Maternal and Young Child Nutrition Adversely Affected by External Shocks Such As Increasing Global Food Prices¹,²

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Abstract

Rising food prices, resulting from the ongoing global economic crisis, fuel price volatility, and climate change, have an adverse impact upon the poor, especially those in food-importing, resource-limited countries. The conventional approach by large organizations has been to advocate for increased staple crop yields of mainly cereals. High food prices are predicted to continue to at least 2015. Past shocks and their known impacts upon nutrition were reviewed. Price instability and increases have long been an existing global problem, which has been exacerbated by recent macroeconomic shocks such as acute emergencies due to war and civil strife, acute climatic events, increase in food prices, fuel price volatility, dysfunction of the global financial systems, long-term climate change, and the emergence of failed states. The FAO estimated that there were 815 million “hungry” people in 2006, with a now additional 75–135 million with increased vulnerability, and currently it is estimated that there are one billion people at risk of food insecurity. The shocks initially compromise maternal and child nutrition, mainly through a reduction in dietary quality and an increase in micronutrient deficiencies and concomitant increases in infectious disease morbidity and mortality. A further reduction in the quantity of diet may follow with greater underweight and wasting. Recent macroeconomic shocks have greatly increased the number of people who are vulnerable to hunger in developing countries. Nutritional surveillance systems need to be strengthened and expanded to inform policy decisions. J. Nutr. 140: 162S–169S, 2010.

Background

It seems likely that the ominous combination of rising food prices, unstable fuel prices, and a global financial meltdown received so much attention because it is the wealthier nations that are being affected in a way they have not in the recent past. In 1988, there was a similar attempt to address these sorts of problems in an intersectoral way, but it was specifically addressed to policy in the developing world (1). Ten years later, much of Asia suffered massive financial problems and nutritional impacts of these were identified (2) with the same concerns of a “lost generation,” and the inadvisability of some of the financial advice was identified, but little else seems to have been learned from that experience (3).

Food prices have surged in the last 2 y but were artificially low for some decades and had been slowly rising for some years. Among other shocks, rising food prices are threatening global gains in poverty and hunger reduction achieved over the last 2 decades (4). The FAO index of food prices rose by 9% in 2006, 24% in 2007, and then surged by 51% in 2008, although there has been some correction more recently, partly as a result of declining fuel prices. FAO forecasts that the world will spend US $1,035 billion on food imports in 2008, US$215 billion more than in 2007 (5). This is already straining the budgets of low-income food-deficit countries as their import bills rose by >40%.

The impact of food price increases, the global financial crisis, and environmental and climatic change are multiple, affecting...
people’s lives and national economies. As is usual, it is the poor that are most affected. While the rural areas have disproportionate numbers of poor, it is the urban poor who are dependent on food purchases. Although the rural poor are also net purchasers of food, they have more ways of accessing food than their urban counterparts. Increasing food prices can benefit those whose livelihood is dependent on agriculture, but for others, the impact is more serious. Although 61% of the world’s population is projected to live in urban areas over the next 3 decades, three-quarters of the poor will remain in rural areas. This paper will examine the impact of increasing prices on the general quality of life and on health and nutrition.

An existing global problem
Food price instability exists against a backdrop of lingering poverty and food insecurity. FAO estimated 815 million people were hungry in 2006 and estimates of increased vulnerability due to the recent events range from 75 million to 135 million more people. FAO now estimates that there are over a billion people at risk of food insecurity (5). A consequence of an extra 100 million people being pushed back into poverty in 2008 will erase at least 4 y of progress toward the Millennium Development Goal 1 target for the reduction of poverty (7). The household-level consequences of this crisis are most acutely felt in low-income, food-deficit countries where a 50% rise in staple food prices causes a 21% increase in total food expenditure, increasing on average to go from 50 to 60% of total income (8) or even higher. In a high-income country, on the other hand, this rise in prices causes a 6% rise in retail food expenditure, with income expenditure on food rising from 10 to 11%. Food purchases represent a several-fold proportion of the family budget for the poor, with many households spending ~70% of their expenditures on food.

More than one form of shock
There are at least 6 macroeconomic and other shocks that have hit at much the same time and all have the potential to affect nutrition, especially of vulnerable groups. They include: 1) acute emergency situations such as those of war and civil strife and those caused by short-term climatic events such as drought and tornadoes; 2) the increases in food prices; 3) fuel price increases and volatility; 4) the global dysfunction of the financial system; 5) longer-term climate change and environmental failure, including increased soil salination; and 6) chronic profound situations such as failed states/systems.

The impact of food shortages and price increases can have an effect at 3 levels, at least: 1) individual health, growth, and development; 2) family intra-household distribution and other coping mechanisms; and 3) a national level, resulting in a slowing of economic development, increases in social inequities, and social dysfunction. All of these have the potential to become a cycle in which the worsening food price system feeds back on itself in terms of inadequate diets through worsening access, leading to inadequate nutrition, reduced immunity (9), increased risk of disease, and less access or availability to food (10) and so on.

Although food security and nutrition are linked, simply ensuring access to an adequate quantity of food does not guarantee adequate nutrition, particularly adequate intake of essential micronutrients. Consequently, the emphasis by the international community on increasing staple crop yields, mainly cereals, including support and funding for a new green revolution for Africa, although necessary, will not of themselves be enough. This is because, as seen later in the paper, it is the quality of the diet that will be affected first, especially for vulnerable groups. The paper will also briefly examine possible winners and losers, the most vulnerable groups affected, the effect of the shocks on diet quality and quantity, coping mechanisms, impact on nutritional status of affected groups, and will, finally, make some conclusions.

Acute emergency situations such as war, civil strife, drought, tornadoes, etc. The nutrition risks and impacts of such situations on people directly and indirectly affected, including those in refugee camps, are well described and may differ from more chronic situations. Displaced people are susceptible to undernutrition, because they frequently depend on food supplies through food aid that for a variety of reasons may be inadequate both in quantity and quality (11).

Food price increases. The World Bank and others have estimated that food price increases over the past few years have driven 100 million people into poverty, reversing the gains of the last decade (12). It was further estimated that the food price increases would negatively affect 2 billion people, an even higher figure than earlier estimates, with a risk of losing a generation. One result has been increasing civil unrest in many countries, not only confined to poorer nations. It also remains to be seen if the food price increases will result in the continuing poverty of poor farmers, but any gains will probably depend on whether the crops they are growing are part of global markets and international trade (3).

The World Bank has also predicted that although food prices will continue to fluctuate, prices will stay high, above 2004 levels until at least 2015 (12). One outcome of this is that countries are in the process of reverting to the 1970s food policies of national self-sufficiency, which the World Bank sees as a negative trend, but this view is not shared by increasing numbers of affected governments. The shift away from national food sufficiency has been a global phenomenon; international cereal, wheat, and rice imports have more than tripled since the 1960s. As described elsewhere in this supplement, the shift is attributed to sustained food demand from emerging markets, increased animal source food consumption, and biofuel mandates (12), although at nothing like the levels unsustainably used in affluent countries for many decades now.

The causes of the price spikes are crop specific (13). Drought and disease in 2007 caused wheat prices to jump and supplies of edible oil were reduced as U.S. farmers reduced soybean production to increase the acreage for maize intended for ethanol. A spike in the price of rice was driven by export bans in some countries that were aimed at helping contain domestic food price inflation in exporting countries but had the unintended effect of setting off panic as supplies to the world rice market were sharply reduced. Timmer (13) concludes that “it seems unlikely that world food prices will return to the declining trend seen between the mid-1970s and the first few years of this century. It is however, interesting that even the highest price levels experienced in 2007 and 2008 were substantially lower than the peaks of the previous world crisis in 1973–74” (13). In fact, real prices in mid-2008 for maize, wheat, and rice remained well below what was considered normal until the full impact of the green revolution was felt in 1980 (13). Another significant factor contributing to decades of relatively low food prices was cheap fossil fuels that became an integral part of modern agriculture.

At the same time, global food production doubled in the past 40 y, as had production per capita; global trade in food grew...
from $US 224 billion in 1972 to $US 438 billion in 1998. Food constituted 11% of global trade, a percentage higher than fuel. Simultaneously, as incomes were rising, so was urbanization and changing preferences that have raised domestic consumer consumption of more vegetables, fruits, fats, sugar, meat, dairy, and fish compared with grains and other staple crops. However, it is now the poor who are increasingly bearing the brunt of the resulting epidemic of obesity, diabetes, and other noncommunicable diseases, often while their infants and children continue to suffer undernutrition, resulting in the double burden of malnutrition. It is likely an increased reliance on “fast” and imported foods has led the urban poor to increased dependency and hence higher risk of the food and price shocks as have been recently seen.

**Fuel price increases and volatility.** The increased price of inputs linked to oil is a major concern, because it discourages smallholders to invest in fertilizer and seeds, and it is these smallholder farmers who supply most of the food in poorer countries. The reliance on fossil fuels as an integral input in modern agriculture has resulted in a profound impact of even modest increases in fuel prices. The upward trend in fuel prices will continue to put pressure on agricultural systems throughout the world. Most importantly, the gradual rise in food prices since at least 2004 has been due to 3 fundamental factors: rapid economic growth in large populations in China and India that has put upward pressure on prices as demand exceeded supply; a sustained decline in the U.S. dollar since the mid-decade added to the pressures on dollar-denominated international market prices; and a combination of high and rising fuel prices coupled with legislative mandates and subsidies designed to increase production of biofuels, thus establishing a firm link between petroleum process and food prices (13).

**Financial system volatility.** There are at least 4 effects of the financial crisis that are contributing to the current hunger crisis (14): 1) remittances to many poor countries are down sharply; 2) reduced demand for commodities from farm produce-exporting countries because of the economic slowdown in buyer countries; 3) declining investment in agricultural infrastructure that was already declining for several decades (11,15); and 4) reduced credit for small-scale farmers who need to borrow money for agricultural inputs (14). There have been more regional experiences in Asia in the late 1990s and subsequently Latin America, and particularly the former provided lessons for nutrition (2,16,17), although less so financially (3). These experiences have been used by the World Food Programme and others to inform responses to the present crisis (18).

**Longer-term climate change and environmental failure.** The current situation worsens the existing poverty common in many countries. As noted by the International Food Policy Research Institute and FAO (11), approximately 1 billion people globally are currently without access to safe water and over 2 billion lack adequate sanitation facilities. The impact of declining water sources affects human health and nutrition and livelihood. Climate change will have a net negative impact in terms of agricultural output despite large areas of what is currently tundra regions potentially becoming open to agriculture. Estimates of agricultural output in population-dense developing countries indicate declines of 10–20% by 2080, with particularly extreme events affecting the stability of and access to food supplies (11).

Climate change reflected by rising temperatures, erratic rainfall, and severe weather is already affecting global food production. The recent 12-y drought in Australia reduced the wheat harvest by 50% in 2007 and the rice harvest by even more. China’s soybean crop has also dropped, increasing imports to feed a burgeoning demand for animal source foods. These reductions in the global food supply due to adverse climate change combined with the shift of production to biofuels herald the beginning of a period of uncertainty in the global food market.

Projected climate change-related exposures will directly affect the health and nutrition of millions of people, especially those with low adaptive capacity, through: 1) increased deaths, disease and injury due to heat waves, floods, storms, fires, and droughts; 2) increased undernutrition; 3) increased frequency of cardio-respiratory diseases; 4) altered spatial distribution of some infectious disease vectors; and 5) increased burden of diarrheal diseases (11).

It has been estimated that a 1-m rise in sea level in India would submerge 576,400 hectares of arable land (19). Over 7.1 million people would be displaced and rice yields would fall 15–42% and wheat yields by 3.4%, leading to a net agricultural revenue decline of 12.3%. Other studies indicate that net agricultural revenues would decline by 12.3% if the temperature rises 2°C and rainfall drops by 7%, with losses in production resulting in a reduction in GDP of 1.8–3.4%. Indian researchers have calculated that India could lose 125 million tons or 18% of its rain-fed crops, affecting 70% of the farming population (20) and leading to a total impact of climate change of −9% of GDP lost, directly affecting diet and undernutrition. Other dire scenarios have been predicted for many other countries, including Bangladesh, Mauritius, and many countries in sub-Saharan Africa.

**Chronic emergencies.** Chronic emergencies are common in failed States and dysfunctional systems with chronic inattention to or overexploitation of agriculture, with a lack of investment in agricultural research and development, especially in sub-Saharan Africa (21). Since the beginning of this millennium, all the large-scale food emergencies that have triggered international interventions in Africa (in southern Africa in 2002 and 2005, in the Sahel in 2005, and in the Horn of Africa in 2000, 2002, 2006, and 2008) took place in a context of extreme poverty, where millions were living on the edge of survival with little or no support from their governments (22). Three decades of donor-driven structural adjustment with requirements to dismantle social protection programs have had adverse affects (22,23).

World Bank lending for agriculture declined dramatically from ~31% of its total lending portfolio in 1979–1981 to <10% in 1999–2000. Similarly, from fiscal years 1992 to 1997, the U.S. Agency for International Development reduced its funding to agriculture programs in sub-Saharan Africa from 10% of its total obligations to only 5%. It cut agricultural investments in sub-Saharan Africa during that period by 57% to about $US 80 million. Sub-Saharan African agriculture has seen increasing inequality and out-migration. In real terms, aid to agriculture is about one-half the level of 25 y ago (11). Part of the chronic preexisting picture includes both national and global systems that both tended to discriminate against the poor farmer. For example, the fastest growth of imports occurred in Africa, rising to 18% in 2001 from 8% 15 y earlier (21). Globally, in countries with >35% of their population food insecure, agricultural investment declined from 6.8% of GDP to 4.9% in 1996 and has continued to decline, as has agricultural productivity per worker in Africa, which has declined by 12% since 1980. At the same
time, Africa’s share of total world agricultural trade fell from 8% in 1965 to 3% in 1996. Among other effects, this has meant that progress toward Millennium Development Goal 1 (target C, to end hunger and undernutrition) is stagnant or even going backward in 14 countries of sub-Saharan Africa (24).

**Vulnerable groups**

The impact of these different shocks, to a greater or lesser degree, has had an impact on at least 4 different levels: the individual, the family household, nationally, and globally. The particularly vulnerable groups include women, children, refugees, internally displaced populations, minorities, and the poor, most of whom, as has been noted earlier, were already vulnerable, especially the urban poor of food-importing countries. At least 4 mechanisms by which a food crisis can negatively affect human development have been identified: increasing poverty and inequality, worsening nutrition status and prevalence, reduced utilization of education and health services, and depletion of productive assets of the poor (17).

**Winners and losers.** Between 1974 and 2005, food had been getting cheaper, increasing accessibility globally. Food prices on world markets fell by three-quarters in real terms during this time (25). However, particularly in poorer countries, farming and investments in agriculture have been in decline and particularly poor farmers have been hit whereas urban consumers have generally benefited. It is one of the contributing factors in the global epidemic of obesity and noncommunicable diseases such as diabetes. It also partly contributed to the decline in agricultural research and development. The concept of winners and losers comes from the fact that cheap food would appear to be a benefit for all but is in fact a threat for many poor rural farmers in Africa (21) and has had unintended effects on ill health globally.

Increasing incomes for small farmers with price increases should follow, but there is little evidence to support this benefit. In the UK, increased input costs because of increases in animal feed are presenting major challenges for livestock and poultry farmers. More generally, in mid-2008, prices of all major traded grains and oilseeds were well above the levels between 2000 and 2005 (26). Another possibility of price increases is that diets will begin to beg for food, while skipping entire days of eating and increasing use of child labor; borrowing/purchasing on credit, leading to indebtedness; selling of productive assets; sale of nonproductive or disposable assets; children dropping out of school; out-migration; increased use of child labor; borrowing/purchasing on credit, leading to indebtedness; selling of productive assets; sale of all assets; and finally, reduced expenditure on essential items (food and water) and sometimes engaging in last resort behaviors such as illegal or hazardous activities (Fig. 1).

Increasing deterioration of household food security and livelihoods is shown by a cascade of responses: an initial diversification or change in livelihood activities; reduced expenditure on nonessential goods; sale of nonproductive or disposable assets; children dropping out of school; out-migration; increased use of child labor; borrowing/purchasing on credit, leading to indebtedness; selling of productive assets; sale of all assets; and finally, reduced expenditure on essential items (food and water) and sometimes engaging in last resort behaviors such as illegal or hazardous activities (Fig. 1).

In addition to a change to cheaper, lower quality, and less-preferred foods, the diets show reduced diversity, poorer nutrient intakes, and increased inequities in household food distribution. Next, there is a decrease in size and number of meals. In rural populations, there is an increased consumption of wild foods, immature crops, and seed stocks. Finally, households begin to beg for food, while skipping entire days of eating and eating items not normally eaten, e.g. insects (Fig. 1).

In terms of nutrition, this leads to a parallel depletion of micronutrients in the diet and then increased clinical signs of micronutrient deficiencies. Next, underweight in infants and young children increases and maternal undernutrition rates increase. These nutrition insults lead to a lowering of immunity and increased risk of infectious disease morbidity. Then wasting increases (stunting is not affected noticeably in acute shocks) and growth and development are delayed. All of these factors lead to increased early childhood mortality rates (Fig. 2). Experience from previous crises including Indonesia and other Southeast Asian countries have demonstrated the above progression (2,16,32).

**Coping mechanisms**

Households responding to the shocks can sometimes be described as coping with these shocks. The term coping mechanisms has been criticized in some contexts, because it implies that households are dealing with the shocks and not...
slipping into irreversible calamity. Families are not coping when children lose weight and become sick or family members leave or even die. Coping strategies are the means people employ to mitigate, master, tolerate, reduce, or minimize the negative consequences of changes in their environment, are very variable, and can be divided into food based and nonfood based (4).

Food-based coping behaviors are usually the first line of defense, with reductions in the variety of foods consumed and especially of more expensive items such as fruit, vegetables, meat, and dairy products. Staple food consumption remains largely unchanged, although a cheaper staple may be consumed in greater amounts. As the crisis worsens, meals are reduced in size and frequency, first among adults and then among children, and eventually even items such as grass, hay, or sawdust may be consumed. In rural areas, more and different foods may be collected from the fields and the forests. Nonfood coping mechanisms include taking loans, selling assets, decreasing expenditures on health, education, and other nonfood items, and taking children out of school so that they can work, collect food, or even be traded (4,32). Family members leave home seeking work, thus adding to the social and economic stress that already exists in such precarious situations (Fig. 2).

Impact on nutritional status of population groups
Evidence over the last few decades or so from developing countries has confirmed that rapid increases in food prices can lead to relatively rapid increases in maternal and child undernutrition levels (4). During the Indonesian financial crisis in 1997–1998, wasting increased in Javanese women, although without increases in child undernutrition, suggesting that mothers maintained their children’s food intake even at their own expense. Increased levels of anemia in mothers and children were associated with a reduction in consumption of high quality foods. The combined effects of the crisis were particularly severe for children conceived and weaned during the crisis (16). The currency devaluation in the Congo in 1994 increased the price of imported staple foods, resulting in increased wasting among mothers, more low-birth weight babies, and greater levels of stunting and wasting among children (34). In Zambia during the drought of 2001–2002, mothers who experienced high corn prices while pregnant had reduced vitamin E and vitamin A status and stunting increased among infants (35).

The actual effect of the recent shocks will depend on the type of shock. The impacts will remain even as food price rises slow down. In terms of more acute effects, experience in Asia suggests: increased rates of maternal anemia by 10–20%, increased incidence of low birth weight by 5–10%, increased rates of childhood stunting by 3–7%, and increased rates of wasting by 8–16% (21). But from evidence from the earlier Asian financial crisis (2,16,32), it is likely the first impacts, before those suggested by Bhutta et al. (17), are already increased rates of young child anemia and maternal thinness and later, increased rates of underweight.

Food shortages also most acutely affect women during pregnancy. The Dutch famine of 1944–1945 showed that even in a previously well-nourished population that was receiving food rations, food restriction during pregnancy produced significant reductions in birth weight, length, and head circumference. Third trimester exposure accounted for the whole of the famine effects on birth weight, which were apparent only below a threshold value of official food rations (36). Although the effects of the Dutch famine on birth weight were small (~100 g), many negative consequences of constricted fetal growth appeared, but only later in life, including increased obesity, increased risk of schizophrenia, more behavioral problems, and elevated rates of high blood pressure and coronary heart disease (4). Maternal undernutrition, poor fetal growth, and stunting in the first 2 y of life lead to irreversible damage across the course of life, including shorter adult height, lower attained schooling, reduced adult income, and decreased offspring birthweight as well as a greater risk of developing noncommunicable diseases (30).
Even before the recent food, fuel, and financial crisis, it was estimated that globally there were 20 million children <5 y old with severe acute malnutrition, with 1 million dying annually (37). Clearly, much more needs to be done to deal with the problem of wasted children, with or without the current crisis (38). The United Nations estimates that up to 1 billion people globally are now at risk of food insecurity, with over 100 million being added as a result of the current crisis. The groups most vulnerable are those living in poverty. However, it is worth noting that even in developed countries the impact of the crises is affecting health and well being, mainly in the poorer segments of the population (26). The current crisis will lead to an increased number of vulnerable people with reductions in the quality of diet rather than quantity most affected, at least initially. Families are experiencing real stress, leaving their communities even more vulnerable to the next or sustained shock. Increasing cereal crop production in developed and developing countries is an insufficient response. This remains true even though Webb (39) in this issue demonstrates that in this crisis, cereal process appeared to be unrelated to shortages and production levels.

Information from robust nutritional surveillance systems in Indonesia and Bangladesh has been used to document the impacts of economic crises and rice prices in the past. Such systems are lacking in most countries and have the added advantage of forming the basis of monitoring the effectiveness of national strategies (40). Such surveillance systems need to be expanded to evaluate programs and advocate for their implementation. The establishment of surveillance systems will play an important role in providing the evidence for policy change.

Achieving food and nutrition security requires a multi-sectoral approach that involves many stakeholders, including public and private entities. A twin track process, as recommended by the Rome-based United Nations agencies for combating hunger and poverty, needs to be widely implemented by strengthening the productivity and incomes of hungry and poor people, targeting rural areas (and now maybe urban poor, at least in food-importing countries), and ensuring direct and immediate access to food by hungry people, and social safety nets, including food transfers (41), conditional and unconditional cash transfers, which are proving successful in several Latin American countries (42), and public work programs. De Pee et al. (43) examine these options further in this issue. Past investment has not been particularly successful in reducing the numbers of undernourished under-5 children globally, although the mortality rate for this group has, for the first time since it has been tracked, fallen to under 10 million deaths/y (44). Any future increases in funding will need to scale-up known interventions (45) and increase coverage with newly emerging strategies such as conditional cash transfers (42,43).

At the same time, local strategies to deal with increased food prices are essential to address the underlying causes of malnutrition, namely food insecurity, poor utilization of health services, and inadequate maternal and child caring practices, with implications for ministries of health, agriculture, education and social security. Ensuring the successful implementation of integrated strategies of all of these ministries at local, national, and regional levels requires a close integration with efforts to decentralize social development programs. Establishing food and nutrition surveillance systems that can inform decision-making at all levels, not just by central policy makers, is a first priority for all nation states. At the same time, despite the recent creation of a United Nations High Level Task Force on the Global Food Security Crisis, and many global level commitments to dealing with the crisis, there is still little progress or collaboration among United Nations organizations, the international banks, and donors in responding to food security issues (22). The 2008–2009 food crisis has become victim to the harsh reality of the global financial crisis, which has starved collective action of much needed funds and cooperation.

It is clear that funding for a nutrition response remains inadequate. Annual donor funding is <$US 300 million (14,46), which compares poorly to $US 2.2 billion spent for HIV/AIDS and even more poorly to the 19% of budgets that many countries devote to military expenditures compared with the 5% to agriculture (11). An investment by countries themselves and the donor community into an adequate response to the current crisis, as well as long-term structural support to social protection programs, is much needed both to address existing levels of undernutrition and for future exacerbations.

Other articles in this supplement include (47–60).

**FIGURE 2** The vicious cycle of the economic crisis (17).
Acknowledgments
LD-H, and B.C. both conceived the format of the paper, wrote and edited it, and are responsible for the final draft. Both authors read and approved the final manuscript.

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