

The Intergenerational Impact of Health on Economic Growth

David Mayer-Foulkes
CIDE

Written for the Global Forum for Health Research,
Forum 8, Mexico City, 16 -20 November 2004.

Introduction

Nutrition and health play a substantive role in economic growth. Long-term historical studies by Fogel (2002), for example, find that one third or more of the economic growth in England during the last two centuries was due to improvements in nutrition. These have been tied to secular rises in height and weight and decreases in mortality. Changes have been so large that height, weight and mortality standards previously considered as normal are now evidence of malnutrition and ill health. Other studies using data covering more than a century of the history of the present developed countries find similar results for other health indicators (Arora, 2001). For the case of Latin America and Mexico, it has been verified that life expectancy has an impact on income thirty years later. To promote development through understanding how nutrition and health have a long-term impact on development in the present-day was the purpose of the World Health Organization's Commission on Macroeconomics and Health. The same purpose has motivated a series of studies undertaken by the Pan American Health Organization, in the case of Latin America and Mexico, and by many other researchers.

This summary article outlines how the long-term impact of health on economic growth can be understood in the more general context of the relation between human development and economic growth.¹ Human development is understood as an intergenerational process of human capital accumulation that is slowed down by market failures that can be strong enough to result in poverty traps. In turn, human development has a dynamic interaction with long-term economic growth, drawing from the economy the resources for human capital investment, and returning to it a generation later its basic inputs – labor, skills and knowledge. In this long-term context, it is easy to see that health, and in particular early child development, plays a crucial role in human capital investment and therefore in long-term economic growth.

Understanding the mechanisms through which health has an economic impact has posed an important challenge for microeconomic research. Traditionally, research attempting to locate in the microeconomic realm the economic impact found for health in macroeconomic and long-term historical studies has focused on productivity. This research addresses such issues as adult labor productivity, household productivity taking into account the economic burden of health, and problems in physical capital investment

¹ A full presentation is found in Mayer-Foulkes (2004), a supporting paper for the report of the Mexican Commission on Macroeconomics and Health. A previous version of that paper was written for the Pan American Health Organization and awarded Gold Medal for Research on Development in the Pro-market Reform and the Poor category at the Fifth Global Development Network Conference, New Delhi, 2004.

caused by epidemics such as malaria. However, the impacts found for these channels have been relatively small compared with those measured macroeconomically or in the long run. For example, in a recently released report, the Micronutrient Initiative and UNICEF (2004) find that the impacts of food deficiencies on mortality, sicknesses, and on early child, mother and adult cognitive ability are very important, but estimate these problems cause a negative effect of only 2% on income, through adult productivity.

A different point of view, taken here, addresses the long-term impact of health by including the intergenerational and life-long dimensions. These provide the underlying logic behind the large long-term impact of health on income.

This conceptual framework on human development and economic growth is supported by showing that an intergenerational low human capital trap exists in Mexico, involving a large part of the population. The trap is characterized by the following constituent elements. Education has increasing returns which are not tapped by a major portion of the population, while the role of health is two-fold. First, early child health and nutrition are strongly associated with the probability of obtaining a higher education later in life, over and beyond parental education, income and wealth. Second, adult health contributes to adult income. The first of these channels is of a large enough magnitude that attainable improvements in early child development can play an important role in overcoming the barriers to investment in higher education, and therefore in overcoming the human development trap itself.

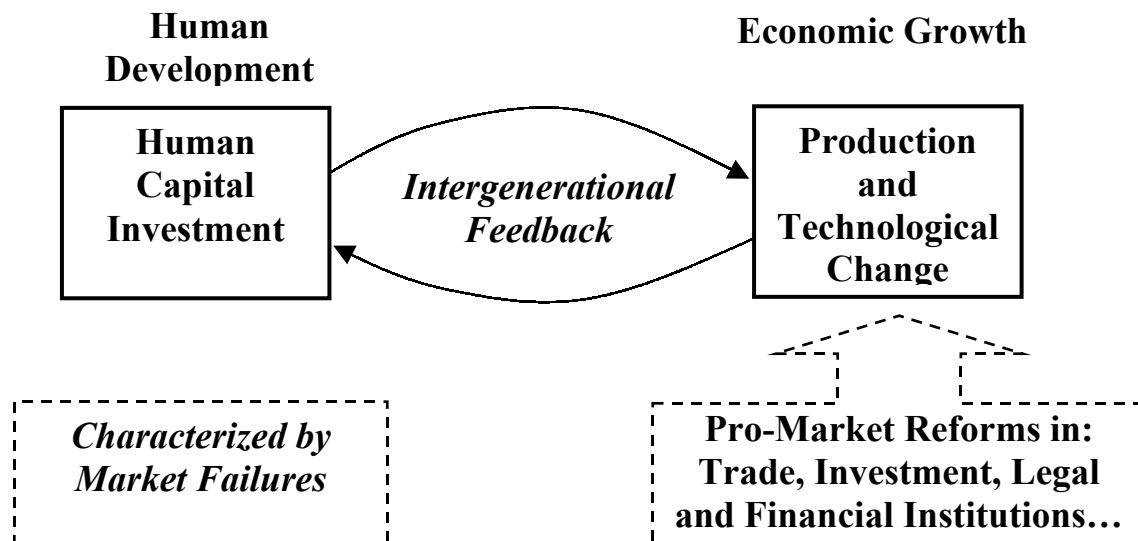


Figure I. Intergenerational relation between human development and economic growth. Market failures in human capital accumulation and pro-market reforms.

Human Development and Economic Growth

Two main characteristics distinguish human development from the rest of the economic process. First, human development has an *intergenerational* character. Second, it involves a process of human capital investment, characterized by *market failures*. These failures slow human capital accumulation and may be strong enough to cause low human

capital accumulation traps. These two basic hypothesis shape a conceptual framework for understanding the interaction between human development and economic growth, in which human development is understood as an intergenerational cycle of investment in nutrition, health and education that is held back by market failures (See Figure I). When pro-market reforms are applied in areas such as trade, investment, and legal and financial institutions to promote economic growth, the presence of market failures in human capital accumulation reduce their effect, especially their long-term effects.

There are many types of barriers to human capital accumulation that may occur. They tend to correspond to different levels of income. A first example is when income levels are too low to sustain labor productivity. A low productivity trap due to malnutrition may arise. A second type of barrier occurs in subsequent stages, when education becomes important, but families may lack the necessary resources to educate their children. Lower discount rates due to poverty may also be involved, as well as barriers due to the unequal inheritance of social capital, knowledge or early child development. These assets may be less available to families with low levels of education and income, and may not be provided by the educational system. These problems may become even worse in the presence of child labor.

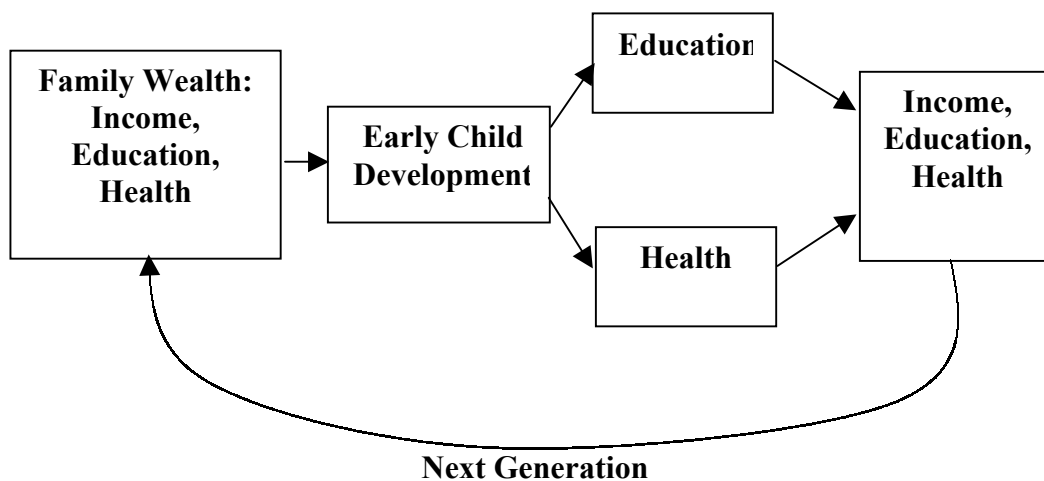


Figure II. The role of early child development in the intergenerational cycle of human capital formation. Early child development is strongly affected by family wealth. In turn, it is an important determinant of young adult education and health and therefore of life-long income, education and health.

The Role of Early Child Development in the Accumulation of Human Capital

Early child development is the combination of physical, mental and social development during the first years of life. There are many links between gestational problems, intra uterine malnutrition, early infections, and after-birth brain development and adult health problems such as blood pressure, respiratory functions, schizophrenia, diabetes, short stature, Parkinson's disease, and so on.

The effects of early child development on health and education during youth and consequently on life-long income, education and health, are very important. The socioeconomic status of a child's family of origin impacts her early development and through this her development through youth and adulthood. This intergenerational mechanism (see Figure II) is found to lie at the heart of the correlation between adult health and income. This correlation, called the 'gradient' of adult health along income, has been studied extensively in developed countries and is analogous to the correlation of health and income across countries. The intergenerational origin of the gradient has only recently been elucidated empirically in prize-winning studies using the 1958 National Child Development Study, which has followed all children born in Great Britain in the week of March 3, 1958 from birth to age 42 (Case, Fertig and Paxson, 2003). These authors find, as confirmed in Mayer-Foulkes (2004) for the case of Mexico, that "controlling for parents' incomes, educations and social status, that children who experience poor health have significantly lower educational attainment, and significantly poorer health and lower earnings on average as adults".

Early child development programs emphasize the complementary roles that nutrition, health and education play in human capital formation. Children participating in them show higher intelligence quotients and improvements in practical reasoning, eye and hand coordination, hearing and speech, and reading readiness. Grade repetition and dropout rates are lower, performance at school is higher, and the probability that a child will progress to higher levels of education increases. This is consistent with findings on Mexico on the impact of stature on school permanence (Mayer-Foulkes, 2004). Early child development also benefits life-long health. Thus, poor nutrition and health are real obstacles to the achievement of *child quality*². As much as a third of the world's population does not meet its physical and intellectual potential because of vitamin and mineral (VM) deficiencies. This is the case even though the control of such deficiencies "is an affordable opportunity to improve the lives of two billion people, and to strengthen the pulse of economic development" (Micronutrient Initiative and UNICEF, 2004).

These are the types of mechanisms through which childhood health later affects health and education. Early child development is a critical link in the intergenerational transmission of wealth. Countries like Canada and the United States have recognized its importance and are spending billions of dollars on early child development programs. Such programs are even more necessary in countries such as Mexico.

The Human Development Trap in Mexico³

The main human capital asset generating adult income in Mexico is education. It has increasing returns that show up for upper secondary school in the case of women, and for higher education in the case of men. These returns are however inaccessible to most of the population. The role of health is two-fold. First, early child health and nutrition are strongly associated with the probability of obtaining a higher education later in life, over and beyond parental education, income and wealth. Second, adult health contributes to

² A conceptualization of the objectives of education echoing the essence of the concept of human capital that has been used in the World Bank.

³ This section summarizes the empirical findings in Mayer-Foulkes (2004).

adult income. Thus there are also substantial returns to nutritional investment, which most the population does not take advantage of.

The presence of a human capital accumulation poverty trap in Mexico conforming to this structure is demonstrated empirically by:

- Increasing returns to education in adult income.
- Substantial and possibly increasing returns to childhood health in the acquisition of education, as measured by school permanence.

These results have been found consistently in a series of studies. Several studies on Mexico find increasing returns to education in income (an additional year of higher education is more profitable than an additional year of primary or secondary schooling). These high returns to higher education have been linked with market reforms such as Mexico's entry into GATT, and the North American Free Trade Agreement (NAFTA). A different literature on the impact of nutrition and health on education also finds consistent results supporting this link. For example, taller children complete more grades than shorter children in Nepal and China; and in the Philippines delayed enrolment in primary school is caused by the effects of nutritional deficiencies in early childhood on "child readiness" for school and early child nutrition is an important determinant of academic achievement. In a study on Mexico by Rubalcava and Teruel (2004), stature is found to significantly influence mother's cognitive ability. This ability, it is found, has a more significant impact on the acquisition of children's stature, than mother's stature itself. Thus, early childhood development, as reflected in stature, is an important determinant of the intergenerational transmission of cognitive ability and health. In other words, early health has an impact on the whole educational cycle. For the case of Mexico, I find that the probability of deciding to continue on a further three years of study is considerably higher for better nourished children. This is true after controlling for the income, wealth, education, stature and weight of the parents, as well as their area of residence. The additional probability of going over from a school triennial cycle to the next, associated with one more centimeter of stature, is higher than 5% for at least 10% of the population. A rough calculation shows that such an improvement in stature could be achieved for Mexico's malnourished population by nutritional programs which would be economically viable just through their positive effects on educational productivity.

Thus, there is a functional relationship between parental wealth and children's human capital and future income, and this relationship has a region of increasing returns. Moreover, there is substantial under-investment in human capital. Thus, at the very least there exists a prolonged intergenerational transition, which may be strong enough to constitute a low human capital accumulation trap. To distinguish between these two alternatives (a prolonged transition or a trap), it is necessary to detect whether there are multiple equilibria subdividing the population into two or more groups according to their human capital assets. The following evidence is presented:

- The distribution of education across households according to spouses' education is multiple-peaked and reflects the existence of two social groups or classes, one with lower secondary schooling or less, and another with higher levels of education (see Figures III and IV).

- Changes in the distribution of schooling in the lower group occur almost exclusively in response to the increased availability of public education. The independent investment of this group does not substantively contribute to human capital accumulation (see Figure V).

Thus, the population classifies itself through marriage into two groups identified by their educational status: a low one with completed lower secondary school or less, and a higher one with 15 or more years of schooling. This is one of the distinguishing features of a low human capital accumulation trap, as opposed to a prolonged transition.

The distribution of schooling among adults aged 25 to 30 is surprisingly stable, except for one very clear pattern of change: a greater proportion of men and women complete secondary and higher education, instead of remaining with a lower level of schooling. However, most of these educational increments have been due to public investment in education. The rises in schooling of the group with lower education are not the result of their private investment, consistently with a low human capital accumulation trap. More than half of the expenditure in public education (58.2%) was received by students in the higher 30% of society. These educational levels are thus almost inaccessible to three fourths of the population, again consistently with the trap mentioned above. Indeed, it is quite possible that much of the higher education in Mexico would not take place without public support.

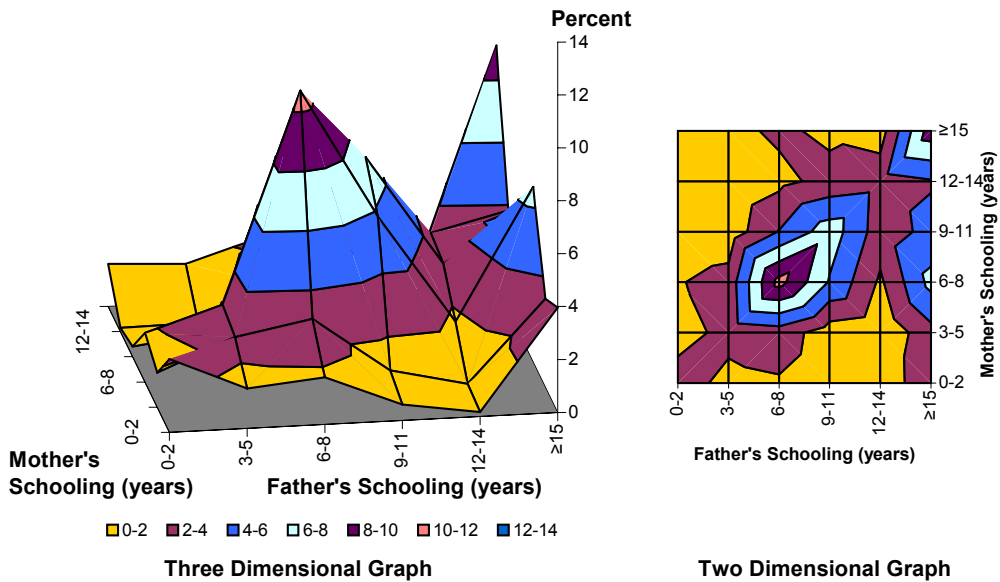


Figure III. Distribution of Mexican households according to female and male spouses' schooling. Households restricted to two spouses of opposite sex ages 25 to 40 in Encuesta Nacional de Salud (ENSA 2000).

The existence of a poverty trap has strong economic implications. Dismantling it would liberate the economic energy of three fourths of the Mexican people, putting their capabilities at the level of those in the highest 25% of the population. Potentially, this economic impact could be higher than the demographic bonus, which increases a generation's savings. Instead, the presence of the trap reduces the possible impact of this

bonus, which in any case is being exported through migration, because the demographic structure is stabilizing without an emergence from poverty.

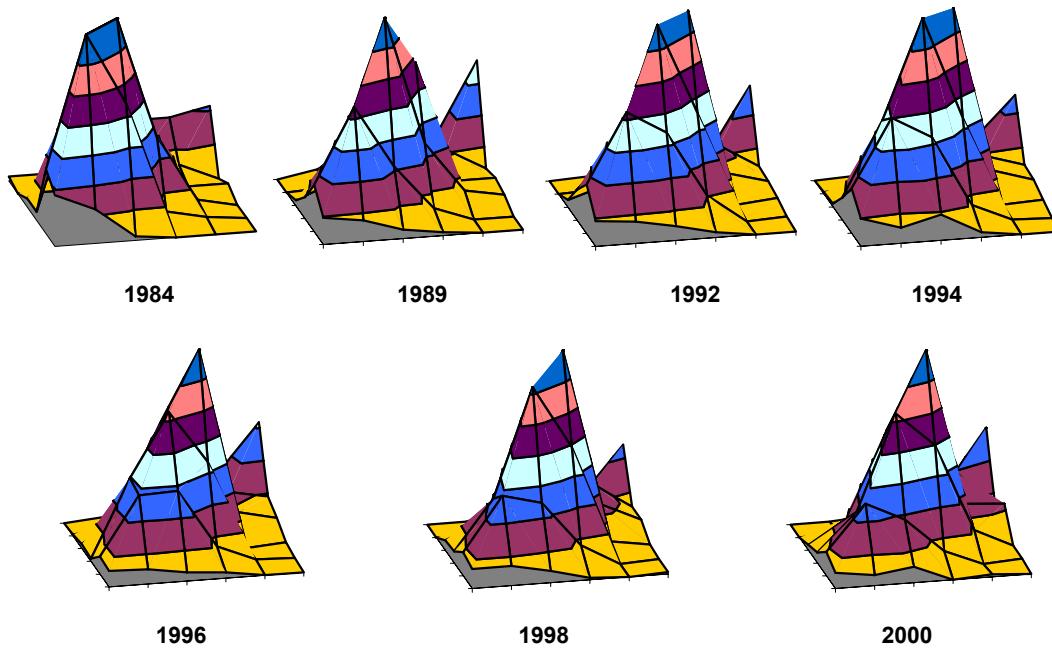


Figure IV. Distribution of Mexican households according to female and male spouses' schooling (coloring as in Figure III). Households restricted to two spouses of opposite sex ages 25 to 30 in the seven Mexican Encuesta Nacional de Ingreso y Gasto de los Hogares (ENIGH) surveys.

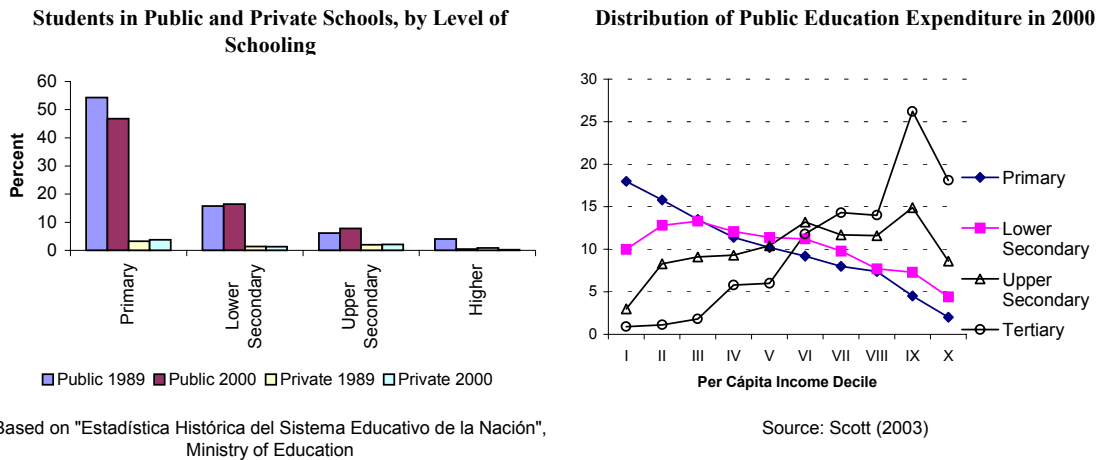


Figure V. Changes in the distribution of schooling in Mexico occur almost exclusively in response to the increased availability of public education.

Market Failures

All children are conceived equally across the population, assuming that the genetic inheritance of abilities is distributed equitably among the population. Nevertheless, malnutrition begins in-uterus, with life-long consequences for health that include cognitive development. For babies to grow up into productive adults realizing their full potential, it is necessary that an investment be made in their nutrition, health, early child development, and education. According to economic theory, *any* important and systematic deviation from optimal investment is due to some kind of failure in the market system. These failures have important consequences for social welfare, and justify public intervention to somehow bridge the financing for investment, so long as such intervention is sufficiently efficient.

The presence of increasing returns to education, and of returns to nutrition and health that much of the population does not access implies that there is an important and systematic degree of under-investment in health and education. Thus market failures in human capital investment must be present. Among such failures may be imperfect or uncaring parenting, credit constraints, lack of information or foresight on the benefits of early child development, excessive impatience due to poverty, and unavailability of necessary public goods in health or education.

Interaction with Pro-Market Reforms

Several studies on Mexico and Latin America find that returns to higher education have risen with market reforms due to an increased demand for skills. The structure of increasing returns to education has been present in Mexico since at least 1984. Nevertheless an increased investment in higher education did not occur. A series of studies have argued, for example, that NAFTA failure to produce the accelerated growth predicted by traditional growth and trade theories is due to a deficit in human capital, lack of infrastructure, and poor institutions. The low human capital accumulation trap, along with institutional failures and a poor provision of public goods, have limited the benefits of reform.

Implications for Long-Term Development Policy

Human development is an essential component of the process of development and economic growth. This holds to such an extent that it can be argued that the very aim of development and economic growth is human development itself (Amartya Sen, 1999). The weight to be given to Human Development as opposed to Economic Growth has long been a vibrant topic of debate. For example, the 1990 Human Development Report of the UNDP “addresses, as its main issue, the question of how economic growth translates - or fails to translate - into human development.” The emphasis on human capital of recent research on economic growth, and on poverty reduction in the policy aims of international aid organisms makes it seem as if this debate has reached a consensus (Aturupane, Glewwe and Isenman, 1994).

These positions and debates miss the point that what matters is the long-term mutual interaction between human development and economic growth. This interaction has seemed too complex to form a coherent basis for policy. However, recent findings are leading to a very useful and practical clarification of this relation in the intergenerational nature of human development. These can be summarized as follows. Human development results from an intergenerational cycle of investment in nutrition, health and education. It draws its resources from the state of production and technological change and then returns to these in the next generation their basic inputs: human labor, skills and knowledge (Figure I). However, the process of human development is beset by market failures that slow it down and consequently slow down economic growth, inducing deficient equilibria and making underdevelopment persistent.

This conceptual framework clarifies the relation between human development and economic growth. Policies for long-term growth and development, and for the reduction of poverty and inequality, must sufficiently emphasize the formation of the coming generations. Moreover, such policies must embrace a large segment of the population. This is due to the *intergenerational* nature of human development and the crucial role of *early child development*, as well as to the difficulties presented in practice by policies of redistribution to adults. Transferring resources to the children of poor families since their early age, to secure their nutrition, health and quality education, will also work as a transfer to adults, making families happier. It will also form the next generation in such a way as to enjoy the abilities and training to find solutions to its problems in the future.

Conclusions

Human development is an intergenerational process in which early child development plays a crucial role, and which can be characterized by poverty traps, as in the case of Mexico. By preventing the formation of human capital, these traps have an important impact on long-term economic growth, and reduce the scope of growth policies in other sectors of the economy. Among the factors substantially favoring human capital formation are early child nutrition and health, which have a life-long influence on health, education and income. The indirect effects that health and nutrition have on adult income through education are higher than the direct effect of health on adult productivity. Moreover, early child nutrition and health improve long-life health and therefore life quality and expectancy. The effects of early nutrition and health on adult income explain a large portion of the long-term impact of nutrition and health on economic growth. Nutrition and health, or human development in its entirety, are *ingredients* of economic growth, besides constituting their main *objective*.

The presence of poverty traps is the result of insufficiencies in the market system, which under-invests in nutrition, health and education. These failures occur from an early age to generate persistent intergenerational inequality in nutrition, health and education. Likewise, they reduce the fruits of market reforms, which tend to concentrate on that part of the population already endowed with human capital.

To understand economic growth, it is necessary not only to account for the positive forces that sustain it, such as human and physical capital accumulation and technological change, but also for the negative forces that hold it back, such as market

failures slowing human capital accumulation, amongst others, that account for the historical and present-day divergence in global income levels.

Neither health nor educational institutions pay enough attention to early child development. An integral public policy for long-term growth and development aiming at dismantling poverty traps so as to eradicate poverty and inequality must sufficiently emphasize the formation of the coming generations, beginning with early child development. In particular, it must eradicate child malnutrition, including micronutrient deficiency and obesity.

References

- Arora, S. 2001. Health Human Productivity and Long-Term Economic Growth. *Journal of Economic History* 61 (3).
- Aturupane, Harsha; Paul Glewwe; Paul Isenman (1994) "Poverty, Human Development, and Growth: An Emerging Consensus?" *The American Economic Review*, Vol. 84, No. 2, Papers and Proceedings of the Hundred and Sixth Annual Meeting of the American Economic Association. (May), pp. 244-249.
- Case, Anne; Fertig, Angela and Paxson, Christina (2003). "From Cradle to Grave? The lasting impact of childhood health and circumstance". *National Bureau of Economic Research*, NBER Working Paper 9788, Cambridge, Massachusetts.
- Fogel, R. W. (2002). *Nutrition, Physiological Capital, and Economic Growth*. Pan American Health Organization and Inter-American Development Bank. (Washington, DC.): available at <http://www.paho.org/English/HDP/HDD/fogel.pdf>.
- Mayer-Foulkes (2004). "The Human Development Trap in Mexico", available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=539082.
- Micronutrient Initiative and UNICEF (2004) Vitamin & Mineral Deficiency: A Global Progress Report, available at www.micronutrient.org.
- Rubalcava, L. N. and Teruel, G. M. (2004). "The Role of Maternal Cognitive Ability on Child Health", mimeo.
- Scott, John (2003). "Public Spending and Inequality of Opportunities in Mexico: 1992-2000", Revised version of Documento de Trabajo 235, División de Economía, CIDE, forthcoming in *Public Spending and Poverty in Latin America*, Quentin Wodon (ed.), Stanford University Press.
- Sen, A. (1999). *Development as Freedom*. New York: Alfred A. Knopf.