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## **Title**

Nutrition, Health, and Economic  
Development: Some Policy Priorities

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# Nutrition, health, and economic development: Some policy priorities

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## Abstract

*Most developing countries face different resource and infrastructural constraints that limit their economic growth. Nutritional deficiencies, poor environmental conditions, and inadequate educational infrastructure hamper children's learning, which is critical for the future supply of skilled labor and hence for economic development. There is a need to assign priorities for resource allocation among nutritional, health-care, and educational policies. This paper draws implications from several studies using data from less developed countries within a multidisciplinary framework. It concludes that iron supplementation of pregnant women and access to family-planning services are likely to enhance maternal and infant health. Where iodine deficiency is endemic, iodized salt is important for preventing cognitive damage to the fetus. Higher intakes of protein and micronutrients such as iron are important for children's physical growth, morbidity, and learning. Improved sanitation and vaccines against infections will prevent loss of vital nutrients. Investments in educational infrastructure, including adult literacy programs, are beneficial for children's cognitive development. Nutrition and health policies based on long-term considerations will lead to a well-trained labor force enabling non-resource-rich developing countries to escape from poverty traps.*

## Introduction

Many people in less-developed countries are undernourished. Although some population groups face shortages of staple foods, such as cereals, that are necessary for meeting energy needs, the quality of diets remains poor for a majority of the people. Typically, a poor-quality diet supplies inadequate quantities of protein and micronutrients such as iron that are essential for various human functions [1]. Where

the environment is poor in iodine, consumption of iodated salt by pregnant women is important for the normal development of the fetal brain. Furthermore, low intakes of fresh fruits and vegetables during certain seasons cause vitamin A, vitamin C, and other nutrient deficiencies, making individuals more susceptible to disease. Adequate intakes of such nutrients are essential for maintaining adult health and productivity over the life span; children's development critically depends on the quality of diet that the household can afford.

Nutrients such as protein and iron are typically found in high concentration in animal products, which are relatively expensive and often beyond the budgets of the poorest households. Because of poor sanitation and unhygienic environments, infectious diseases often deplete the body's stores of vital nutrients such as iron [2]. Many studies in developing countries have shown that poor nutritional status is associated with reduced productivity [3–5]; even the walking pace of individuals can be affected by iron-deficiency anemia [6].

The link between poor adult health status and child development has not, however, been explored sufficiently in the literature. For example, parents in poor health may be forced to leave household tasks to children. Such tasks reduce the amount of time children spend on school-related activities and learning. Because learning is a cumulative process, children with excessive household responsibilities are likely to complete fewer years of education. The future supply of skilled labor is therefore likely to be affected by poor parental health. Because skilled labor is critical for economic growth, it is important to formulate comprehensive policies to protect children's cognitive development. The purpose of this comment is to draw policy implications from research modeling health and nutrition data from less-developed countries within a multidisciplinary framework.

It is important to recognize that there is considerable variation in food intake among individuals within a country. This is especially true for the intake of meat and other energy-dense foods whose consumption has risen with household incomes. For example, in

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countries such as India and China, prevalence rates have increased for chronic conditions such as obesity, diabetes, hypertension, and cardiovascular diseases [7]. Thus, health policies now have to tackle not only the traditional diseases of poverty but also chronic conditions caused by excessive food consumption and a sedentary lifestyle. Because the latter diseases afflict primarily the well-off groups who are likely to be better educated, a preventive approach via educational messages and counseling is appealing. By contrast, public health policies are necessary to improve the health status and productivity of undernourished people.

The importance of an educated labor force for economic development has been recognized in the economics literature. Studies using data at the country level from emerging economies such as those in East Asia have reported positive associations between human capital and economic growth [8]. However, it is essential to understand the pathways through which educational levels are achieved by populations in different settings. A detailed knowledge of the interrelationships between nutrition, infection, and child development would be useful for allocation of resources. Thus, for example, undernourished children are unlikely to fully benefit from the resources spent on the educational infrastructure.

Although nutritionists and psychologists have emphasized the link between children's nutritional status and cognitive development [9], the studies have typically observed a small number of children over a short time span. Because school dropout rates are high in many developing countries, without a mobilization of resources for enhancing children's learning, a large number of children are likely to remain functionally illiterate. For creating a well-trained labor force, therefore, it is essential to look at stages in children's development and identify factors that can be influenced by public policies in a cost-effective way.

### Maternal and infant health

To understand the causes underlying children's poor nutritional status and cognitive development, it is useful to begin with the effects of poor maternal nutritional status on intrauterine growth. In a research setting, it is often difficult to relate the effects of food intake during pregnancy to birth outcomes, partly because of the expense of continuously measuring food intake. When food-intake data were available at some time points, insignificant associations were reported in Kenya between nutrient intake by pregnant women during the trimesters and birth outcome [10]. However, the prepregnancy nutritional status, represented by the maternal body mass index, was a significant predictor of infant birth weight, length, and

head circumference. Although maternal hemoglobin concentration was not significantly associated with anthropometric measurements at birth, it was a significant predictor of growth in head circumference and weight between the ages of one and six months.

Hemoglobin concentration is a good indicator of iron-deficiency anemia. Moreover, iron body stores are typically low in undernourished women and may be inadequate to support full fetal growth. Thus, iron stores depleted by each pregnancy cannot be replenished in a short time interval because of poor diet quality, helminth infections, etc. These issues have not been fully integrated in demographic research. For example, using data from household demographic surveys, researchers have found that short birth intervals are associated with increased child mortality [11]. This can be explained by the fact that retarded babies are at a greater risk of mortality.

In the absence of family-planning methods for birth spacing, infants born to undernourished women are more likely to be physically retarded and hence susceptible to infections; mothers with many children also have less time for child care. Further, poor physical development of the surviving infants can restrict brain growth, thereby hindering cognitive development. It is evident that there is considerable biological and socioeconomic information underlying the reported negative associations between birth intervals and child mortality. Policies affecting such factors would ultimately determine the future supply of skilled labor that is critical for economic growth.

The interrelationships between poor diet quality, access to family planning, birth outcomes, and child development have not been thoroughly investigated in the literature. This is because an elaborate longitudinal study would require observing children for extended periods and would be expensive. However, these interrelationships determine the sequence of events underlying the formation of a skilled labor force. The relative importance of the nutritional, demographic, and economic factors will depend on the level of economic and social development in a country.

For example, some economists have emphasized the link between female education and decline in fertility, while asserting that family-planning methods are unlikely to be effective [12]. The analysis was based on national averages of fertility rates that cannot capture the differential access to family-planning and healthcare services for the well-off and poor households in developing countries. Moreover, there is a large unmet demand for family-planning services even among so-called backward population groups in countries such as India that is also likely to affect the health of the surviving children [13]. Ignoring such factors can lead to misleading conclusions, such

as poor efficacy of family-planning programs for maternal and child health.

Further, iron-deficiency anemia is widely prevalent, especially among pregnant women in developing countries such as Bangladesh [14]. Iron supplementation of anemic women is relatively inexpensive, costing approximately US\$2.50 per woman per year [15] and can improve birth outcomes [1]. Having a large number of children has severe consequences to an undernourished woman. For example, girls may be assigned a disproportionate number of household tasks that interfere with education. It is important that poor couples have access to contraceptives for birth spacing. Interventions that include both the provision of birthcontrol measures and iron supplements are likely to achieve better maternal and infant outcomes. Healthier infants have a greater potential for learning.

### Preschool children

In developing countries, a large majority of the infants who survive until one year of age can expect to reach old age [16]. For the surviving children, the early childhood period is critical for brain development. Because protein and iron are important for brain growth [17], maintaining a steady supply of these nutrients is a challenge to policy makers. Shortfalls in micronutrient intakes can reduce physical growth and exacerbate sickness, thereby reducing activity levels. Food-supplementation programs, for example, such as the provision of a nutritious high-protein beverage supplement for Guatemalan children 6 to 24 months of age, have brought lasting improvement in growth and cognitive performance [18]. Moreover, using data on Kenyan and Egyptian children, psychologists have found associations between the intake of particular nutrients and the scores on cognitive tests [19, 20].

Learning is a complex process that is influenced by the stimulation received at home. For example, the time that Kenyan mothers spent talking with infants in the period between one and six months of age was a significant predictor of the infants' scores on eight items from the Bayley Infant Behavior Record given at six months [10]. Iron-deficiency anemia is associated with lower scores on cognitive tests of school-aged children [9, 21, 22], including adolescent girls [23, 24], as well as of infants and preschool children [25, 26].

The logistics of running large-scale food-supplementation programs for preschool children in developing countries are formidable, although such programs are often necessary for certain population groups. National policies often give priority to children's sicknesses. Vaccinations against preventable diseases can not only enhance child survival but also enhance children's nutritional status, as can environmental

sanitation and personal hygiene that reduces diarrheal disease. The helminth infections widely prevalent in developing countries reduce nutrient absorption, and some increase iron loss [27, 28]. These infections are easy to prevent.

There is a paucity of studies that can inform policy decisions based on cost-benefit considerations for reducing iron-deficiency anemia among children. For example, it is known that increasing the intake of bioavailable iron can improve iron status, and some parasitic infections deplete iron stores. Yet there are few studies comparing the efficacy and costs of increasing bioavailable iron intake and treatment of helminth infections. Most interventions against helminth infections have been short-term approaches [29], and reinfection rates remain high. Vaccines against various types of helminth infection, such as hookworm, that are under development [30] would be useful for preventing iron loss. A vaccine against malaria would improve children's survival chances and health status in endemic areas.

Improved sanitation can also achieve lower rates of enteric infection due to bacteria, viruses, and helminths. Although treatment of sewage is often beyond the budgets of local governments, better methods for waste disposal can reduce disease transmission and improve the quality of drinking water, thereby reducing nutrient loss through enteric diseases. In the absence of detailed studies that include nutritional, environmental, and population variables in a developing country, it is more difficult to design and implement cost-effective strategies for enhancing the health status of preschool children. Nevertheless, children's nutritional intakes must be above a certain threshold to enable them to fully benefit from school education. Data on nutrient intakes have become available from many developing countries; hemoglobin concentration is now measured in many household surveys. Such nutritional information is useful for targeting the most vulnerable children who are likely to face the worst environmental conditions as well.

### School-aged children

In addition to nutrient deficiencies and disease transmission due to poor environmental conditions, policy makers have to address the role played by the educational infrastructure in the cognitive development of school-aged children. Broadly speaking, children's learning in school is affected by three sets of factors. First, regular school attendance is essential for learning. Second, the school environment should be stimulating; teachers should be qualified for their job, and books and school supplies should be adequate. Third, children need additional time at home to master the

concepts introduced in school. For example, in the analysis of data from the Embu region of Kenya [22], the time spent by children in school and their parents' scores on cognitive tests were positively associated with the children's scores on various components of cognitive tests. Children's illnesses were negatively associated with the scores. Although some of the factors affecting the scores can be easily influenced, cognitive development of children requires long-term strategies, because physical and intellectual development are intertwined with levels of nutrition [31, 32].

Children's school attendance plays an important role in learning. Repeated sicknesses can hinder school attendance. Although a number of school-based interventions have assessed the effects of anthelmintic treatment on the scores on cognitive tests, no study has attempted to quantify the effects of such treatment on the duration and intensity of illnesses [33]. Moreover, children from poor households are likely to be performing household tasks that reduce the time available for studying at home. Poor parental health can exacerbate the situation. Meager teaching materials and poorly trained teachers may not be sufficient to sustain children's interest in learning. Children who cannot keep up with school examinations usually discontinue school. Because learning is a cumulative process, such children seldom return to school.

It is evident that creating an educated labor force in many poor countries is likely to be a long-term goal requiring several decades to achieve. Nevertheless, high literacy rates have been achieved in some poor societies, such as in the Indian state of Kerala [34]. Moreover, with the media now reaching remote areas in developing countries, parental aspirations for the well-being of their offspring are rising. Couples want to have fewer children so that they can be educated to take advantage of the new opportunities. Greater availability and utilization of family-planning and health-care services, achieved through national and international efforts in populous countries, is likely to result in fewer children born at longer time intervals.

Birth spacing enables poor couples to stretch their meager resources and would facilitate children's escape from poverty via education.

## Conclusions

Many factors promote economic development, among which population health is of critical importance. Countries need to devise different strategies for increasing prosperity, depending on their level of economic and social development [35]. For example, resource-rich countries, such as those in the Middle East, have enhanced the nutritional status of their citizens through better food intake and access to health care.

Some countries in East Asia have prospered without natural resources by reducing family size and educating children to create a well-trained labor force. However, the developmental problems in many countries in Africa and Asia remain complex and cannot be viewed in terms of simple paradigms. Rather, policy makers need to devise specific policies for each country, taking into account the nutritional and health status of their populations, the environmental conditions, and the educational infrastructure. In populous African countries, the AIDS epidemic is reducing the life expectancy of both unskilled and skilled population groups and is hindering economic development. Without better policies, many of the poor countries are unlikely to escape from the poverty trap in the foreseeable future.

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