**Impact Evaluation of the**

**Rwanda Stunting Prevention and Reduction (SPAR) Program**

**Concept Note**

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# Country context

Over the past 20 years, Rwanda has made dramatic progress in reducing poverty, decreasing income inequalities, and improving infant and child survival. Maternal mortality has dropped steeply from 1071 (2000) to 203 (2019-20) per 100,000 live births, with improved access to health services, and substantial investments in health systems. Access to prenatal care (i.e. at least one visit) is now virtually universal and over 94% of women benefit from skilled attendance at birth. The availability of family planning services rose rapidly over the past decade with a steep drop in the total fertility rate (from 6.0 to 4.1). Rwanda is among the countries that met virtually all MDG targets with the two exceptions of poverty reduction and stunting.

While the Sustainable Development Goal (SDG) target on wasting (*acute malnutrition*) has already been met in Rwanda, and there have been declines in stunting (*chronic malnutrition*) since 2010, the stunting rate has remained stubbornly high (33.1 percent, 2019/2020 DHS). Moreover, there is an unequal distribution of stunting in Rwanda. Stunting affects 49 percent of children from the poorest households, in comparison to 11 percent of those from the richest. Childhood stunting remains high in rural areas (36 percent) compared to urban areas (20 percent). While prevalence of exclusive breastfeeding of infants in the first six months is high (81 percent) and helps protect infants from early growth faltering, there is a steep and progressive rise in stunting after weaning (i.e. from 20 percent in 9-11 months old, to almost 40 percent in 18-24 months old). This is a pattern common in many developing countries during this period, as a child is introduced to greater disease risks through inadequate complementary feeding and poor hygiene practices. *Stunting requires a fundamental shift in awareness of the challenge and what can be done to address it at the community and the policy levels.*

Underlying causes of stunting include the following:

* Persistent concerns with the health and nutritional status of pregnant and lactating women, contributing to the intergenerational transmission of undernutrition and poverty. Eighteen percent of women report that their newborns were “smaller than average” or “very small” at birth, 13% of women are anemic (9% mild anemia,4% moderate anemia; among pregnant women, 16% mild and 8% moderate), and 6% have low BMI (a measure of thinness). At the same time 26% of Rwandese women are overweight/obese -- suggesting deficiencies in maternal health and a growing double burden of nutrition. Poor maternal nutrition contributes to high levels of stunting in early life, underscoring the importance of expanding access to high quality maternal health and nutrition interventions. Coverage of key health care services, such as four or more antenatal and postnatal visits, is inadequate and the availability and quality of nutrition-specific interventions delivered through the health sector, such as iron-folic acid supplementation also remains low.
* Household food security remains highly variable.[[1]](#footnote-1)Food insecure households are dependent on low-income agriculture, reinforcing the centrality of agricultural production for household food security. Food insecure households have less livestock, less agricultural land, grow fewer crops, are less likely to have a vegetable garden, have lower food stocks, and consume more of their own production at home. Food insecure households also have less diversified diets[[2]](#footnote-2), contributing to micronutrient deficiencies. Inadequate dietary intake of iron is amongst the most common causes of anemia in Rwanda (2014/ 2015 DHS).
* Recent analysis of the nutrition situation in Rwanda underscored the importance of coordinated scale up of high impact interventions to address the adequacy of food intake, environmental health, and care practices.[[3]](#footnote-3) Only 21% of children achieved a minimum acceptable diet with adequate diversity and frequency of feeding, less than 50% of women attended 4 or more ANC visits in their most recent pregnancy, and while household access to improved water has improved (73% in 2015 and 80% in 2020), there has been no marked improvement in household access to improved sanitation (DHS 2019-2020). While trends in coverage since 2000 have been encouraging, the rates of improvement in all three dimensions need to be accelerated to have a more dramatic impact on stunting. These figures suggest a need for coordinated action and a national scale up of high impact interventions.
* Poverty is not the only driver of stunting. The highest stunting rates are in the west of the country *—* *Nyamagabe, Nyabihu, Ngororero —* districts targeted for Bank support through this project *—* while the highest poverty rates are in different districts *—* *Nyamasheke, Gisagara, Rutsiro —* some of which are also targeted for support. In addition, 2015 CFSVA results point to a convergence of food insecurity and stunting. The level of food insecurity is high in the western and northern parts of the country. At the district level, *Rutsiro* (57 percent), *Nyamagabe* (42 percent), *Nyabihu* (39 percent), *Nyaruguru* (37 percent), *Rusizi* (36 percent), *Karongi* (35 percent) and *Nyamasheke* (35 percent) have the highest percentages of food insecure households. These patterns may be explained by inadequate knowledge about and practice of appropriate childcare and feeding practices (e.g. food diversity; meal frequency) as well as deficient WASH practices across all wealth quintiles, and limited availability and access to adequate and diverse diets.

It is in within this context that the Rwanda Stunting Prevention and Reduction (SPaR) program has been designed. The SPaR program is a coordinated and harmonized program that supports activities in both the health and social protection sectors, with a focus on the reduction in stunting prevalence among Rwanda’s children, especially those under-24 months old. Program activities will be described in detail below.

# Rationale for program activities

Supply-side barriers have impeded the scale up and coverage of high-impact interventions**.** Although the last fifteen years have seen important improvements in utilization of antenatal, skilled birth attendance, and postnatal services, important gaps remain. Utilization of the four recommended antenatal care visits (47%) and of child postnatal care visits within two days after delivery (75%) can be improved. The availability and quality of nutrition-specific interventions delivered through the health sector, such as micronutrient supplementation (e.g. only 16% of women receive the recommended dose of 90+ iron tablets during pregnancy) and promotion of appropriate nutrition and feeding practices (e.g. only 21 percent of children benefit from the three-recommended infant and young child feeding practices) remains very low.

The quality and efficiency of key platforms for delivering core interventions need to be improved**.** A notable example is the national Community Health Worker (CHW) program that plays an important role in improving knowledge of childcare practices, and ensuring that the most vulnerable women and children are systematically followed and accompanied to health facilities. A recent evaluation of the program found that CHWs have variable workloads, are not systematically remunerated, do not benefit from regular training and mentoring, and their performance is hindered by stock outs of medicines and critical commodities.[[4]](#footnote-4) There is also a need to revamp the incentive system, review potential alternative models, and make the program more sustainable.

Demand side barriers that contribute to stunting include socio-cultural factors, geographic and financial impediments to health service utilization, and general levels of poverty and vulnerability. While Rwanda has a strong community health insurance scheme (*mutuelles*), geographic and financial barriers to receiving relevant and high-quality health care services persist, particularly for the poor and vulnerable. The government’s strong social protection program (*Vision 2020 Umurenge Program*) plays a general role in targeting vulnerable families with income support, financial services and public works. This offers a unique opportunity to scale up nutrition sensitive cash transfers and other innovative approaches to target the poorest groups. Finally, despite progress made to tackle poverty and vulnerability, a substantial proportion of households (39%) still fall below the poverty line and are highly dependent on a subsistence economy which impedes food security and nutrition outcomes. Cash transfers to these poorest households may be effective in addressing important underlying causes of stunting and malnutrition.

# Description of program activities

To support Rwanda’s vision and commitment to eliminate chronic malnutrition in children under two, the SPaR program will support the scale-up of a combination of nutrition-specific and nutrition-sensitive interventions, addressing both the supply side, by strengthening health and nutrition services, and the demand side, through cash transfers (CTs) This support will focus on investing in the full package of core nutrition actions with intensive coverage in a targeted number of 13 high-stunting districts (out of a total of 30 districts in Rwanda) to ensure that the basic, immediate and underlying causes of stunting are addressed. With cross-sectoral inputs from health, social protection (and agriculture) in these 13 districts, the Bank-supported program aims to demonstrate how a multi-sectoral approach has great potential to reduce stunting. Under this program there are two principal World Bank projects.

1. The Stunting Prevention and Reduction Project, or SPRP, (centered in the Health Nutrition Population Global Practice) includes different components to address the supply-side of high-impact nutrition and health interventions, including the use of CHWs. The SPRP project also involves home-based early childhood education (ECD) and complementary WASH interventions, as well as the distribution of fortified blended foods (FBF) targeting the most vulnerable households.
2. The Strengthening Social Protection (SSP) project (centered in the Social Protection Global Practice), of which the novel Nutrition-Sensitive Direct Support (NSDS) represents the core component. The NSDS involves providing cash transfers (CTs) to vulnerable households and involves "co-responsibilities" for children to participate in growth promotion activities at health centers, and mothers to attend antenatal and postnatal services. This component of the SPP project was originally rolled out in 17 districts (13 of which are targeted for support under the health SPRP), and has recently been expanded to an additional district (18 in total).

In addition to the SPRP and SSP projects, nutrition-sensitive interventions will also be supported through the Sustainable Agricultural Intensification for Improved Livelihoods, Food Security and Nutrition Project (SAIP) which includes economic empowerment of women and enhancing availability and consumption of nutritious foods. Innovations under the agriculture projects are implemented in 3 of the target 13 districts targeted for support under the SPRP and SSP projects (Karongi, Nyabihu, and Rutsiro). The agriculture project will cover one sector and a small proportion of the villages in each district. Given the limited scope of the agriculture project, the program evaluation focuses on impacts from the SPRP and NSDS component of the SSP project, and excludes intervention sectors in the 3 SAIP districts.

The overall program also includes several cross cutting dimensions: (a) behavioral change communications to bring about a paradigm shift in the way Rwandan policy makers think about stunting (rather than wasting) and to improve child caring, feeding, and WASH practices; (b) targeted support to 13 high stunting districts, the poor and vulnerable populations therein, and especially children during the first 1,000 days; (c) service delivery innovations, such as home-based and community-based ECD models; interactive technologies and interoperable information systems for prompt identification and response to growth faltering; provision of FBF; nutrition support grants; and results-based approaches to enhance accountability at all levels; and a (d) learning by doing approach that will determine what works and how it can be scaled up.

In terms of financing, the SPaR program leverages new resources from Power of Nutrition (35m$ across the two projects) and the Global Financing Facility (GFF, 18m$ across the two projects) to co-finance the amount allocated through IDA. Total external financing for the nutrition program, summarized in Table 1, reaches almost 120m$.

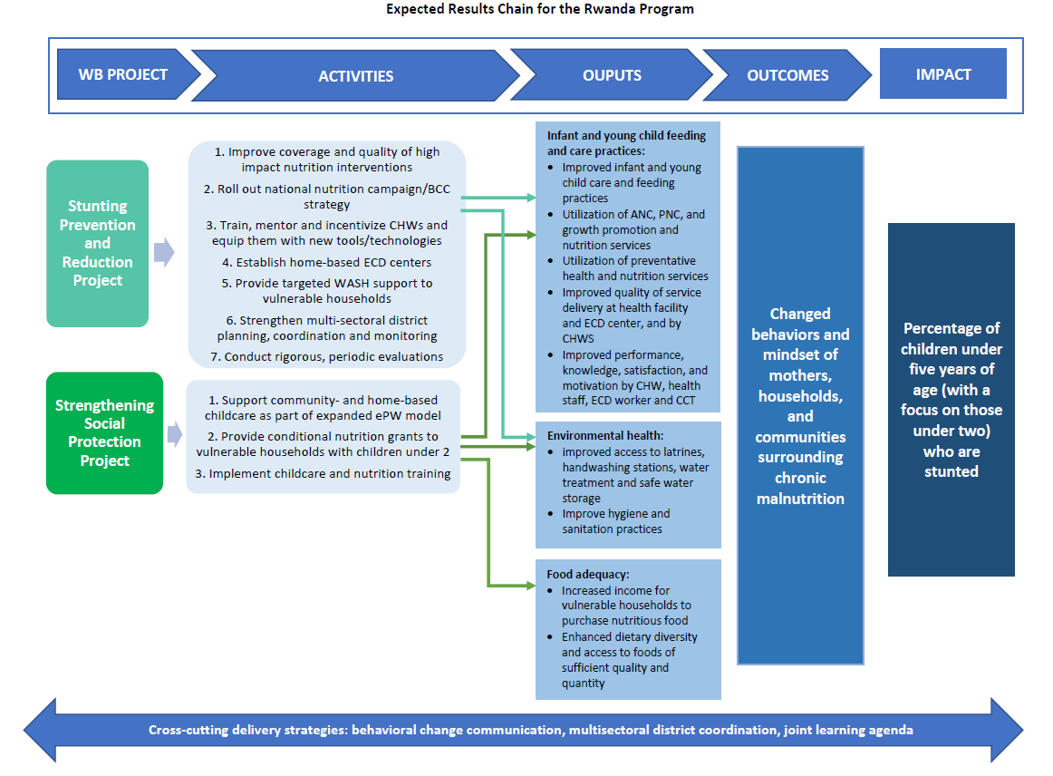
**Table 1. Overall co-financing summary for Rwanda’s stunting-reduction program:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Nutrition-sensitive or Nutrition Specific | | |
|  | Total  Project  *(US$M)* | IDA  *(US$M)* | Proposed PON  *(US$M)* | Proposed GFF match  *(US$M)* |
| SSP Project | 106\* | 80\*\* | 15 | 8 |
| SPRP Project | 55 | 25 | 20 | 10 |

\*This US$106 million includes US$80 million from IDA, US$6 million domestic financing from GoR, US$ 15 million from PoN, and US$ 5 million from GFF.

\*\* This represents the allocation from the overall SSP project for the nutrition-sensitive elements.

Annex 1 and Annex 2 describe the program activities in further detail and the criteria for the selection of the priority districts respectively, while Figure 2 depicts the anticipated results chain for the overall program components. Of particular note, the nutrition sensitive CTs were designed to target extremely poor and vulnerable (known as *Ubudehe* 1 households in the Rwanda targeting system) pregnant women and infants in the 1,000-day window from pregnancy until age 2, but has been expanded to Ubudehe 2 households, and is expected to be rolled out in all 30 districts of Rwanda by December 2021.



# Evaluation questions

## Overview

The impact evaluation of the SPaR program addresses a series of (nested) research questions concerning the effectiveness of either the overall program or of particular components of the program. Specifically, the evaluation plans to investigate the following two questions:

1. What is the net impact of the total program effort on the priority outcomes of interest among children under five years of age, with a special focus on children under two years of age for the most vulnerable households (*Ubudehe* 1)? What is the net impact overall for children under 2 years?
2. What is the impact of the nutrition-focused CT on priority outcomes in targeted households (*Ubudehe* 1)? Is there a differential impact of the CT on targeted households in the districts not accompanied by the SPRP health system strengthening activities?

The primary outcomes for all interventions are height-for-age in children under 2 years of age.

Secondary outcomes depend on the specific intervention and, in part, will be selected to trace mechanisms through which the intervention operates, including coverage of key services/interventions (as based on the results chain in Figure 1) and improved birth outcomes. These data will both describe the intervention impact on intermediate and other secondary outcomes and will assist the attribution of the relative contributions of each intervention to any estimated overall effect. While most outcomes will be collected prospectively, birth weight of children born at health facilities will be retrospectively extracted through health facility administrative records. With 93% of births taking place in a health facility in Rwanda (DHS 2019-20), this strategy will allow the research team to construct a long time series of birth weights measured at the facility level to investigate the effect of the program on low birth weight, a strong predictor for stunting.

Potential supplementary evaluation questions are discussed in Annex 3.

## Specific research questions

### 1. Net impact of the overall program effort

The overall program is the combination of the above-mentioned activities supported by the two projects. Of Rwanda’s 30 districts, 13 districts receive the combined NSDS/CT and SPRP while, currently, five districts[[5]](#footnote-5) are receiving only the NSDS/CT component. Eligibility was determined by a district score – districts were ranked and selected by the Government of Rwanda based on a summary score composed of three criteria: stunting prevalence, household poverty, and household food insecurity. The five CT-only districts will be excluded from the analysis for this first question, implying the 13 districts in the program will constitute the treatment population. Impact will be estimated for the Ubudehe-1 children as well as all children under 24 months. In addition to the program activities, there may be other ongoing activities in all districts, or a subset of districts, that can affect the evaluation’s target outcomes (see discussion of risks below). Therefore, all related nutrition activities at scale will need to be mapped and monitored for researchers to understand possible confounders to this question and to reduce inferential risks.

### 2. Nutrition Sensitive Direct Support (NSDS/CT)

The CT is implemented in the 18 districts described above. Thirteen of these CT districts are also part of the Health Practice SPRP project. As the CT is being implemented in 13 districts with health system engagement, and five districts without, this evaluation question can investigate the effectiveness of the CT in relation to (a) no corresponding cash-transfer (out of 30 districts in Rwanda, 12 districts neither participate in the SSP nor in SPRP) and (b) the CT offered in conjunction with nutrition focused health system strengthening and scale-up of high impact interventions.

Originally, the eligible population for the NSDS/CT included exclusively *Ubudehe*-1 households with children under 2 years of age or pregnant women; all such households in the program districts are eligible for the SSP. As described in Annex 2, Ubudehe 2 households also became eligible to receive NSDS in April 2020, however it is unclear the extent to which the component has been scaled up to date.

# Proposed evaluation design

The identification of the causal impact of program efforts will leverage the most rigorous method that can be applied to the evaluation question given program design decisions around the scope and phasing of activities. The method choice also critically depends on the program assignment mechanisms determining beneficiary eligibility, which are evolving throughout the evaluation period. In light of the program expansions (see Annex 1), the analytic strategy outlined below might have to be adapted based on the scale up of the program.

1. Net impact of the overall program effort

As this overall program extends to 13 purposively selected districts, the evaluation method must necessarily be quasi-experimental. Specifically, to determine the net effectiveness of overall program efforts, a difference-in-differences methodology will be employed to contrast changes in the priority outcomes in the population of interest across districts with differential net exposure to the various programs and activities. The identifying assumption of the difference-in-differences model is that of parallel trends. Pre-existing data sets (listed in the appendix) will be used to interrogate the pre-intervention trends across treatment and control districts to check for consistence or divergence.[[6]](#footnote-6)

Outcomes will be assessed at the individual level, while standard errors will be corrected to account for observational dependency within the unit of treatment (the district). The main estimating equation for this research question takes the following form,

Where the outcome *Y* (say, for example the HAZ of under-2s) for child *i* in village *v* (where village is equivalent to PSU), district *d*, and time *t*, is regressed on a constant term, γ0, a treatment indicator IT that takes the value of 1 if the district is a program district, a period indicator IF that takes the value of 1 if the period of observation is the follow-up period, as well as an interaction term IF\*IT. The coefficient γFT on the interaction term yields the estimate of the causal impact of the program. The estimating equation also adopts flexible controls for the age of the child in months, *X*. The *X* vector may also include other covariates of import (i.e. that also determine the outcome variable) such as household distance to the primary health clinic or the ratio of total village population to active CHWs. These covariates can also be interacted with the treatment indicator.

As written above, the data to inform this estimating equation can consist of only Ubudehe-1 children under 24 months of age at baseline (those directly targeted by the CT component), only Ubudehe-2 that have not yet received the NSDS and Ubudehe-3 children, or all children under 24 months depending on the population of interest.

Effects on birth weight across districts with differential net exposure to the SPRP will be similarly assessed with a difference-in-difference analysis, as displayed by the equation below:

While the equation mirrors the aforementioned community-level approached, child *i* in health center *f,* rather than in a village or PSU, will be considered. The covariates of import represented by the *x* vector will include, for example, newborn sex, as well as maternal characteristics such as age, weight, term of pregnancy and parity. Given that birth weight data will be extracted retrospectively from delivery registers, the data included to inform the equation will include all children born at health facility, without distinguishing for Ubudehe status.

2. NSDS/CT

There are two sub-questions involving the CT component: the effectiveness of the program in the presence of the health systems strengthening activities under SPRP, and the relative effectiveness of the CT alongside the related supply-side activities against the absence of such activities.

(1) As the CT is a household targeted program, the evaluation can use ineligible households just above the eligibility threshold (i.e. Ubudehe-2 households that have not yet received the NSDS, or Ubudehe-3 households) as a comparison group. This approach is commonly referred to as a regression discontinuity design. In practice, as the assignment variable is not continuous, this approach reduces to a difference-in-differences analysis that compares, over baseline and follow-up periods, households that are eligible for the CT (Ubudehe-1) with those who are not eligible (Ubudehe-2 that have not yet received it or Ubudehe-3) in the 13 districts that receive both the SSP and the SPRP projects.

Outcomes will be assessed at the individual level, while standard errors will be corrected to account for observational dependency within the unit of treatment (the district). The main estimating equation for this research question takes the following form,

Coefficient and variable definitions are as above, with *IUb1* an indicator for the whether the child resides in an Ubudehe 1 household. A further level of control can be afforded by including observations of Ubudehe-1 and Ubudehe-2 (if NSDS was not yet received) children in non-comparison areas and estimating the triple difference across Ubudehe 1 and Ubudehe 2 categories, baseline and endline periods, and CT and non-CT areas. This triple difference would control for any possible spillover (beneficial or negative) of the CT program to non-beneficiary children in the same communities. While the CT program may lead to spillovers, for example through the price mechanism[[7]](#footnote-7), the relatively low aggregate community exposure to the cash transfer would likely limit this possibility.

(2) To estimate the relative effectiveness of the CT program in areas with supply-side strengthening, the same difference-in-differences of program effectiveness must be estimated, but now for both the 13 SPRP-and-SSP districts and the four non-SPRP-only-SSP districts. These two estimates will then be compared in a triple-difference framework, specifically:

Where *ISP* is an indicator variable taking the value of 1 if the child resides in one of the 13 SPRP districts. The triple difference coefficient, γCTF, estimates the relative effectiveness of the CT program in the SPRP districts when compared with the SSP-only districts.

This is the most data-challenging of the four evaluation questions to address, and it may only be possible to estimate relatively large differences in effectiveness at standard levels of statistical precision. As mentioned above for Question 1, the possibility of community-level matching on baseline observables across treatment and control districts to improve comparability/precision will also be explored.

# Study size necessary for sufficient power

The power analyses to inform study size for sufficient statistical power were conducted through simulation methods [[8]](#footnote-8) and using Stata version 15.0. One analysis was conducted to investigate statistical power at the community-level, using the HAZ score for children under 24 months as the outcome of interest. The section below describes the process and simulation results (summarized in Table 2) for the study size of a community survey to collect prospective impact evaluation data.

A second analysis, summarized in Table 3, was carried out to inform study size of the facility survey, including the administrative data extraction of birth weights. As previously mentioned, this outcome of interest differs from the other prospectively collected impact evaluation outcomes, as it will be retrospectively extracted from health center administrative data at the facility (rather than community) level.

**Community survey power analysis** Four scenarios using the HAZ score for children under 24 months were considered for the community survey power analysis, and each was simulated 10000 times. In all simulations, various conservative assumptions around study design and population parameters are made. These include: (a) the study conducts one baseline survey round and one follow-up round, and (b) the parameter values regarding the attribution of variance are informed by values from the 2018 baseline survey. The baseline data followed the pre-specified sampling rules to include: 7 children under 24 months from Ubudehe 1 households, 10 children in the same age range from Ubudehe 2 households, and 11 children from Ubudehe 3 households and from households with unknown Ubudehe categorization.

The power analysis for evaluation question 1 is explored for both sub-questions. In terms of identifying the overall net impact of the program on prospective outcomes, we first simulate the impact on Ubudehe 1 and Ubudehe 2 children only. While Ubudehe 1 was the group originally targeted for the CT payments, Ubudehe 2 children have also started receiving the transfers. As these payments are one of the main components of the SPaR program, children from both Ubudehe 1 and 2 represent a key population of interest. We also simulate the impact on all children (distributed across Ubudehes 1, 2, 3, and from households with unknown status) as many program activities are expected to benefit all children living in the target areas.

Evaluation question 2 is also explored in two ways. First, we estimate study size necessary to identify an impact of the CT program offered in the 13 districts against the counterfactual of the 12 districts that are not in the SPaR program. Secondly, we estimate any differential effect of the CT program in the 13 districts that also receive health system strengthening investments (the SPRP activities) and the 4 districts that offer the CT in the absence of such investments.

The simulations suggest a study design that selects 15 enumeration areas per district. A study of this size will be powered to identify relatively small gains in HAZ all 4 scenarios considered. For evaluation question 1, an MDES (minimum detectable effect size) of 0.071 standard deviations is estimated for the first scenario, and 0.063 standard deviations for the second scenario, at a significance of 0.05 and a power of 0.8-0.9. For the first scenario of question 2, the same design choices yield an MDES of 0.083, while for the second scenario, an MDES of 0.117 standard deviations is estimated. These effect sizes are quite small compared to the broader evaluative literature yet gains of this magnitude are still of policy significance, and stakeholders have stated a wish to identify an impact of this relatively small magnitude.

Also note that the assumptions in this exercise are deliberately conservative. For example, there is only one follow-up survey simulated. However, power can be increased through repeated observation[[9]](#footnote-9) and several follow-up rounds are proposed in the study design. In addition, the use of cluster and individual level controls or propensity weights are expected to yield further power gains.

Table 2. Community survey power analysis summary results, all outcomes measured in HAZ

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Treatment districts** | **Control districts** | **Treatment PSUs (villages) per district** | **Control PSUs (villages) per district** | **U1, Target children per PSU** | **U2 target children per PSU** | **U3 and U unknown target children per PSU** | **Mean HAZ at baseline** | **Variability of outcome due to district** | |  | |  | | Evaluation question 1, scenario 1, only Ubudehe-1 and Ubudehe-2 children | | | | | | |  |  |  | | 13 | 12 | 15 | 15 | 7 | 10 | -- | -1.29 | 0.02 |  | | Evaluation question 1, scenario 2, all children | | | |  |  |  |  |  |  | | 13 | 12 | 15 | 15 | 7 | 10 | 11 | -1.29 | 0.02 |  | | Evaluation question 2, scenario 1, relative gain in Ubudehe 1 +2 compared to Ubudehe 3 as a result of CCT | | | | | | | | |  | | 13 | 12 | 15 | 15 | 7 | 10 | -- | -1.29 | 0.02 |  | | Evaluation question 2, scenario 2, relative gain in Ubudehe 1+2 compared to Ubudehe 3, in districts with and without SPaR health investments | | | | | | | | |  | | 13 | 4 | 15 | 15 | 7 | 10 | 11 | -1.29 | 0.02 |  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variability of outcome due to PSU** | **Residual variability** | **Effect size (in HAZ)** | **MDES** | **Signficance level** | **Power** |
|  |
|  |
| Evaluation question 1, scenario 1, only Ubudehe-1 and Ubudehe-2 children | | | | | |  |
| 0.06 | 1.12 | **0.085** | **0.071** | 0.05 | **0.843** |  |
| Evaluation question 1, scenario 2, all children | | | |  |  |  |
| 0.06 | 1.12 | **0.075** | **0.063** | 0.05 | **0.905** |  |
| Evaluation question 2, scenario 1, relative gain in Ubudehe 1 +2 compared to Ubudehe 3 as a result of CCT | | | | | |  |
| 0.06 | 1.12 | **0.100** | **0.083** | 0.05 | **0.821** |  |
| Evaluation question 2, scenario 2, relative gain in Ubudehe 1+2 compared to Ubudehe 3, in districts with and without SPaR health investments | | | | | |  |
| 0.06 | 1.12 | **0.140** | **0.117** | 0.05 | **0.827** |  |
| Notes: Following Arnold et al. 2011 BMC MRM, mean and overall variability from 2015 Rwanda DHS, apportion of variance from results in Arnold et al. PNAS 2010 | | | | | | | |
| Additional expected power gains from: repeated measurement post-baseline, cluster and individual level controls or propensity weights | | | | | | | |

**Birth weight extraction power analysis**

Since birth weight data extracted retrospectively from administrative data cannot be linked to Ubudehe status, the original evaluation questions were simplified for this study size. The questions, which are referred to as question 1a and 2a in Table 3 below, include: an overall comparison between treatment and control districts (1a), and an estimation of any differential effect of the CT program in the 13 districts that also receive health system strengthening investments (the SPRP activities) and 4 districts that offer only CT without the SPRP component of health investments (2a). The power analysis was conducted using birth weight as the outcome, with simulation methods equivalent to the community study analysis previously displayed in Table 2.

The parameters used included mean birth weight and estimated variance due to District and PSU, which were informed by records extracted from the health cards of young children whose caregivers were interviewed for the community baseline data collection.

The simulations suggest a study design that includes 96 birth cases to be extracted for estimation of birth weight per facility for the period before the introduction of the SPAR program, and 96 birth cases after the introduction. A study of this size will be powered to identify relatively small gains in birth weight for both questions considered.

Table 3. Birth weight power analysis summary results,

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment districts** | **Control districts** | **Treatment facilities per district** | **Control facilities per district** | **Individual outcome per facility (service or birth)** | **Mean outcome at baseline** | **Variability of outcome due to district** |
|  | |
|  | |
| Evaluation question 1a, birth weights (kgs) in SPAR vs comparison districts | | | | | | | |  | |
| 13 | 12 | 15 | 15 | 96 | 3.18 | 0.04 |  | |
| Evaluation question 2a, birth weights (kgs) in districts with and without SPaR health investments | | | | | | | |  | |
| 13 | 4 | 15 | 15 | 96 | 3.18 | 0.04 |  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variability of outcome due to PSU** | **Residual variability** | **Effect size** | **MDES** | **Significance level** | **Power** |
|  |
|  |
| Evaluation question 1a, birth weights (kgs) in SPAR vs comparison districts | | | | | |  |
| 0.08 | 0.40 | **0.025** | **0.048** | 0.05 | **0.947** |  |
| Evaluation question 2a, birth weights (kgs) in districts with and without SPaR health investments | | | | | |  |
| 0.08 | 0.40 | **0.025** | **0.048** | 0.05 | **0.916** |  |

|  |
| --- |
| Notes: analysis assumed 4 births sampled per month per facility, birthweight comparison contrasts 24 months of births pre-intervention with 24 months post-intervention |

# Data needs and data plan

## Key measures of interest

The results chain identifies several program activities that are expected to affect a range of outputs and outcomes. The below Table 4 depicts which primary and secondary outputs/outcomes are most likely affected by each of the different program activities, based on the results chain, to determine inclusion of an indicator as a measure of interest to be assessed. The most important activities are:

* Improved coverage and quality of high-impact nutrition interventions, and roll-out of national communications campaign
* Improved child-care practices such as exclusive breast-feeding until six months of age and introduction of complementary foods at the right ages
* Effective use of CHWs for nutrition service delivery and messaging
* Establishment of home-based ECD centers, and support to community and home-based childcare
* Provision of targeted WASH support to vulnerable households
* Provision of CTs for nutrition to vulnerable households with children under 2 or pregnant women, along with appropriate nutrition messaging

The table also lists process indicators that derive from the components of each program, e.g. the set of co-responsibilities that must be met for the CT. The rationale for measuring these process indicators is to assess implementation fidelity and to help characterize through which channels the overall program generates the greatest impacts.

The definitions of individual indicators are listed in Annex 4.

**Table 4: Overview of primary, secondary and process indicators**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Nutrition interv and campaign** | **CHW** | **ECD** | **WASH** | **CT** | **Marketing of nutritious food** | **Production of nutritious food** | **Data Source** |
| **Primary (impact) indicators** | | | | | | | | | |
| 1.1 | Height-for-age in under-2s | Y | Y | Y | Y | Y | Y | (Y) | Survey |
| 1.2 | Stunting in under-2s | Y | Y | Y | Y | Y | Y | (Y) | Survey |
| 1.3 | Pregnant women nutrition services | Y |  |  | Y | Y | Y | (Y) | Survey |
| 1.4 | Child development score | Y |  | Y |  |  |  |  | Survey |
|  |  |  |  |  |  |  |  |  |  |
| **Secondary indicators** | |  |  |  |  |  |  |  |  |
| **Birth outcomes** | | | | | | | | | |
| 2.1 Birth weight | | Y | Y |  | Y | Y | Y | Y | Admin |
| **Health outcomes of non-targeted populations** | | | | | | | | | |
| 3.1 | Height-for-age in 2-5 years old | Y | Y | Y | Y | (Y) | Y | Y | Survey |
| 3.2 | Stunting in 2-5 years old | Y | Y | Y | Y | (Y) | Y | Y | Survey |
|  |  |  |  |  |  |  |  |  |  |
| **Infant and young child feeding and care practices** | | | | | | | | | |
| 4.1 | Infant and young childcare practices |  | Y | Y |  | Y |  |  | Survey |
| 4.2 | Infant and young children feeding practices | Y | Y | Y |  | Y | (Y) | (Y) | Survey |
| 4.3 | Utilization of ANC and PNC services |  | Y | Y |  | Y |  |  | Admin and survey |
| 4.4 | Utilization of growth promotion / nutrition services | (Y) | Y | Y |  | Y |  |  | Admin and survey |
| 4.5 | Utilization of preventive services |  | Y | Y |  | Y |  |  | Admin and survey |
| 4.6 | Utilization of additional nutrition services | Y | Y | Y |  | Y |  |  | Admin and survey |
| 4.7 | Quality of service delivery |  | Y | Y |  |  |  |  | Survey |
| 4.8 | Knowledge of child nutrition issues | Y | Y | Y |  | Y |  |  | Survey |
| 4.9 | Satisfaction with service delivery |  | Y | Y |  |  |  |  | Survey |
|  |  |  |  |  |  |  |  |  |  |
| **Environmental health** | | | | | | | | | |
| 5.1 | WASH, e.g., access to latrines, safe water storage |  |  |  | Y |  |  |  | Survey |
| 5.2 | Hygiene and sanitation knowledge and practices |  | Y | Y | Y | Y |  |  | Survey |
|  |  |  |  |  |  |  |  |  |  |
| **Food adequacy** | | | | | | | | | |
| 6.1 | Increased income (to purchase nutritious foods) |  |  |  |  | Y |  | Y | Survey |
| 6.2 | Enhanced dietary diversity | (Y) | Y | Y |  | (Y) | (Y) | (Y) | Survey |
| 6.3 | Access to nutritious foods |  |  |  |  |  | Y | Y | Survey |
|  |  |  |  |  |  |  |  |  |  |
| **Process indicators (see Appendix for longer list)** | | | | | | | | | |
| 7.1 | CT participation and requirements |  |  |  |  | Y |  |  | Admin and survey |
| 7.2 | Encounters with CHW |  | Y |  |  |  |  |  | Admin and survey |
| 7.3 | Encounters with ECD |  |  | Y |  |  |  |  | Admin and survey |

Y = likely affected

(Y) = maybe affected

Blank = likely not affected

## Data sources

The two main data sources are primary data from surveys and secondary data from administrative records. The administrative data sources include the delivery registers at health facilities, the existing health management information system (HMIS, which also captures data from CHWs) and the data system that tracks adherence to co-responsibilities of the CT (only in areas where the CT is active). More information on data sources to inform evaluation design and supplement primary data are presented in Annex 5.

## Community data collection

We will conduct repeated cross-sectional surveys to interview caregivers of children under 24-month old and CHWs who serve the same population. Anthropometric data for children under 2 years old and their biological mothers will also be collected, as well as for all women who are pregnant (and therefore eligible to receive the CT) and living in the same household. Finally, we will collect anthropometric data for any other child under 5 years old from the same households to account for spillover effects.

## Facility data collection

As previously mentioned in reference to birth weight, an additional survey will be carried out at the health facility level. This survey will not only serve as an opportunity for the retrospective extraction of administrative data but will also collect primary data on the supply-side of high-impact nutrition and health interventions. Strengthening the delivery of nutrition services at health facilities is a significant component of the SPaR program interventions and a key pathway in the results chain for ultimately improving nutrition outcomes of children under 5.

There are three primary aims for the facility survey:

1. To assess the provision and quality of antenatal and growth monitoring and promotion services, with a focus on nutrition, and how these vary according to the SPaR intervention component received, and between data collection rounds. The assessment of service quality will include components on provider knowledge, content of care, patient satisfaction, as well as provider trainings, supervisions, and structural quality.

2. To monitor whether the expected program activities are being implemented, and how this varies between districts and data collection rounds (see Process evaluation section below); and

3. To assess the potential impact of the project interventions on birth outcomes, specifically birth weight, using data retrospectively extracted from administrative records. The facility survey will be conducted in all 30 districts of Rwanda: approximately 50% of the sectors included in the completed baseline community survey – each including at least one health center for primary care - will be sub-sampled with probability proportionate to size (PPS) of the sector for inclusion in the study. The resulting geographic overlap between the facility and caregiver survey will allow researchers to assess whether the quality of care found at the facility level correlates with the health outcomes found in the study communities.

The facility survey will consist primarily of four data collection activities: (1) health facility questionnaire and checklist, (2) health worker interviews, (3) exit interviews with patients and caregivers, and (4) review and extraction of retrospective birth weight data from administrative records. Although facility records of birth weight are expected to be widely available in Rwanda, concerns about data quality of retrospectively collected data exists. The facility survey will therefore also include validation strategies to offer insights on the quality of the birth weight data recorded at the facility, as presented in Annex 6.

While study size to estimate birth weight was already displayed in Table 3, the results of an additional power analysis to inform study size for sufficient statistical power to estimate quality of antenatal and growth monitoring and promotion services are displayed in Table 5 below. To distinguish them from the main power analyses presented in table 2 and 3, the evaluation questions considered include questions 3 and 4, which respectively focus on quality of antenatal care and quality of growth monitoring and promotion. Estimates were computed with Stata version 15's *powersim* command.

The parameters used include PCA indices estimated from caregiver-reported experiences on antenatal care and growth monitoring and promotion, which were used to estimate mean health facility care quality, and variance.

The simulations suggest a study design that includes 5 instances of service delivery per facility for the estimation of quality of care. A study of this size will be powered to identify moderate to large gains in quality of antenatal care and growth monitoring and promotion.

Once again, additional power is expected to be gained from repeated measurements after baseline, as well as the use of cluster and individual level control or propensity weights.

Table 5. Additional power analysis using facility collected data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment districts** | **Control districts** | **Treatment facilities per district** | **Control facilities per district** | **Individual outcome per facility (service or birth)** | **Mean outcome at baseline** | **Variability of outcome due to district** |
|  | |
|  | |
| Evaluation question 3, ANC quality scores, single difference comparison | | | | | | | |  | |
| 13 | 12 | 15 | 15 | 5 | 0.00 | 0.12 |  | |
| Evaluation question 4, GMP quality scores, single difference comparison | | | | | | | |  | |
| 13 | 12 | 15 | 15 | 5 | 0.00 | 0.07 |  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variability of outcome due to PSU** | **Residual variability** | **Effect size** | **MDES** | **Signficance level** | **Power** |
|  |
|  |
| Evaluation question 3, ANC quality scores, single difference comparison | | | | | |  |
| 0.12 | 0.38 | **0.130** | **0.211** | 0.05 | **0.819** |  |
| Evaluation question 4, GMP quality scores, single difference comparison | | | | | |  |
| 0.07 | 0.69 | **0.150** | **0.182** | 0.05 | **0.868** |  |

|  |
| --- |
| Notes: |
| Additional expected power gains from: repeated measurement post-baseline, cluster and individual level controls or propensity weights |
| Evaluation questions 3 and 4 are single difference estimates computed with Stata's *powersim* command, not through simulations |

### **Timeline**

We will conduct three community surveys over four years of program operations, as well as two facility surveys. The baseline community survey was conducted in the second quarter of the 2019-20 fiscal year, and will be followed by a midline survey and by the first facility survey round in 2021-22. Endline surveys are expected to follow in the third quarter of 2022-23. See the timeline below:

Timeline

Description automatically generated

# Process evaluation

A key assumption in assessing the impact of the program is that interventions will be delivered with sufficient effort, high quality, and reach the intended targets. In other words, the interventions will be implemented with a high degree of fidelity to rigorous protocols. To assess the fidelity and consistency of the implementation of the interventions, identify barriers to and enablers of successful implementation, and to inform improvements in the delivery of interventions, we will undertake process evaluations in parallel with the quantitative data collection for the impact evaluation. The process evaluations will be conducted at three levels: at the household level of the target population, among providers at the community level (CHWs and social protection staff), and at health facilities.

At the household level, the process evaluation will utilize the household questionnaire administered during the community survey to assess coverage of key services and utilization of program interventions among the target populations, as well as self-reported beneficiary compliance with the NSDS/CT conditions. Potential areas of assessment include households’ exposure to and engagement in community nutrition counseling and demonstration activities, caregivers’ efficacy in translating intervention messages to improved care and feeding practices, and specific barriers encountered to participation in intervention activities. Assessments will also be made on the extent to which households have access to improved water and sanitation facilities, as well as engagement in appropriate sanitation and hygiene practices.

Among providers at the community level, the process evaluation will assess the ability of CHWs to deliver the interventions as intended and the quality of services they provide. This will be assessed using a dedicated knowledge, attitudes, and practices (KAP) questionnaire. Barriers to the provision of quality services will be elicited from the surveyed professionals. In addition, client satisfaction among beneficiaries will be estimated as part of the community survey.

At health centers, the process evaluation will assess the quality of and satisfaction with SPRP-related service delivery. This will be pursued through questions and practical scenarios to assess health providers' knowledge of selected health and nutrition services, and exit interviews with a random sample of -patients accessing relevant nutrition-related services at the health centers. The process evaluation will also seek to elicit perceived barriers to the provision of effective nutrition-related services on the part of both health workers and patients.

Finally, the timely analysis of routinely collected data through the HMIS and NSDS portals will review the reported coverages of the intervention activities. These coverages will be compared with anticipated coverage levels and local areas with large divergences will be communicated to implementers for further interrogation. In additional any local area with large changes in coverage over relatively short periods will also be flagged for further, possibly field-based, inquiry.

The process evaluations will be implemented largely in parallel with the surveys for the impact evaluation. Given that one aim of the process evaluation is to inform continuous improvements in the delivery of the project interventions, process evaluation activities may also be carried out in Year 3, when no impact evaluation services are planned. The timeline below provides a schedule of potential process evaluation activities.

In addition, a parallel effort on financial tracking on nutrition which is ongoing with World Bank support will provide additional information for the evaluation.

# Study risks and mitigation of risks

There are several potential risks to study validity that should be considered as well as possible mitigation strategies discussed. These risks include:

* Concurrent at-scale nutrition related interventions implemented by GoR or other organizations, such as UNICEF or USAID, that may confound inferences derived from the Question 1 evaluation design.
* The scale-up of the NSDS /CT program before endline data collection necessitates a revisiting of the Question 2 evaluation design.
* Reduced power of inference due to poor quality primary data collection.

Certain study design decisions have been taken to insure against these risks:

* To mitigate risks presented by possible concurrent at-scale interventions, the evaluation team has prepared a comprehensive overview of nutrition related interventions by district through an extensive mapping exercise with all local and international counterparts. The resulting district-intervention level data set includes the geographic scope and nature of activity for all identified nutrition related activities. This data will be reviewed, and each listed intervention will be assigned a score regarding its threat to the internal validity of the Question 1 evaluation. Any intervention deemed a high threat will either be (a) accounted for in the design, by excluding the districts of operation, or (b) directly controlled for in the analysis. The evaluation team will update this mapping exercise on an annual basis for the purposes of on-going monitoring and risk-mitigation.
* If the scale up of beneficiaries occurs rapidly across space, i.e. more comparison districts are included in the NSDS/CT program, then program impacts can still be estimated by the comparison of Ubudehe-1 and -2 household outcomes over time using the same difference-in-differences evaluation design described earlier. Depending on the scale of the NSDS/CT program's scale up through the offer to Ubudehe-2 households, program impacts can be estimated by a comparison of Ubudehe-2 beneficiaries with Ubudehe-3 non-beneficiaries. If both types of scale-up occur rapidly, estimates can still be pursued through the Ubudehe-2 and -3 comparisons but the triple-difference estimate that controls for possible within-community spillovers is no longer possible.
* The evaluation team will invest in all feasible actions to ensure primary data of sufficient quality. These actions include (a) the selection of a counter-part data collection firm with the capacity and oversight to ensure quality data collection through survey and field-based measurement, (b) the placement of a qualified consultant in Kigali with the responsibility to liaise on all aspects of data collection and conduct independent oversight of data collection efforts, (c) direct co-management along with the firm of both enumerator training and data template programming that includes automated checks on data quality, (d) real-time monitoring of uploaded data to identify any need for correction while fieldwork is still underway. This strategy allowed to successfully administer a large and complex survey to a population of over 10,000 individuals in all 30 districts in Rwanda at baseline. The trends identified are largely consistent with the Rwandan context, confirming high data quality. This is expected to further improve at successive data collection rounds through lessons learned.

# Evaluation team

The evaluation team is composed of the following researchers and implementation specialists:

Harold Alderman, IFPRI, co-investigator

Jed Friedman, World Bank Research Group, co-investigator

Meera Shekar, Global Lead, Nutrition, World Bank, co-investigator

Jonathan K. Akuoku, Nutrition Specialist, World Bank, co-investigator

Chiara Dell'Aira, Consultant, World Bank, co-investigator

# Annex 1: Detailed program descriptions

## The Stunting Prevention and Reduction Project (SPRP)

The SPRP encompasses three core intervention components, alongside a fourth component focused on M&E and program management. It is administered by the World Bank’s Health Global Practice.

### Component 1: Prevention of Stunting at Community & Household Levels

This component supports the government to improve understanding of stunting in Rwanda, and deliver harmonized behavior change messages at all levels (i.e. national, local government, and household) and across several key sectors (i.e. health, social protection, agriculture, water and sanitation). It supports the MoH/RBC to design and implement a revamped national behavioral change communication strategy and develop communication tools, that are harmonized and disseminated through different channels and across all relevant sectors. It supports frontline CHWs to raise awareness about stunting, and systematically carry out growth promotion activities, including use of new tools to visualize growth and sensitize caregivers and communities on the importance of proper child growth. CHWs benefit from regular retraining on a revised curriculum; supportive supervision and mentorship; innovative technologies to enhance their effectiveness; and are incentivized through the performance-based financing (PBF) scheme to deliver a set of interventions at the community level. In addition, component 1 involves the roll out different community-based approaches and strategies for bringing about behavioral change such as home-based early childhood development (ECD) models and positive deviance strategy. While the bulk of the proposed interventions address behavioral change, to address deficits in access to clean water and improve sanitation facilities that contribute to the high stunting rates, the component also supports complementary WASH interventions targeted to the most vulnerable groups (*Ubudehe* 1/2 households) in the 13 participating districts. Additionally, component 1 strengthens accountability mechanisms and governance structures at the community and district levels to bolster the multi-sectoral response.

At the request of the Government of Rwanda, the first SPRP component was restructured in August 2019 to incorporate the provision of fortified blended foods (FBF) to targeted children under 6-23 months of age and pregnant and lactating women in Ubudehe 1 households. FBF were originally provided to these targeted beneficiaries in all 30 districts of the country through a national program supported by development partners. Additionally, children 6-23 months old in Ubudehe 2 households in the 11 highest stunting districts also received FBF. Through the restructuring, the FBF program was expanded as it follows with support from the SPRP:

1. Through process evaluation and coverage surveys of the existing program, GoR found that the product was often shared among all children in the household and the targeted children were likely not consuming adequate quantities of the product to be effective. To combat this, children 6-23 months old and pregnant and lactating women in Ubudehe 1 households in the 13 SPRP districts will receive double rations of FBF.
2. Not only children 6-23 months old, but also pregnant and lactating women in Ubudehe 2 households will now be targeted and receive single rations in the 13 SPRP districts.

The roll out of the restructured FBF subcomponent began in September 2019.

Finally, as part of the restructuring of the SPRP, the use of length mats at the community level was introduced to ensure timely detection of growth faltering in all 30 districts.

### Component 2: High-impact Health and Nutrition Services

To address key gaps in service delivery, health facilities in the targeted districts are supported and incentivized to improve utilization and coverage of an enhanced package of high-impact nutrition and health interventions. These interventions include those identified in the government’s *Acceleration of Reduction of Stunting Strategy* which are in line with the 2008/2013 Lancet recommendations: (i) *height monitoring and growth promotion* and effective tracking of faltering children, early initiation and exclusive breast feeding, deworming, micronutrient supplementation (i.e. Vitamin A supplementation; therapeutic zinc supplementation with ORS; multiple micronutrient supplement powders)*;* and (ii) critical *nutrition and health interventions for women* (i.e. four antenatal care visits, four postnatal care, iron/folic acid supplementation in pregnancy, post-partum family planning, counselling on child care, complementary feeding and hygiene). Health facilities are held accountable and incentivized to provide these interventions through the national PBF program. The project supports health facilities with training, information technologies, and logistical support from the national level. To this end, support is provided for the design and roll out of new information technologies (i.e. two-way messaging system, tablets) and interactive systems for tracking every pregnant woman and child, ensuring prompt identification of growth faltering and effective response at the facility and household levels*.*

## The Strengthening Social Protection (SSP) Project

The SSP project is administered by the World Bank’s Social Protection Global Practice. The project includes one core intervention component, “Improving Coverage, Adequacy and Effectiveness of the Vision 2020 Umurenge Program (VUP)”, with a subcomponent on cash transfers (CTs) to nutritionally vulnerable households. A second component aims to enhance access to human capital and economic inclusion services, and a third component focuses on M&E and program management. For the purpose of the SPaR evaluation, the following description will focus on the first core intervention and its CT subcomponent.

### Component 1 Improving Coverage, Adequacy and Effectiveness of the VUP Cash

The VUP was established in 2008 and subsequently scaled up by the Government of Rwanda as an effort to accelerate the country's socio-economic development. Its core Safety Net Components included nationwide Classic Public Work (cPW) and Direct Support (DS) grants, which were strengthened and expanded as part of the SSP project.

The cPW element involves offering short-term work opportunities on labor-intensive projects to eligible households with labor capacity. The adequacy of the total annual transfers is expected to improve by progressively increasing the percentage of eligible households that are covered, the timeliness of payments, and the average number of days of work offered.

Since the cPW offered some challenges to households caring for children, a new expanded public works (ePW) component was introduced through the SSP. This gender- and child-sensitive program was designed for moderately labor-constrained households caring for children over the age of two, and offers a more flexible year-round work schedule, which is more compatible with daily wage work and caring responsibilities of these households.

The DS grants provide unconditional cash transfers to eligible households lacking labor capacity. As a result of the SSP expansion, households with a member living with a disability have also become eligible for the grants, which are expected to reach populations nationwide.

The SSP project also led to the design of a new cash transfer (CT) component: the Nutrition-Sensitive Direct Support (NSDS), targeting vulnerable households with pregnant women and infants in the 1,000-day window from pregnancy until age 2. The objective of this CT/NSDS is to provide a complementary intervention as part of the current suite of social protection cash transfers managed by VUP (Public Works, Direct Support, Financial Services and more recently, gender and child sensitive expanded-Public Works). The NSDS scheme will be implemented as part of an integrated package of SSP services including behavioral change communications, parenting education and complemented with supply-side investments through the SPRP.

Given the extreme/food poverty line of RWF 105,064 (approximately US$131), the agreed upon transfer level is of RW Francs 7,500 (about US$9) per month per household irrespective of the number of eligible infants in the household or whether a woman becomes pregnant again before her previous child reaches its second birthday. These transfer levels would provide approximately 86% of the food poverty line for targeted individuals and equates to around 112% of child-sensitive Productive Works (cPW) wages and 75% of the expanded Public Works (ePW) wages under the larger VUP program.

Co-responsibilities associated with the nutrition-sensitive CTs include a sub-set of the supply-side indicators from the SPRP project, and vary by beneficiaries as described in the table below:

|  |  |
| --- | --- |
| **Beneficiary group** | **Responsibilities** |
| Pregnant women | 4 ANC visits at health facility |
| Mothers and newborn children ages 0–6 weeks | 2 PNC visits at health facility, including child height-for-age measurement |
| Children 7 weeks–24 months | Attend all (6) child height-for-age measurements at health facility |

In the event of household not undertaking relevant co-responsibilities, CHWs, local government staff, and other outreach agents will approach households to encourage performance of the co-responsibilities.

After children are two years of age (from age 2 to 5 years old) the mothers would then transition to work on Community/Home based ECD where they will benefit from other nutrition targeted interventions as provided for under the guidelines for community and home-based childcare, under the flagship VUP program. Furthermore, parents participating in the NSDS will be required to participate in regular parenting education sessions (including those delivered at village level ECD centers) throughout the period of their enrollment in the NSDS. This will also be combined with financial literacy training to support the development of sustainable livelihoods. These sensitization services will be delivered through CHWs and health center staff. Furthermore, these households will be eligible for livelihood development support provided under the Minimum Package for Graduation framework, where this is operational.

The NSDS was initially designed to target 17 districts (13 of which overlapping with the SPRP project) and to be limited to extremely poor and vulnerable (Ubudehe 1) eligible households, with the aim to cover approximately 61,000 households. The roll out of this intervention began during the second quarter of 2019-2020. However, Ubudehe 1 households were found to be mainly composed of elderly and persons with disabilities, leading to a lower-than-expected incidence of program eligibility. Additionally, with the spread of the COVID-19 pandemic and its effect of vulnerability, it became apparent that the safety net program should be targeted to benefit additional families. In the first expansion, Ubudehe 2 households with children 6-23 months old or pregnant and lactating women became eligible to receive NSDS in April 2020, bringing the coverage of beneficiaries from 20,353 as of March 31, 2020 to 41,000 by June 30, 2020.

On April 30, 2020, Rwanda’s Cabinet approved the Post COVID-19 Economic Recovery Plan, which provides broad outline of different measures for mitigating the impact of COVID-19, including social protection programs. The implementation timeline for this plan is from March 2020 to December 2021. Among others, it includes increasing the NSDS transfer amount to 15,000 Rwandan Francs per month and expanding the coverage of the intervention to all 30 districts beginning in January 2021, which should help the GoR in reaching an overall 74,000 beneficiaries. Implementation of the plan is dependent upon financial support from various DPs beyond the support provided by the World Bank.

A further expansion of NSDS is expected under a World Bank financed human capital DPO. Under this DPO, the coverage target for NSDS will be expanded to 148,812 beneficiaries. This will be accomplished through both vertical (support for Ubudehe 2 households) and horizontal (nationwide) expansion. To date, only one district has been added to the list of NSDS beneficiaries (Kirehe district), but the overall target is expected to be achieved by June 2022.

# Annex 2: Priority ranking of Rwanda’s districts

Districts were ranked and selected by the Government of Rwanda based on a summary score composed of three criteria: stunting prevalence, household poverty, and household food insecurity. Districts in red constitute the 13 SPRP districts.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Districts** | **Stunting (DHS 2014-2015)** | **Score** | **Moderately food insecure(CFSVA\_2015)** | **Score** | **Poor and extremerly poor HH (EICV4)** | **Score** | **Total score** |
| Nyabihu | 59% | 5 | 32% | 4 | 49.60% | 4 | 13 |
| Ngororero | 55.50% | 5 | 22% | 4 | 45.30% | 4 | 13 |
| Rubavu | 46.30% | 4 | 22% | 4 | 51.40% | 5 | 13 |
| Ruhango | 41.10% | 4 | 24% | 4 | 53.30% | 5 | 13 |
| Nyamagabe | 51.80% | 5 | 37% | 5 | 32.50% | 2 | 12 |
| Rutsiro | 45.80% | 4 | 48% | 5 | 35.10% | 2 | 11 |
| Rusizi | 34.70% | 2 | 30% | 4 | 62.00% | 5 | 11 |
| Gakenke | 46% | 4 | 21% | 3 | 50.40% | 4 | 11 |
| Karongi | 49.10% | 4 | 29% | 4 | 35.50% | 2 | 10 |
| Huye | 42.60% | 4 | 13% | 2 | 47.90% | 4 | 10 |
| Nyaruguru | 41.70% | 4 | 32% | 4 | 30.50% | 2 | 10 |
| Kayonza | 42.40% | 4 | 10% | 2 | 46.80% | 4 | 10 |
| Bugesera | 39.40% | 2 | 27% | 4 | 44.10% | 4 | 10 |
| Nyanza | 33.30% | 2 | 30% | 4 | 42.00% | 3 | 9 |
| Burera | 42.90% | 4 | 21% | 3 | 34.90% | 2 | 9 |
| Musanze | 37.80% | 2 | 15% | 2 | 55.30% | 5 | 9 |
| Nyamasheke | 34% | 2 | 28% | 4 | 41.50% | 2 | 8 |
| Muhanga | 41.60% | 4 | 10% | 2 | 37.80% | 2 | 8 |
| Gisagara | 37.50% | 2 | 17% | 4 | 25.90% | 2 | 8 |
| Gicumbi | 36.60% | 2 | 12% | 2 | 48.10% | 4 | 8 |
| Nyagatare | 36.80% | 2 | 11% | 2 | 44.10% | 4 | 8 |
| Gatsibo | 31.70% | 2 | 12% | 2 | 43.80% | 4 | 8 |
| Ngoma | 40.90% | 4 | 9% | 1 | 34.30% | 2 | 7 |
| Kamonyi | 36.60% | 2 | 10% | 2 | 38.00% | 2 | 6 |
| Kirehe | 29.40% | 2 | 15% | 2 | 41.80% | 2 | 6 |
| Rulindo | 33.80% | 2 | 7% | 1 | 26.40% | 2 | 5 |
| Nyarugenge | 28.70% | 2 | 2% | 1 | 19.90% | 2 | 5 |
| Rwamagana | 25.30% | 1 | 9% | 1 | 25.40% | 2 | 4 |
| Gasabo | 22.30% | 1 | 3% | 1 | 23.40% | 2 | 4 |
| Kicukiro | 17% |  | 3% | 1 | 16.30% | 1 | 2 |

# Annex 3: Potential supplementary evaluation questions

Alongside the two main questions addressed in this concept note, there is ongoing discussion regarding an additional set of evaluation questions related to the effectiveness of particular modes of service delivery. As decisions over these modes have not yet been taken, this annex sketches the broad outlines of possible evaluation activities that would complement the activities earlier described in detail in this note.

## Evaluation questions

### Overview

1. What are effective modes of involving CHWs in nutrition services?
2. What are effective modes of delivering ECD services to children 6 to 23 months old and their mothers?

The primary outcomes for all interventions are height-for-age and stunting in children under 2 years of age. Secondary outcomes depend on the specific intervention (such as developmental scores for Question 2) and, in part, will be selected to trace mechanisms through which the intervention operates (as based on the results chain in Figure 1). This data will both describe the intervention impact on intermediate and other secondary outcomes and will assist the attribution of the relative contributions of each intervention to any estimated overall effect.

### Specific research questions

### 1. Involving CHWs in nutrition services

There is ongoing discussion concerning the engagement of CHWs under the SPRP. If there is sufficient interest among donors and the GoR, this evaluation design may be able to support an evaluation of the effectiveness of new home-based ECD and nutrition service delivery modes involving CHWs. Any intervention will be at the community level; all households in the community will be eligible. The units of study would constitute not only CHWs, but also ECD centers in both participating and comparison areas.

### 2. ECD efforts supported under the two programs

There is ongoing discussion over how to offer ECD services to the target population served by the SPaR program. If there is sufficient interest among donors and the GoR, the evaluation design may be able to support an evaluation of the effectiveness of new ECD delivery modes such as contrasting center-based and home-based services. Any intervention will be at the community level; all households in the community will be eligible. The units of study would constitute not only the beneficiary and other households, but also ECD centers and component staff in both participating and comparison areas.

## Proposed evaluation design

### Involving CHWs in nutrition services

If stakeholders wish to pilot innovations in the involvement of CHWs in nutrition services, the evaluation design will employ a cluster-randomized trial at the community level, stratified by districts’ rank for external validity purposes.

### . ECD efforts supported under the two programs

If stakeholders wish to pilot innovations in the mode of ECD service delivery, the evaluation design will employ a cluster-randomized trial at the community level, stratified by districts’ rank for external validity purposes.

# Annex 4: Definitions of indicators

|  |  |  |  |
| --- | --- | --- | --- |
| # | **Indicator** | **Definition** | **Type** |
| **Primary (impact) indicators** | | | |
| 1.1 | Height-for-age in under-2s | Height-for-age using the 2006 WHO Child Growth Standards | Continuous |
| 1.2 | Stunting in under-2s | Height-for-age <= 2 standard deviations below WHO Child Growth Standards median | Percent |
| 1.3 | Child development score | Age-appropriate overall child development score on the CREDI | Number |

|  |  |  |  |
| --- | --- | --- | --- |
| **Secondary indicators** | | | |
| **Health outcomes of non-targeted populations** | | | |
| 2.1 | Height-for-age in 2-5 year olds | Height-for-age using the 2006 WHO Child Growth Standards | Continuous |
| 2.2 | Stunting in 2-5 year olds | Height-for-age <= 2 standard deviations below WHO Child Growth Standards median | Percent |

|  |  |  |  |
| --- | --- | --- | --- |
| **Infant and young child feeding and care practices** | | |  |
| 3.1 | Infant and young child care practices |  |  |
|  |  |  |  |
| 3.2 | Infant and young children feeding practices |  |  |
| 3.2.1 | \* Breastfeeding | Children 0-6 months who are exclusively breastfed | Percent |
|  | \* Breastfeeding | Median duration of exclusive breastfeeding | Number |
|  | \* Complementary feeding | Breastfed children 6-23 months who received a minimum acceptable diet | Percent |
|  | \* Complementary feeding | Children 6-8 months old who were fed complementary foods | Percent |
| 3.2.2 | \* Micro nutrient supplements | Children 6-23 months receiving adequate supplement of Micro Nutrient Powder (MNP) | Percent |
| 3.2.3 | \* Vitamin A supplements | Children 6-59 months children receiving appropriate Vitamin A supplementation | Percent |
| 3.3 | Utilization of ANC and PNC services |  |  |
| 3.3.1 | \* First ANC visit | Pregnant women who had first ANC checkup (with trained provider) in first trimester | Percent |
| 3.3.2 | \* Vitamin A for pregnant women | Women who received any vitamin A supplements in their pregnancy | Percent |
| 3.3.3 | \* Iron for pregnant women | Women who received any iron supplements in their pregnancy | Percent |
| 3.3.3 | \* First PNC visit | Women who had their first PNC checkup (with trained provider) within two days of birth | Percent |
| 3.4 | Utilization of growth promotion and monitoring / nutrition services |  |  |
| 3.4.1 | \* Growth promotion and monitoring | Children 0-23 months receive at least quarterly growth monitoring (height, weight measurement) | Percent |
| 3.5 | Utilization of preventive services |  |  |
|  |  |  |  |
| 3.6 | Utilization of nutrition services |  |  |
|  |  |  |  |
| 3.7 | Quality of service delivery |  |  |
|  |  |  |  |
| 3.8 | Knowledge of child nutrition issues |  |  |
|  |  |  |  |
| 3.9 | Satisfaction with service delivery |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Environmental health** | | |  |
| 4.1 | WASH, e.g., access to latrines, safe water storage |  |  |
| 4.1.1 | \* Clean water | Households using an improved drinking water source (tbd) | Percent |
| 4.1.2 | \* Safe water storage | Households using safe water storage (tbd) | Percent |
| 4.1.3 | \* Latrines | Households using an improved sanitation facility (tbd) | Percent |
| 4.2 | Hygiene and sanitation practices |  |  |
| 4.2.1 | \* Health effects | Children under five years suffering from diarrhoea in the last 2 weeks | Percent |

|  |  |  |  |
| --- | --- | --- | --- |
| **Food adequacy** | | |  |
| 5.1 | Increased income (to purchase nutritious foods) |  |  |
| 5.1.1 | \* Income | Household income | Continuous |
| 5.1.2 | \* Expenditure | Household expenditure on nutritious food (tbd) | Continuous |
| 5.2 | Enhanced dietary diversity |  |  |
|  |  |  |  |
| 5.3 | Access to nutritious foods |  |  |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Process indicators** | | |  |
| 6.1 | CT requirements |  |  |
|  | \* Participation in CT | Target households who are participating in the CT | Percent |
|  | \* Receipt of CT | Target households who are received the CT in the last 3 months | Percent |
|  | \* Attended 4+ ANC checkups | Pregnant women who had 4+ ANC checkups during their pregnancy | Percent |
|  | \* Attended 2+ PNC checkups | Women had 2+ PNC checkups after delivery (time period tbd) | Percent |
|  | \* Attended height monitoring sessions | Household member attended all required height monitoring sessions | Percent |
|  | \* Attended parent education sessions | Households who attended required parental education sessions in the last 3 months (tbd) | Percent |
| 6.2 | Encounters with CHW |  |  |
| 6.2.1 | \* CHW encounters (pregnant women) | Pregnant women who had at least one encounter with CHW during pregnancy | Percent |
| 6.2.2 | \* CHW encounters (care givers) | Care givers of children 0-2 who had at least one encounter with CHW in the past 12 months | Percent |
| 6.2.3 | \* Stunting awareness | Care givers of children 0-2 who report being informed by CHW about stunting in the last 12 months | Percent |
| 6.2.4 | \* Growth promotion activities | Care givers of children 0-2 who report being told about growth promotion by CHW in the last 12 months | Percent |
| 6.3 | Encounters with ECD |  |  |
| 6.3.1 | \* ECD use | Children 2-5 attending organized ECD programs | Percent |
|  |  |  |  |

Example of age-specific CREDI instrument given below:

Caregiver Reported Early Development InstrumentS (CREDI)

Short Form: 24-29 MONTHS

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Interviewee ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Child Date of Birth: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Child Age (in Months): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Assessor Instructions:

* Administer the set of questions that corresponds with the child’s age band.
* Remember to show caregivers the corresponding full-page illustration for those items that include an image.
* Before administering items, SAY (to caregivers):

**Now I am going to ask you about the types of things your child is currently able to do. Please answer "yes" or "no" to these questions. If you are unsure, you can also answer by saying “don’t know.” Please keep in mind that children learn and grow at different rates, so it is fine if your child can't yet do these things. Some of these skills children only achieve at older ages. If there is any question you feel uncomfortable answering, please let me know and we can move to the next question.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Item # | Item | Image | Response | | |
| E1 | If you show the child an object he/she knows well (e.g., a cup or animal), can he/she consistently name it? |  | Yes | No | DK |
| E2 | Can the child say ten or more separate words (e.g., names like "Mama" or objects like "ball")? |  | Yes | No | DK |
| E3 | Can the child sing a short song or repeat parts of a rhyme from memory by him/herself? |  | Yes | No | DK |
| E4 | Can the child jump with both feet leaving the ground? |  | Yes | No | DK |
| E5 | Can the child speak using sentences of three or more words that go together (e.g., "I want water" or "The house is big")? |  | Yes | No | DK |
| E6 | Can the child correctly ask questions using any of the words "what," "which," "where," or "who"? |  | Yes | No | DK |
| E7 | Can the child correctly use any of the words "I," "you," "she," or "he" (e.g., "I go to store," or "He eats rice")? |  | Yes | No | DK |
| E8 | Does the child ask about familiar people other than parents when they are not there (e.g., "Where is the neighbor?")? |  | Yes | No | DK |
| E9 | Can the child count up to five objects (e.g., fingers, people)? |  | Yes | No | DK |
| E10 | Can the child identify at least one color (e.g., red, blue, yellow)? |  | Yes | No | DK |
| E11 | Does the child often kick, bite, or hit other children or adults? |  | Yes | No | DK |
| E12 | If you show the child two objects or people of different size, can he/she tell you which one is the big one and which is the small one? |  | Yes | No | DK |
| E13 | Does the child become extremely withdrawn or shy in new situations? |  | Yes | No | DK |
| E14 | If you point to an object, can the child correctly use the words "on," "in," or "under" to describe where it is (e.g., "The cup is on the table" instead of "The cup is in the table."). |  | Yes | No | DK |
| E15 | Does the child ask "why" questions (e.g., "Why are you tall?")? |  | Yes | No | DK |
| E16 | If you ask the child to give you three objects (e.g., stones, beans), does the child give you the correct amount? |  | Yes | No | DK |
| E17 | Can the child explain in words what common objects like a cup or chair are used for? |  | Yes | No | DK |
| E18 | Can the child dress him/herself (e.g., put on his/her pants and shirt without help)? |  | Yes | No | DK |
| E19 | Can the child say what others like or dislike (e.g., "Mama doesn't like fruit," "Papa likes football")? |  | Yes | No | DK |
| E20 | Can the child talk about things that have happened in the past using correct language (e.g., "Yesterday I played with my friend" or "Last week she went to the market")? |  | Yes | No | DK |

# Annex 5: Identified existing data sources to inform evaluation design and supplement primary data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Indicator / type of information** | **Data source** | **Administrative entity / organization** | **Available years for data source** | **Notes** |
| *Historical facility-level HMIS data* | HMIS | Ministry of health |  | Nutritional status indicators are not tracked in the HMIS, but most service utilization indicators should be available. The request for data will need to be directed to MOH and not RBC. |
| Utilization of RMNCH services |
| Geolocations of health facilities |
| Staffing levels |
| Catchment area |
| Village infrastructure and services | Individual line ministries | MOH, Ministry of agriculture, Ministry of infrastructure, etc |  | There is no single source, such as a village census, for this information, and will need to be requested through each of the ministries. |
| Ubudehe distribution and poverty/livelihood statistics | EICV | NISR - National Institute for Statistics Rwanda | 2013/14, 2010/2011, 2005, 2000-2001 | Data is generally publicly available. The report for EICV5 should be available in late 2018, and the data should be available shortly afterward. EICV 4 has distribution of Ubudehes and comparison with the conventional wealth quintile categorizations. However, this was based on the previous 6-level Ubudehe system, which has now been consolidated into 4 levels.  According to NISR, the questionnaire and sampling for EICV 5 is the same as for EICV 4. |
| Nutritional status indicators | CFSVA | WFP/NISR | 2006, 2009, 2012, 2015, 2018(in progress) | Data is generally publicly available. The 2018 analysis should be ready by September 2018 |
| DHS | NISR - National Institute for Statistics Rwanda | 1992, 1996, 2000, 2005, 2007/2008, 2010, 2014/2015 | Data publicly available |
| CFSVA EA areas/geolocations | CFSVA | WFP | For 2018 survey | Should be available this week from WFP. |
| Knowledge, attitudes, and practices around child and maternal nutrition | KAP Survey | Rwanda Health Communication Center / UNICEF | 2014 | RHCC is to provide the questionnaire. We may also request directly from UNICEF. |

# Annex 6: Birth weight data validation

While the gold standard for birth weight validation is field observations of deliveries at the health facility, this strategy was considered not feasible as part of the baseline facility survey due to the following challenges:

* Access to delivery rooms will be restricted due to the COVID-19 related health protocols.
* Due to the sensitive nature of carrying out a delivery observation, additional IRB approval as well as authorizations from the Ministry of Health would be required, causing a delay in the expected timeline for data collection.
* Births may take place unexpectedly at multiple times of the day and are unlikely to occur at each health center during the allocated data collection days. Conducting a representative set of observations will require significantly more data collection time at health centers.
  + from their experience it's the health workers collecting data

The following alternative strategies to assess quality of birth weight data were therefore adopted: data triangulation, assessment of equipment, and analytical validation.

**Data triangulation**

When births take place at a facility, health providers use the partograph to record the progress of labor as well as maternal and child observations, including birth weight. Birth weight data are successively transcribed onto delivery registers and individual health cards. This data entry process may be affected by transcription and approximation errors. In order to identify the extent to which errors may have occurred, the facility survey will include a data triangulation effort: after completion of birth weight extraction from the delivery register, a subset of cases will be selected for their birth weight to be compared against what is recorded on the partographs. Data extractors will be assisted by nurses to identify the partographs and will enter the partograph recorded birth weight for comparison.

**Assessment of equipment**

The facility survey includes checklists to determine the availability and functionality of different equipment throughout the facility. Availability and functionality of child weighing scale (250 g graduation) and infant weighing scale (10 g graduation) will be recorded. Additionally, with the purpose of further investigating the precision and accuracy of the latter, questions have been included to investigate the type of infant weighing scale (digital versus analogue), and the availability of an infant scale calibration record – including whether it has been updated recently or not.

**Analytical validations**

The analytical validation strategy proposed will take place post-data collection to specifically identify the extent of:

1. biologically implausible values and outliers.
2. heaping and rounding.

Implausible values will be defined as < 350 g or > 6000 g. Additional outliers will also be identified by comparing observations to the population distribution.

Following Kong et al[[10]](#footnote-10)'s methodology, heaping and rounding will be evaluated by observing the proportion of total birth weights per facility that were multiples of 500g, and the proportions of heaped weight values relative to all weight values within the adjacent 500g bracket.

1. The 2015 Comprehensive Food Security and Vulnerability Analysis (CFSVA) found that *40 percent of all households are food secure* (i.e., able to meet essential food and non-food needs without engaging in atypical coping strategies, have an acceptable diet and use a low share of their budget to cover food needs); *40 percent are marginally food secure*; *17 percent are moderately food insecure*; and *3 percent are severely food insecure*. [↑](#footnote-ref-1)
2. Starches (i.e. including cereal and tubers) and pulses constitute the primary staple food in Rwanda. Food insecure households rarely consume pulses and legumes (0 to 3 days per week), while fruits and animal proteins (i.e., meat and milk) are consumed even less (Food and Nutrition Security Monitoring System, Round 11, 2015). [↑](#footnote-ref-2)
3. *Rwanda Situation Analysis and Policy Options*, The World Bank, June 2017. [↑](#footnote-ref-3)
4. *Comprehensive Evaluation of the Community Health Program in Rwanda*, LSHTM, November 2016. [↑](#footnote-ref-4)
5. In the original program design, four districts received only NSDS. Kirehe district was added in January 2021 as part of the Government expansion program, as described in Annex 1. [↑](#footnote-ref-5)
6. Possible mitigation strategies in the presence of significantly different pre-intervention trends include a narrowing of the study on treatment and comparison study districts closer to the district stunting thresholds used to determine program eligibility where pre-intervention trends are expected to be more similar. Further, community level matching estimators can be combined with difference-in-differences, including matching communities in part on the basis of pre-intervention trends as recorded in administrative data, in order to improve comparability. [↑](#footnote-ref-6)
7. Filmer, Deon P.; Friedman, Jed; Kandpal, Eeshani; Onishi, Junko. 2018. *General equilibrium effects of targeted cash transfers: nutrition impacts on non-beneficiary children (English)*. Policy Research working paper; no. WPS 8377. Washington, D.C.: World Bank Group.  [↑](#footnote-ref-7)
8. See Arnold et al. (2011) for a review of power analyses simulations in nutrition programs. Arnold, Benjamin F., Daniel Hogan, John Colford, and Alan Hubbard. 2011. *Simulation methods to estimate design power: an overview for applied research*. BMC Medical Research Methodology, 11(94). [↑](#footnote-ref-8)
9. Mckenzie, David. 2012. “Beyond baseline and follow-up: The case for more T in experiments.” Journal of Development Economics, 99(2): 210-221. [↑](#footnote-ref-9)
10. Kong et al. 2021. Birthweight: EN-BIRTH multi-country validation study. *BMC Pregnancy and Childbirth*, 21(Suppl 1):240 [↑](#footnote-ref-10)