



Impact Assessment of a Disease Vaccination Project in Rural Tanzania

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The purpose of this study was to assess the socioeconomic impact of the Newcastle Disease and Avian Influenza Control Research Project, a chicken vaccination project designed by the GL-CRSP Avian Flu School (AFS), on villagers and households in rural Iringa, Tanzania. Findings showed that households in project villages kept significantly more chickens than households in control villages, however, there was no significant difference in income earned from chicken and egg sales between the project and control households. Likewise, no significant difference in the frequency of chicken consumption among mothers and children from project and control village households was found, yet both mothers and children from project village households consumed eggs more frequently than mothers and children from control village households. Women in project villages reported higher measures of empowerment, as well as a trend towards less household food insecurity. Interestingly, measures of support for the vaccination of chickens were greater in control villages than in project villages. In conclusion, an intervention as simple and inexpensive as vaccinating chickens for Newcastle disease can have a beneficial impact on the livelihoods and well-being of women, children and resource-poor farmers. To enable farmers to attain these benefits, policymakers and development practitioners can establish vaccination programs, facilitate farmers' access to vaccines and markets for chickens and eggs, and provide training and education programs on the best practices for chicken production along with the nutritive value of consuming poultry, eggs and other animal source foods.

Background

Small-scale, family-based poultry production can provide a practical and effective way to alleviate poverty, particularly for women and resource-poor farmers. Family-based poultry production systems are characterized by low productivity and face constraints related to high mortality and disease rates, housing, feeding, breeding, marketing, credit, education/training, and extension (Permin et al. 2004; Guèye, 2005). Despite these challenges, village chickens play a vital role in many poor rural households by providing an important source of high-quality nutrition and income with very little cost or management.

A major constraint to family-based poultry production in Tanzania is viscerotropic vologenic Newcastle disease (hereafter referred to as Newcastle disease), which is caused by a virus and is capable of causing up to 80-100% mortality in unprotected flocks (Sonaiya and Swan, 2004). Several vaccines against Newcastle disease have been developed and used to significantly decrease chicken morbidity and mortality rates. One of these vaccines, the I-2 vaccine, can easily be administered to chickens in the form of an eye-drop, is produced in Tanzania, and is relatively inexpensive. A dropper vial of the I-2 vaccine, enough to vaccinate about 400 chickens, costs 2,000 to 3,000 Tanzanian Shillings (1 USD ≈ 1,200 TSH in 2008). An increase in poultry production

can lead to an increase in household income and/or consumption of chicken and eggs, and, subsequently, an increase in household food security. Food security is defined as a state in which "all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life" (USAID 1992).

The Newcastle Disease and Avian Flu Control Project (NDAFCP), a sub-project under the GLCRSP-funded Avian Flu School, is a research project aimed at improving poultry health and production, and improving avian flu control strategies in rural Tanzania (Msoffe and Cardona, 2008). As part of the NDAFCP, Newcastle disease vaccinations were conducted in three project villages in rural Iringa Region. The purpose of this study was to assess the socioeconomic impact these vaccinations on households in rural Tanzania. Specifically, the study measured the impact that an increase in numbers of chickens has on: 1) household income from chicken and egg sales, 2) household food security, 3) consumption of eggs and chickens among children and women, 4) the empowerment of women, and 5) household support for chicken vaccinations. Three control villages were selected based on similarities (socioeconomic, location and infrastructure) to the project villages for comparison.

The study used a mixed method approach for data collection, including key informant interviews and a cross-sectional household survey. Key informant interviews were conducted in the six villages with male and female village leaders, and household interviews were conducted (n=237) with mothers having at least one child between 1-5 years of age (40 households per village selected at random).

Major Findings

There were no significant demographic differences between households in project and control villages. The mean number of chickens owned by households in the project villages was 14, while for households in control villages it was 8.4, a statistically significant difference. When respondents were asked to compare the current year to the previous year, more respondents from project village households reported an increase in the numbers of chickens raised and numbers of eggs collected compared to respondents from control village households.

To prevent diminishing immunity and to assure that all chickens above three weeks of age are vaccinated, it is recommended that chickens be vaccinated against Newcastle disease three times per year. Although the aim of the program was to vaccinate all chickens in the project villages three times during the previous year, the vaccination coverage was not as complete as intended. Approximately 20.2% of the households had vaccinated their chickens three times and 43.7% had vaccinated their chickens twice. In the control village households, 92.4% had not vaccinated their chickens during the previous year. It is interesting to note, however, that even without complete vaccination coverage project village households kept significantly more chickens. This may be because rates of immunization in the flocks were higher than actual rates of inoculation. The I-2 vaccine is a live virus that can spread from bird to bird. Further work to characterize the transmission dynamics of the I-2 vaccine in this setting is needed to fully understand the impacts of vaccination.

According to key informants, chickens are primarily used for sale, secondarily for household consumption, and thirdly, are given as gifts. Eggs are primarily reserved for hatching into chickens, secondarily for household consumption, third, for sale, and fourth, as gifts. Although a greater number of project village households sold chickens and eggs compared to control village households, overall, relatively few households sold chickens and eggs. The mean price households obtained for chickens and eggs was similar in the project and control villages. The study did not find a significant difference in income earned from chicken and egg sales between households in project and control villages. However, project village households tended to sell more eggs and showed a trend towards greater income from egg sales compared to control village households.

Regarding measures of support for Newcastle disease vaccinations, the mean amount of money respondents from households in the project villages were willing to pay to vaccinate one chicken was 99.6 Tanzanian Shillings (US \$0.07 in 2008). Respondents from households in the control villages were willing to pay 210.8 Tanzanian Shillings (or US \$0.16). When asked about the perceived importance of and benefit from Newcastle disease vaccinations, surprisingly, more control village households than project village households perceived the vaccinations to be 'extremely important' and expected they would gain a 'very large benefit' from vaccinating their chickens. These measures of support defied original study expectations. Reasoning for these findings may be twofold. First, because households in the project villages did not pay for the vaccinations, they may not have valued them. Furthermore, vaccination recipients may have been reluctant to offer any money for the vaccine, thinking that if they offered to pay they would not receive vaccinations for free in the future. Second, because of the close proximity of the project and control villages, households in control villages may have heard about the beneficial effects of the vaccinations, increasing the demand for and perceived importance of vaccinating chickens.

Women's empowerment, defined as the transfer of authority and resources to enable women to obtain greater autonomy and control, was measured by asking women respondents about the person who made decisions regarding chicken and egg use, who sold chickens and eggs, and who kept the money from chicken and egg sales within their household. In the majority of the households (89.1% of project village households and 87.3% of control village households), the female head of the household was the primary caretaker of the household's chickens. Female heads of household in project villages tended to play a larger role in both deciding whether to eat or sell chickens and eggs, and in selling chickens and eggs than in control villages. The female heads of household in both project and control villages usually kept the money from both chicken and egg sales.

There was no significant difference in the frequency of chicken consumption among mothers and children from project and control village households. However, both mothers and children from project village households consumed eggs more frequently than mothers and children from control village households.

A nine-item food insecurity scale, based on the Household Food Insecurity Access Scale (HFIAS), developed by the United States Agency for International Development (USAID) Food and Nutrition Technical Assistance (FANTA) Project (Coates et al. 2007), was used to measure household food insecurity. In brief, the scale is based on a household's experience of problems regarding access to food, and represents the various aspects, or domains, of

food insecurity found to be universal across cultures (Coates et al. 2006; Webb et al. 2006). Households receiving vaccinations had a mean food insecurity score of 8.1, while households not receiving vaccinations had a mean food insecurity score of 10.4. Food insecurity scores range from 0-27 with a high score representing greater food insecurity.

By investigating the correlations between household socioeconomic characteristics with household food insecurity and chicken and egg consumption among mothers and children, findings revealed that higher levels of maternal education, paternal education, and household wealth were associated with less food insecurity. Households with younger mothers and fewer members also were relatively less food insecure. Agro-pastoralist households were more likely to experience higher levels of food insecurity than agriculturalist households.

Maternal education was positively related to both chicken and egg consumption in mothers and to egg consumption in children. Greater household wealth was associated with higher egg consumption among mothers and children and greater chicken consumption among children. Mothers from pastoral households consumed significantly fewer eggs than mothers from agricultural households. Girls consumed both chicken and eggs more frequently than did boys.

The household socioeconomic characteristics found to be significant predictors of household food insecurity and chicken and egg consumption among mothers and children were included in multivariate models to determine whether differences in food insecurity scores and frequency of chicken and egg consumption varied when accounting for the effect of the socioeconomic characteristics. When controlling for household characteristics related to food insecurity, a statistically significant difference in mean food insecurity scores between project and control households was no longer present. Instead, project households showed a trend towards experiencing less food insecurity. However, significant differences in mother's and children's egg consumption remained.

Table 1 shows how the project village households were impacted by Newcastle disease vaccinations. Although measurements of support for chicken vaccinations were weaker in project villages and were subsequently listed as a negative impact in Table 1, it may be that the methodology used to measure support did not accurately capture support for vaccinations. In regards to women's empowerment, although female heads of household in project villages tended to play a larger role in decision-making related to chicken and egg use than in control villages, it is difficult to determine the mechanisms behind these findings and

Table 1. Summary of the impacts of chicken Newcastle disease vaccinations.

Measured Outcomes	Positive Impact	Negative Impact	No Impact
Household chicken numbers	X		
Income from chicken sales			X
Income from egg sales			X
Support for vaccinations		X	
Women's empowerment	X		
Chicken consumption			X
Egg consumption	X		
Food insecurity	X		X

in this cross-sectional study, it cannot be inferred greater women's empowerment due to the vaccination project. Lastly, food insecurity is shown as both positive and no impact because project village households were only slightly less food insecure than the control village households.

Practical Implications

In general, the vaccination of chickens against Newcastle disease appears to have a beneficial impact for rural households involved in small-scale, indigenous chicken production. Households vaccinating their chickens have a larger number of chickens than non-vaccinating households, and show a trend towards less household food insecurity. Women and children from households vaccinating chickens consume eggs more frequently than non-vaccinating households, and women may enjoy greater autonomy and control over resources due to increases in chicken production. Additional beneficial impacts, such as increased income from chicken and egg sales and increased chicken consumption might not be noticeable initially, but may develop as time progresses and with continued chicken vaccinations.

A logical progression of events due to increased chicken survival may be as follows: 1) households begin to keep more chickens; 2) a larger number of eggs are collected and consumed; 3) when household egg consumption is satisfied, households begin to sell a greater number of eggs; 4) households begin to sell chickens due to a number of reasons, such as a limited capacity for keeping chickens, the need for money, or the access to markets and/or buyers; 5) thereafter, households may begin to consume more chicken either from household stocks or by purchasing them. If this progression is accurate, then the timing of this study may have come too early to notice changes in chicken sale and consumption (*at the writing of this brief, the AFS project is conducting a follow-up evaluation led by the author*).

An intervention as simple and inexpensive as vaccinating chickens for Newcastle disease can have a beneficial impact on the livelihoods and well-being of women, children and resource-poor farmers. To enable rural farmers to attain these benefits, policymakers and development practitioners

can establish vaccination programs, facilitate farmers' access to vaccines and markets for chickens and eggs, and provide training and education to rural households on the best practices for chicken production and the nutritive value of consuming poultry, eggs and other animal source foods.

Further Reading

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Avian Flu School (AFS) was created to address the need for a train-the-trainer program to disseminate the knowledge necessary to minimize the health and economic impacts of H5N1 HPAI by improving the ability of a country, district or community to prevent, respond to, and recover from an outbreak. The project is led by Dr. Carol J. Cardona, University of California, Davis. Email: cjcardona@ucdavis.edu.



The Global Livestock CRSP is comprised of multidisciplinary, collaborative projects focused on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk in a changing environment. The program is active in East and West Africa, Central Asia and Latin America.

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