Social determinants of health: Food fortification to reduce micronutrient deficiency in Uganda

Strengthening the National Food Fortification Programme

David Ouma Balikowa
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Executive Summary

Problem
By 2007, 69% of Uganda’s population comprising Women of Reproductive Age (WRA) and children under 15 years suffered inordinate levels of micronutrient deficiency. These high levels are largely attributed to the inability of most households to afford foods rich in vitamins and minerals. As a result, there is a relatively high incidence of iron deficiency anaemia, accounting for 20% of maternal deaths and poor cognitive development in babies and young children.

In mitigation, the Global Alliance for Improved Nutrition (GAIN), in 2007, extended a $2.4 million grant to the government of Uganda to bolster a national effort to reduce prevalence of iron deficiency anaemia in women of reproductive age and children aged below 15 years.

Over a three-year period, this grant supported the Strengthening the National Food Fortification Programme in the enrichment of three widely consumed foods: vegetable oil, maize and wheat flour. Vitamin A was introduced into vegetable oil processing, while a range of vitamin B-12, B-1, B-2, B-6 additives along with zinc, iron, niacin, folic acid and Vitamin was infused in wheat and maize flour milling.

Project targets were a reduction in iron deficiency anaemia from 34% to 29% amongst women of reproductive age, and from 64% to 57.6% amongst children under 15 years. It also aimed at reducing Vitamin A deficiency from 50% to 42.5% among WRA, and 28% to 25.2% in children under 15 years.

A National Working Group on Food Fortification (NWGFF) drawn from the health, agricultural, education, industry and trade sectors, was formed to plan and coordinate the multi-sectoral action.

Impact
A complete picture is yet to be gained of the full extent of the project’s outcome. However, 85% of all vegetable oil on the market is now fortified with vitamin A. Between 20% and 30% of wheat flour on sale is fortified. Agitation is mounting for regulation which will make it mandatory for a specified capacity of all edible oil and fats, wheat and maize flour produced in the country to be fortified according to Uganda standards. Local technical capacity has also grown.
Key lessons
Public-private sector cooperation is possible where it is needed to address a public health issue. It would especially work seamlessly where a given industry is less fragmented making it easier to negotiate participation. Food fortification also revealed itself to be the better and more cost effective answer to micronutrient deficiency. The experience with food fortification provides good ground for a case study in dealing with other social determinants of public health problems using the multisectoral approach.

MICRONUTRIENT DEFICIENCY PROBLEM IN UGANDA
Consistently low intake of vitamins and minerals is responsible for high levels of micronutrient deficiency amongst 69% of Uganda’s population, with 46% of children younger than 15 years, and 23% of women of reproductive age (WRA), invariably affected. By 2007, iron deficiency anaemia was pronounced amongst 34% of WRA, and 64% among children under 15 years. That year, vitamin A deficiency stood at 50% among WRA and 28% in children under 15 years (UNBS, 2007).

Anaemia increases maternal deaths
Iron deficiency anaemia is common among WRA (both pregnant and breastfeeding women) especially because most households cannot afford iron-rich foods like fish, meat and eggs in their diets. Consequently, up to 20% of maternal deaths are attributed to anaemia. The situation is compounded by rampant malaria (insecticide-treated net use among pregnant women is less than 10%) and HIV/AIDS (prevalence estimates of 7% in 2009) which depletes red blood cells. This increases the risk of death during pregnancy or child birth.

Maternal anaemia is cited as a major cause of fatigue and poor mental concentration which affects the health and, ultimate productivity of women. Anaemia also impairs cognitive development in infants and children. Later in life, this affects their education and, in the long run, inhibits productivity, thus perpetuating the cycle of poor health and poverty in the country.

To ensure the integrity of blood in mothers, MoH provides sulphate and folic acid tablets to women at the health centres during pregnancy and three months after delivery. However, besides being costly, access is not guaranteed and adherence is compromised by poor attendance of antenatal clinic (4 visits at 47%; UDHS 2007). Where available, mothers rarely followed recommended doses.
Because of the limitations associated with iron, folic acid and Vitamin A supplementation, a preventative approach was considered to address the underlying causes of micronutrients deficiency.

**Interventions**

In 2004, the MoH adopted food fortification to strengthen foods and also promoted it as a response to malnutrition. Three years later, the Strengthening the National Food Fortification Programme followed in 2007. Fortification was chosen as a strategy in the quest to try and solve a major public health problem by adding vitamins A and B12, iron and folic acid to particular foods known to be consumed on a large scale.

The project expected to reduce prevalence of iron deficiency anaemia from 34% to 29% among women of reproductive age, and from 64% to 57.6% among children under 15 years. Vitamin A deficiency reduction was planned from 50% to 42.5% among WRA, and 28% to 25.2 among children under 15 years.

It was anticipated that Uganda’s disease burden would be significantly reduced thus enhancing prospects for the realisation of the right to health by vulnerable groups. Additionally, public expenditure on importation of supplements to treat micronutrient deficiency would reduce. Resulting improvements in health would expectedly raise household and national productivity.

**THE UGANDAN CONTEXT**

Uganda is located in East Africa and occupies 241.039 sq. km. The country is predominantly agricultural with the majority of the population dependent on subsistence farming. Due to climatic changes, high population growth rate (3.2%), depletion of soil nutrients as a result of land over-use and increased reliance on traditional food crops for income, household food insecurity is on the rise. The majority of households cannot afford micronutrient-rich foods such fish, eggs, meat and milk.

**Burden of disease**

The country’s burden of disease is still enormous. Malaria is the major communicable disease in Uganda and is responsible for the high infant mortality of 79 per 1,000 live births (UBOS, 2007).
Maternal mortality stood at 435/100,000 births by 2010. By 2009, up to 1,192,372 individuals had been affected with HIV while 64,016 people had died from HIV/Aids related causes (MoH, 2010).

A number of interventions, though limited, have improved Uganda’s health situation. Between 1995 and 2005, infant mortality reduced from 85 to 75 deaths per 1,000 live births, and under-five mortality from 156 to 137 deaths per 1,000 live births. Although wasting increased from 4% to 6%, under-weight prevalence declined from 23% to 16%, and stunted growth from 41% to 32% in the same period (MoH July 2010).

The burden of disease in Uganda is linked to socio-economic factors. While the country’s population grew from 4.8 million in 1960 to 24.3 million in 2002 (2011 estimates at 34 million), failure to have corresponding economic growth is accelerating poverty, exposing the poor majority to a host of killer but preventable conditions such as under-nutrition (UBOS, 2007). The UBOS has observed a direct relationship between malnutrition and poverty (UBOS, 2006). Low levels of education (little knowledge of nutrition) and negative cultural beliefs aggravate the problem.

**Food fortification history**

With 96% of households reported to be consuming iodised salt by 1995, the government decided in 2000 to expand fortification to other food products commonly consumed in the country (UBOS, 2007). An Industry Assessment Report in 2001 identified maize flour and oil/fat as possible candidates for fortification with vitamins A, B complex and iron (maize) and vitamin A (edible oil and fat) because they are massively consumed.

The MoH in 2002 established a multi-sectoral NWGFF to champion the drive to reduce micronutrient deficiency. The Strengthening the National Food Fortification Programme – a voluntary public-private sector partnership – was born out of the continued search for ways to increase regular consumption of fortified foods by the most vulnerable groups in the country.

**FOOD FORTIFICATION PLAN**

In 2007 Uganda, under the Strengthening the National Food Fortification Programme, received a three-year $2.4 million grant from the Global Alliance for Improved Nutrition to fortify vegetable oil
with vitamin A; maize and wheat flour with vitamin A, folic acid, vitamin B-12, B-1, B-2, B-6, niacin, zinc and iron.

A country food consumption survey was carried out in 2008 to determine the dietary patterns of Ugandan women and children. The Makerere University Department of Food Science and Technology, one of the partners responsible for monitoring and evaluation, provided the principal and co-investigators. Findings confirmed inadequate intake levels for five vitamins and minerals critical to good health (Harvey et al, 2008).

**Project goal:** To improve the health, productivity and cognitive function of people in Uganda.

**Objective**
The objective was to increase regular consumption of fortified foods among the target groups in Uganda.

**Target group and coverage**
The project covered women of reproductive age (WRA) and children aged below 15 years who make up an estimated 69% of Uganda’s total population and are considered to be the most vulnerable.

Enriched vegetable oil and wheat flour was to be made available to 7,649,400 and 6,371,460 people at risk per year, respectively. A total of 20,520,000 (80%) and 12,312,000 (43%) people at risk, respectively, were supposed to have been reached by 2011. The figures were calculated basing on market share of the participating oil and wheat flour private sector concerns.

On the other hand, 220,000 school children receiving World Food Programme (WFP) supplies were targeted with fortified maize flour. Simultaneously, participating private maize millers would supply fortified flour on the open market. Participating industries were chosen on the basis of their capacity to produce fortified flour. Where required, necessary equipment and fortificants (premix) were provided free of charge to wheat and maize flour millers.
Planned outcome

Based on the baseline food consumption survey, a target was set to reduce prevalence of iron deficiency anaemia from 34% to 29% among women of reproductive age, and from 64% to 57.6% among children under 15 years. Vitamin A deficiency reduction was projected from 50% to 42.5% among WRA, and 28% to 25.2 in children under 15 years by the year 2011.

Participating stakeholders

Several interested parties both in the public and private sector were invited into the project. A National Working Group on Food Fortification (NWGFF) was formed to plan and coordinate the multi-sectoral action and promote a true partnership.

Implementation was focused under five components encompassing the health, agricultural, education, industry and trade sectors (public and private). Its components included production and industry quality control and assurance, legislation and policy development, social marketing and communications, monitoring and evaluation.

The NWGFF set-up enabled collaboration between experts, policy and lawmakers and the public sector. Production and industry component was assigned to the Food Biosciences Research Centre (FBRC) based at the National Agricultural Research Laboratories under the Ministry of Agriculture; food control to Uganda National Bureau of Standards (UNBS) and National Drug Authority (NDA) under the Ministries of Industry and Trade, and Health respectively; communication and social marketing to the MoH and Uganda Consumer Protection Association (UCPA); and monitoring and evaluation to Makerere University Department of Food Science and Technology under the Ministry of Education.

Partnership of ideas, interests

NWGFF meetings helped clarify assumptions and arrive at more result oriented decisions. Initially, it had been assumed that maize flour would be a more effective vehicle for food fortification because it is widely consumed in homes and schools. However, the food industry corrected the view, showing that unlike maize milling which involves thousands of small millers who are scattered around the country, wheat flour is controlled by few big players through whom the project could be diffused.
Wheat is widely used to bake bread, cakes, buns, chapati etc which have become affordable staples in homes. It was, therefore, realised that wheat flour fortification was more effective. The alliance also exploited networks and trust established in between some stakeholders over years of intersectoral cooperation. This way, the alliance was able to convince the private sector that fortification was good for their businesses and the health of their consumers.

Communication and social marketing strategy
An already existing 2004 national food fortification communication strategy was adapted to the micro-nutrient deficiency effort. The resulting approach mapped activities to raise awareness of food fortification benefits. It also intended to debunk suspicions about side effects associated with fortified foods, and to inform people about availability on the market.

Several activities were also planned for the secondary audience – the industry – to address ignorance about fortification, perceived high cost of fortification and a belief that there is inadequate demand for fortified foods. These included positioning the Food Fortification Logo to both the consumer and industry (producers and distributors) as a “must have” through preferred communication channels.

PROJECT IMPLEMENTATION
To get the process underway, the MoH signed memoranda of understanding with assorted partners involved with the key components of production and distribution and; quality control and awareness; and monitoring and evaluation. The memoranda spelt out their roles and responsibilities.

Food production and industry
The FBRC visited producers to recruit food processors who would participate in the project and also to find out areas where additional support was required. The recruitment promise was that food fortification was good for business and the health of their consumers.

Needs identified ranged from training in food handling; fortification and hygiene; and infrastructure necessary to fortify food products. Some of them already had the basic equipment like dosers for mixing the micronutrients on-site. An additional incentive was the offer of premix, free of charge, to get the food processors started.
Along the way, another large scale producer of vegetable oil, Bidco, entered the industry. Bidco voluntarily took up fortification at its own cost possibly upon realising that its products would suffer a comparative disadvantage in a market where Mukwano Industries was already fortifying its vegetable oil.

Joint meetings were convened for processors of similar foods to promote openness, sharing of knowledge and interests. For example, because all wheat flour millers have dosers, a meeting of all the processors made them realise a common interest and embrace food fortification followed by signing of a memorandum of understanding. But not every wheat miller approached came on board, though. Only four out of the 11 wheat millers participated in the project. Some said they would start fortification only if it became mandatory. This reduced the market coverage to between 20-30%.

These meetings were also used to insinuate the cross-cutting roles of quality control, monitoring and evaluation into the activities of processors.

The implementation phase went through trials of premixes with vegetable oil, wheat and maize flour and reformulated where necessary. Valuable insights were gained through the back and forth consulting process, winning the trust of partners. This way, the alliance was able to convince the participating private sector processors that food fortification made business sense and was good for the health of their consumers.

**Quality control and assurance**

At the start of the project, the UNBS did not have sufficient technical capacity to carry out quality assurance and control. The project helped UNBS recruit two officers and set up a desk on food fortification quality assurance and control. UNBS standards officers toured factories assessing and certifying their suitability for fortification, as well as ensuring compliance with good manufacturing practices.

It also developed the testing and inspection protocol and frequently inspected and tested the fortified foods at both the industries and in the market to ensure compliance. The UNBS carried out studies on the integrity of the standards and made suggestions for further development. UNBS also
disseminated to food processors policies, regulations and standards on food fortification, which Uganda had previously developed. For example in 2010 UNBS sampled oil/fat, wheat and maize at the fortifying industries and at the retail markets throughout the country. The findings found out that fortification of cooking oils is making Vitamin A accessible to the population. It however noted that the key challenge of low industrial participation in flour fortification needed to be addressed if wheat flour were to be “successfully and sustainably” be fortified in Uganda (Eboku et al, 2011).

The NDA in line with its mandate, worked to ensure the quality and safety of the fortificants (premix) added to the foods.

**Communication and social marketing**

Part of the communication and social marketing component was executed by the MoH (Health Education and Promotion Division), with certain specific activities carried out by the Uganda Consumer Protection Association.

Since Uganda already had a communication strategy for food fortification developed in 2004, it was essentially reviewed in order to suit the new realities uncovered by the national food consumption and formative qualitative studies. Unfortunately, the communication strategy was delayed and came when the project was in its last year. Information, Education and Communication materials were developed and disseminated via radio, television and print media including posters and other specific information packs.

A logo with the words “Fortified Foods Added Value” with the letter F in the middle was developed and used to brand all fortified foods and information materials. The public was asked to look out for and choose fortified foods with this logo.

The key selling point of food fortification to the public was in the boost to education engendered through improved school attendance by pupils/students, concentration and performance in class, dramatic improvements of mental and motor skills, and increased productivity through increased mental and physical abilities.
Participating alliance partners felt that if more consumers had been made aware of the benefits, and had made informed choices when making purchases, the resulting market forces of demand would have forced non-participating food processors to start fortifying.

**Monitoring and evaluation**

Makerere University’s Department of Food Science and Technology was assigned the monitoring and evaluation function in close collaboration with MoH. The department provided the principal investigators for the 2008 Uganda Food Consumption Survey which was used as a baseline for the implementation of activities by the NWGFF. They also, in conjunction with the project partners, carried out periodic monitoring of the activities.

**RESULTS**

A comprehensive view of the impact the food fortification initiative has had on the micronutrient status of WRA and children below 15 is yet to be ascertained. However, a year to the close of the project, fair results are already evident. Up to 85% of the oil on the market is now fortified with Vitamin A. An industrial sampling by UNBS in 2010 found average concentration of Vitamin A in oil at 6.25mg/100g. While the overall concentration of vitamin A in 817 oil samples in the market during the first two rounds of surveillance was 5.02 mg/100 (Eboku et al., 2011). The findings indicate that fortification of cooking oil and fat has increased access of Vitamin A to the population. It has been possible to achieve such a significant level of fortification because the vegetable oil industry is less fragmented with only four major processors accounting for 85% of the market share.

Notably, after the market leader (Mukwano Industries) having fortified her oil product, the other major new entrant (Bidco) saw this as a competitive advantage and straightaway opted for fortification on its own. Neighbouring South Sudan and Rwanda which rely on vegetable oil imports from Uganda have their markets saturated with fortified cooking oil.

Only four big wheat millers with a combined market share ranging between 20% - 30% are participating, reflecting a similar percentage of flour on the market now fortified. An industrial and market sampling by UNBS in 2010 found fortified wheat flour in conformity with the standards. However, the millers who are fortifying want mandatory fortification for domestically produced and imported wheat flour.
Because the project subjected the food processing industry to high levels of scrutiny by the various arms of the alliance, processors have significantly improved their hygiene.

Some food processors and retail outlets reported an increase in sales as consumers who are aware of the benefits look out for fortified foods. This was true for maize. Despite the industry being fragmented, some stores that specifically stock fortified maize flour reported running out of stock often. They partly attributed this to media announcements which mentioned Maganjo maize flour as among those foods that are fortified.

Several food processors have acquired capacity (skills and equipment) for fortification. As the end of the project looms, and with free pre-mix incentives no longer being offered, participating partners in the private sector continue to fortify their products at their own cost. They have bought the equipment which was lacking, improved the skills of the personnel and are realising the benefits of food fortification.

While the NWGFF had been established years before, the project provided an opportunity for it to be tested at national level. The alliance has subsequently established influence in both the public and private sector which can be used to drive the cause for fortification through the improved policies and regulation such as the push for mandatory fortification of selected domestic and imported processed foods.

A strong thinking has evolved among participating private sector firms of the twin need to make fortification mandatory and also to protect the local market against unfortified food imports.

**LESSONS LEARNED AND WAY FORWARD**

Visible results so far demonstrate that it is possible to work with the private sector to address a public health problem, especially if a multi-sectoral approach is used to build bridges between common interests and values.

The experience should be used to foster a food processing industry which is sensitive to health both as a business and social goal. While the MoH has previously been involved in other sectors such as agriculture and education, food handling was a new territory for it to venture into. The approach
should be emulated in addressing the social determinants of other public health problems where the other sectors are the major stakeholders.

As the country strives to address the wider social determinants of micronutrient deficiency such as poverty, food insecurity and low education, food fortification presents a better approach to the problem compared to relying on the medical approach of providing supplements which are costly, not universally accessible and sometimes late.

It is gratifying to note that both the food processors who participated and those who did not are calling for mandatory fortification. Those who never participated say they would do so if it was mandatory. While those who participated say food fortification ought to be treated like immunisation which is mandatory because of its strong disease prevention benefits. Therefore, while exploring this option, some food processors suggested that making food fortification an East African Community Common Market agenda would help level the playing field and also widen the health benefits in the region.

In dealing with the private sector, it was learned that the less fragmented the industry the easier it becomes to engage and win them over for a public cause. The success in the vegetable oil industry demonstrates that similar gains could be made with other food sectors such as the sugar industry dominated by a few major players.

Food retailers hold a strong position in the food chain. Besides deciding what type of foods to stock, they are a pivotal communication point in influencing the consumption habits. They, therefore, ought to be a key target of communication efforts as the food fortification drive continues.

Overall, the food fortification initiative has demonstrated that a multi-sectoral approach can foster and harness voluntary participation, initiate policy and regulatory framework development, and prepare the country for mandatory food fortification. It also provides a structure (multi-sectoral approach) for engaging other public and private sector players to make them realise the importance of investing in tackling the social determinants of health.
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