Feed the Future Innovation Lab For *Collaborative Research on Nutrition* - Asia Heifer International - Annual Report - Year 4

Feed the Future Innovation Lab

For Collaborative Research on Global Nutrition

Annual Report
Heifer International
Year 4 (October 2013-September 2014)
Nutrition Innovation Lab-Asia

Submitted by:
Laurie C. Miller MD
Consultant, Heifer International
Professor, Department of Pediatrics, Tufts University School of Medicine
Adjunct Professor, Friedman School of Nutrition & Policy, Tufts University
Adjunct Professor, Eliot-Pearson Department of Child Study & Human Development, Tufts University
lmiller1@tuftmedicalcenter.org
laurie.miller@tufts.edu

1) Executive Summary

Heifer International received funding from the Nutrition Innovation Laboratory-Asia to pursue two projects in 2013-2015. These projects are both based in Nepal, and are carried out in close collaboration with Heifer Project Nepal. The projects are described below, in addition to the progress achieved in each over the past 12 months.

1. Project 1B. This project was a follow-up survey of a cohort of 415 rural families previously studied by Heifer Project Nepal from 2009-2011. The families resided in three districts in Nepal: Nawalparasi, Chitwan, and Nuwakot. The initial investigation was a two-year randomized, controlled trial on the effects of community-development activities (supervised by Heifer Project Nepal) on child health and nutrition. Project 1B was a four-year follow-up of these families, assessing primary outcomes of child health and growth, as well as secondary outcomes of household socioeconomic status, income, animal ownership, land ownership, and dietary diversity.
2. Project 2. This new project was funded by the Nutrition Innovation Lab-Asia, and began in the spring/summer of 2013. This project was established in Banke district in Nepal. The goals are to investigate child health and nutrition in communities randomized to receive one of three interventions: (1) Heifer community development activities and livestock training, supplemented by specific training in child nutrition; (2) livestock training and nutrition training alone; or (3) no intervention activities.

I) Program Activities and Highlights

In order to conduct these activities, the memorandum of understanding (MOU) between Heifer International and the Nutrition Innovation Lab-Asia remained in place. Heifer also maintained a consultancy arrangement with Dr. Miller.

Project 1B. The following activities have been completed:

a. Field work and data collection.
b. Data cleaning and data entry.
c. Preliminary data analysis.
d. Manuscript prepared, “Livestock Interventions in Rural Nepal: Effects on Child Health and Nutrition.”
e. Discussion and revisions with co-authors is underway, with anticipated submission by October 1, 2014.
f. Manuscript prepared, “Head growth in rural Nepali children.”
g. Discussion and revisions with co-authors is underway, with anticipated submission by October 1, 2014.
h. Manuscript preparation in process, “Food allocation choices in rural Nepali households.”
i. Manuscript planned, “Household animal resources and dietary diversity in rural Nepal” (analysis underway).
j. Abstracts submitted to Nutrition Innovation Lab-Asia at November 2014 meeting:

a. Growth and Health of Rural Children in Three Districts of Nepal: Effect of a Community Development Intervention over 48 Months.
b. Household and Child Dietary Quality across Seasons in Rural Nepal: Effectiveness of a Community Development Intervention.

Project 2: The following activities have been completed:

a. Progress reports and renewals submitted as needed to the Nepal Health Research Council (NHRC).
b. Progress reports and renewals submitted to Tufts University Institutional Review Board.
c. Meetings were held to orient community leaders to project design and requirements, and to invite their participation.
d. Community meetings were held to introduce citizens to project design and requirements, and to invite their participation.
e. Valley Research field staff collected baseline data in Banke district, including 953 Households (289 assigned to Heifer plus nutrition training group, 360 assigned to training-only group, and 304 assigned to control group). These households had a total of 1300 children <5 years of age (350 from Heifer plus nutrition training group, 510 from training-only group, and 440 from control group). Altogether, there were 1057 mothers interviewed (some conjoint households had >1 eligible mother).
f. After baseline survey, Heifer field teams began work with the Full Intervention group as well as the Training-Only group.
g. Valley Research returned to the field for Round 2 of data collection. Overall, this was successful although some people (72) from the initial survey were not able to be included in Round 2 of data collection. The reasons are shown below.

Reasons: Dropped out of group	Number
Opposed by family member/husband	23
Lack of time/busy with household chores	3
Was away from home at the time of orientation	5
Not interested (due to the predominance of one specific ethnic group only)	6
Total	**37**
Reasons: Could not complete interview	Number
Gone to parent's home	23
Gone to another house (in the hills)	5
Gone to India for husband's medical treatment	1
Refused to participate in the interview	1
Migrated to other place	3
Death of eligible child	1
Went to India to work with husband	1
Total	**35**
Grand total	**72**

h. Data from Round 1 was cleaned and entered.
i. Data from Round 2 was cleaned and is in the process of being entered.
j. Very preliminary analyses were done to verify cleaning, completion, and matching.

II) **Key Accomplishments**

Project 1B

a. Field work and data entry completed.
b. Results have generated two to four manuscripts to be submitted within the next three to six months.

Project 2

a. Project data collection is proceeding.
b. Enrollment expected to provide adequate power for statistical analysis.

III) **Research Program Overview and Structure**

These research activities have been conducted in collaboration with Heifer Project Nepal. The organization uses the introduction of livestock and related training as tools for poverty alleviation, citizen empowerment, and community development. *Heifer International* activities focus on the distribution of livestock and training to rural women's groups with an emphasis on income generation. These activities occur within the context of a strong focus on the development of social capital, specifically, citizen empowerment, values training, social mobilization, microcredit, and enterprise. Heifer values research as a means to inform their field activities and policies. As they are active in 31 countries throughout the world, research findings can be quickly disseminated into field practice, to benefit child health and nutrition outcomes in their project areas.

Project 1B:

1) Name: "Livestock Interventions in Rural Nepal: Effects on Child Health and Nutrition."
2) Description: Follow-on project to allow 48-month longitudinal data collection in cohort initially studied by *Heifer International* in rural Nepal over 24 months. Project 1A enrolled 611 children in 415 families, with results obtained every six months for two years from a 125-item questionnaire addressing demographics (family composition, socioeconomic status, income sources, livestock ownership, child health, child nutrition, and dietary diversity). In addition, anthropometric data on all household children was collected. While important trends and differences in outcomes were seen at 12 and 24 months, it was hypothesized that improvements in child health and nutrition would increase with a longer duration of Heifer interventions. Alternatively, reduced benefits of Heifer activity on child nutrition could occur as time progressed. Project 1B was designed to test these hypotheses.

Specific Aim #1: Extend data collection for previous existing project. The opportunity to extend this project provided a special opportunity to obtain longitudinal nutrition data in a large sample of children, in the context of socioeconomic, demographic, and other parameters.

Specific Aim #2: Analyze effects of Heifer activities on the outcomes of child health and nutrition four years after start of intervention.

a. Evaluate longer-term outcomes of Heifer activities on child growth and health.
b. Identify characteristics of families and children who demonstrate the most improvement in child nutrition.
c. Identify characteristics of families and children who demonstrate the least improvement in child nutrition.
d. Use this information to further refine Heifer activities and programs to benefit the most malnourished children.

3) Collaborators: Heifer International (Little Rock, Arkansas), Heifer Project Nepal (Kathmandu, Nepal), Dr. Laurie Miller (Heifer International, Consultant), Dr. Beatrice Rogers (Professor, Friedman School of Nutrition Science and Policy, Tufts University), and Dr. Robert Houser (Statistician, Friedman School of Nutrition Science and Policy, Tufts University). Additional guidance and input from Nutrition Innovation Lab leadership (Dr. Patrick Webb, Dr. Shibani Ghosh, Dr. Jeffrey Griffiths).
4) Achievements: (a) Successfully completed data collection and child anthropometry to obtain 48 months of results for 415 households in Nawalparasi, Nuwakot, and Chitwan. (b) Data analysis underway. (c) Two manuscripts in near-final form; submission anticipated soon. (d) Two manuscripts in preparation. (d) Initial results demonstrate that Heifer intervention improves many outcome measures (income, SES), but these outcomes may be mediated in part by maternal educational level (n.b.: these are still under analysis and should be considered preliminary and should not be released):
    i) The percent of children with underweight decreased from ~50% to about 30% over four years. It is unclear if this is a general trend in the Nepali population or if it relates to the Heifer intervention.
    ii) There was no statistical difference between either maternal education levels or SES at baseline between the two intervention groups. At baseline, there was a very mild positive linear relationship between female education and SES in both intervention groups.
    iii) In the Terai, in Intervention Group 2 (Control), households with better-educated mothers and/or with increases in animal score were associated with greater positive change in SES from birth to 48 months. (Animal score was not used to calculate SES.) This was confirmed with a regression analysis (without the animal score included).
    iv) Households with more highly-educated women had greater improvement in household income.
    v) Mother's education does not seem to predict any changes in child growth scores (but we plan some additional analyses to address this further).

vi) Greater improvement in income was significantly associated with higher educational status in the group with the longest exposure to the intervention (Group 1).

5) Capacity Building: (a) successfully mentored Nepal-based research NGO (Nepal Technical Assistance Group, NTAG) in conduct of longitudinal research project over four years; (b) supervised Nepali staff in data cleaning and data management for longitudinal research project; (c) developed research skills of Heifer Project Nepal office and field staff; and (d) Heifer staff and NTAG staff received training in Ethics of Human Subjects Research.
6) Lessons Learned: (a) special expertise is required to successfully conduct longitudinal research projects; and (b) feedback from field enumerators can provide valuable insights into project success and candid assessments of interventions.
7) Presentations and Publications:
    a. Manuscript preparation completed, "Livestock interventions in rural Nepal: Effects on child health and nutrition."
    b. Discussion and revisions with co-authors underway, with anticipated submission by October 1, 2014.
    c. Manuscript preparation completed, "Head growth in rural Nepali children."
    d. Discussion and revisions with co-authors underway, with anticipated submission by October 1, 2014.
    e. Manuscript preparation in process, "Food allocation choices in rural Nepali households."
    f. Manuscript planned, "Household animal resources and dietary diversity in rural Nepal" (analysis underway).
    g. Abstracts submitted to Nutrition Innovation Lab November 2014 meeting:
        (i) Growth and Health of Rural Children in Three Districts of Nepal: Effect of a Community Development Intervention over 48 Months.
        (ii) Household and Child Dietary Quality across Seasons in Rural Nepal: Effectiveness of a Community Development Intervention.

Project 2

1) Name: "Child health and nutrition after livestock interventions in rural Nepal: Disaggregating the effects of social capital development and training inputs."
2) Description: Project 2 was designed to extend on the results from Project 1A. While important effects on child nutrition and health were observed in the first two years of data collection for Project 1, it was recognized that these changes occurred in the absence of specific interventions addressing nutrition. Thus, we hypothesized that inclusion of a nutrition intervention would further improve child nutritional outcomes. A basic nutrition education curriculum was developed and field tested by Heifer Project Nepal. However, the effect of the use of this curriculum on child growth is unknown. In addition, Heifer activities in Project 1A were not disaggregated with regard to specific animal husbandry training, provision of livestock, and community/social capital development. Heifer community development activities typically include broad supports related to promotion of social capital (values training, facilitation of formation of women's groups, social mobilization,

training in savings, microcredit, and enterprise), along with training in animal husbandry and provision of livestock.

Specific Aim #1: Conduct a randomized controlled trial to evaluate the effects of the nutrition curriculum on child growth. The trial was designed to include matched communities in Heifer working areas. Communities were randomly assigned to receive either: (1) Heifer activities plus the nutrition curriculum; (2) training in child nutrition and animal husbandry, and provision of livestock, without social capital activities; or (3) no interventions. Surveys to address demographics (family composition, socioeconomic status, income sources, livestock ownership, child health, child nutrition, and dietary diversity) were conducted at baseline, and then every six months for two years (total five surveys; two are completed). Anthropometric measurements are obtained on all household children at each survey time, along with indicators of child health.

Specific Aim #2: Analyze the effects of the introduction of the nutrition curriculum on child growth and nutritional status.

a. Assess child nutritional outcomes.
b. Determine characteristics of families related to child nutritional and health status.
c. Identify behavioral changes among participants as a result of curriculum.
d. Conduct focus groups among participants to evaluate responses to the use of the curriculum.

3) Collaborators: Heifer International (Little Rock, Arkansas), Heifer Project Nepal (Kathmandu, Nepal), Dr. Laurie Miller (Heifer International, Consultant), Dr. Beatrice Rogers (Professor, Friedman School of Nutrition Science and Policy, Tufts University), and Dr. Robert Houser (Statistician, Friedman School of Nutrition Science and Policy, Tufts University). Additional guidance and input from Nutrition Innovation Laboratory leadership (Dr. Patrick Webb, Dr. Shibani Ghosh, Dr. Jeffrey Griffiths).
4) Achievements: With the assistance of Valley Research, field enumerators enrolled 953 Households (289 assigned to Heifer plus nutrition training group, 360 assigned to training only group, and 304 assigned to control group). Baseline data was collected from 1057 mothers in these households (some conjoint households had >1 eligible mother), and anthropometry and child health information was obtained on 1300 children <5 years of age (350 from Heifer plus nutrition training group, 510 from training only group, and 440 from control group). All but 72 mothers were re-interviewed in Round 2 of data collection; an additional 17 mothers and their children were enrolled. Data cleaning and entry have been completed for baseline, and nearly completed for Round 2.
5) Capacity Building: (a) Heifer Project Nepal office and field staff, as well as the Valley Research team, have received training in Ethics of Human Subjects Research. (b) Heifer Project Nepal and Valley Research teams have received mentoring in conduct of longitudinal research. (c) Heifer Project Nepal and the Valley Research team have received

mentoring in statistical methods. (d) Nepali dieticians have been mentored in development of nutrition training curriculum.

6) Lessons Learned: We have encountered two problems which interfered with or most likely will interfere with data collection in our project area. The baseline data collection took place during July-August 2013. Round 2 data collection, which was initially scheduled for January-February 2014, was postponed until March-April 2014, due to unexpected political activity in the area which made travel difficult. Round 3 data collection is currently scheduled for November 2014, but at the end of August, the region was devastated by severe mud slides. There has been extensive loss of life, property, and livestock. At the moment, the situation is chaotic, and humanitarian aid is being provided. Although it is still more than two months away, it is unclear if the research teams will be able to work in November as planned, and it is also unclear what effect this natural disaster may have on the research outcomes.
7) Presentations and Publications: None to date.

III) **Future Directions**

Project 1A suggested that community development activities could have an indirect but significant effect on child growth. Project 1B was conducted to determine if these effects increased or decreased over time, as community-development support from an external agency (Heifer) was reduced in intensity. It was a unique opportunity to evaluate six communities before, during, and after intensive intervention activity, and assess household and child characteristics. It became clear that although some improvements in child nutrition were seen, many children in the project areas remained malnourished. However, notably, the percentage of children with underweight improved from ~50% to ~30%. It could not be determined if this was a direct effect of the Heifer activities alone, or if there was a general trend in Nepal during this time period.

Project 2 was designed to attempt to provide further (and more rapid) improvements in child nutrition via the introduction of a specific nutrition training curriculum. In addition, the study design will allow the separation of the effect of training activities provided with and without the context of community-development activities which promote social capital and women's empowerment. The hypothesis is that nutrition training in the context of a holistic scheme to improve community development and family socioeconomic status is more effective than training provided without this context. Baseline and Round 2 data collections are now complete. Round 3 will be supplemented with the first field test of a child development assessment for children ages 24-36 months. However, the recent mud slides in the region may compromise the ability of the field teams to conduct Round 3 as planned.

IV) **Work Plan**

Project 1B

Project 1B produced a large dataset describing 415 families over four years. In addition to child anthropometry, health, and educational status, the information includes detailed demographic

material, land ownership, family wealth, animal resources, household composition, hygiene practices, and household infrastructure. The availability of this information over a four-year period makes it a valuable resource. We expect to utilize this dataset to complete additional scholarly papers addressing multiple topics. The approach for each is shown in the table below:

Title	Analysis	Draft	Review with co-authors	Submit
Livestock Interventions in Rural Nepal: Effects on Child Health and Nutrition	Complete	Complete	Underway	Projected: October 2014
Head growth in rural Nepali children	Complete	Complete	Underway	Projected: October 2014
Food allocation choices in rural Nepali households	Underway	Partial		
Household animal resources and dietary diversity in rural Nepal	Underway			
Hygiene practices in rural Nepal: effect of a community development intervention	Planned			

Additional topics may be suggested by further analysis of the dataset.

Project 2

Project 2 is progressing well, although some local difficulties have been encountered. Political issues delayed the timing of Round 2 data collection. The recent mudslides have been catastrophic for some VDCs and the effect of this on our research activity is not known at present. Without factoring in possible problems from the mudslides (this cannot be assessed completely at this moment), we plan the following for the upcoming rounds of data collection:

	Data collection	Data cleaning	Data entry	Preliminary analysis
Round 3	Nov 2014	Dec-Feb 2015	Feb-Apr 2015	May 2015
Round 4	May 2015	Jun-Aug 2015	Aug-Sep 2015	Oct 2015
Round 5	Nov 2015	Dec-Feb 2015-2016	Feb-Apr 2016	May 2016

Final analyses and draft manuscripts will be prepared between May-December 2016. Depending on results of preliminary analyses, earlier manuscripts may be prepared based on interim results.

In addition, a collaboration was developed with colleagues at the Harvard School of Public Health (HSPH) to investigate the developmental status of a subset of children in this project area. The status of this project and full report were submitted to HSPH for inclusion in their year-end report to the Nutrition Innovation Lab-Asia. Please contact us with any questions about the status of this project or any of our work. We thank you for your ongoing support.

Respectfully submitted,

Laurie C. Miller, M.D.
Consultant, Heifer International
Professor, Department of Pediatrics, Tufts University School of Medicine
Adjunct Professor, Friedman School of Nutrition & Policy, Tufts University
Adjunct Professor, Eliot-Pearson Department of Child Study & Human Development, Tufts University