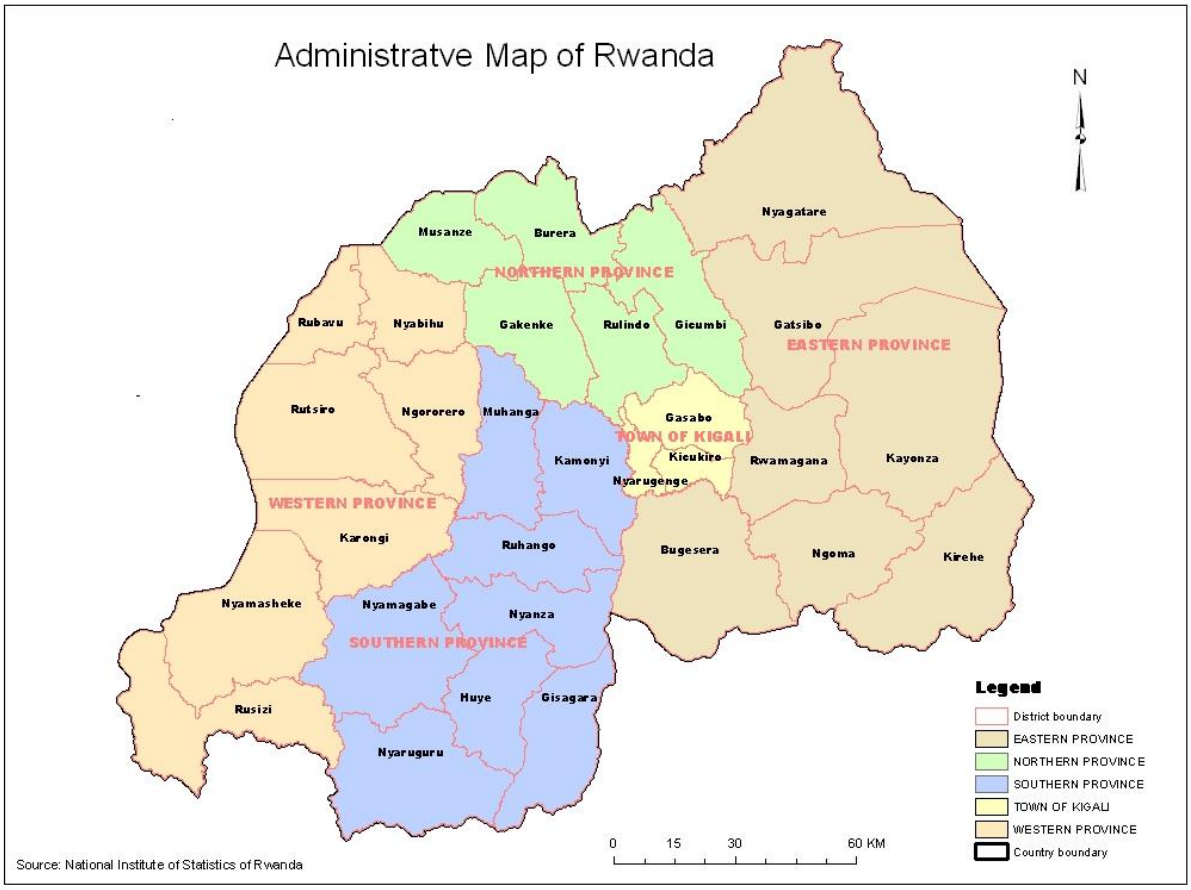
Intended/potential use of study findings

Results from the RDHS-V will be used to describe current patterns at the national and provincial level of fertility, knowledge and use of contraception, maternal and childhood mortality, and sexually transmitted infections and HIV/AIDS. Some indicators will be representative at district level where the sample will permit to compute them.

Study design/locations

The fifth Rwanda Demographic and Health Survey in 2014-15 (DHS-V) is a nationally representative cross-sectional household survey of under five children, women 15-49 and men 15-59 to be conducted across thirty (30) districts in five provinces in Rwanda.

Map of Rwanda



Survey Objectives

- Collect data at the national level to facilitate calculation of essential demographic rates, especially rates for fertility and infant and child mortality and analyze the direct and indirect factors which determine levels and trends in fertility and child mortality;
- Measure the levels of knowledge and use of contraceptive methods among women/men;
- Collect data on family health including immunization practices, prevalence and treatment of diarrhea, acute upper respiratory infections and fever and/or convulsions among children under five years of age, antenatal visits assistance at delivery; and post natal care;
- Collect data on the knowledge, prevention and treatment of malaria, in particular the possession and use of treated mosquito nets among children under-five , women and pregnant women; as well as household members
- Collect data on nutritional practices of children, including breastfeeding;
- Collect data on the knowledge and attitudes of men and women on sexually transmitted infections (STI) and AIDS and evaluate recent behavioral changes with regard to condom use;
- Collect data for the estimation of adult mortality and maternal mortality at the national level;
- Take anthropometric measurements in half (50%) of sampled households in order to evaluate the nutritional status of children, men and women;

- Test malaria infection using malaria Rapid Diagnostic Tests and blood smear in children under five and pregnant women living in selected subsample (50%) of the RDHS 50%) households in order to estimate the prevalence of malaria;

- Collect dried blood spots (finger stick) for anonymous HIV testing in half (50%) of survey households among women aged 15-49 years and men aged 15-59 years in order to estimate the prevalence of HIV in the adult population of reproductive age.
- Collect dried blood spots (finger stick) for anonymous HIV testing at the NRL in (25%) of survey households among children aged 0-14 years in order to estimate the prevalence of HIV in the population of this age group at the national level.
- Conduct anemia testing in half (50%) of survey households among all children aged 6-59 months, women aged 15-49 years in order to estimate the prevalence of anemia in children and in the adult women of reproductive age;
- Collect information on Early Children Development (ECD)
- Collect information on Domestic Violence

C. PROCEDURES/ METHODS:

Design

The Fifth Rwanda Demographic and Health Survey 2014-15 (RDHS-V) is a nationally representative cross-sectional household survey of men and women to be conducted across thirty (30) districts in the five (5) provinces of Rwanda. The RDHS-V follows Four prior DHSs conducted in 1992, 2000, 2005 and 2010; and an Interim DHS in 2007-08. As with the prior surveys, the primary goal of the survey is to collect data on fertility, knowledge and use of contraception, maternal and childhood mortality, and sexually-transmitted infections and HIV/AIDS. The data are representative at the national level, for urban-rural residence, and for each of the five provinces. The RDHS-V will also provide some indicators at the district level.

Audience and stakeholder participation

An organizational body was assigned the preparation and establishment of the RDHS-V including a steering committee (SC) and a technical advisory committee (TAC). The SC includes representatives from national and development partner institutions, with input in the areas of health and population. The steering committee will be consulted on the principal guidelines of the project and will be regularly informed on the advancement of the project. This SC will oversee the coordination and execution of the RDHS-V. It will be chaired by the Ministry of Health (MOH) and the NISR will assume the role of secretariat. It will include representatives from national and development partner institutions with responsibility, or significant interest in health and population. GOR will be represented by officials from the Ministry of Finance and Economic Planning (MINECOFIN), the Ministry of Local Government (MINALOC), Ministry of Gender and Family Promotion (MIGEPROF), Malaria & OPDD and HIV & OBS Division of Rwanda biomedical Center (RBC) and the School of Public Health. Representatives from partner organizations will include USAID, CDC, UNICEF, UNFPA, UNAIDS, and WHO. The SC will meet at least every month to review progress and facilitate decision-making for timely and quality implementation of the RDHS-V.

Key responsibilities will include:

- Advocacy for successful implementation and use of the RDHS-V;
- Mobilization of resources, both technical and financial, and approval of the overall budget;
- Approval of the final protocol;
- Coordination of the official launch and presentation of results;
- Strategic oversight of planning, implementation and reporting by NISR;
- Approval of the final report;
- Review and concur with organizational contracts and Memorandum of Understanding related to the RDHS-V;
- Ensure legal and ethical requirements are fully met;
- Ensure capacity building.

As chair of the Steering Committee, the MOH is in charge of mobilizing resources for supporting the implementation of the survey and will raise public awareness in collaboration with the Ministry of Local Government (MINALOC), the media, and decentralized administrative structures. The MOH will provide expert advice to the national decision makers so that they understand the purpose and results of the survey, and to facilitate acceptance of the results as viable and useful indicators. Officials of the MOH will provide guidance on all health related aspects through the Steering Committee.

The technical advisory committee is in charge of the regular follow up of all technical aspects of the survey particularly the scope of work for the RDHS-V and the protocol of the HIV test as well as the final content of the questionnaires.

The technical advisory committee will assist NISR by providing expert technical advice through reviews, observations and recommendations on all aspects of the RDHS-V. The technical advisory committee will be chaired by NISR and the secretariat will be assumed by the MOH. Members will come from national and development partners with inputs in health and population: NISR, MOH, RBC/ HIV, STIs and OBBI, Malaria and Other Parasitic Diseases, and National Reference Laboratory divisions, the School of Public Health, and representatives from partner organizations (USAID, CDC, UNICEF, UNFPA, UNDP, UNAIDS, and WHO).

The technical advisory committee will be meeting at least once a month to monitor the progress of the implementation of the survey. But, different sub-groups with common interest will meet as appropriate to agree on issues concerning their interest.

This committee will be responsible for:

- Reviewing and providing recommendations on indicators to be measured and associated survey protocol(s), data analysis plans, cartography and survey manuals, training manuals, questionnaires and all other tools that are required;
- Observing implementation of survey preparations and data collection and provide feedback and/or recommendations to assure the quality and integrity of data collected;
- Reviewing and providing recommendations on the analysis and interpretation of data and its presentation in preliminary and final reports.

A Technical team from NISR, MOH and RBC / HIV, STIs and OBBI, Malaria and Other Parasitic Diseases, and National Reference Laboratory Divisions is in charge of the implementation of all

activities, under the responsibility of the NISR which is the implementing agency with the technical support of ICF International. Each organization/institution has clear responsibilities to complete during the preparation and implementation of the RDHS-V:

The National Institute of Statistics of Rwanda (NISR) is responsible for planning and executing the RDHS-V, in particular the preparation and implementation of fieldwork, data processing of collected data, and both the writing of and national dissemination of reports. The NISR will name a National Technical Director who will be responsible for all aspects of the RDHS-V; NISR will provide the necessary work space needed to serve as the central office for survey personnel, preparations, implementation, data analysis and reporting. NISR will provide a manager/accountant who will be responsible for the management of the budget for the RDHS-V and other administrative tasks. NISR will be responsible for supervising daily technical operations, including recruitment and training of field and data processing personnel, and the supervision of office and field activities.

NISR will collaborate at all stages of the project execution with international and national institutions and organizations who are interested and working in the area of population, health and HIV/AIDS, in particular, the Ministry of Finance and Economic Planning (MINECOFIN), the Ministry of Health (MOH), Ministry of Local Government (MINALOC), USAID, CDC/GAP, UNFPA, UNICEF, UNDP, and UNAIDS.

The Demographic and Health Survey (DHS) program of ICF International, Calverton, Maryland, U.S.A., will provide technical assistance through its contract with the United States Agency for International Development (USAID). This assistance concerns all aspects of the survey: preparation of questionnaires and manuals, data processing programs and tabulation and analysis plans. This technical assistance will be aimed at capacity building of the NISR and MOH institutions involved.

Rwanda Biomedical Center/National Reference Laboratory Division (RBC/NRL) is the agency responsible for training of health technicians and interviewers in taking blood samples and testing. RBC/NRL is also responsible for the analysis of blood samples for HIV screening and quality control of blood slides and blood smears for malaria parasitemia. The procedure followed by the NRL for analyzing samples of dried blood will be conform to the protocol adopted by ICF International, including a rigorous program of quality assurance. ICF International will carry out an evaluation of the protocols for external and internal quality control followed by the National Reference Laboratory prior to the pretest of the RDHS-V. The National Reference Laboratory will also participate in the integrated analysis of all the HIV data related to biomakers. NRL with support from the CDC will be responsible of sending a sample of HIV specimen for external quality control to National Institute of Communicable Diseases in Johannesburg, South Africa.

RBC/NRL Division will train the lab technicians on taking and conservation of blood samples. It will also organize processing of blood samples. RBC/HIV Division will follow up the transfer of household members referred for HCT results. It will also ensure HIV testing kits (PCR) for children 0-23 months.

RBC/Malaria Division will be leading the malaria component of the RDHS and will coordinate the finalization of the malaria component questionnaire and supervise the data collection of malaria indicators. The Malaria & OPDD will be responsible of the malaria blood smear reading and analysis while the NRL Division will be in charge of malaria quality control testing. All children under five tested which will be found malaria positive will be immediately treated by CHWs using the national malaria guidelines and will be reported to the respective health center and to the Mal & OPDD-RBC for follow up. All pregnant women found malaria positive will be referred to the respective health center for free malaria case management. The Malaria & OPDD-RBC will also

participate in the integrated analysis of all the malaria and anemia data related to biomarkers. Severe cases of malaria and anemia will be referred to hospitals according national treatment guidelines.

The Centers for Disease Control and Prevention (CDC/GAP) will ensure technical support to the National Reference Laboratory division in conducting the training for field testing, blood collection, and laboratory testing.

Funding for the RDHS-V will be ensured by the Government of Rwanda who will make its contribution by making technical staff time, offices and a portion of the logistics for the survey available; and by development partners, including USAID, CDC/GAP, United Nations Agencies (ONE UN), Global Fund, World Vision and Swiss Cooperation.

Study time line

An estimated time line for project activities is provided below. Three fieldwork operations include household listing update, pre-testing the survey instruments, and main data collection. Training for pre-test will be carried out over the period of roughly three weeks including the training for anthropometry, malaria, anemia and HIV tests. A field pre-test will be conducted over the period of about 5 days during which around 250 women and 250 men will be interviewed. Training for the main data collection will be carried for about 5 weeks. Data collection will last about 5.1 months. Preliminary results (malaria and HIV test results excluded) will be available in about 4 weeks after the completion of data processing. Comprehensive survey results are expected to be published approximately 6-7 months after the completion of fieldwork.

Table 1 Time line

ACTIVITIES	Month
Finalization of MOU, protocol, budget, and contract	1-2
Approval survey protocol	2-3
Sample design; selection PSUs	4
Recruitment	3-4
Household listing manual, adaptation, and training	5
Sample update, household listing (fieldwork)	5-7
Finalization Questionnaire content	3
Preparation Manuals	4
Translation questionnaires/manuals	4-6
Sensitization for data collection	6-11
Pretest (training and fieldwork)	6-7
Questionnaire/manuals review/printing	7-8
Training main survey	8-9
Fieldwork for data collection	9-14
Data processing (entry and editing)	10-15
Preliminary results	15-16
Analysis, report writing	16-19
Finalization of final report at ICF International	19
Printing of final report and key finding	20-22
National seminar	23

Study population

Description and source of study population and catchment area

The source population of the survey is composed of a nationally representative sample of approximately 12,800 households. All women aged 15-49 and men aged 15-59 years who are usual residents of the household or who were present in the sampled households on the night before the survey are eligible to be interviewed. In addition, a subsample of 50 percent and 25 percent of all households selected will be selected for the biomarker testing.

The sampling frame used for RDHS-V will be the complete list of Enumeration Areas (EAs) of the

2012 Rwanda Population and Housing Census (RPHC) which will be provided by the National Institute of Statistics of Rwanda (NISR), the implementing agency for the RDHS-V. The enumeration area should have all information according to province, district, identification codes, as well as population size, number of households, and classification as urban or rural.

Participant inclusion criteria

All members of each selected household will be listed in the Household Questionnaire. Every woman aged 15-49 years and men aged 15-59 who are usual residents of the household or who were present in the sampled households on the night before the survey are eligible to be interviewed using the Women's and Men's Questionnaires. All men aged 15-59 years and all women aged 15-49 years in half of the households selected will also be asked to consent to biomarker and anthropometric measures including height, weight, malaria tests and HIV tests. Anemia test will be administered to all women aged 15-49 and children aged 6-59 months in half of the selected households for men interview. Additionally parents or adults responsible for all children 0-14 in 25% of the households will be asked to consent for HIV testing among these children

Participant exclusion criteria

The sample does not include institutions (e.g., hospitals, prisons, residence halls of educational institutions, etc.); therefore persons residing in these institutions are not eligible for the survey.

Sampling, including sample size and statistical power[1]

A nationally representative sample of about 12,800 households will be selected. All women age 15-49 who are usual residents of the selected households or who slept in the households the night before the survey are eligible for the survey. The survey will result about 13,800 interviews of women age 15-49. Apart from the female survey, a male survey will also be conducted at the same time in a sub-sample consisting of one household in every two selected for the female survey. All men age 15-59 who are usual residents of the selected households or who slept in the households the night before the survey are eligible for the male survey. The survey will result about 6,500 interviews of men age 15-59. In this sub-sample, all women and men eligible for the individual interview will be asked to consent for biomarkers testing. The survey is designed to produce representative estimates for the main demographic and health indicators for the country as a whole, for the urban and rural areas, and for each of the five provinces. For some indicators, representative results may be available for each of the thirty districts, where possible.

Sampling frame

The sampling frame used for RDHS-V, 2014-15 is the frame of the Rwanda Population and Housing Census (RPHC) which was conducted in 2012, provided by NISR. The sampling frame is a complete list of Enumeration Areas (EAs) covering the whole country. The enumeration area should have all information according to province, district, identification codes, as well as population size, number of households, and classification as urban or rural.

Rwanda is divided into provinces; each province is sub-divided into districts; each district into sectors, each sector into cells and each cell into villages. There are 5 provinces, with a total number of 30 districts and 416 sectors.

[1] Detail sampling design will be provided after the sampling design visit by DHS project.

Structure of the sample and the sampling procedure

The sample for RDHS-V, 2014-15 will be a stratified sample selected in two stages from the 2012 census frame. Stratification will be achieved by separating each province into districts; each district forms a sampling stratum. In total, 30 sampling strata have been created. Samples will be selected independently in each sampling stratum, by a two-stage selection. Implicit stratification and proportional allocation would be achieved at each of the lower administrative unit levels by sorting the sampling frame according to administrative unit in different levels before sample selection and by using a probability proportional to size selection at the first stage of sampling.

In the first stage, the EAs will be selected with probability proportional to the size and with independent selection in each sampling stratum with the sample allocation. A household listing operation will be carried out in all of the selected EAs before the main survey. The household listing operation consists of visiting each of the selected EAs; drawing a location map and a detailed sketch map; and recording on the household listing forms all residential households found in the EA with the address and the name of the head of the household. The resulting list of households will serve as the sampling frame for the selection of households in the second stage. Some of the selected EA may be found to be large in size in the household listing operation. In order to minimize the task of household listing, the selected EAs with an estimated number of households greater than 300 will be segmented. Only one segment will be selected for the survey with probability proportional to the segment size. The methodology and the detailed household listing procedure are addressed in the household listing manual.

At the second stage, a fixed number of households will be selected from each selected EA. In Kireha District and in South of Kayonza District, an oversample will be made to allow the computation of many indicators at this level. But, the data collection in the oversampled households will follow just after the completion of that of the RDHS-V main survey.

With the request of representative results for some indicators at district level, the total sample size is tight and therefore an equal size allocation was adopted, with a slightly larger sample size for the districts in the Kigali City because of the low fertility level in Kigali City. In fact, the equal size allocation is not far from the proportional allocation which is the best allocation, because the district sizes are quite homogeneous. On the other hand, the total sample size is already large; any substantial increase in the total sample size in order to provide representative results for most of the indicators at district level will compromise the data quality due to the longer duration of field data collection or larger number of field workers. With the current sample size, adequate survey precision at district level will be obtained for women indicators above 15%; and for children (under five) indicators above 20%.

The expected survey results are calculated based on the survey results of the RDHS 2010: these are included the average number of women 15-49 per household; the average number of men 15-59 per household; household response rate and women individual response rate that will be more than 99 percent; men individual response rate that will be more than 98 percent; the response rate to HIV testing that will be more that 98 percent for both men, women, and children and young adults.

Expected survey precision

Since the request of survey results at district level for some indicators, the sample allocation

adopted is an equal size allocation, with 438 expected women interviews for all the districts except the three districts in Kigali province, which is the **maximum sample size allowable.** For the three districts in Kigali province, 548 expected women interviews were allocated to each district taking into account that the fertility rate is lower in the capital city than in other areas. With the current sample design, the following tables provide the expected survey precision for women survey at national level, province level and district level. The relative standard error (CV) for a proportion P is calculated by the following formula:

$$CV = \frac{Deft * \sqrt{P * (1 - P) / n}}{P}$$

At national level, the relative standard error will be under 5% for all indicators of 10% or above which is a very good precision; at province level, since the sample size varies according to the number of districts per province, the precision for an indicator at 10% or above will have a relative standard error under 10% which is a good precision at survey domain level; at district level, the precision for an indicator at 10% or above will have a relative standard error under 20% which is acceptable as precision for second level domains.

Expected survey precision at national level according to indicator levels

(With 13470 women interviews and assuming a design effect of Deft=1.5)

Indicator level	SE	CV	%95 Confidence limits	
			Lower	Upper
0.10	0.004	0.04	0.092	0.108
0.15	0.005	0.03	0.141	0.159
0.20	0.005	0.03	0.190	0.210
0.25	0.006	0.02	0.239	0.261
0.30	0.006	0.02	0.288	0.312

Expected precision at province level for an indicator P=10%

(Assuming a design effect of Deft=1.5)

Province	# of women interviews	SE	CV	%95 Confidence limits	
				Lower	Upper
East	3,066	0.008	0.08	0.084	0.116
Kigali	1,644	0.011	0.11	0.078	0.122
North	2190	0.010	0.10	0.081	0.119
South	3,504	0.008	0.08	0.085	0.115
West	3,066	0.008	0.08	0.084	0.116

Expected precision at district for different indicator levels

(With an estimate of 440 women interviews and assuming a design effect of Deft=1.5)

Indicator level	SE	CV	%95 Confidence limits	
			Lower	Upper
0.10	0.022	0.22	0.057	0.143
0.15	0.026	0.17	0.099	0.201
0.20	0.029	0.14	0.143	0.257
0.25	0.031	0.12	0.188	0.312
0.30	0.033	0.11	0.234	0.366

As for the precision of HIV testing, since Rwanda is a low HIV prevalence country, HIV testing must be included in a high proportion of the households sampled for the survey. HIV testing will be conducted in the sub-sample households for men survey; consisting one of every two households selected for the household and women survey. The sample for the RDHS-V is designed to measure the prevalence of HIV within ±0.5 percentage points at the national level and generally within ±1 percentage point at the province level. The confidence interval for Kigali City is expected to be somewhat larger than that of the other provinces due to its higher prevalence estimate; however, the relative error for the Kigali City estimate is expected to be equal to or less than that of the other provinces. Compared to the last RDHS-IV (2010), the precision of HIV testing will be similar due to the same sample size.

Expected precision for HIV testing at national level and province level for women and men together, based on the HIV testing results of RDHS-IV (2010)

Province	Expected # of HIV tests	Expected HIV prevalence	SE	CV	95% Confidence limits	
					Lower	Upper
East	2,779	0.025	0.004	0.142	0.018	0.032
Kigali City	1,488	0.067	0.008	0.116	0.051	0.083
North	1,985	0.020	0.004	0.189	0.012	0.028
South	3,176	0.027	0.003	0.128	0.020	0.034
West	2,779	0.032	0.004	0.125	0.024	0.040
Rwanda	12,207	0.030	0.002	0.061	0.026	0.034

Selection probability and sampling weight

Due to the non-proportional allocation of the sample to the different provinces and to their districts and the possible differences in response rates, sampling weights will be required for any analysis using RDHS 2014-15 data to ensure the actual representative of the survey results at national level and as well as at domain level. Since the RDHS 2014-15 sample is a two-stage stratified cluster sample, sampling weights will be calculated based on sampling probabilities separately for each sampling stage and for each cluster. We use the following notations

P_{1hi}: first-stage sampling probability of the i^{th} EA in stratum h

P_{2hi}: second -stage sampling probability within the i^{th} EA (household selection)

Let a_h be the number of EAs selected in stratum *h*, M_{hi} the total population according to the sampling frame in the i^{th} village, and $\sum M_{hi}$ the total population in the stratum *h*. The probability of selecting the i^{th} EA in the RDHS 2014-15 sample is calculated as follows:

$$\frac{a_h M_{hi}}{\sum M_{hi}}$$

Let b_{hi} be the proportion of households in the selected segment compared to the total number of households in the EA *i* in stratum *h* if the EA is segmented, otherwise $b_{hi} = 1$. Then the probability of selecting village *i* in the sample is:

$$P_{1hi} = \frac{a_h M_{hi}}{\sum M_{hi}} \times b_{hi}$$

A RDHS 2014-15 cluster is either an EA or a segment of a large EA. Let L_{hi} be the number of households listed in the household listing operation in the cluster *i* in stratum *h*, let g_{hi} be the number of households selected in the cluster. The second stage's selection probability for each household in the cluster is calculated as follows:

$$P_{2hi} = \frac{g_{hi}}{L_{hi}}$$

The overall selection probability of each household in cluster *i* of stratum *h* is therefore the production of the two stages selection probabilities:

$$P_{hi} = P_{1hi} \times P_{2hi}$$

The design weight for each household in cluster *i* of stratum *h* is the inverse of its overall selection probability:

$$W_{hi} = 1 / P_{hi}$$

A spreadsheet containing all sampling parameters and selection probabilities will be prepared to facilitate the calculation of the design weights. Design weights will be adjusted for household non-response and as well as for individual non-response to get the sampling weights, for women and men surveys respectively. The differences of the household sampling weights and the individual sampling weights are introduced by individual non-response. The final sampling weights will be normalized in order to give the total number of un-weighted cases equal to the total number of weighted cases at national level, for both household weights and individual weights, respectively. The normalized weights are relative weights which are valid for estimating means, proportions and ratios, but not valid for estimating population totals and for pooled data. The sampling weights for HIV testing are calculated in a similar way, but the normalization of the individual sampling weights is different compared to the individual survey weights. The HIV testing weights are normalized for males and females together at national level, in order that the HIV prevalence calculated for males and females together is valid.

Sampling errors will be calculated for selected indicators for the national sample, for the urban and rural areas separately, and for each of the five provinces.

All men aged 15-59 years and all women aged 15-49 years in 50% of households will also be

asked to consent to be measured for height and weight, and tested for HIV. Children under 5 years of age residing in the household sub-sample will be eligible to be measured and weighed in order to determine their nutritional status. Children under five years of age and women 15-49 will be eligible for the malaria and anemia tests. In addition, children 0-14 years in 25% of household will be tested for HIV.

Before the beginning of the survey, an updating of the EAs selected will be undertaken (mapping and enumeration) so that updated household lists will be made available for the selection of households for the sample. The updating will be undertaken by 17 teams, each composed of two enumerators, for a period of 3 months. Four staff members from NISR will be assigned to supervise the activities of the enumeration teams. NISR will organize a training session for field staff in the 7 days prior to the commencement of field work. The Enumeration Manual of the DHS program will be adapted and utilized during this training. Office and field supplies, office space, and vehicles for field activities will be made at the disposal of the enumeration staff. Twenty three (one per each team and one per each supervisor, and two for coordination) vehicles will be needed for the work of updating the mapping and carrying out the numbering.

Variables/intervention

Variables

Data to be collected as a part of the survey are detailed on the Household's, Women's and Men's questionnaires (see appendix). The **Household Listing** in the Household Questionnaire captures information on the number of persons residing in the household and reason(s) a household refuses to participate. The reasons for refusal will be clearly documented and concise.

Study instruments, including questionnaires, laboratory instruments and analytic tests

Three questionnaires will be used during the RDHS-V: 1) a household questionnaire, 2) an individual questionnaire for women aged 15-49 years and 3) an individual questionnaire for men aged 15-59 years. These three instruments will be based on the questionnaires developed within the framework of the international DHS program, and will be adapted to the specific conditions and needs of Rwanda. In addition to the usual sections, the questionnaires will also include the following modules:

- A module on malaria (household and woman's questionnaires);
- A module on anemia testing (household questionnaire)
- A module on HIV testing (household questionnaire)
- A module on HIV/AIDS in order to obtain the information necessary for the calculation of Monitoring and Evaluation indicators adapted by the RBC/HIV Division from the UNAIDS recommendations (woman's and man's questionnaires);
- A DHS module on adult mortality and maternal mortality in woman's questionnaire.
- An Early Child Development module

The technical committee established for the RDHS-V will participate in the finalizing of questionnaires for the survey.

1. The **household questionnaire** draws up the list of all members of the household, collects information on their basic socio-demographic characteristics, and collects information on housing characteristics. The data collected at the level of the household, will measure in particular:

At the **general demographic** level:

- Distribution of the population by age and sex;
- Size and composition of households;
- Proportion of female heads of household.

In the area of **education**:

- Distribution of the population by level of education;

Concerning **housing** (this information combined with other data collected during the survey will calculate the poverty index of the population, according to the methodology developed by ICF International for the World Bank):

- Type of water supply;
- Type of toilet;
- Construction material;
- Type of fuel;
- Availability of electricity;
- Possession of durable goods;
- Possession of means of transportation.

Concerning **malaria**:

- Possession of mosquito nets (treated or not);Number of treated mosquito nets

- Use of mosquito nets by household members.

Indoor residual spraying

2.The **individual woman's questionnaire** includes the following sections: a) background characteristics of women, b) reproduction, c) contraception, d) pregnancy and post natal care, including breastfeeding and feeding practices, e) immunization and health and nutrition of children, f) marriage and sexual activity, g) fertility preferences, h) characteristics of the spouse and employment activity of the woman, i) HIV/AIDS and other sexually transmitted infections, j) other health issues, k) adult and maternal mortality. Data collected at the level of women age 15-49 years, will allow, in particular, the estimation of indicators in relation to:

The **socio-economic and demographic** characteristics of women:

- Religion;
- Level of education;
- Level of literacy;
- Employment (type of work, type of income, use of income, participation in household expenses).

Relations between the men and spouses

- Decision making at the household level;
- Opinions concerning domestic violence;
- Opinions concerning the refusal of sexual intercourse within the couple.

Demographic indicators:

- Fertility rates;
- Teenage fertility;
- Birth interval;

- Age at first birth;
- Infant and child mortality.

Fertility determinants:

- Marital status;
- Age at marriage;
- Polygamy;
- Fertility preferences;
- Desire to limit births;
- Ideal number of children;
- Desired fertility.

Reproductive health:

- Knowledge of contraceptive methods;
- Past use of contraception;
- Contraceptive prevalence;
- Future use of contraception;
- Unmet needs for contraception;
- Sources of contraception;
- Information on contraception.

Maternal health:

- Problems in obtaining care;
- Antenatal care: frequency, content;
- Conditions of delivery;
- Postnatal care.

Child health:

- Immunizations;
- Prevalence and treatment of diarrhea;
- Prevalence and treatment of ARI;
- Prevalence and treatment of fever;
- Prevalence of malnutrition.

Malaria:

- Prevention of malaria during pregnancy;
- Use of mosquito net during pregnancy; by children and members of the household
- Treatment seeking of malaria among children;
- Use of mosquito nets by children•Knowledge of symptoms, treatment and prevention of Malaria

Breastfeeding and nutrition:

- Frequency and duration of breastfeeding;
- Introduction of nutritional supplements (age and type of food);
- Content of Vitamin A in foods;
- Night blindness among pregnant women;
- Iron supplementation during pregnancy;

- Access of children/women to iodized salt.

Adult Mortality:
- Mortality rate of adults by age group and by sex
- Maternal mortality ratio

Domestic violence:
- Experience of physical and sexual violence
- Experience of spousal violence
- Helps seeking to stop violence

HIV/AIDS and STIs: The questions on HIV/AIDS deal with sexual behavior, condom use, knowledge, attitudes and practices concerning HIV/AIDS and STIs. These questions allow, among other things, calculation of the total of **follow-up and evaluation indicators** based on the general population and defined by the RBC/HIV Division from the recommendations of **UNAIDS** and in particular:
- Age at first sexual intercourse;
- Frequency of sexual intercourse;
- Type of partner;
- At risk sexual intercourse;
- Difference in age with the partner;
- Condom use by type of partner;
- Knowledge of the means of preventing HIV/AIDS;
- Abstinence, fidelity, condom;
- Mother/child transmission;
- Stigma;
- Screening for HIV/AIDS (general and during antenatal care);
- Knowledge of STIs and symptoms;
- Stated prevalence of STIs;
- Treatment of STIs and informing the partner;
- Prior testing, testing before married;

3. The **individual men's interview questionnaire** includes the following sections: a) background characteristics, b) reproduction, c) contraception, d) marriage and sexual activity, e) fertility preferences, employment and gender roles, f) HIV/AIDS and other sexually transmitted infections, g) other health issues, h) domestic violence. The data collected for men age 15-59 years measure in particular: socio-economic and demographic characteristics of men (same indicators as those for women), certain determinants of fertility (in particular: marital status, age at first marriage, polygamy, ideal number of children), and the same indicators as those for women concerning HIV/AIDS and STIs and domestic violence.

After elaboration of the definitive questionnaires in English, they will be translated into Kinyarwanda. These translated questionnaires will be used during training and practice in the field. All translation problems must be resolved before the pretest. In addition to the questionnaires, other technical documents will be produced, specifically:

The manual for male/female interviewers;
The manual for team leaders/female supervisors;
The assignment sheets for male/female interviewers/female supervisors;

The manual for malaria, HIV, anemia and anthropometric measurements;
The control cards for the HIV test.

ICF International will provide models for all these documents and will participate in the adaptation of these documents with representatives of NISR, MOH and RBC.

Biomarkers

In addition to information collected through the questionnaires, certain types of information will be collected by means of tests and the taking of measurements. Results from the malaria rapid test will be recorded on the questionnaires for the household survey, which will allow the health technician to provide treatment according the MOH standard protocol and the results to be linked to the results of the interviews.

NISR in collaboration with the relevant services from the Ministry of Health will prepare an information brochure related to anemia, malaria, HIV/AIDS in Kinyarwanda, which will offer advice about how to avoid these conditions. These brochures will be distributed to survey participants whether they accept to be tested or not.

Anthropometric measurements

In a sub-sample of 50% of households, all women aged 15-49 years and men aged 15-59 years in the households surveyed and all children under age 5 years will be weighed and measured in order to determine their nutritional status (wasting, insufficient weight and stunting for children, and Body Mass Index for men and women) and to assess prevalence of overweight and obesity. In households where children are identified to be malnourished, the study team will provide a referral to the nearest health facility for follow-up care.

Malaria testing

Malaria diagnostic tests are included in the RDHS-V. The tests are given to the women and children. An informed consent form is read to the eligible person or parent/responsible adult of the child or teenager aged of 15 to 17. This consent form asks, first of all, for the authorization of the person before undertaking the test and then explains the objectives of the test, informs the individual taking the test or those responsible for children that the results will be communicated immediately after the test.

For each eligible women and children, a slide with a thick blood smear will be prepared, transmitted, and stored at the Malaria and Other Parasitic Diseases Division for microscopic examination and reading of malaria parasites. RBC/National Reference Laboratory division will be in charge of quality control of malaria test.

For the rapid diagnostic test (RDT) for malaria, a drop of blood will be obtained by a prick at the end of the finger (except for infants for whom the sample will be taken from under the heel). The drop of blood will be tested using RDT First Response. The results of the RDT malaria will be recorded in the Household Questionnaire, which allows them to be linked with the characteristics of the respondents. There is a control band in each RDT kit used in the field allowing for positive and negative control.

The National Institute of Statistics of Rwanda, in collaboration with RBC/Malaria & Other Parasitic

Diseases division, will prepare an information brochure on malaria. These brochures will be distributed to participants, whether or not they agreed to undergo the malaria diagnostic test. The survey team will provide treatment and referral to local health services to respondents whose RDT results were positive according to the approved RBC/Malaria & Other Parasitic Diseases division protocol.

HIV testing

Screening for HIV will also be part of the RDHS-V.The Internal Review Board (IRB) of ICF International and the Rwanda National Ethics Committee and the CDC will give advance approval of the survey methodology for HIV screening. The test will be carried out in the sub-sample of households selected for the men's survey. The blood samples will be drawn among all eligible men and women from these households who voluntarily accept to take these tests, after reading an informed consent. For unmarried minors between 15 and 18 years of age, the consent will be obtained from parents or persons in charge of minors, before asking the personal consent of the minor. In addition to HIV screening in adults, the RDHS-V will also collect blood sample among children 0-14 years in a subsample of 25% of selected households.

The HIV test will be anonymous, that is, the results of the test will not be linked to survey data until individual respondent's identifying information is destroyed by NISR, therefore, respondents' HIV test result can never be linked to identifying data. For respondents accepting to be tested, drops of blood will be drawn and dried on filter paper. In most cases, the drops of blood will be obtained from the same finger (or heel) prick as for malaria test. Only an identification number drawn at random will be assigned to each specimen. Analysis of the samples for anti-HIV antibodies (or Polymerase Chain Reaction (PCR) for children 0-23 months) will be carried out at the National Reference Laboratory.

Since no information containing personal identification will accompany the samples, it will not be possible to inform the respondents of the result of their test.

Moreover, information and education brochures about HIV/AIDS and the means of prevention and the existing HCT and MTCT sites will be distributed in all the households selected for the survey, whether these households are selected for the test or not. These brochures will be prepared by RBC/IHDPC/HIV,STIs and OBBI Division in close collaboration with NISR.

Results from the test will be linked to variables coming from the survey itself. Consequently, the prevalence of HIV can be analyzed in relation to numerous variables in the RDHS-V.

In each filed team, a laboratory technician will be in charge of blood samples. This laboratory technician will also be responsible for anthropometric measurements. However, all interviewers will be trained so that a replacement can easily be found in case the person assigned to the blood samples is prevented from doing them. Therefore, in addition to training related to the entire survey, the interviewers will receive a special training on anthropometric measurements and all aspects of the test protocols for HIV (informed consent, blood drawing procedure, hygiene precautions, respect for confidentiality, and procedures for the elimination of bio-hazardous products). ICF International will provide standard supplies for the training and field activities and will assist NISR in the adaptation of these documents. Concerning training of personnel for the collection of blood samples, it will be ensured by Rwandan specialists with the assistance of CDC and ICF International.

The sample transfer manual will be prepared by ICF International will be adapted by RBC/NRL

division and NISR. This manual will clarify in detail the procedures to be followed by the laboratory for receiving the samples, the test results, and the reporting of results. This manual will also clarify in detail the external and internal quality control procedures and the quality assurance procedures that will be followed throughout all the test activities.

1. Tasks to be accomplished before the survey: validation of the screening method

The screening method originating with blood samples on absorbent paper (Dried Blood Spots-DBS) validated at the serology laboratory of the NRL prior to the beginning of the pre-test planned for the month of May 2014.

This validation will focus on one hundred samples (about 50 HIV+ and 50 HIV negative) tested in parallel provided by CDC, according to the algorithm retained (see below) on the dried and reconstituted blood and recovered on plasma obtained after decantation.

Before the beginning of the pretest, the NRL must provide RBC, NISR and ICF International with the results of this study showing the correspondence of the results from the screening tests carried out from plasma and dried blood.

2. Storage and Transport of DBS samples

The DBS from each site will be carefully collected in a highly impervious cardboard box by the staff responsible for the drawing of blood. The supervisor will bring them at NISR at least once a week. The medical supervisor/coordinator will have the responsibility of taking them to the NRL after verification of the labeling of the filter papers. The DBS must not spend more than 5-7 days at the sampling site.

3. Processing of blood samples

The blood samples on filter paper and the transfer forms for the samples from each cluster will be returned to the central office of NISR where they will be registered and checked. The samples will not be transferred to the National Reference Laboratory until any discrepancy between the questionnaires of the RDHS-V, the transfer forms and the samples has been regulated. These samples will arrive by lot at the NRL. The NRL will register each lot of samples that it receives and will sign a transfer's form indicating the date and number of samples received for each cluster. Any discrepancy between the samples received by the laboratory and the number of samples recorded at the central office of NISR will be regulated immediately. Each blood sample provided to the NRL will be identified only by a bar code, and only this code will be entered into the CSPro program file with the test results. Bar codes will be designated in quadruplicate for all survey participants regardless of whether or not they were included in the HIV testing survey sample. For participants who did provide blood samples, sets of identical bar codes will be attached to the survey questionnaire, blood sample, transmittal sheet and voucher for HIV counseling and testing (HCT). For participants who did not provide blood samples for HIV testing, identical bar codes will be attached to the survey questionnaire and vouchers. Per below, this will allow for determination of HIV testing uptake among survey participants. This confidential file will remain under the responsibility of the NRL until the end of the survey. The samples will only be analyzed at the NRL once all sample collection in the field and survey field work is completed.

In order to accomplish this task in a timely manner, the NRL will be given all the personnel and all the equipment that might be necessary.

The NRL must name 6 lab technicians for blood sample malaria testing and 6 others for HIV blood sample testing, one lab coordinator, and one data manager from its staff to be responsible for all testing activities in the RDHS-V. Two of the 6 lab technicians must be permanently present at the NRL during office hours and will be responsible for receipt of samples, their control and their storage. Moreover, these persons must immediately communicate to RBC/Malaria & Other Parasitic Disease and HIV divisions, NISR and eventually to ICF International any problem which might come up during the survey poor quality of the samples received.

4. Algorithm

The NRL will process the samples according to the following algorithm:

a) Screening

- ELISA1: The Vironostika HIV Ag/Ab uniform II 4th generation, will be used, to detect HIV.

If a sample presents an optic density (OD) in ELISA1 lower than the threshold value (TV), the result is Negative.

b) Confirmation

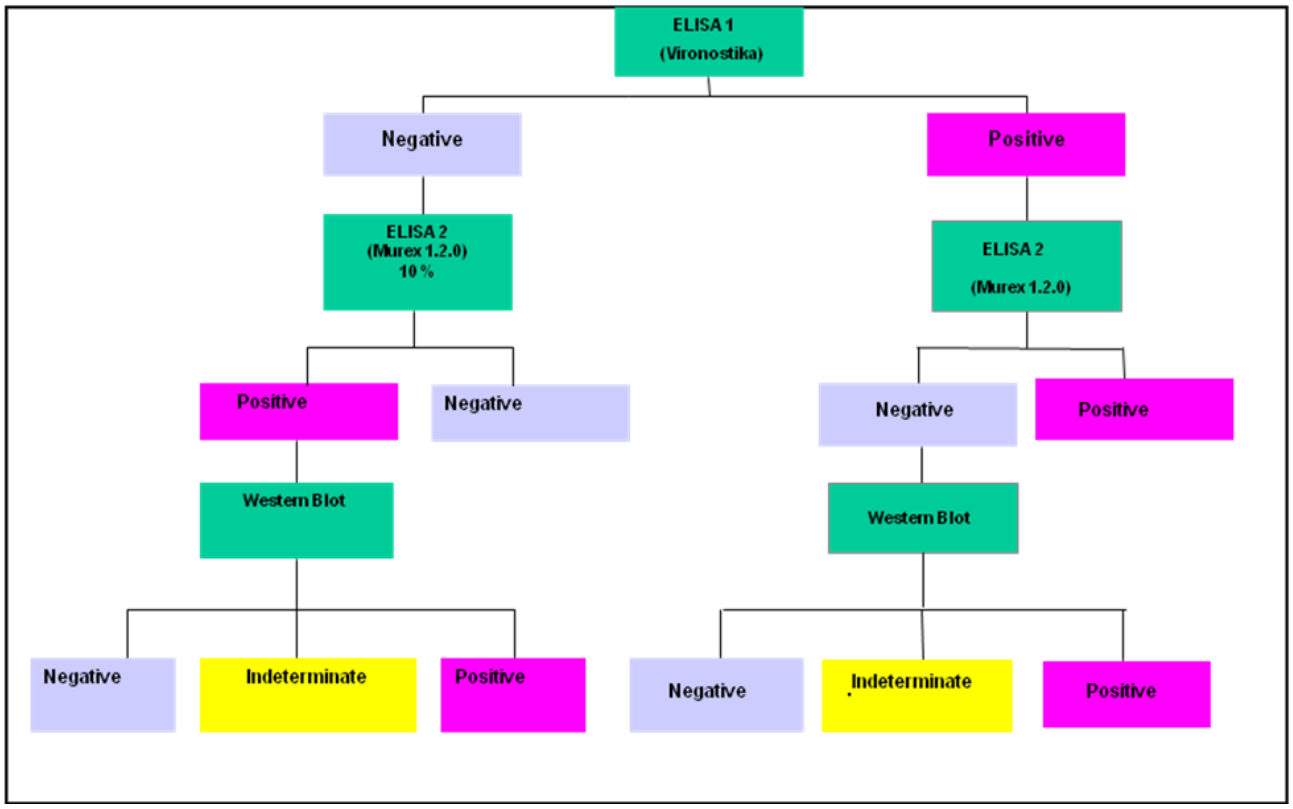
- Positive samples with ELISA1 (OD higher than or equal to the threshold value) will be tested with a second ELISA2 with a different antigenic principle than ELISA1, highly specific for HIV (the EIA Murex HIV Ag/Ab combination will be used).

- If a sample is positive in ELISA2 (concordance), the result is Positive.
- If a sample is negative in ELISA2 (discordance), the samples will be confirmed with the Western Blot (WB), the criteria for WB validation are those of the CDC.
- Final result is positive if WB result is positive, and is negative if WB result is negative. If WB result is indeterminate the final result is indeterminate.

- Within the framework of the DHS-V 10 % of negative samples in the screening with ELISA1 will be tested following the complete algorithm similar to positive sample (see above).

The HIV testing algorithm can be summarized in the following flow chart:

HIV testing algorithm*



** Indeterminate result did not exist in 2010 RDHS. However, if it will happen this time, there will be only 1-2 cases maximum. In that case, they will be confirmed by DNA/PCR using testing instrument and material available at NRL.*

A program in CSPro, specially conceived according to the algorithm chosen, will be provided to the NRL for the entry of test results. Personnel from the NRL will be trained in the use of this program. As entries are made, this program will proceed to an automatic counting of all the entries (number of samples tested, number of positives and negatives according to the various kits used). Each month, the RBC/NRL will provide RBC, NISR and ICF International with the following results: total number of samples analyzed, total positive number and total negative number.

However, no individual result will be transmitted to the central office of NISR, RBC and ICF International until all data processing activities for the DHS-V have been completed. Following analysis, the samples will be kept at the NRL at -70°C for eventual later studies on HIV; but in no case will the NRL be able to use these blood samples collected during the survey to conduct any other study without the approval of the National Ethics Committee.

5. Internal Quality Control

Each manipulation (test) will be recorded in the logbook. For each manipulation, the following will

be indicated: the date, name of technician, test used, lot and expiration date. The NRL will use the usual internal quality control system: on each red blood disc aliquots known and frozen at – 80°C (an HIV+ aliquot and an HIV- aliquot) will be incorporated. The results obtained over time allow visualization of the eventual drift of the method independent of the sample tested.

6. External Quality Control

The NRL has participated since 2001 in the External Quality Control through the WHO-sanctioned activities of the National Institute of Communicable Diseases (NICD), South Africa. This control consists of executing anti-HIV antibody research on a panel coded and expedited by the organizer of this control.

7. Conservation of samples at the NRL

The DBS will be kept at the NRL at – 80°C for until testing is initiated after completion of data collection, per above. Left-over samples will remain in frozen storage for any additional future testing, for example a study on HIV incidence. But in no case will the NRL be able to use these blood samples collected during the survey to conduct another study without the prior approval of the Rwanda National Ethics Committee. After the test, the samples will be kept at – 80°C for five years.

8. Access to HIV counseling and testing and receipt of HIV test results by survey Participants

The Rwandan MOH and RDHS V, 2014-15 stakeholders believe there is an ethical obligation to maximize access to HIV testing and receipt of HIV test results among RDHS 2014-15 survey participants. At the same time, it is imperative that current HIV testing service delivery, which remains primarily facility-based, not be disrupted and that limited resources have the greatest impact.

Currently, Rwanda MOH does not allow HIV rapid testing to be conducted by non-laboratory technicians. Countrywide, facility-based services have been scaled up tremendously in Rwanda; currently, roughly 485 health facilities in the country offer HIV counseling and testing (HCT) services from which 430 give the ART package. By June of 2012, 2,908,146 HIV tests were administered in a population of about 10 million. This level of HCT scale-up will help to ensure that survey participants are not required to travel more than 5-10 km to health facilities. Since HCT will be conducted in facilities, all participants who consent for HIV Testing during the survey will be advised to go to the nearest HCT and all HIV positive individuals will receive care and treatment according to national protocol and guidelines. Community health workers will be involved in community sensitizations in order to increase health services seeking for appropriate HIV management follow-up for HIV positive study participants.

For the above reasons, the RDHS-V, 2014-15 Steering and Technical Committees propose the following “enhanced” voucher-based approach:

1. All pre-survey implementation community sensitization activities will emphasize the importance of receiving HIV counseling and testing (HCT).

2. At the end of the survey interview, all survey participants, eligible for testing, regardless of whether or not they provided blood for HIV testing in the survey, will be encouraged to seek HCT and given a voucher which includes participant barcode by survey staff, and an

informational brochure which includes the following:

- Information about all existing facility-based VCT services within a 10 km radius.
- A value of up to 2,500 FRW (~$3.85) for transportation, to be reimbursed by local health facilities to the survey participant.
- A value of 2,000 FRW (~$3.07) for food and beverages in compensation for their time, to be reimbursed by local health facilities to the survey participant.

3. Community health workers (CHW) in each sector (average 3-4) will be informed of the survey Enumeration Areas (EAs) selected in their sectors. They will follow-up by implementing community-based sensitization and mobilization campaigns within these EAs in order to encourage all inhabitants to seek HCT. This activity is not considered a part of routine CHW activities and thus is requiring of compensation. For the additional work burden associated with supporting this HCT promotion activity, a value of 500 FRW ($0.77, based on 650 FRW = 1 USD) will be allocated to CHWs for each survey participant referred for and receiving HCT, including results. This is the current level of compensation provided to facility-based health workers for provision of HCT to one person under the Performance Based Financing (PBF) program and is more than the amount of compensation provided to CHWs for referrals under the community PBF program. Example, if a CHW successfully refers 10 survey participants for HCT services = 5,000 FRW in reimbursement by the local health facility.

4. Local health facility staff will also be given a list of EAs from their sector, and will be encouraged to mobilize the respective CHWs to carry out community mobilization efforts to promote HCT using the national HIV rapid testing algorithm. This activity is not considered a part of routine health service delivery and will likely result in an increased work burden. For the additional work burden associated with supporting this ancillary HCT activity a value of 500 FRW ($0.77) will be allocated to each health worker for each survey participant that they provide with HCT at the health facility, including results. Example, if a health care worker successfully provides 10 survey participants with HCT services = 5,000 FRW in reimbursement by the local health facility.

This approach would result in an estimated expenditure of ~US$10/survey participant who receives HCT, if all the steps are followed. This approach was relatively successful in the RDHS 2010, with the high uptake of HCT among survey participants.

9. Tracking, monitoring, and evaluation.

Rigorous monitoring and evaluation will accompany this enhanced voucher distribution plan which aims primarily to promote survey participants' access to HCT and receipt of HIV test results. During the survey and post-survey HCT promotion period, health facility HCT staff will be encouraged to ask all persons seeking HCT whether they have a survey voucher, if not presented to them. In addition, as above a bar code will be attached to the voucher. This bar code will be used to link the survey information with the voucher- and HCT service data; however the information will remain strictly anonymous. CHWs will be asked to record the EAs where they carried out community sensitization campaigns, along with other corroboratory information, such as date, location, number of persons reached. CHWs will be compensated based on persons who are confirmed to have received HCT services, including HIV test results, at the local health center(s) corresponding to the EAs.

HCT staff will be asked to document the following information in dedicated RDHS-V's HCT log books: current date and rapid HIV test results. In addition, the number of the participant recorded in the HCT log will be written on the bar code sticker, and will be used to anonymously link the survey, voucher and log information. The information recorded on the voucher will also be used to determine compensation of facility-based HCT staff according to the above guidelines. Routine HCT client data will also be recorded in standard national HCT registers, however only standard data elements will be included, i.e. there will be no recording of bar codes or other survey-related information. During implementation of the survey and for 3 months afterwards, RBC's HIV/AIDS division, MOH, and District Hospital staff will be required to support this activity through routine supervision. After the 3-month post-survey follow-up period all vouchers and log books will be collected and data will be entered into an EPI-Info database at RBC's HIV division for analysis. After linkage of the databases the vouchers and logs will be destroyed. Of note, laboratory testing of the blood samples collected during the survey will not be delayed by the HCT promotion activity; linkage of the databases can be performed after the fact using the anonymous bar codes.

ICF International will release a clean version of the main database to RBC's HIV division for linkage (using the bar codes) to the HCT dataset within 6 months of completion of data collection RBC's HIV/AIDS division and MOH will analyze the data to address the question of what percent of persons did not know their serostatus and those data will be used to inform returning test results in future surveys.

Anemia testing

Anemia testing will be part of the RDHS-V, 2014-15. RBC/NRL Division will lead activities of training, collection of anemia. The Malaria & OPDD will be responsible of the analysis of aneamia.

Blood specimens for anemia testing will be collected from all children aged 6-59 months, if the parent or guardian consents to the test. Blood specimens will also be collected from all eligible women who voluntarily consent to the testing. Anemia testing will be carried out in the households selected for the man's survey.

For the anemia testing, a blood drop will be obtained from each eligible woman and child by picking the finger (or heel in the case of very young children). The blood drop will be tested using the HemoCue system (photometer and microcuvette), which assesses the level of hemoglobin in the blood. Results will be provided immediately following the anemia testing both verbally and in writing for each of the individuals who are tested. All survey participants eligible for anemia testing will receive a brochure explaining what is anemia, and providing advice regarding types of food to eat to avoid iron deficiency. Results of the anemia test will be recorded in the DHS questionnaire.

Individuals whose hemoglobin levels fall below designated cutoff points (9 g/dl for pregnant women and 7 g/dl for women who are not pregnant (or do not know if they are pregnant), and children under age five) and who are severely anemic will be referred for assessment and treatment to a health facility.

Training for all study personnel

Seventeen (17) teams of field staff will be recruited by NISR for the needs of the main survey. Each team will be composed of a team leader (male), one controller or field editor (female), three female interviewers, one male interviewer, and a lab technician in charge of blood drawings and anthropometric measurements. However all interviewers will receive special training for the tests.

All candidates for the field staff positions will be selected on the basis of their maturity, their skill in communicating, their level of education, their knowledge of the national language and availability to work far from home for a period of at 5.1 months. Everything will be done to involve qualified field personnel whose qualifications will be established beforehand by the technical team for the survey.

The candidates will take classroom training for about four weeks, dealing with all aspects of the survey. A greater number of candidates than needed will be trained so that the best of these may be chosen and, so that changes may eventually be made, as needed, during the first days in the field. The training will take place in a venue of sufficient size to accommodate the candidates and where it will be possible to take meals. NISR will provide trainers and ICF International will assist them. Presentations on specific topics will be made by personnel from the Ministry of Health or other appropriate institutions.

The training program will include: a detailed description of the content of the questionnaires; a presentation of interview techniques; explanations on how to fill out the questionnaires; and training on the taking of anthropometric measurements. The training will include presentations, practice interviews in the classroom, and practice interviews in the field. Each interviewer will carry out at least five interviews throughout the training period.

A special training session of about one week will be organized for persons who will be in charge of the malaria, anemia and HIV tests. The training will focus on: the procedures to be used in obtaining voluntary consent from respondents; the techniques to be used for taking blood samples; to use rapid test and blood smear for malaria, the procedure to treat the patient with RDT malaria positive, for referring participants who need follow-up for malaria or malnutrition and providing the HCT vouchers to eligible participants; the procedures for handling and storing the samples on filter paper until their transport to the laboratory; and the procedures for eliminating bio-hazardous products. The training will include a detailed presentation on the procedure to follow for the transfer of samples from the field to the laboratory. All personnel in the central office of the RDHS-V and those from the NRL who will be involved in the activities of the HIV test, as well as field personnel, will participate in this aspect of the training. Personnel from the NRL will be trained on the manner to record test results and the way to deliver results to NISR when all the survey activities are completed.

A half day of training will be devoted to giving information to all personnel of the RDHS-V (whether they are involved or not in the HIV test) about the AIDS epidemic and the means of prevention as well as on the reasons why the HIV test is included in the survey. Questions on stigmatization, misconceptions, and questions of confidentiality will be dealt with during this training.

Finally, at least one day will be reserved for team leaders and female supervisors to train them in the manner of observing interviews in the field, editing completed questionnaires and controlling the quality of samples.

After having completed the training session, every field staff member must have an in depth knowledge of their role to play in the collection of data in order to achieve maximum effectiveness in the fieldwork.

Data handling and analysis

Data analysis plan, including statistical methodology and planned tables and figures

Once data entry is completed, the data will be cleaned and the data entry supervisor will produce a single database file with all the entered data from the instruments, data analysis would be started.

Data analysis should be conducted in a very standardized and methodical way, using the guidelines suggested by the Technical Committee and relevant partners including ICF International. Standardizing certain aspects of the data analysis will allow trend analysis in the future between DHS surveys Standard tables and formats are available for DHS data.

Data collection

Pre-test survey instrument

NISR will make the necessary arrangements for organizing a pretest of the RDHS-V as soon as the protocol have been approved, the questionnaires have been finalized and translated; and supplies and equipment for biomarkers for pre-test are available. The objective of the pretest is to detect eventual problems in the questionnaires and their translation, as well as to evaluate the time necessary for conducting the interviews. The pretest will also provide information on the eventual problems that could occur at the time of the biomarkers tests (blood drawing, conservation, transportation and analysis of samples).

NISR will recruit 34 staff members for the pretest (everybody will receive training for the anthropometrics, malaria, and HIV test). The pretest personnel must correctly speak Kinyarwanda. Training for the pretest will last about three to four weeks. During training, health experts will present basic information on the various areas covered by the survey. The pretest training will include a detailed presentation of procedures to follow for the collection of blood samples and their transfer from the field to the laboratory. The three persons in charge of the test at the NRL will participate on this aspect of the training and will accompany the pretest in order to be informed about collection and transfer procedures for the samples.

The pretest in the field will last for about 5 days during which around 250 women and 250 men will be interviewed: the interviews must be undertaken in Kinyarwanda so that eventual problems in the translation can be identified. The persons in charge of measurements and blood drawing will take anthropometric measurements of women and children and will carry out the biomarker tests among men and women in at least 100 households.

The blood samples will be analyzed at the NRL in order to test the procedure for transmission and analysis, all the measures will be taken to destroy the identifying numbers of the persons tested in order to guarantee the confidentiality of the results.

Results from the pretest will be used to modify the survey instruments and field procedures, if necessary. The manner in which the tests are conducted will be examined in a particularly careful way and the field procedures will be modified in consequence. All decisions concerning modifications after the pretest must be taken in common agreement between the MOH, RBC/NRL, RBC/Malaria, RBC/HIV Divisions, NISR, and ICF International.

Main fieldwork for data collection

During the data collection process, at any point in the survey the participant can decide he/she no longer wishes to participate.

Data collection will last about 5.1 months. Each team will interview around two clusters per week. NISR will make the necessary office space available to survey personnel as well as vehicles for field activities. Seventeen (17) vehicles (sufficiently large to hold 8 people including the driver) will be necessary for the collection teams; 5 vehicles for technical supervision and 2 vehicles for

coordination of the survey.

Seventeen (17) teams of field staff will be recruited by NISR for the needs of the main survey. Each team will be composed of a team leader (male), one supervisor (female), three female interviewers, one male interviewer, and one Laboratory technician in charge of blood drawings and other biomarkers testing. However all interviewers will receive special training for the tests. All candidates for the field staff positions will be selected on the basis of their maturity, their skills in communicating, their level of education, their knowledge of the national language and availability to work far from home for a period of at 6.5 months. Everything will be done to involve qualified field personnel whose qualifications will be established beforehand by the technical team for the survey.

After approaching selected households, identifying eligible participants, explaining the purpose of the survey, informing participants of the details of the survey (explaining survey process, collection methods, survey time frame, community benefits, individual rights, and confidentiality); interviewers will obtain consent from the household who are respondents to household questionnaire, and each women and men respondents to women and men questionnaires respectively. Each participant must provide verbal consent before taking part in biomarkers testing. Examples of **Informed Consent forms** can be founded in the questionnaire[2]. Following participant provision of consent, data collection using the women's and men's survey instruments can proceed.

Information management and analysis software

Data entry, editing and management: (including handling data collection forms, different versions of data and data storage and disposition)

After editing and correction in the field, the questionnaires and blood samples for the HIV test will be sent to NISR. Once having arrived at the central office, the questionnaires will be registered, verified and the questions not pre-coded will be coded before data entry: this verification and coding will be carried out by a team of 3 staff members. These same staff members will verify the labeling of the filter papers and will return them the same day so that they may be brought in to the RBC/NRL Division. Entry and verification (double entry) of all questionnaires will be carried out by 14 data entry personnel. Furthermore, two staff from the computer programming department will supervise the data processing activities overall and will be in charge of the management of the questionnaires. Finally, two demographers will be in charge of the second editing of the data in collaboration with the computer programming staff. This entire group of personnel makes up the data processing team.

NISR will provide 16 computers for the period of data processing. The data processing personnel will attend a portion of the training for male/female interviewers in order to familiarize themselves with the questionnaires and to understand their internal logic.

Data entry, editing and tabulation of the RDHS-V will be achieved by using CSPro, the software developed by the MEASURE DHS+ project and the Bureau of the Census of the United States. ICF International will provide training on data entry, editing, and tabulation programs using CSPro and will provide assistance to NISR for installing the programs and the entire data processing system for the RDHS-V. NISR will provide a room sufficiently large to contain 16 data entry stations and furnished with shelves to allow for storage of the questionnaires. This work space must be secure and electricity must be assured on a regular basis.

[2] Questionnaires will be available after the questionnaire design visit by ICF International.

Data entry will be done using a program that monitors the range of data and the logic of skips in the questionnaire, as well as internal coherence. Identification codes from the blood samples will be entered during the activities of data entry by using a bar code scanner. Editing of data will include the verification of data ranges, the structure of questionnaires and a holistic monitoring of internal coherence. All errors detected during the editing process will be corrected.

Once the verification and cleaning of data has been completed, imputed dates will be added to the data file, weighting factors will be calculated and added to the data file and all necessary tables for both the preliminary and final reports will be produced and verified. These tables will be based on the standard tabulation plan of the DHS program, adapted to the specific needs of Rwandan users and funding organizations.

After the tabulation phase has been completed and no additional cleaning has been shown to be needed, all sections of the questionnaire of the RDHS-V containing personal identification, such as the name, household number, cluster number and district number will be destroyed, particularly the part of the questionnaire containing identification codes from blood samples.

A new data file will then be created in which the household and cluster numbers will be replaced by new numbers randomly generated so that the integrity of the clusters and households in these clusters is maintained all the while making any identification of respondents, households and clusters impossible. All procedures followed on the original file will be repeated on this new file in order to ensure that the results have not been affected by these changes. After having verified that this new file is complete, all the data files including the original cluster and household numbers will be destroyed.

The file established by the NRL containing the identification number of samples and the results of analyses will be reinstated. By using the unique identification number of the samples, the results of the HIV test will be added to the new data file for the survey in which the household and cluster numbers are no longer the original ones. ICF International will provide its assistance for the merger of the two files.

Quality control/assurance

There must be close communication between the central office of NISR and field personnel during collection work. Details concerning supervision and communication will be discussed during training and will be included in the interviewer's and supervisor's manuals.

Quality control will be ensured through supervision and follow-up of teams during fieldwork. Each team leader and female controller will be responsible for the quality of work of their team: they will hold regular meetings with their team in order to reinforce their training and correct eventual errors committed during collection. In addition, team leaders and female controllers must re-interview about 5% of households in order to control data quality. These re-interviews, limited to certain sections of the questionnaire, will be undertaken before leaving the cluster. The team leaders and female controllers will use the re-interviews to closely monitor the reasons for « non-responses » to the HIV tests, particularly absences from the household and refusals.

In order to strengthen quality control, NISR will designate three (3) coordinators who will be present in the field throughout the period of the survey. Furthermore, 5 teams of two supervisors will have to visit the field staff regularly. Within each team one of the two supervisors will be responsible for quality control of interviews (assist in interviews and verification of questionnaires); the second will have the responsibility of follow up of the biomarkers measurements and testing in order to ensure

that the field staff follow the instructions given exactly, whether from the point of view of consent, blood drawing techniques themselves, storing of samples, or measures for eliminating errors. This supervisor will also be in charge of monitoring blood samples and their transfer to the central office of NISR.

Finally, a group of control tables will be produced by NISR at least once every two weeks throughout data collection in order to verify the validity of the data entered. Special tables will monitor the « response rate » for the HIV test. As soon as they are produced, these tables will be examined by NISR and eventual problems disclosed in these tables will be examined with the field teams in order to improve response rates and the quality of the collection. In the event that after examining these tables, it appears that a team and/or an interviewer is doing work of a particularly mediocre quality, then this team and/or this individual will be dismissed and replaced in the shortest possible time.

Routine calibrations and checks of the physical equipment ensure that the equipment is standardized and producing accurate measures.

Quality control procedures for measurements are extremely important and must be observed. The most common errors in anthropometrics are body positioning, reading measurements and recording. In order to minimize these errors, standard procedures for obtaining measurements are described in this manual. The goal of the training session is to standardize all examiners to these procedures. Errors made in measuring technique are also minimized by the recorder's role in assisting the examiner. The recorder assists the examiner with positioning of the participant and the examiner's reading process. Reading errors frequently occur as a result of parallax, the phenomenon where an observer sees a different value on a measuring device depending on the angle from which it is viewed. Again, standardization in training will help alleviate this problem.

All equipment used in the body measurement component should be checked, maintained and cleaned on a regular basis to protect the equipment, the participant, and the interviewer/technician. Broken equipment will be discontinued from field use and the DHS Study Coordinator will be notified. Broken equipment will be replaced immediately.

Verifying independence of tests used to confirm results of new test being studied

As noted above, the HIV screening method originating with blood samples on absorbent paper (Dried Blood Spots-DBS) will be validated at the serology laboratory of the RBC/NRL Division, prior to the beginning of the pre-test planned for May-June 2014. This validation will focus on one hundred samples (about 50 HIV positive and 50 HIV negative) tested in parallel, according to the algorithm retained on the dried and reconstituted blood and recovered on plasma obtained after decantation. Before the beginning of the pretest, the RBC/ NRL Division must provide RBC's HIV division, NISR and ICF International with the results of this study showing the correspondence of the results from the screening tests carried out from plasma and dried blood.

The RBC/ NRL Division and CDC Rwanda will evaluate the PCR test for HIV among young children (0-23 months) and validate the technique and methodology prior and during the pretest.

D HANDLING OF UNEXPECTED OR ADVERSE EVENTS

Emergency care

Field teams will be equipped with standard first aid kits to deal with minor events. Major health

emergencies will be referred to appropriate health authorities by field staff.

E DISSEMINATION, NOTIFICATION, AND REPORTING OF RESULTS

Notifying participants of their individual results

Data from the anthropometric and biological sample components that make up DHS provide important information on the health status of the people of Rwanda. However, these components are not intended to serve as a screening instrument or diagnostic measure or to substitute for an examination performed by a participant's own health care provider. Nonetheless, the information from the DHS was thought to have important implications for the health of the individual sample person. Therefore, DHS staff designed a referral form and system to provide participants with results from the anthropometric and biological sample components.

For the RDT for malaria test, results of the tests will immediately be given, verbally and in writing, to each person who had participated in the test.

The survey participants will have the opportunity to receive HIV results through voluntary counseling and testing (VCT) services available in the nearest health care facility. Since the VCT services in Rwanda are widely available and of good quality, the Ministry of Health decided to use VCT voucher for participants selected for HIV testing. The eligible person will be given a voucher for free counseling and testing at a HCT center in the nearest health care facility.

Anticipated products or inventions resulting from the study and their use: (Disseminating results to public)

Three reports will be written based on results from the RDHS-V: a preliminary report on the main results of the survey, a final report, and a summary report.

The preliminary report will be published about one month after the end of fieldwork. It will be brief and will include about fifteen tables defined in the model preliminary report of the DHS program. The text that accompanies the report will be brief and will not exceed ten pages. This report will be in English, and will be written jointly by NISR and MOH in collaboration with personnel from ICF International. About 250 copies will be printed. NISR will be in charge of distribution at the national level and ICF International will ensure a limited dissemination at the international level.

The final report will be published in the 6 months following the end of fieldwork. This report will be in a single volume and will have about 540 pages. The tables presented will be drawn up from the tables of the Final Report of the DHS Project. The tables will be drawn up by NISR, MOH, and the NRL in collaboration with ICF International. The report will be in English and will be written jointly by personnel from NISR, other Rwandan institutions involved in the project including MOH, the RBC/NRL Division, NISR and ICF International personnel. In addition, three members from the technical staff of the RDHS-V will make a visit to the main office of ICF International in Rockville, Maryland, for a period not to exceed three weeks in order to finalize this report in consultation with ICF International personnel. ICF International will print 1000 copies of the final report. ICF International will keep around 200 copies of this report and will ensure dissemination at the international level. ICF International will send 800 copies to NISR who will be responsible for the

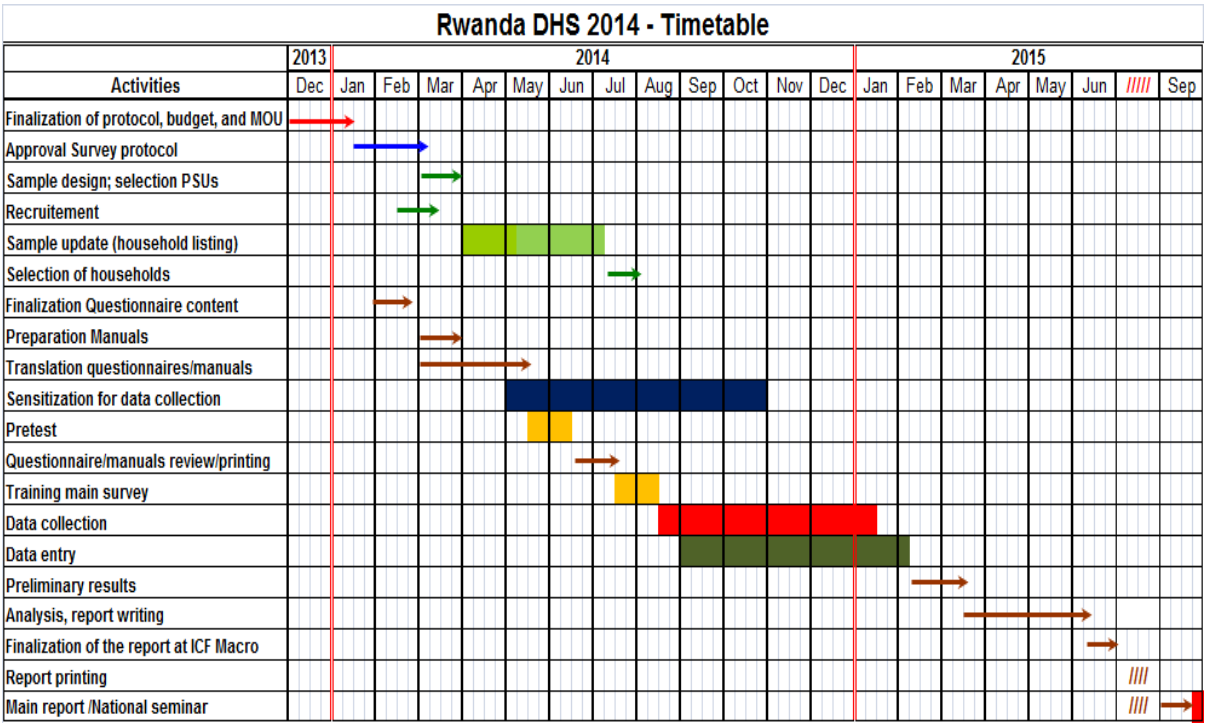
distribution of copies to institutions and organizations in Rwanda who are interested in the results.

Tables that summarize indicators at the district level will be provided in an appendix of the final report.

As soon as the final report and the summary report are ready, NISR will organize a national seminar to present the results. ICF International will lend its assistance to the preparation of the seminar and will actively participate in it.

Once the national report is published, the data file from the survey will be at the disposal of any interested institution or individual who would like to undertake additional analyses, both at the national and international levels.

F TIME TABLE


Rwanda DHS 2014 - Timetable
2013
2014
2015
Activities
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Sep
Finalization of protocol, budget, and MOU
Approval Survey protocol
Sample design; selection PSUs
Recruitement
Sample update (household listing)
Selection of households
Finalization Questionnaire content
Preparation Manuals
Translation questionnaires/manuals
Sensitization for data collection
Pretest
Questionnaire/manuals review/printing
Training main survey
Data collection
Data entry
Preliminary results
Analysis, report writing
Finalization of the report at ICF Macro
Report printing
Main report /National seminar

G. BUDGET

A. Local cost

	BUDGET ITEMS	Final Budget in RWFs	Final Budget in US $
1	ADMINISTRATION	0	0
2	PROTOCOLE	1,010,000	1,554
3	RECRUITMENT OF FIELDWORKERS	1,304,748	2,007
4	PROCUREMENT	7,917,709	12,181
5	Management fees for equipments	62,497,077	96,149
6	SAMPLING	ICF/NISR	ICF/NISR
7	LISTING	304,499,782	468,461
8	Pre-test	23,617,527	36,335
9	Main Survey	1,183,031,177	1,820,048
10	Sensitization	15,029,613	23,122
11	Data processing	56,767,823	87,335
12	Lab testing	30,165,983	46,409
13	VCT for HIV eligible respondents	108,350,000	166,692
14	Preliminary report	1,634,929	2,515
15	Data analysis	17,334,503	26,668
16	Capacity Building	49,073,334	75,497
17	Insurance	12,781,200	19,663
18	National seminar for dissemination	8,930,500	13,739
	Grand Total(Local costs)	1,883,945,903	2,898,378

B. **External Cost**

1	**Equipments and supplies**		475,119
2	**Technical assistance**		
		1. Survey:	812,000
		2. Capacity Building:	367,881
Total External cost			**1,655,000**
Total Budget (A+B) in Us Dollars			**4,553,378**

H. APPENDICES

Appendix A. Data analysis plan for HIV results

Table A.1 Coverage of HIV testing by residence and Province

Percent distribution of women age 15-49 and men age 15-59 eligible for HIV testing by testing status, according to residence and Province (unweighted), Rwanda 2014-15

	Testing status									
	DBS tested[1]		Refused to provide blood		Absent at the time of blood collection		Other/missing[2]			
Background characteristic	Inter-Viewed	Not inter-viewed	Inter-viewed	Not inter-viewed	Inter-viewed	Not inter-viewed	Inter-viewed	Not inter-viewed	Total	Number
WOMEN 15-49										
Urban									100.0	
Rural									100.0	
Province									100.0	
Kigali									100.0	
South										
West										
North									100.0	
East									100.0	
Total									100.0	
MEN 15-59										
Residence										
Urban									100.0	
Rural									100.0	
Province									100.0	
Kigali										
South										
West									100.0	
North									100.0	
East									100.0	
Total									100.0	
TOTAL (WOMEN 15-49 and MEN 15-59)										
Residence										
Urban									100.0	
Rural									100.0	
Province									100.0	
Kigali									100.0	
South										
West										
North									100.0	
East									100.0	
Total									100.0	

[1] Includes all Dried Blood Samples (DBS) tested at the lab and for which there is a result, i.e. positive, negative, or indeterminate. Indeterminate means that the sample went through the entire algorithm, but the final result was inconclusive.
[2] Includes: 1) other results of blood collection (e.g. technical problem in the field), 2) lost specimens, 3) non corresponding bar codes, and 4) ther lab results such as blood not tested for technical reason, not enough blood to complete the algorithm, etc.

Table A.2 Coverage of HIV testing by selected background characteristics

Percent distribution of women age 15-49 and men age 15-59 eligible for HIV testing by testing status, according to selected background characteristics (unweighted), Rwanda 2014-15

	Testing status									
	DBS tested [1]		Refused to provide blood		Absent at the time of blood collection		Other/missing[2]			
Background characteristic	Interviewed	Not interviewed	Interviewed	Not interviewed	Interviewed	Not interviewed	Interviewed	Not interviewed	Total	Number
WOMEN 15-49										
Age										
15-19									100.0	
20-24									100.0	
25-29									100.0	
30-34									100.0	
35-39									100.0	
40-44									100.0	
45-49									100.0	
Education										
None									100.0	
Primary									100.0	
Secondary									100.0	
More than									100.0	
Wealth										
Lowest									100.0	
Second									100.0	
Middle									100.0	
Fourth									100.0	
Highest									100.0	
Total									100.0	
MEN 15-59										
Age										
15-19									100.0	
20-24									100.0	
25-29									100.0	
30-34									100.0	
35-39									100.0	
40-44									100.0	
45-49									100.0	
50-54									100.0	
55-59									100.0	
Education										
None									100.0	
Primary									100.0	
Secondary									100.0	
More than									100.0	
Wealth										
Lowest									100.0	
Second									100.0	
Middle									100.0	
Fourth									100.0	
Highest									100.0	
Total									100.0	

[1]Includes all Dried Blood Samples (DBS) tested at the lab and for which there is a result, i.e. positive, negative, or indeterminate. Indeterminate means that the sample went through the entire algorithm, but the final result was inconclusive.
[2]Includes: 1) other results of blood collection (e.g. technical problem in the field), 2) lost specimens, 3) non corresponding bar codes, and 4) other lab results such as blood not tested for technical reason, not enough blood to complete the algorithm, etc.

Table A.3 HIV prevalence by age

Among the de facto women age 15-49 and men age 15-59 who were interviewed and tested, the percentage HIV-1 positive, by age, Rwanda 2014-15

	Women		Men		Total	
Age	Percent-age HIV-1 positive	Number	Percent-age HIV-1 positive	Number	Percent-age HIV-1 positive	Number
15-19						
20-24						
25-29						
30-34						
35-39						
40-44						
45-49						
50-54	na	na			na	na
55-59	na	na			na	na
Total age 15-49						
Total age 15-59	na	na			na	na

na = Not applicable

Table A.4 HIV prevalence by socioeconomic characteristics

Percentage HIV positive among women and men age 15-49 who were tested, by socioeconomic characteristics, Rwanda 2014-15

	Women		Men		Total	
Background characteristic	Percentage HIV positive	Number	Percentage HIV positive	Number	Percentage HIV positive	Number
Religion						
-						
-						
-						
-						
Employment (last 12 months)						
Not employed						
Employed						
Residence						
Urban						
Rural						
Province						
Kigali						
South						
West						
North						
East						
Education						
None						
Primary						
Secondary						
More than secondary						
Wealth quintile						
Lowest						
Second						
Middle						
Fourth						
Highest						
Total 15-49						
50-59	na	na			na	na
Total 15-59	na	na			na	na

na = not applicable

Table A.5 HIV prevalence by demographic characteristics

Percentage HIV positive among women and men age 15-49 who were tested, by demographic characteristics, Rwanda 2014-15

	Women		Men		Total	
Demographic characteristic	Percentage HIV positive	Number	Percentage HIV positive	Number	Percentage HIV positive	Number
Marital status						
Never married						
Ever had sexual intercourse						
Never had sexual intercourse						
Married/living together						
Divorced or separated						
Widowed						
Type of union						
In polygynous union						
Not in polygynous union						
Not currently in union						
Times slept away from home in last 12 months						
None						
1-2						
3-4						
5+						
Time away in last 12 months						
Away for more than 1 month						
Away only for less than 1 month						
Not away						
Currently pregnant						
Pregnant			na	na	na	na
Not pregnant or not sure			na	na	na	na
ANC for last birth in last 3 years						
ANC provided by the public sector			na	na	na	na
ANC provided by other than the public sector			na	na	na	na
No ANC/no birth in last 3 years			na	na	na	na
Male circumcision						
Circumcised	na	na			na	na
Not circumcised	na	na			na	na

Total 15-49				
50-59	na	na	na	na
Total 15-59	na	na	na	na

na = Not applicable

The percentage HIV positive for pregnant women corresponds to UNAIDS Health and Social Impact Indicator 1 “HIV prevalence among pregnant women.”

Table A.6 HIV prevalence by sexual behavior

Percentage HIV positive among women and men age 15-49 who ever had sex and were tested for HIV, by sexual behavior characteristics, Rwanda 2014-15

	Women		Men		Total	
Sexual behavior characteristic	Percentage HIV positive	Number	Percentage HIV positive	Number	Percentage HIV positive	Number
Age at first sexual intercourse						
<16						
16-17						
18-19						
20+						
Higher-risk intercourse in last 12 months[2]						
Had higher- risk intercourse						
Had sexual intercourse, not higher risk						
No sexual intercourse in last 12 months						
Number of sexual partners in last 12 months						
0						
1						
2						
3+						
Number of higher-risk partners in last						
0						
1						
2						
3						
Condom use						
Ever used a condom						
Never used a condom						
Condom use at last sexual intercourse in last 12 months						
Used condom						
Did not use condom						
No sexual intercourse in last 12 months						
Condom use at last higher-risk intercourse in last 12 months[2]						
Used condom						
Did not use condom						
No higher risk intercourse/no intercourse in the last 12 months						
Number of lifetime partners						
1						
2						
3-4						
5-9						
10+						
Paid for sexual intercourse in last 12						

months[4]						
Yes	na	na			na	na
Used condom	na	na			na	na
Did not use condom	na	na			na	na
No/no sexual intercourse in last 12	na	na			na	na
Total 15-49						
50-59	na	na			na	na
Total 15-59	na	na			na	na

na = Not applicable
[2] Sexual intercourse with a partner who neither was a spouse nor who lived with the respondent
[3] A partner who neither was a spouse nor who lived with the respondent, among the last

Table A.7 HIV prevalence by other characteristics

Percentage HIV positive among women and men age 15-49 who have ever had sex and were tested for HIV, by whether had an STI in the past 12 months and by prior testing for HIV, Rwanda 2014-15

	Women		Men		Total	
Characteristic	Percentage HIV positive	Number	Percentage HIV positive	Number	Percentage HIV positive	Number
Sexually transmitted infection in past 12 months						
Had STI or STI symptoms						
No STI, no symptoms						
Prior HIV testing						
Ever tested						
Received results						
Disclosed positive result						
Disclosed negative result						
Declined to disclose result						
Did not receive results						
Never tested						
Total 15-49						

Table A.8 Prior HIV testing by current HIV status

Percent distribution of women and men age 15-49 who tested HIV positive and who tested HIV negative by HIV testing status prior to the survey, Rwanda 2014-15

	Women	Men	Total

HIV testing prior to the survey	HIV positive	HIV negative	HIV positive	HIV negative	HIV positive	HIV negativ
Previously tested						
Disclosed positive result						
Disclosed negative result						
Declined to disclose result						
Did not receive result of last test						
Not previously tested						
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number						

Table A.9 HIV prevalence by male circumcision

Among men age 15-49 who were tested for HIV, the percentage HIV positive by whether circumcised, according to background characteristics, Rwanda 2014-15

	Circumcised		Uncircumcised	
Background characteristic	Percentage HIV positive	Number of men	Percentage HIV positive	Number of men
Age				
15-19				
20-24				
25-29				
30-34				
35-39				
40-44				
45-49				
Religion				
-				
-				
-				
-				
-				
Urban				
Rural				
Province				
Kigali				
South				
West				
North				
East				
Education				
None				
Primary				
Secondary				
More than				
Wealth quintile				
Lowest				
Second				
Middle				
Fourth				
Highest				
Total 15-49				
50-59				
Total 15-59				

Table A.10 HIV prevalence among couples

Percent distribution of couples living in the same household, both of whom were tested for HIV, by the HIV status, according to background characteristics, Rwanda 2014-15

Background characteristic	Both HIV	Man HIV positive,	Woman HIV positive,	Both HIV	Total	Number
Woman's age						
15-19					100.0	
20-29					100.0	
30-39					100.0	
40-49					100.0	
Man's age						
15-19					100.0	
20-29					100.0	
30-39					100.0	
40-49					100.0	
50-54					100.0	
Age difference between partners						
Woman older					100.0	
Same age/man older					100.0	
Man older by 5-9					100.0	
Man older by 10-14					100.0	
Man older by 15+					100.0	
Type of union						
Monogamous					100.0	
Polygynous					100.0	
Residence						
Urban					100.0	
Rural					100.0	
					100.0	
Province					100.0	
Kigali						
South						
West						
North						
East					100.0	
Woman's education						
None					100.0	
Primary					100.0	
Secondary					100.0	
More than secondary					100.0	
Man's education						
None					100.0	
Primary					100.0	
Secondary					100.0	
More than secondary					100.0	
Wealth quintile						
Lowest					100.0	
Second					100.0	
Middle					100.0	
Fourth					100.0	
Highest					100.0	
Total couples					100.0	

Note: The table is based on couples for which a valid test result (positive or negative) is

Couples include women 15-49 and men 15-54. The text referring to this table should explain how couples are defined, especially in the case of polygynous unions.

Appendix B. List of indicators with district-level estimates

Table B.1 Probable indicators that may be provided at the district-level, Rwanda 2014-15

Indicators	Description	Minimum Prevalen	Source
Household characteristics			
a. Education attainment:	Female population (no education/primary/ secondary or higher)	≥5%	2010 RDHS
b. Education attainment:	Male population (no education/primary/ secondary or	≥5%	2010 RDHS
c. Housing characteristics:	[electricity (yes/no); source of drinking water improved/non improved); time to sources of water (<15 minutes/≥ 15 minutes); toilet facility (improved/non improved)	≥20%	2010 RDHS
d. Wealth quintile:	Lowest, second, middle, fourth, highest	~20%	2010 RDHS
e. Birth registration:	(registered/did not registered)	≥20%	2010 RDHS
Characteristic of survey			
a. Sample distribution by district:	(weighted/un-weighted), women/men		2010 RDHS
b. Education of women:	(no education/primary/ secondary or higher)	≥15%	2010 RDHS
c. Education of men:	(no education/primary/ secondary or higher)	≥30%	2010 RDHS
d. Literacy: women	(literate/illiterate)	≥15%	2010 RDHS
e. Literacy: men	(literate/illiterate)	≥30%	2010 RDHS
f. Access to mass media: women	(radio/any three media/no media)	≥15%	2010 RDHS
g. Access to mass media: men	(radio/any three media/no media)	≥30%	2010 RDHS
h. Employment status:	employed in the 12 months preceding the survey	≥15%	2010 RDHS
Family planning			
a. Knowledge of contraceptive:	(any modern/ any traditional/ any method)	≥15%	2010 RDHS
b. Knowledge of contraceptive: men	(any modern/ any traditional/ any method)	≥30%	2010 RDHS
c. Knowledge of contraceptive:	(any modern/ any traditional/ any method)	≥30%	2010 RDHS
d. Knowledge of contraceptive:	(any modern/ any traditional/ any method)	≥40%	2010 RDHS
e. Ever use of contraception: women	(any method/ modern method/ never use)	≥15%	2010 RDHS
f. Ever use of contraception: men	(any method/ modern method/ never use)	≥30%	2010 RDHS
g. Ever use of contraception:	(any method/ modern method/ never use)	≥30%	2010 RDHS
h. Ever use of contraception:	(any method/ never use)	≥40%	2010 RDHS
i. Current use of contraception:	(any modern/ any method)	≥15%	2010 RDHS

j. Current use of contraception:	(any modern/ any method)	≥30%	2010 RDHS
k. Exposure to FP message: women	(radio/any three media/no media)	≥15%	2010 RDHS
l. Exposure to FP message: men	(radio/any three media/no media)	≥30%	2010 RDHS
Sexual activity			
a. Recent sexual activity: women	(ever had sex/sex within last 4 weeks/never had sex)	≥15%	2010 RDHS
b. Recent sexual activity: men	(ever had sex/sex within last 4 weeks/never had sex)	≥30%	2010 RDHS
Maternal and child health			
a. Antenatal care:	(trained provider/non trained provider; no care)	≥30%	2010 RDHS
b. Component of antenatal care:	(some components with prevalent > 30%)	≥30%	2010 RDHS
c. Tetanus injection;	(none/one injection/2+ injection)	≥30%	2010 RDHS
d. Place of delivery;	(health facility/home)	≥20%	2010 RDHS
e. Assistant during delivery:	(trained personnel/untrained; relative; no one)	≥20%	2010 RDHS
f. Vaccination in children 12-23	(Fully immunized)	≥50%	2010 RDHS
g. Prevalence of childhood illnesses	(yes/no); fever (yes/no); and diarrhea (yes/no) in past 2	≥15%	2010 RDHS
Malaria			
a. Possession of mosquito net:	any net; ever-treated net; LLIN (at least one/2+)	≥15%	2010 RDHS
b. Use of mosquito net	by children 0-59 months	≥20%	2010 RDHS
c. Use of mosquito net	by women	≥15%	2010 RDHS
Breastfeeding and nutrition of mothers			
a. Initial breastfeeding	(ever breastfed; within 1st hour, within 1st day;	≥20%	2010 RDHS
b. Prevalence of ANY anemia in	(yes/no)	≥35%	2010 RDHS
c. Prevalence of ANY anemia in	(yes/no)	≥30%	2010 RDHS
HIV/AIDS related knowledge, attitudes, and behavior			
a. Knowledge of AIDS: women and	has heard of AIDS	≥30%	2010 RDHS
b. Knowledge HIV prevention:	using condom (1)	≥15%	2010 RDHS
	limiting sex to one uninfected partner (2)	≥15%	2010 RDHS
	both (1) and (2)	≥15%	2010 RDHS
	abstaining from sex (3)	≥15%	2010 RDHS

c. Knowledge HIV prevention: men	using condom (1)	≥30%	2010 RDHS
	limiting sex to one uninfected partner (2)	≥30%	2010 RDHS
	both (1) and (2)	≥30%	2010 RDHS
	abstaining from sex (3)	≥30%	2010 RDHS
d. Knowledge about AIDS: women	healthy looking person can have AIDS (1)	≥15%	2010 RDHS
	AIDS cannot be transmit through mosquito bites (2)	≥15%	2010 RDHS
	AIDS cannot be transmit through supernatural means	≥15%	2010 RDHS
	A person cannot become infected by sharing with food with a person who has AIDS (4)	≥15%	2010 RDHS
	All (1), (3), and (4)	≥15%	2010 RDHS
e. Knowledge about AIDS: men	healthy looking person can have AIDS (1)	≥30%	2010 RDHS
	AIDS cannot be transmit through mosquito bites (2)	≥30%	2010 RDHS
	AIDS cannot be transmit through supernatural means	≥30%	2010 RDHS
	A person cannot become infected by sharing with food	≥30%	2010 RDHS
	(1), (3), and (4)	≥30%	2010 RDHS
f. Knowledge of PMTCT: women	HIV can be transmitted by breastfeeding (1)	≥15%	2010 RDHS
	Risk of MTCT can be reduce by taking ARVs (2)	≥15%	2010 RDHS
	Both (1) and (2)	≥15%	2010 RDHS
g. Knowledge of PMTCT: women	HIV can be transmitted by breastfeeding (1)	≥30%	2010 RDHS
	Risk of MTCT can be reduce by taking ARVs (2)	≥30%	2010 RDHS
	Both (1) and (2)	≥30%	2010 RDHS
h. Accepting attitude: women	Willing to care for family member with AIDS	≥15%	2010 RDHS
	Buying fresh vegetable from vendor with AIDS	≥15%	2010 RDHS
	Agreeing that female teacher with AIDS and not sick	≥15%	2010 RDHS
	Would not keep a secret of family member with AIDS	≥15%	2010 RDHS
i. Accepting attitude: men	Willing to care for family member with AIDS	≥30%	2010 RDHS
	Buying fresh vegetable from vendor with AIDS	≥30%	2010 RDHS
	Agreeing that female teacher with AIDS and not sick	≥30%	2010 RDHS
	Would not keep a secret of family member with AIDS	≥30%	2010 RDHS
j. Negotiating safer sex with a husband if he has STD: women	Refusing sex (1)	≥15%	2010 RDHS
	Asking to use condom (2)	≥15%	2010 RDHS
	Both (1) and (2)	≥15%	2010 RDHS
k. Support of education about condom use in children: women	(Yes/no)	≥15%	2010 RDHS

l. Support of education about condom use in children: men 18-		≥30%	2010 RDHS
m. Ever tested for HIV: women	(yes/no)	≥15%	2010 RDHS
n. Ever tested for HIV: men	(yes/no)	≥30%	2010 RDHS
o. Received counseling during	(yes/no)	≥35%	2010 RDHS
p. Knowledge about AIDS in youth	Knowledge of AIDS and a source of condom	≥25%	2010 RDHS
q. Never had sex among youth (15-	Knowledge of AIDS and a source of condom	≥45%	2010 RDHS
*Each category of indicators must be at least at this level or higher allowing for the computation at the district-level with relative standard error of 20%. These indicators were selected based on the 2010 RDHS. If the levels of indicators drop lower than the			

Appendix C Referral form for anemia

Anemia Referral Form

RWANDA DEMOGRAPHIC AND HEALTH SURVEY
RDHS 2014-15

Ministry of Health Rwanda
National Institute of Statistics of Rwanda

During the Demographic and Health Survey in Rwanda (RDHS 2014-15), Ms./child , age __ __ years, was tested for anemia on __ __/__ __/__ __.

His/her level of hemoglobin was __ __ . __ g/dl, which indicates he/she is seriously anemic.

This person needs medical attention to treat the anemia.

Appendix D Questionnaires (include informed consents)