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The Stabilization of Marginalized Communities in Guatemala via Food and Nutrition Security on Child Stunting: Employing Systems Thinking Tools

CONFLICT & DEVELOPMENT FOUNDATION

CENTER ON CONFLICT AND DEVELOPMENT TEXAS A&M UNIVERSITY

The Conflict and Development Foundation and the Center on Conflict and Development at Texas A&M University are pleased to collaborate with Lee Voth-Gaeddert of the Missouri University of Science and Technology in this project that will produce a novel approach and unique tool to improve access to information on food security and water, sanitation and hygiene issues in marginalized communities in Guatemala.

December 1, 2016 – Progress Report for October and November 2016

Project Title: **The Stabilization of Marginalized Communities in Guatemala via Food and Nutrition Security on Child Stunting: Employing Systems Thinking Tools**

Project Summary:

The project, conducted by Principal Investigator Lee Voth-Gaeddert of the University of Missouri, utilizes a systems analysis, multi-methods approach to identify key areas for interventions in the complex system of causal factors to child malnutrition (stunting) to attain the largest return on investment for marginalized communities. The investigation contains three parts; 1) use of machine learning algorithms and three regionally representative datasets to identify potential causal factors related to child stunting, 2) the execution of a field study to test these trends including DNA sequencing of fecal samples and levels of mycotoxins in maize, and 3) developing a systems dynamics model to test confirmed casual factors with different hypothetical policy or program interventions. The study aims to improve access to information to marginalized communities as well as the US Missions' ability to reduce child stunting and subsequently improve intellectual potential.

Tool Calibration – Machine Learning and Advanced Algorithm Analysis

Trough our work in October and November we accomplished several significant steps towards creating our tool. 1) Significant improvements were made to our statistical code to provide more flexibility in the analysis. 2) Two separate teams completed their initial analyses, one using a clustering methodology and the other using a weighted network methodology. Finally, 3) we presented our initial findings to groups at the Universidad Rafael Landivar, the IEEE Global Humanitarian Technologies Conference, and the USAID Guatemalan Mission.

First, the group working on the clustering algorithm developed a mini tool for preparing the available data sets, as they are quite often messy and not well aggregated. Both groups have made it through the first round of analysis and have a base code to work with and to improve upon.

Figure 1A – Severely Stunted <-3

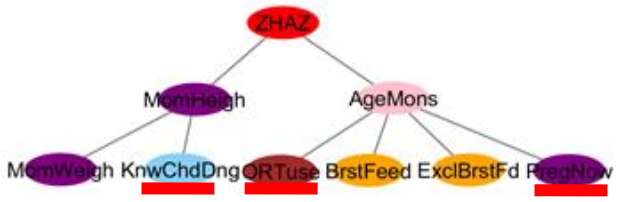

Figure 1B – Stunted -3 to -2

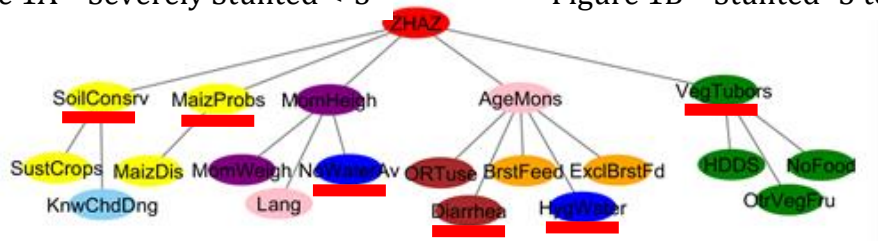

Figure 1C – Not Stunted > -2 SD

Second, and probably most exciting, are some of the results from our initial analyses. The above Figure 1 displays an example of one type of output for the weighted network trees. Currently we produce three primary views, all based on variables' relationships with child stunting; overall network trees (all variables, all children), bins of age groups (all variables, ages 0-6, 6-12, 12-17, 17-24 mo), and bins of stunting severity (all variables, children < -3 SD, -3 to -2 SD, and > -2 SD). We can see in Figure 1 several interesting insights. As children become healthier (in regards to child stunting), more variables become correlated. The mother's height and weight, and breastfeeding are important for all three groups. However, as we move from severely stunted to stunted, Oral Rehydration Therapy use and Knowledge of Child Health Dangers, become important. This suggests that these two items are partially responsible for improving the health of children. However, looking at not stunted children (> -2 SD) we see many additions. First is a group of nutrition/food variables, along with improved farming practices (SoilConserv, SustCrops), and improved health/quality of maize (MaizProbs, MaizDis). Two WaSH variables come into play as well. These results are exciting, but only initial results. We are now working to expand to two more datasets and create a second part of this tool which includes the ability to test hypotheses. This would be targeted for field practitioners and academics.

Three, several opportunities were given to us to engage the broader development community in excellent platforms to talk about specific initial results and present our systems approach to development for marginalized communities. First, I had the opportunity to talk about our work at large to students in the School of Nutrition in the Xela campus of the Universidad de Rafael Landivar (see photo on the right). Second, my colleague presented our research at one of the most popular development tech conferences on the west coast, IEEE GHTC 2016 (http://ieeeghtc.org/). Lastly, I presented an update to the USAID Guatemala Mission that included people from M&E, Health, Economics, and Food Security. We are excited about the progress and timeline for this activity and are looking for several big strides in the month of December.

Hypothesis and Assumption Testing – Field Work and Structural Equation Modeling

In parallel, a separate field team was deployed during the month of October to work with the local Health Center and two Health Posts in San Vicente Buenabaja, Totonicapan to host health assemblies and conduct house visits. During this time, we were able to conduct four health assemblies where, in collaboration with two other Peace Corps workers and Health Center staff, we hosted health charlas (talks), distributed monthly nutrient packets, collected health data, and distributed vaccines (done by Health Center).

After the completion of the assemblies, the field team conducted house to house visits in order to collect observational data on water, sanitation, and hygiene as well as maize samples for mycotoxin testing. In total, over 300 households were visited for a total of just under 400 children encompassing a majority of the population serviced by the three health facilities. These activities not only provided an opportunity for our data analyses, but a chance for Peace Corps to deliver short presentations and other information, the Health Center to complete anthropometric measures, vaccine updates, and nutrient distribution, and bring awareness to the community of the *chronic* piece of child malnutrition. The field team also consisted of four young workers from the local community.

Finally, during the month of November our partner laboratory in Guatemala City began analyzing maize samples and extracting the DNA from fecal samples. At the same time, a second team in Salcaja, Quetzaltenango began transferring data from the paper based surveys to digital form for analysis. The majority of funds utilized for this field project went directly to the community.

Testing Programs and Policies – System Dynamics Modeling

Finally, early work on setting the environment for group model building as well as attaining resources and data for developing the system dynamics modeling began in November. This included identifying stakeholders important for the improvement of child malnutrition in marginalized communities as well as identifying the colleagues back at the University of Missouri best suited to be a part of the model development team.

Conclusion

Based on the set proposed timeline, the project is on target and on budget for a successful conclusion by the proposed date. Greater than expected engagement from higher level entities has occurred and provided excellent direction and potential new avenues for dissemination and impact. We look forward to what the next several months have in store and believe that the financial support provided by the Conflict and Development Foundation is having a very catalytic effect on the communities as well as the higher entities these results and tools are targeted for.

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