A Collaborative Research Project Funded by:

DFID Department for International Development

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Animal Source Foods and Nutrition of Young Children: An ex ante analysis of impact of HPAI on nutrition in Indonesia

HPAI Research Brief | No. 2 – Year: 2008

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Key Findings

- ASF plays an important role in the nutrition of young children. Milk consumption was associated with reduced stunting and underweight, increased weight-for-age, height-for-age scores, and hemoglobin concentration.
- Meat/poultry at any frequency of consumption was associated with reduced anemia.
- Eggs (any/4+/7+) was associated with reduced anemia, eye infection, diarrhea, and ARI.
- Fish (any/7+) was associated with increased hemoglobin concentration and reduced eye infection.
- Poultry product consumption shock through HPAI shown to increase anemia risk by 9 percentage points and increase stunting risk by 14-percentage-points and decrease H b concentration by 0.46 g/dl.

One aspect of livelihood in developing countries that has been largely neglected is the effect of HPAI disease, prevention, and control strategies on nutrition. An HPAI outbreak may have income and price effects that could influence the consumption of all food commodities and hence, the nutrition of household members. Perhaps more importantly, an HPAI outbreak can lead to discrete changes in preferences away from poultry, implying a consumption shock to poultry products.

Infants and young children are likely the most vulnerable to the nutritional consequences of an HPAI shock. The recent landmark *Lancet* series on Maternal and Child Nutrition reported that 32 percent of all children living in developing countries who are less than five years of age are stunted, 19.3 percent are underweight, and 3.5 percent are wasted. It is usually in the early stages of the complementary feeding period (between 6-12 months of age) when infants from resource-poor settings experience marked growth faltering—as solid foods are introduced into the diet and infectious disease exposures increase (Shrimpton et al. 2001). This is also the period when micronutrient deficiencies may arise, in particular for those micronutrients that are inadequately provided by breast milk.

Animal source foods (ASFs), of which poultry products are a part, offer both higher concentrations and more bio-available matrices for critical micronutrients when compared to plant-derived foods. Thus, the presence of ASF in the diet can be an efficient delivery mechanism during periods when requirements are high (pregnancy, lactation, early infancy and childhood, and adolescence). Poultry meat, for example, is a good source of heme iron and zinc, while eggs provide preformed vitamin A (retinyl ester), vitamin $B_{12,}$ and riboflavin in forms available for absorption.

In considering the possible impact of HPAI on child nutrition in Indonesia, it is thus imperative to understand the role played by poultry (meat and eggs) in conjunction with other ASFs in child nutrition. This brief analyzes the role played by poultry and other ASFS in the determination of nutritional outcomes such as wasting, stunting, being underweight, or being anemic. It also assesses the impact on continuous markers such as hemoglobin concentration. The analysis is based on the 2000 Indonesian Family Life Survey (IFLS-3).

Role of poultry in nutrition outcomes

Consumption of ASFs, including poultry products

High proportions of children ages 6 to 36 months from this sample were reported to have consumed some form of ASF in the last week, using a seven-day recall method given to caregivers. . After one year, there were large increases in the proportion of children consuming ASFs, with the exception of milk. Eggs were the most widely consumed ASF after one year, while milk consumption was more highly prevalent from 6 to 11.9 months. Meat and poultry consumption remained low for all age categories, especially for children from the poorest households. Differences in meat/poultry frequencies by per capita expenditure (PCE) quartile are more marked than the other food groups. In children more than a year old, eggs and fish are more evenly spread than the other food groups, and consequently, demonstrate more variability across frequencies; the PCE quartile differences are also attenuated. Milk consumption demonstrates a U-shaped distribution, with higher proportions reported in the upper and lower frequency categories in all three age categories. By the second year of life, the largest disparity in consumption between the poorest and richest households is in milk.

Other food group categories were assessed, including fruits and vegetables that might supplement the quantity or enhance the absorption of particular micronutrients. While half of the children had had vegetables seven or more times in the previous week, 20 percent had none: 46.5 percent of the children had carrots, 16.9 percent had mangos, and 43.7 percent had papayas one or more times in the previous week.

Nutritional Outcomes

Mean height for age (HAZ) in this population was -1.14 (±1.81), mean weight for age (WAZ) was -0.86 (±1.33), and mean weight for height (WHZ) was - 0.29 (±1.61). The mean hemoglobin concentration was 10.2 (±1.47). Among all children, 30 percent were classified as stunted, 17 percent as underweight, 11 percent as wasted, and 65 percent as anemic. Hence, anemia is most prevalent problem in this sample of children. Prevalence of undernutrition varied by age, with the exception of wasting**.** For children between the ages of 12 and 36 months, being in the upper PCE quartile reduced the odds of stunting, underweight, and anemia.

Effect of ASFs, including poultry consumption, on children's nutrition outcomes

The consumption of meat or poultry showed a significant protective effect on childhood anemia, which is highly prevalent among young children in Indonesia. Milk consumption showed a significant negative association with a child being classified as underweight or stunted and was associated with improved anthropometric outcomes. In case of WAZ, HAZ, and WHZ scores and hemoglobin concentration no significant impact of meat/poultry or egg consumption was observed**.**

The consumption of eggs at least four times in the previous week was negatively associated with diarrhea and eye infection morbidities after adjusting for other factors, including consumption of vitamin A-rich fruits and vegetables and vitamin A supplementation. The consumption of fish seven or more times protected against eye infection. Boys were at higher risk for eye infection and diarrhea. Increasing age decreased the likelihood of fever and diarrhea. In the case of acute respiratory infection alone, the consumption of eggs seven or more times in a week showed a significant protective effect.

Impact of HPAI on child nutrition

Based on the restricted data where a dependence on poultry is not clearly identified and only participation is observed, the income effects on nutrition from a HPAI shock are likely to be small. A very specialized type of shock—one time, moderate (in the range of 10-30-percent reduction), concentrated on poultry farmers—is likely to have a small impact on nutrition. This kind of an income shock was implemented in the analysis.

Even though in the aggregate, the income shock to the poultry growers is not a significant factor for altering nutrition outcomes, a few considerations apply. First, within the class of poultry growers there are likely to be some households for whom the share of poultry in income is high, and hence, the nutrition of these households and their children is likely to be affected. Unfortunately, the current dataset does not allow for a distinction across households in terms of the importance of poultry.

Second, poultry growers are only a segment of the poultry-supply chain; others are also likely to be affected by HPAI. Ignoring these households and the children in those households is an underestimation that in some contexts could be very important.

Finally, the magnitude of shocks and their persistence will determine the overall impact on nutrition. The shocks as modeled here are transitory and hence, only instantaneous impacts are assessed. In modeling consumption shocks, there is an implicit assumption of shocks being persistent where changes in weekly consumption are used to ascertain effects on nutrition. Even when they are of identical magnitudes, persistent shocks will magnify the impact on nutrition through starker adjustments in consumption patterns.

A drop in PCE affects the consumption of all food products (including other ASF), not only poultry products. Additionally, PCE has independent effects on nutrition outcomes, such as through access to information and services, and also on the quality of the food consumed. With persistent and greater magnitudes of shocks, the cumulative effect on nutrition will magnify.

Modeled as a consumption shock, HPAI is postulated to have a significant impact on the concentration of stunting, anemia, and hemoglobin in the case of children in similar situations (in terms of household characteristics, for example). In the case of hemoglobin concentration, the difference between the treated and control group implies that because of poultry consumption per se, the concentrations are higher on average by 0.46g/dl. Since the children in these households are most likely to drop poultry consumption to zero, the outcome in terms of hemoglobin concentration could worsen. In the case of the dichotomous outcome variables (stunting and anemic) the probability that children will be stunted or anemic will likely be lower by 14 and 9 percent, respectively, relative to the control group.

Future Research Directions

The brief, which is based on preliminary analysis, suggests an important potential impact of HPAI. IFLS-4, which is likely to become available soon, has a specific module on Avian Flu. Information directly linking nutrition with income and consumption shocks will be become available. The data will possibly allow also us to distinguish the time periods in terms of endemicity of disease that has happened in Indonesia.

Acknowledgement: This Research Brief has been extracted from L. Iannotti, M. Barron, and D. Roy, Animal Source Food Consumption and Nutrition Among Young Children in Indonesia: Preliminary Analysis for Assessing the Impact of HPAI on Nutrition. Available on www.hpai-research.net..

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