

# Impact of Pedestrian Footbridges on Rural Communities in Rwanda

Grant/Cooperative Agreement Number: 7200AA20FA00021

## Revised Study Design

### 1. Introduction

Our study design is informed by a pilot study we conducted in Rwanda from August 2019 to March 2020 of 12 bridge and 12 comparison sites. Our at-scale study uses a stepped wedge, block randomized design. When the initial study design was proposed in 2019, Bridges to Prosperity (B2P) had launched a partnership with the Government of Rwanda that would support the construction of up to 355 trailbridges over a five year period. This study was designed to capture 150 of those trailbridges over a four year study period, in addition to 50 long-term control sites. The first three years of the study were co-funded by USAID DIV and the Wellspring Foundation, and the fourth year was fully funded by the Wellspring foundation.

COVID-19 led to significant delays in the construction of these trailbridges, due in part to restrictions on travel and construction activities within Rwanda, but largely due to decisions that the Government of Rwanda made with regards to priorities and budgeting during the pandemic. This directly impacted B2P's ability to construct the bridges that are the focus of this impact evaluation. Therefore, in late 2020, the Wellspring Foundation, the University of Colorado Boulder and B2P agreed to allocate the equivalent of the year four impact evaluation budget directly to B2P to ensure the construction of the 2020 and 2021 bridge sites.

To date, B2P has constructed 10 trailbridges, with 7 more bridges to be completed by June 30, 2021. B2P also anticipates a slower pace of bridge building to continue moving forward, with 35 bridges to be completed during year two of this study and 45 bridges to be completed during year three, for a total of 97 bridges to be completed before the final round of surveying in year four. As a result, it is necessary to modify the study design to reflect this reality.

### 2. Revised Study Design

Overall, the study design remains unchanged - a stepped wedge, block randomized design. However, instead of following 200 sites over 3 years for a total sample of 600 site-surveys, with 150 transitioning from control to intervention over the study period and 50 remaining as long-term controls, we propose to follow 146 sites over 4 years, for a total sample of 584 site-surveys, with 97 transitioning from control to intervention and 49 remaining as long-term controls. This proposed change takes into account B2P's revised construction schedule over the study period and also ensures the availability of funding from the Wellspring Foundation for a fourth round of household-level surveying (year four of study).

Table 1 below presents the minimum detectable effects (MDE) calculations, comparing the original 200-site, 3-year study with the revised 146-site, 4-year study. Overall, there are no meaningful impacts on the MDEs that impair the integrity of the study and we are within our target detectable effects on all primary outcomes. Importantly, because many of our outcomes are infrequently observed and may take time to emerge, a 4-year study in fact is more robust than a 3-year study with roughly the same number of total site-surveys.

**Table 1. MDE Calculations**

Outcome	Original		Revised		Target
	Std Deviation	%	Std Deviation	%	%
Food expenditure	0.090	4.07%	0.103	4.65%	5%
Income	0.112	12.91%	0.113	13.03%	15%
Use of fertilizer	0.122	5.80%	0.127	6.04%	10%
Likelihood to work outside community	0.129	5.80%	0.130	5.84%	10%
Visited clinic in last month	0.100	4.62%	0.108	4.99%	5%
Mid-upper arm circumference	0.111	1.23%	0.113	1.25%	5%
Birth weight	0.139	2.48%	0.147	2.64%	5%

### Household-level Surveys

This study will follow 146 sites over 4 years, which will include the transition of 97 sites from control to intervention in 3 steps. The number of sites to be transitioned in each step are: 17 (7/1/2020-6/30/2021); 35 (7/1/2021-6/30/2022); and 45 (7/1/2022-6/30/2023). The remaining 49 sites will serve as long-term controls throughout.

The build order was randomized within each district, and each site was assigned a build year, following the Rwandan fiscal year (7/1-6/30). The steps in the wedge design are yearly, with each site surveyed once a year. Using the list of 146 sites, the study team contacted local leaders and, using a standardized protocol, identified the three most impacted villages for each site. During each round, thirty five household-level surveys will be conducted in each of the three villages, totaling 105 surveys per site. Baseline surveys were carried out 8/1/2020 to 5/31/2021. Surveying will also occur 8/1 to 5/31 in 2022, 2023 and 2024, for 4 total rounds of surveying.

Thanks to the cost-efficiency of the enumeration teams during the baseline, the study team identified the opportunity to conduct additional household-level surveys at more distant villages for a subset of the study sites. Specifically, at 20 intervention sites and 10 long-term control sites, 10 additional household-level surveys will be conducted at a more distant village from the

bridge site. These surveys will support the development of a statistical model examining the impact of the trailbridges among communities at varying distances from the bridge sites.

### **Bridge Use**

Due to the delay in completion of trailbridges, cameras to monitor bridge use have not yet been installed. Installation will happen in a single, month-long campaign once a sufficient number of bridges have been completed. With 7 more bridges slated for completion by June 30, 2021, we anticipate that this campaign will take place during July 2021.

Originally, the study team planned to install cameras at 20 bridge sites. However, instrumenting only the year one bridge crossings will enable the most significant longitudinal data collection to examine the impact of rainfall events on bridge crossings. Further, the video analysis services constrain the budget available. Therefore we have determined that the overall study budget will be able to support analysis from 12 bridge sites.

## **2. Revised Key Performance Indicators**

Based on the above proposed revisions, we request the following changes be made to the Key Performance Indicators:

- KPI AA1 - adjusted from 150 to 97 trailbridges to reflect the revised sample size; and
- KPI AA2 - based on the revised sample size, the addition of more distant household surveys, and the average household size of 4.56 people (thus far), we propose to revise AA2 from 360,000 to 214,000.