Impact of the Economic Crisis and Increase in Food Prices on Child Mortality: Exploring Nutritional Pathways1–3

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Abstract
The current economic crisis and food price increase may have a widespread impact on the nutritional and health status of populations, especially in the developing world. Gains in child survival over the past few decades are likely to be threatened and millennium development goals will be harder to achieve. Beyond starvation, which is one of the causes of death in famine situations, there are numerous nutritional pathways by which childhood mortality can increase. These include increases in childhood wasting and stunting, intrauterine growth restriction, and micronutrient deficiencies such as that of vitamin A, iron, and zinc when faced with a food crisis and decreased food availability. These pathways are elucidated and described. Although estimates of the impact of the current crisis on child mortality are yet to be made, data from previous economic crises provide evidence of an increase in childhood mortality that we review. The current situation also emphasizes that there are vast segments of the world’s population living in a situation of chronic food insecurity that are likely to be disproportionately affected by an economic crisis. Nutritional and health surveillance data are urgently needed in such populations to monitor both the impacts of a crisis and of interventions. Addressing the nutritional needs of children and women in response to the present crisis is urgent. But, ensuring that vulnerable populations are also targeted with known nutritional interventions at all times is likely to have a substantial impact on child mortality. J. Nutr. 140: 177S–181S, 2010.

Introduction
Gains in public health over the past few decades are currently threatened by the global economic and food crises, with young children, women, and the elderly in the developing world likely to be disproportionately affected. Concern about the impact of this crisis on the nutritional status of populations was expressed by WHO Director General of Health, Margaret Chan, as follows: “The world already faces an estimated 3.5 million deaths from malnutrition each year. Many more will die as a result of this crisis” (1).

The world food crisis is characterized by the price index of major food commodities, including staples such as rice, corn, wheat, oil, and sugar having increased overall by 24% in 2007, with increases as high as 87% in oil, 58% in dairy, and 46% in rice (2). In the past 6–7 mo, marked decreases in prices of many commodities has created hope that the food crisis is past. However, the hikes in food price may have created a complex food insecurity situation and, although not quite the same as a famine or drought, the nutritional status and health of vast sections of the world’s population living in poverty and suffering from chronic food insecurity and hunger may have been affected.

The impact of such a crisis situation on mortality is less well known or recorded, although change in diet and nutritional status and increase in the number suffering from hunger may have been assessed. It would be well worth examining what occurs in a famine situation to contrast it with the likely impact on mortality in a crisis situation. A famine situation is defined in numerous ways, but a common theme of these definitions is the
inclusion of excessive deaths. Historically, high numbers of deaths were reported during famines, with starvation-related deaths being common. The impact on mortality under circumstances of increased food insecurity has been less well elucidated, although we know that socioeconomic inequalities in mortality, especially child mortality, do exist. Analysis of survey data on inequalities in mortality among infants and children by quintiles of consumption using the Living Standards Measurement Study from 9 different countries shows that the poorest quintile suffered higher infant and under-5 mortality rates than other quintiles (3).

Numerous frameworks such as the one proposed by Waters et al. (4) exist for analyzing pathways through which an economic crisis may affect health, many of which focus on complex processes including health care spending and utilization. Changes in relative prices combined with deteriorating household purchasing power related to increasing unemployment and decrease in availability and quality of services provided all occur simultaneously to affect health and nutritional status and, in turn, survival (4).

Exploring nutritional pathways

This paper focuses on exploration of nutritional pathways by which an economic crisis and inflation in food prices may directly or indirectly result in increases in child mortality. Figure 1 illustrates the various pathways by which nutritional deficiencies directly or through their interaction with infectious disease will increase the risk of childhood mortality. A number of the links are derived from causal evidence using data from randomized controlled studies, whereas others are likely to be associations derived from prospective follow-up of children with undernutrition or nutritional deficiency. The synergistic relationship between infectious diseases and mild-to-moderate undernutrition in causing childhood deaths suggests that an estimated 55% of deaths in young children (<72 mo) may be attributable to undernutrition (5). The cause-specific, population attributable fractions were 45% for measles, 37% for malaria, 52% for pneumonia, and 61% for diarrhea (6). Recent estimates of deaths and burden of disease attributable to nutritional risk factor (7) revealed wasting and stunting are responsible for the largest disease burden, with these indicators and intrauterine growth restriction-low birth weight contributing to 21% of deaths in children under 5 y. This indicates that any increase or decrease in the population prevalence rates of undernutrition is likely to affect rates of child mortality. As discussed by Darnton-Hill and Cogill (8) and based on estimates from the Asian economic crisis (9), it is estimated that childhood stunting rates will increase by 3–7% and those for wasting will increase by 8–16%, at least in East Asia and the Pacific. Estimates from South Asia and sub-Saharan Africa are urgently needed. It is also estimated that child mortality will increase by 3–15% as a result of the crisis (9).

Among micronutrient deficiencies, the largest disease burden is attributed to vitamin A and zinc deficiencies at 6.5 and 4.4%, respectively (7). Vitamin A deficiency has long been known to increase the risk of child mortality by 23–30% based on data from 8 randomized, controlled trials (10). Programs of biannual dosing of children under 5 y of age with vitamin A exist in many developing countries. The economic crisis is likely to decrease intakes of vitamin A-rich foods and increase the risk of vitamin A deficiency, as described by West and Bouis (11). It is also likely that vitamin A distribution programs may receive less attention and funding amid competing needs and resources. This may exacerbate the impact of the crisis on child survival.

Zinc deficiency is associated with an increased risk of severe and persistent diarrhea, pneumonia, and stunting. Meta-analysis from prevention trials of daily zinc supplementation in children up to 48 mo of age, however, have found no overall impact on survival [combined relative risk (RR) = 0.91; 95% CI: 0.82–1.02] (12). Whereas the impact on survival was not significant for infants (RR = 1.04; 95% CI: 0.90, 1.21), there was an 18% reduction in mortality among those >12 mo old (RR = 0.82; 95% CI: 0.70, 0.96). Thus, it is plausible that an increase in zinc deficiency as a result of the economic crisis and increased food prices may influence child health and survival.

Kramer (13) showed more than 2 decades ago that maternal nutritional factors may account for >50% of the etiology of low birth weight in developing countries. Maternal nutritional factors such as low BMI, stunting, poor weight gain during pregnancy, and micronutrient deficiency result in poor fetal growth and decreased gestational duration. Adequate energy intake and weight gain are critical during pregnancy. Balanced energy protein supplementation in pregnancy based on randomized controlled trials was shown to reduce fetal growth restriction by 32% (26–44%) (14). In a prospective observational study carried out in a rural area of Maharashtra that examined the association between maternal diet during pregnancy and birth outcomes, energy, protein, or carbohydrate

![FIGURE 1 Nutritional pathways by which the economic crisis and increase in food prices may affect child mortality.](https://academic.oup.com/jn/article-abstract/140/1/177S/4600343)
intakes were not associated with birth weight and other anthropometric measurements despite low intakes of energy that did not change during pregnancy (15). However, after adjusting for various confounders, consumption of green leafy vegetables, fruits, and milk was associated in a dose-responsive manner to birth weight. Although causal inference cannot be made from these results, lower intakes of micronutrients supplied by green leafy vegetables, fruit, and milk related to the increasing food prices may limit fetal growth, especially in energy-deficient populations. In studies from Indonesia, decreased intake of plant foods during the Asian economic crisis has been associated with an increased under-5 mortality rate (16). Maternal iron deficiency may result in adverse birth outcomes. Recent trials demonstrated the benefit of iron supplementation in improving birth weight and reducing low birth weight (17–20) and preterm (19,20).

It is also likely that all of these nutritional pathways will interact with increased susceptibility to infection. Children during the crisis will be more likely to be exposed to infectious pathogens due to worsening of sanitation and supply of clean water and greater exposure to disease vectors. This will result in increased susceptibility to disease exacerbated by undernutrition and micronutrient deficiency and increased sickness due to lack of access to preventive interventions or deterioration in health care utilization. Illness followed by lower quality of health care can lead to an increased risk of mortality (21). It has been estimated that the economic crisis, if unaddressed, will increase childhood stunting by 3–7%, wasting by 8–16%, maternal anemia by 10–20%, and low birth weight by 5–10%, at least in East Asia and the Pacific region (9).

**Impact on child mortality: previous evidence**

There is limited data on the estimated impact of the current economic crisis on child mortality beyond the estimates for East Asia (9), primarily due to limited systematic surveillance-type data being available. Even the current crisis is shifting with food prices having recently declined in the past several months. Each decade in the past appears to have brought an economic crisis. Previous economic crises provide estimates of the impact on increases in infant and child mortality that can be used to estimate the impacts of the current one, with the caveat that each economic crisis has its own unique aspects, causes, and manifestations. In fact, the estimated impact for East Asia that was recently derived used findings from the last Asian economic crisis of 1997–1998 (9).

The world economic crisis of the early 1980s provides one such example. This crisis resulted in declining growth rates and a decrease in living standards (22). High cost of fuel, heavy burden of interest payments, and unfavorable terms of trade all resulted in devaluation of money, increased unemployment, and austerity policies leading to cuts in health care and other spending in Africa and Latin America. Food production in Africa was most affected and fell by 15%, further exacerbated by drought, with ~150 million people suffering from food shortages and in some cases famine (22). One-half of the children in 1984 in areas of drought had protein energy malnutrition and 50% of infant deaths were directly or indirectly caused by malnutrition. At least 5 million children were estimated to have died during 1984, one-quarter more than would have died without a crisis. In Chad, Burkina Faso, and Mozambique (in 6 of 9 provinces), infant mortality rate (IMR) was above 200/1000, whereas in Ghana, IMR increased from 100 to 120–130/1000. In Sudan 20,000 more children died every month in mid-1985. In Latin America there is evidence from Costa Rica of severe malnutrition doubling in 1981–1982 and of dramatic increases in IMR in Bolivia between 1973 and 1983, especially due to diarrhea and an increased proportion of infant deaths due to malnutrition (22). Sharp increases in IMR in Brazil between 1983 and 1984 were also accompanied by a marked rise in the prevalence of anemia among children.

In the Congo, the government undertook a structural adjustment program in 1986 and 1991 to cope with the economic crisis with negative consequences on availability and consumption of food. Using cross-sectional data collected from a study undertaken in Brazzaville, researchers were able to quantify the negative impact of the adjustment (23). This study showed that rates of wasting and stunting were higher in 1991 compared with 1986; whereas rates of wasting were higher among those <24 mo of age, stunting rates were higher among those > 24 mo. The proportion of mothers whose BMI was <18.5 was higher in 1991 (29%) compared with 25% in 1986. Also, low birth weight prevalence, which had decreased from 18.4 to 10.2% between 1981 and 1985, increased to 18.7% by 1990 (23).

Data from examination of the chronic situation of household food insecurity in the drought-prone areas of northern Ethiopia can also be used to infer the impact of an economic and food crisis on mortality, although data are limited on children. These data reveal that household vulnerability to food crisis is strongly related to total number of deaths (24). Increases were observed from 1989 to 1993–1994 during periods of increased drought and famine. Interestingly, unlike in 1984–1985 during the Great Ethiopian famine when hunger/starvation-related deaths were much higher, illness was a more commonly reported cause during the period of 1989–1994. The data also revealed that deaths clustered among the younger age groups of 1–4 y and even 5–9 y, suggesting that children were disproportionately more likely to suffer from these periods of household vulnerability (24). Another example is northern Sudan, which by the end of 1991 was facing a severe food crisis and despite the international relief response had received only one-half of the amount of relief food that it requested (25). Numerous small-scale surveys carried out during this time compared with previous surveys by the Sudan Emergency and Recovery Information and Surveillance Surveys indicated increases in rates of childhood malnutrition and higher than expected mortality rates in different regions of Sudan (25). Also, a survey in squatter settlements around Khartoum showed that IMR was 240/1000 and more than double that expected (107/1000). Mortality among children 1–4 y of age was estimated to be 4 times higher than expected at 90/1000 (25).

**Impact on maternal nutritional status: previous evidence**

Maternal nutritional status, especially during pregnancy, may deteriorate in an economic crisis, leading to adverse pregnancy outcomes such as low birth weight and preterm birth. There are scant data on surveillance of nutritional status among women during situations of crisis. Few examples when data were collected are described here. During the late 1970s, increases in world oil prices triggered a global recession that caused a debt crisis in the Dominican Republic, which combined with structural adjustments imposed by the International Monetary Fund created a dire economic condition (26). Following this, international economic policies resulted in a further loss of revenue from sugar exports, a reduction in gross domestic product, and increased prices in the 1980s. This resulted in dramatic decreases in government expenditures on health during this period and despite inaccurate records and data, secular trends in IMR, low...
likely to have a considerable impact on child mortality unless prone.

Such surveillance data are needed to enable modeling such impacts. For example the estimated global burden of death and disease related to undernutrition and intakes of complementary foods (29). The prevalence of women with a low BMI (<18.5) increased from 11.3 to 15.6% from the baseline to the follow-up survey. Besides affecting birth outcomes, the impact on maternal nutritional status can also negatively affect child caring and feeding and preventive health care, and care during illness may also decline, both of which can result in deterioration in child health and survival.

More recently during the Asian crisis, nutrient intakes of macro- and micronutrients showed secular trends of decline (27), whereas a survey of households in rural Java revealed increases in maternal wasting as well as anemia during 1997–1998 (28). On the other hand, wasting among children was not affected, suggesting that the limited food was preferentially distributed to young children, but not women, within the household. Rates of anemia among children, however, increased, suggesting an impact on availability of the more expensive micronutrient-rich foods across the board. Maternal thinness (wasting) was also shown to be an indicator of increasing food prices and financial crisis in a Brazzaville, Congo, where surveys conducted before and after a 50% devaluation of the CFA (African Financial Community) franc revealed increases in this indicator along with a decrease in child undernutrition and intakes of complementary foods (29). The prevalence of women with a low BMI (<18.5) increased from 11.3 to 15.6% from the baseline to the follow-up survey. Besides affecting birth outcomes, the impact on maternal nutritional status can also negatively affect child caring and feeding and preventive health care, and care during illness may also decline, both of which can result in deterioration in child health and survival.

Modeling the impact of the economic crisis and increase in food prices using previous evidence of the relationship between nutritional status and child survival is possible to do. Robust estimates of the attributable risks for mortality are available to enable modeling such impacts. For example the estimated global burden of death and disease related to undernutrition and vitamin A and zinc deficiency can be used for this purpose (7). However, nationally representative surveillance data on indicators such as low birth weight, maternal and child nutritional status, and micronutrient status that record the change in these due to the economic crisis are not available in many places. Ad hoc survey-based data on maternal and childhood nutrition status are needed to estimate the magnitude of effects on child mortality. Furthermore, it is not necessary that rates of undernutrition should increase for child mortality to increase or for this to happen sequentially. Surveys conducted in drought-prone areas of Ethiopia by Save the Children, UK, as part of the famine early warning system have shown that child mortality increased prior to declines in mean weight for length below 90% of the reference, an indicator used for alerting a crisis situation requiring intervention (30). Such surveillance data are needed in many regions of the world and beyond areas that are drought prone.

In conclusion, the current economic and food price crisis is likely to have a considerable impact on child mortality unless urgent action is taken by the global health community and governments. Decreases in dietary intake (both due to eating less and fewer meals) and poorer dietary quality and micronutrient content can result in increased morbidity and mortality in children. Declines in maternal nutritional status may result in poor birth outcomes such as fetal growth restriction and preterm birth, which are linked with infant and child mortality. Economic crises experienced in the past 2–3 decades provide examples of the impact they can have on child mortality. Surveillance data can be used to estimate the impact of the present crisis but may not be available in many settings. The current crisis needs urgent attention but should also trigger a broader response to the need of a large segment of the world’s population facing a situation of chronic food insecurity.

Other articles in this supplement include (31–44).

Acknowledgment

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Literature Cited


FIGURE 2 Impact of the economic crisis in the Dominican Republic on maternal and child health and survival (26).
Economic crisis and child mortality


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