



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



Legume Innovation Lab



Feed the Future Legume Innovation Lab Enhancing Nutrition

Legumes, Environmental Enteropathy, the Microbiome, and Child Growth in Malawi

The Challenge

Approximately 45 percent of deaths among children under five (3.1 million annually) are related to undernutrition. Additionally, stunting permanently affects 165 million children worldwide and reduces physical, immunological, and cognitive capacity throughout life.

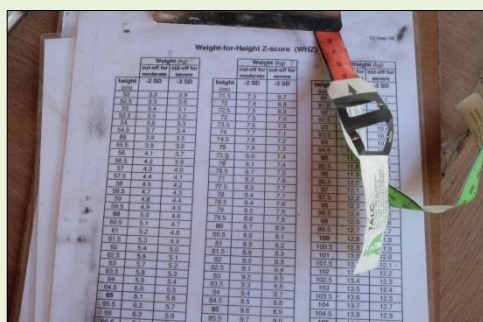
In developing countries, a gut inflammatory condition, *environmental enteric dysfunction (EED)*, often develops within the first three years of life during the transition from exclusive breastfeeding to mixed feeding with complementary foods, which are dominated by protein-poor and micronutrient-poor starches, such as maize, cassava, and sorghum. EED is related to dietary intake and gut health in children younger than three and places them at high risk for stunting, malabsorption, and poor oral vaccine efficacy. With nearly half of Malawian children under five stunted,



A mother and child at a health post in Malawi



Children's arm circumference is measured at the beginning of each study. A simple technique conducted with measuring tape, it can replace the need to measure body weight and length. Small arm circumference indicates moderate or severe malnutrition and indicates feeding is necessary.



All test results are systematically recorded for analysis.

interventions to decrease EED are urgently needed.

The Project

Scientists speculate that the addition of grain legume-based foods into the diets of weaning children in these countries could decrease childhood malnutrition by improving gut health and better nutrient absorption, eliminating the resultant EED and stunting.

Feed the Future Legume Innovation Lab researchers are conducting two randomized, controlled clinical trials, one for children 6-11 months, the other for children 12-35 months, to investigate the effect of both common bean and cowpea consumption on infant and toddler growth and gut health. The study includes developing legume recipes in accordance with World Health Organization. The recipes underwent acceptability testing in Malawian infants, and the preferred recipes are being used in the clinical trials.

When the project is complete, scientists will know whether children provided with a grain legume supplement to their diet have greater growth and decreased EED compared to those who receive standard food supplements.



l. to rt., Nutrition education with mothers is critical to the project's success, measuring a child's height, the bean- or cowpea-based cereal as prepared; below, rt., a baby is weighed before registration as a project participant.

Project Objectives

1. Evaluate changes in children's height- and weight-for-age z scores, biomarkers of EED, and the characteristics of the microbiome after the inclusion of either cowpeas or common beans in the complementary feeding for 6-11-month-old and 12-35-month-old rural Malawian children, respectively.
2. Analyze changes in the developing intestinal microbiome among both age groups and all three intervention cohorts (cowpeas, common beans, and standard feeding) to gain understanding of the role of microbiota in early childhood growth and gut health.

Projected Outcomes

1. Development of legume recipes.
2. Continuous enrollment, randomization, intervention delivery, and specimen collection for both groups of children.
3. Specimen processing and data analysis.
4. Evaluation of future directions and implications of findings.

Major Achievements to Date

1. Development of the *Operational Manual* to delineate procedures and guidelines for clinical trials.
2. Development and testing of multiple legume recipes and completion of a recipe-acceptability study with 100+ children.
3. More than 50 percent enrollment in Study 1 and 100 percent enrollment in Study 2.

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This project is funded by

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