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Investment in Health and Economic Growth: a perspective from Latin America and the Caribbean

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Table of Contents

Page

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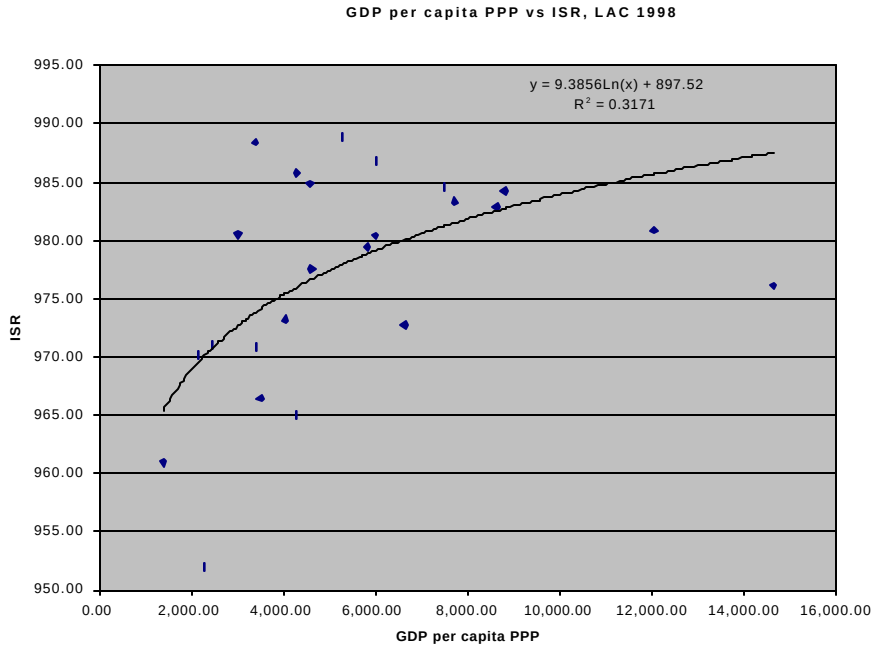
1. THE INCOME-HEALTH LINK AND DETERMINANTS OF HEALTH

"The positive correlation between health and income per capita is one of the best known relations in international development."[1] Higher income gives greater command over many of the goods and services that promote health, such as better nutrition, access to safe water and sanitation, good quality health services and better information and education. In the case of the Latin American and Caribbean (LAC) countries, Figure 1 shows the corresponding income-health typical correlation curve obtained by plotting infant survival rates vs. GDP per capita; it is evident that the lower the income level, the higher the potential health gains (in this case, in infant survival rates) to be made by marginal increments of income. On the other hand, Figure 2 evinces an even more interesting fact: in three curves, with ten year intervals, the infant mortality rate for any given constant income level in LAC has been reduced without any change in income, reaching 50% of previous average value by income level in comparison to the IMR twenty years before. What this means is that, even in the absence of real economic growth, health conditions can improve, even dramatically, and that this trend towards improvement seems evenly distributed in all income groups.

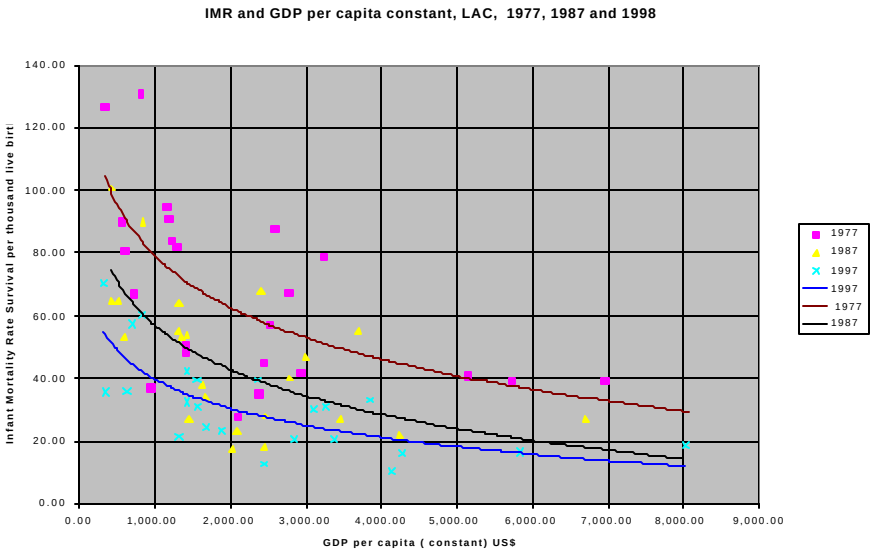
Figure 1.



Source: World Bank, World Development Indicators, 2000.

[1] Bloom and Canning, op cit.

Figure 2.



Source: World Bank, World Development Indicators CD ROM, 2000.

One conclusion to derive from this simple evidence is that even though health status is strongly associated with income, there are other determining factors that can influence the level of population health. Whatever these may be, this means that certain policy levers can be applied to improve health status, even in situations of relative resource limitation. If this is the case, and if health status can be identified as a positive input for income growth, this reverse relationship can become the basis for policies geared towards investing in human capital formation, not only through education, but also by improving nutritional and health status of the population.

Improved health is both a cause and consequence of economic growth. As shown above, many studies have concluded that the direct role played by national economic performance in long term health improvement is difficult to characterize.[2] Some authors find that mortality in the past two centuries has not been helped by market forces. Economic growth has not been behind the worldwide improvement in life expectancy, since the great geographic concentration of population engendered by economic growth largely reversed any positive level of living effects. According to this school of thought, public policy initiatives, based on new knowledge of disease, have been essential to the improvement of life expectancy, and these can be, and have been, undertaken in the absence of economic growth.

[2] Easterlin, Richard. A., How beneficient is the Market? A look at the Modern History of Mortality, February, 1998, mimeo

Many studies have shown a positive correlation between income and health status, both on a cross-sectional and longitudinal basis. According to Gertler and van der Gaag, in cross-sectional study of GNP and health status for a sample of 34 countries, the variance in GNP explained between 74% and 79% of the variance in life expectancy at birth, infant mortality rate (IMR), and child mortality rate (CMR). They found that, on average, a 10% increase in income is associated with one extra year of life expectancy, an 8.3% lower IMR, a 14,2% lower CMR. This structural relationship has shifted over time (see figure 2). The reasons for this shift is that it progressively becomes easier or cheaper to attain and maintain given levels of health over time because of technological innovations and investment in public infrastructure. Health increases with income because people are better off and because it is more affordable. A useful way of examining the link between income and health is to look first at the way certain broad classes of consumption goods affect health, and to ask how the use of these goods and services is usually related to income. Perhaps the most obvious input into good health is medical services, including curative and preventive interventions. Such services, particularly curative care, can be less important when other goods, including clean water, nutrition, adequate housing, safe work environments, and so on are also available and used effectively. To have a positive impact on health, the consumption of these goods must be effective: simple improvements in behavior can have substantial impacts on health status.

Most studies have found that the level of education of individuals is a significant determinant of health status, and particularly the improvement of mothers' literacy is strongly correlated with improvements in children's health. Education, as an investment in human capital, does not increase health status by itself. But as a proxy for effective use of other health-improving goods and services, it is significant. Cultural norms are also important determinants of consumption patterns and health outcomes. The social status of women is positively correlated with both their health status and that of their children. Access by women to prenatal care and the extent of their heavy household and agricultural work (such as water carrying) are likely to have significant impact on health but are often determined by social constraints that are unresponsive, in the short term, to economic interventions.

Despite the presence of some externalities (immunization, potability of water supplies), one's health depends mainly on one's own consumption of medical care, food, shelter, clothing, water, sanitation and so on. Therefore, the distribution of income also matters: it is an established fact that income inequality is correlated with lower health status[3 4 5 6]. The average life expectancy across incomes is much less than the average life expectancy of those with average incomes, because the fitted relationship is concave. The flatness of incomes above the unweighted average suggests that redistribution from the rich to the poor would have a

[3] Wilkinson, RG,, Unhealthy societies: the afflictions of inequality, London, Routledge, 1996
[4] Kaplan, GA, Pamuk, ER, Lynch, JW, Cohen, RD, Balfour, JL, Inequality in income and mortality in the United States, BMJ, 1996 312:999-1003
[5] Kennedy, BP, Kawachi, I, Prothrow-Smith, D, Income distribution and mortality:cross-sectional ecological study of the Robin Hood Index in the United States, BMJ, 1996:312:1004-1007
[6] Wolfson, Michael, Kaplan, George, Ross, Nancy, Backlund, Eric, Relation between income inequality and mortality:empirical demonstration, BMJ, 1999:319:953-957

significant impact on average life expectancy, with little if any negative effect on the health status of the rich.

Other authors find that changes in average national life expectancies over the past several decades have been much less disparate than changes in national output per person. Preston examined the relationship between life expectancy at birth and national economic performance; even though the relationship between income and life expectancy is extremely robust at any given point in time, life expectancy can be observed to increase over time even after holding income constant, as shown in our LAC data above. This observation also suggests that the substantial improvements in human health which have been attained in the last century are not entirely attributable to economic performance. In fact, only 10-25% of the increase in life expectancy between 1930 and 1960 may be explained by factors directly related to national economic performance. Among the main factors exogenous to income at the national level global improvements in health technologies and practices may be the most important.[7] This raises important policy issues: while some may argue that improved health is a consequence of successful development strategies, other evidence suggests that such strategies must incorporate effective health interventions. This statement must in no way be taken as a minimization of the fact that human well being is an end in itself, and that good health is a basic component of human capability, the measure itself of agency, a constituent component of development.[8] Nevertheless, a better understanding of the complex relationship between health and economic growth is important for proper priority setting and policy implementation. Despite some protestations to the contrary[9], an economic case can be made for investing in health.

2. ECONOMIC GROWTH MODELS AND HUMAN CAPITAL

A very recent paper produced by the World Bank studied a time series of over four decades of data from a sample of 80 countries, with fair amount of variation around general relationships. It found that policy induced growth is as good for the poor as it is for the overall economy. Openness to foreign trade benefits the poor to the same extent that it benefits the whole economy. It concluded that an avoidance of high inflation is super pro poor, since high inflation is more harmful to the income of the poor than to GDP overall. The researchers reported no evidence that public spending on health and education have systematic effects on income of the poor. They concluded, "We know very little about what systematically causes changes in the distribution of income."[10]

Another simulation model proposed by Robert Lucas states that a country's chance of embarking on growth depends on the average incomes in the world at that date. The richer the world as a whole, the greater the chance that any given pre-industrial country will begin to grow. A pattern of growth emerges in which the 19th Century, with low global incomes, is slow, it

[7] Preston, Samuel H., The changing relation between mortality and level of economic development, Population Studies, 29(2) 231-48
[8] Sen, Amartya, Development as Freedom, Random House, New York, 1999.
[9] Norman, Charles, Can an economic case be made for investing in health?, BMJ, June 1998:316:1762-1770
[10] Dollar, David, Kraay, Aart, Growth IS good for the Poor, World Bank, March 2000.

accelerates markedly during the 20th century, and tails away late in the 20th century because there are fewer pre-industrial economies where growth has not begun. The rate of growth depends on the income gap between leader and follower. The chance of starting growth depends on incomes in the world as a whole, through human capital (knowledge produced anywhere can benefit producers everywhere), diffusion through policies and institutions and diminishing returns, in which high wages in leaders cause capital to flow elsewhere. It concludes that the period of high global growth is over. In a transition lasting decades the world will slowly converge on a long term growth rate of 2% which leads to the reduction of inequality among countries.[11]

The above are two examples of simple neoclassical growth theory. The Solow model, which predicts that per capita incomes of economies will tend to converge to the same level over time as lower income nations grow faster than higher income nations, assuming that all have the same access to the same technology and share similar savings and investment rates. During the decades of the 1950s and 1960s, Solow's theoretical structure validated policies that focused on the expansion of the industrial capital stock and the rate of savings as the instrument mean to promote economic growth and higher income per capita. The primacy of physical capital accumulation has continued to draw the attention of development economists as a result of the neoclassical model's theoretical construct: to develop countries need to save and invest more as to augment the capital stock of the nation. A larger physical capital stock per worker will boost the attainable level of income, although at a declining rate as a consequence of the law of diminishing returns, by increasing the productivity of each worker who will have more physical capital with which to work.[12]

It was recognized that many poor nations will experience difficulty in accumulating additional physical capital due to low incomes and low savings and fewer resources that can be freed for investment. Many believed that this insufficient level of capital accumulation could be complemented by external financing. Aggregate economic growth was not believed to be constrained in an absolute sense by a shortage of domestic resources in less developed countries, since limited domestic savings could be complemented by foreign savings in the form of loans, aid and direct foreign investment. External resources could add to and complement domestic financing for investment and economic growth.

The economic models of that period strongly suggested that economic growth was essentially a technical or transfer problem to be solved through large injections of physical capital into the production process of poor nations, and by measures to slow population growth. Given the prediction of convergence of world income levels by Solow type neoclassical growth models, economists and policy makers assumed that within a not too distant future, world poverty could be expected to be eradicated. For a time, the rapid rates of growth of many countries in the less developed world compared to the developed countries after the Second World War seemed to corroborate these optimistic expectations. Comparing the low and middle-income countries as group with the high-income group over the period of 1965-93, the rate of income of the former exceeded that of the latter, as predicted by the income convergence

[11] Lucas, Robert, cited in The Economist, 8th Jan 2000, Journal of Economic Perspectives
[12] Cypher, J.M., Dietz, J.L., The process of Economic Development, Routledge, London, 1997, P.239-42

hypothesis. However, there is much variability in the data when it is examined more closely: for example, Latin America outperformed the high income economies up to 1980 and then under-performed in the following thirteen years. On the other hand, two other regions stand out for their consistency. Sub Saharan Africa's growth rates have been lower than those of the high income economies in every period, while East Asia and Pacific have consistently evinced per capita growth rates greater than in those of the high income nations. This provides contradictory evidence for the neoclassical models prediction of income convergence and the faster growth rates for lower income countries. Even though the model seems to fit in the case of the East Asian experience, for Sub Saharan Africa, the opposite seems to be the case: even though it is the poorest region, it has had the worst overall growth performance. According to the model, those lower income economies with a smaller initial capital stock would have the greatest opportunities for profits from increased capital accumulation; their growth rates would have been expected to be the highest, then, not the lowest.

The relatively slow progress of many African and South Asian economies, as well as the debt crisis and the corresponding reduction of per capita incomes in the early 1980's in the Latin American region, have led a number of economist to question the validity of a growth model, which predicts eventual income convergence, leading to a critical examination of policies recommending the accumulation of ever more physical capital, by saving or borrowing that were the product of neoclassical economic formulations. The empirical research on growth using the neoclassical framework often found that more than 50% of the growth rate of a country could not be accounted for by changes in the use of capital and labor, leaving an unexplained, or *Solow, residual* as the major determinant explaining growth rates. All the diverse factors that might be attributed to this residual, such as the effects of education, technology, business organization, research and development, health status, culture, governance, international trade and others were postulated but empirical models that might untangle and explain these influences were slow to come forth.

In the late 1980s, new "endogenous" growth models (EGMs) began to appear in the literature. These theories do not assume physical capital accumulation to be the dominant determining factor for economic growth, nor in explaining the differences in income level among nations. More importantly, these models reject the neoclassical assumption of diminishing returns as applying to any of the reproducible inputs to production, particularly capital and labor, but also technology, turning a country's short-run production function into a long-run, dynamic relationship that is constantly evolving. Furthermore, in endogenous theory, the rate of growth of long-run per capita income is not constrained nor solely explained by exogenous technological change or the all encompassing "Solow residual", as is the case with the neoclassical models. In the endogenous growth models a higher level of investment can not only get a country to higher levels of per capita income but can also sustain higher rates of growth per capita income in the future. By breaking the link between the rate of economic growth and the law of diminishing returns and by removing the ceiling on per capita income for any particular rate of savings and investment, EGMs models can account quite well for the widening gap in income between poorer and richer nations.

In most EGMs, the most important factors of production contributing to higher and sustained growth has been found to be both the rate of accumulation, and the initial stock, of ***human capital***, which is created by any improvement in the quality of labor, be that as the result of increased education, on the job learning, better health care, interaction with other workers with accumulated human capital or other influences which improve labor's productivity without adding more physical capital production. EGMs postulate technological progress, or the growth of total factor productivity, as a function of the level of human capital, in the assumption that an educated labor force is better at creating, implementing and adapting new technologies. Higher income countries not only have access to a large stock of physical capital, but by investing time and money in maintaining an educated and healthy workforce, they are able to produce a large stock of human capital: labor that is skilled in production, labor that can operate complex machinery, labor that can create new ideas and new methods of economic activity. It is important to distinguish this form of labor from unskilled labor, which is as abundant in lesser developed countries as human capital is scarce. According the Solow models, families can 'save" into holdings of physical capital or rights to the proceeds of such capital. In the simplest EnGM, households can also "save" by investing in education, which raises the market value of labor that they supply in the future. Such savings may benefit the individual or household directly, or it may adopt a more altruistic form in which parents invest in the education of their children. It is precisely in this regard that the impact of improving population health status, in its various dimensions, can be regarded as means for deliberately augmenting a country's human capital. Families make many choices regarding their health, based on capacities for consumption and production that will have many direct and indirect influences on their capacity to improve the quality of labor of the present and future generations, thereby contributing to the accumulation of human capital.

The EGMs and their insistence on the existence of pervasive positive externalities suggest a wider arena for public policy action than is evident from the simple Solow model. EGMs suggest that government policies can affect the rate of accumulation of both physical and human capital, as well as the level of research and development expenditures. Markets for savings and borrowing are often less than perfect in many developing economies. Consequently a purely market based development strategy will fail to adequately tap a society's potential to the extent that investment is financed by private savings and investment decisions The new growth theory examines production functions that show increasing returns because of specialization and investment in "knowledge" capital. Technological progress and human capital formation are endogenized within general equilibrium models of growth. New knowledge is generated by investments in the research sector. The technological residual is accounted for by endogenous human capital formation. With knowledge being treated as a public good, spill over benefits to other firms may then allow aggregate investment in knowledge to exhibit ***increasing*** returns to scale. This in turn allows investment in knowledge capital to persist indefinitely and to sustain long term growth in per capita income. A policy implication is that governments can promote growth by providing incentives to agents in the knowledge producing, human capital intensive sectors, as well as be aided by the international transfer of technology.[13] Furthermore, it becomes

[13] Meier, G.M., Rauch, J.E., Leading Issues in Economic Development, 7 ed. Oxford University Press, 2000, P.75.

imperative to invest in those interventions that will improve cognitive ability, learning skills, and social adaptability of the young, such as ensuring adequate health and nutrition for mothers and children, as well as promoting and protecting the health and capacity of the adult workers who have accumulated individual human capital and knowledge stock and can be resources for improving human capital in their firms and communities.

Human capital contributes directly to growth by increasing productivity or boosting investment in physical capital, contributing to the invention of new technologies and facilitating their adoption. Initial levels of education strongly influence the growth rate of countries and low income economies converge faster when their initial stock of human capital is larger, and human capital affects growth rates by enhancing productivity. Much of this contribution may be related to the impact of nutritional and health status on learning capacity. The low rates of growth and high inequality of Latin American countries over the last decades, compared to East Asian countries, can be attributed to differences in educational performance, part of which are caused by poor health and nutrition. After the crisis of the early 1980s, countries with the strongest rate of growth were precisely those with higher levels of education among younger workers and with higher life expectancy.[14] One characteristic of health improvement on growth is that the effect is permanent, i.e., once a certain level of health is achieved it is maintained, mainly because of technology and knowledge gains. Further improvements lead to further growth; therefore it is an important issue in the rate of diffusion and assimilation of new knowledge in health.

3. EMPIRICAL EVIDENCE OF PATHWAYS OF HEALTH TO GROWTH AND POVERTY REDUCTION

There is abundant and growing evidence that investment in health not only improves productivity and creates human capital, and therefore has a strong effect on the rate of economic growth, but that the provision of effective health care, particularly for the poor, can also provide security against consumption or income shocks and prevent further slippage into poverty. Whereas the focus of this paper is on the role of health in human capital formation, it is important to bear in mind the second line of positive effects of health care on poverty reduction, particularly in view of the fact that up to now, relatively little correlation has been found between public expenditure on health and actual health status.[15] Even though other determinants of health are probably more relevant in the health production function, access to appropriate health care, particularly to health financing, is not only a basic human right, it is also good social and economic policy in the measure in which it protects lower- and even middle-income groups from catastrophic health costs and potential impoverishment.[16]

[14] IDB, Economic and Social Progress Report 1996-1997, Washington DC, P.246
[15] See Filmer and Pritchet, op cit.
[16] Sen,, Binayak, The life and death question: health as a contributor to development, draft, WHO, June 2000

Empowerment of women, maternal health, early child development and future productivity

One of the most important pathways is mediated through the agency role of women in human development. Investing in mothers' health not only improves the nutritional status of children at birth, but also their subsequent educational attainments, influencing future occupational choice and productivity; there is also a growing body of evidence that chronic diseases at later ages are, to a considerable degree, the result of exposure to infectious diseases and other types of biomedical and socioeconomic stress early in life.[17],[18],[19],[20] . Women's empowerment leads to lower fertility, better antenatal and neonatal care and lower infant mortality, as well as reducing the incidence of low birth weight, a major factor of child malnutrition. Maternal health is also an outcome of women's empowerment. A higher nutritional status of children associated with better maternal health status and women's empowerment is conducive to better performance of children in school, higher human capital formation, with strong productivity effects. Because of attention that mothers pay to children's school work, the productivity effect of maternal health is generally larger for educated women.[21]

The positive relationship between initial health capital and subsequent economic growth may be tested with cross-country data as well. Recent research in Asian contexts has explored these relationships.[22] The variation in the incidence of low birth weight babies is strongly influenced by the educational status of women even after controlling for the differences in the income level, urbanization and other economic data. Since women's health status is closely correlated with female educational status, a more direct incorporation of women's health status in the growth function equations used could shed more insights into the correlation between maternal health, child nutrition at birth and future productivity.

The INCAP longitudinal study in four Guatemalan villages in which different food supplements were given to pregnant women and young children, and longitudinal information collected, initiated in 1969 and followed up in 1988, has shown evidence of physical growth, body composition, maturation, work capacity, intellectual performance and school achievement that clearly demonstrates how improved nutrition and health status in early childhood leads to enhanced human capital formation in adolescents and adults.[23] Now that the study subjects are

[17] Keating, Daniel P., Hertzman, Clyde, Developmental health and the wealth of nations: social, biological and educational dynamics, Guilford Press, New York, 1999

[18] Deutsch, Ruthanne, How early childhood intervention can reduce inequality: an overview of recent findings, IDB POV-105, Washington DC, 1998

[19] Van der Gaag, Jacques and Jee-Pan Tan, The benefits of early child development programs: an economic analysis, World Bank, Washington, 1998

[20] Smith , George Davey, Hart, Carole, Blane, David, Hole, David, Adverse socioeconomic conditions in childhood and cause specific adult mortality:prospective observational study, BMJ, 30 May 1998, 316:1631-1635

[21] Glewwe, Paul, Hanan Jacoby and Elizabeth King, An economic model of nutrition and learning: evidence from longitudinal data, Policy Research Department, World Bank, 1996, mimeo, cit in Sen, op cit

[22] Bargava, Alok and S.R. i, Osmani, Health and nutrition in emerging Asia, Asian Development Bank, Manila, 1997, mimeo, cit in Sen, op. Cit.

[23] Martorell R., Habicht JP, Rivera JA, History and design of the INCAP longitudinal study (1969-1977) and its follow-up (1988-89), J. Nutr, 1995 Apr 125(4 Suppl):1027S-1041S

approaching the most productive life stage in economic terms, a follow-up study of differential wage earning capacity, educational attainment and other welfare indicators will provide a unique opportunity to directly observe the impact of early child health and nutrition on the creation of human capital and its impact on income and welfare.

Human Capital, Health Nutrition and Wages

Good health and nutrition enhance worker productivity.[24] Health has direct impact on household income and wealth, labor productivity, labor force participation, savings and investment rates, demographic factors and other human capital factors. Several mechanisms have been proposed. First ill health and malnutrition reduce the physical capacity and mental faculty of the laborer, leading to lower productivity and bargaining power, resulting in lower wages. Secondly, chronically ill workers may not get hired at any wage, falling into a health based poverty trap. In such cases transfer programs promoting greater health equity would not only be poverty reducing, but also efficiency enhancing. Third, the provision of public resources for better health can assist the poor to release resources for other investments, such as in education, as a means to escape poverty.

Healthier populations tend to have higher labor productivity, because workers are physically more energetic, mentally more robust and suffer fewer lost workdays from illnesses of their own or of family members.

Healthier people who live longer have stronger incentives to invest in developing their skills, because they expect to reap the benefits of such investments over longer periods. Increased schooling promotes greater productivity and, in turn, higher income. Good health also promotes school attendance and enhances cognitive function.

Improvements in longevity create a greater need for people to save for retirement. Insofar as increased savings lead to increased investment, workers will have access to more capital and their incomes will rise.

A healthy and educated workforce attracts foreign investment, in addition to the positive externalities posed by a healthy environment for increased trade, tourism, investment and other economic activities.

Nutrition is an important health factor, which has long-term human resource impacts. Strauss and Thomas[25] review evidence that height and body mass index are both determined largely by nutritional factors. Using data from Brazil and the United States, they find that these variables are positively correlated with wages after controlling for differential ages and education levels. For example, there is a powerful association between height and wages in Brazil: taller men earn more. A 1% increase in height is associated with an almost 8% increase in wages. Even in the U.S.A., taller American men earn higher wages. In addition, poor nutrition may have

[24] For a recent and broad review of the evidence and measurement issues, see Strauss, John, Duncan, Thomas, Health Nutrition and Economic Development, Journal of Economic Literature, XXXVI, June 1998, Pp.766-817
[25] Strauss, Duncan, op cit.

long-term costs to individuals by impairing cognitive development. Infants who receive micronutrient supplementation have been observed to develop better motor skills than peers who did not receive it, an accurate predictor of overall cognitive development. Adult stature and strength is extremely sensitive to nutritional inputs and overall health during childhood and adolescence. Improved conditions later in life may not fully reverse the impacts of malnutrition and illness.

Impact of specific diseases on economic outcomes

There are many examples of evidence of the linkage between specific disease control or reduction and impact on labor productivity and or income growth. One recent study, using classification rule analysis found a dominant role of climate in accounting for cross-country differences in malaria morbidity, but it also concluded that tropical location is not destiny: accounting for climate, access to rural health care and income equality influenced malaria morbidity. In a cross sectional growth framework, it was found that there is a significant negative association between higher malaria morbidity and GDP growth rate which is robust, including controlling for reverse causation. In a quarter of the sample countries the negative impact is a quarter of one percent per annum, but in Sub Saharan Africa, the estimated absolute growth impact malaria exceeds a half percent per annum[26]

Sachs and Gallup investigated the quantitative impact of endemicity of malaria on cross-country macroeconomic growth. Controlling for tropical location, location in Africa, life expectancy at birth, trade policy, geographical accessibility to international trade and initial income, they found that endemicity of falciperum malaria correlates with substantially reduced GDP per capita growth rates over a 25-year period. They speculated that much of this impact could be through hindered integration of malarious areas into global trade networks.[27]

On the other hand, Bloom and Mahal found that the AIDS epidemic has had an insignificant effect on the growth rate of per capita income, with no evidence of reverse causality, across fifty one developing and developed countries, using established empirical growth models and controlling for a variety o factors possibly correlated with AIDS prevalence that could influence growth, as well as accounting for simultaneity in the relationship between AIDS and economic growth. The authors conclude that similar conclusions could be drawn from the analysis of the insignificant impact of the Black Death on wages in England and France during the Middle Ages. Nevertheless, the point is made that the most serious economic consequences of AIDS are to be found in particular industrial and occupational sectors, in particular geographic regions and among particular demographic groups. The authors conclude that these topics appear to be the most promising areas for further research, along with greater

[26] McCarthy, F. Desmond, Wolf, Holger, Wu, Yi, The Growth costs of malaria
, NBER, Paper 7541, Cambridge, Feb 2000.
[27] Gallup, John L, Jeffrey D. Sachs and Andrew Mellinger, Geography and economic development, 1998, cit in Hamoudi, Amar A. And Sachs, Jeffrey D., Economic Consequences of Health Status, CID Working Paper No. 30, November 1999

application of cost-benefit and cost-effectiveness analysis to programs and policies that address the care of persons living with AIDS and the prevention of HIV transmission.[28]

On the other hand, Mead Over and others estimate the average total cost of treatment and lost productivity in Tanzania resulting from a single HIV infection to be about 8.5% to 18% of per capita income.[29]

Impact of individual and household morbidity on wages

T.P. Schultz and Tansel have developed a methodology for quantifying the impact of illness on worker productivity during the term of the illness, using data from household surveys in the Ivory Coast and Ghana, in a wage function which related productivity to health status, education, post-schooling experience and parental experience. They found that on a disabled day a worker in the Ivory Coast can be expected to be over 10% less productive and a worker in Ghana can be expected to be 11,7% less productive than if he or she were in good health.[30]

Studies of recent Latin American household surveys were coordinated by the IDB, in conjunction with PAHO, in an effort to determine the relationship between morbidity and wages.[31] They found that self-reported morbidity was associated with lower wage rates when evaluated using the framework proposed by Schultz[32] although the results were occasionally stronger for men than for women, perhaps, because of the problems of sample selection on labor force participants or wage earners that can be more serious for women than for men.

Poor health lowers hourly earnings by 58% for male elderly workers in Mexico. A sizeable effect in the context of a developing country without a universal social security system, in which, many elderly individuals work whether their health permits it or not. Poor health may also prevent partners or family members from working therefore leading to poverty among the elderly.[33]

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[28] Bloom, David E, Mahal, Ajay S., Does the AIDS epidemic really threaten economic growth?, NBER, Paper 5148, June 1995

[29] Over Mead, The macroeconomic impact of AIDS in sub-Saharan Africa, Population and Human Resources Department, World Bank, 1992.

[30] Schultz, Tansel, Wage and labor supply effects of illness in Cote de Ivoire and Ghana: Instrumental variable estimates for days disabled, Journal of Development Economics, 1996, 53(2) 251-86

[31] [31] Parker, Susan W., Elderly Health and Salaries in the Mexican Labor Market, Latin American Research Network, Working Paper R353, Interamerican Development Bank, January 1999.

[31] Ribero, Rocio, Nunez, Jairo, Productivity of Household Investment in Health, the Case of Colombia, IDB, Latin American Research Network, Working Paper R354, January 1999

[31] Cortez, Rafael, Salud y Productividad en el Peru, un analisis empirico por genero y region, IDB, LARN, WP R363, May 1999

[31] Murrugarra, Edmundo, The returns to health for Peruvian urban adults: differentials across genders, life cycle and the wage distribution, IDB LARN, #R352, March 1999

[31] Knaul, Felicia Marie, Linking health, nutrition and wages: the evolution of age at menarche and labor earnings among adult Mexican women, IDB LARN, # 355, April 1999

[32] Schultz, T. Paul, Productive benefits of improving health: evidence from low-income countries, November, 1999 mimeo

[33] Parker, Susan W., op cit

In Colombia, the returns to good health of individuals and the determinants of the health production function show that public and private investments in health are related to future earnings of individuals. The study identified the magnitude of the returns to having good health status through the direct effect of health variables on earnings of individuals. One more day of disability decreased male rural earnings by 33% and female by 13%, having a disability in a given month decreased earnings of an urban male by 28% and by 14%for an urban female. Having one more centimeter of stature increased urban female earnings by 6.9% and urban male earnings by 8%. These returns to height are much larger than those found in other countries and reveal that investments in nutrition is as important as in education for future increases in productivity and growth. Estimations of health production functions showed that social security coverage in rural areas would contribute to lower prevalence of illness in that region. In urban areas, higher social security coverage leads to relative over-reporting of illness. Wealthier individuals tend to have better health, and policies oriented to providing more adequate housing translate into better health conditions and productivity for individuals. Coverage of basic services in households, such as electricity, potable, water or sewage have a negligible effect on height and productivity.[34]

In Peru one of the findings of an analysis of the impact of on health status on salaries by place and sex showed that the return to education is overestimated if the production function of health is not considered, mainly for urban women and rural men. One day less of disability increases urban women's earnings by 3.4% and rural women by 6.4%. In men it was 4.7% and 14.2%, respectively, in rural and urban men. Health status in rural areas, particularly men, was associated with access to basic health services. Poverty and unemployment, conversely from wealth, were negatively associated with individual health. In rural areas, housing and health service infrastructure were associated with better health. Hourly salaries for urban men and rural women are positively associated with investment in housing, with positive effects on health.[35]

Another paper on Peru found the same robust positive effect of health on wages, especially for urban males. The negative effect of an additional sick day on hourly earnings are larger among older self-employed males (4.3%) those at the bottom of the earnings distribution (-3.8%) and those in the private sector (-1.8%). This shows that health has a stronger impact on the wages of those jobs where productivity and health are closely connected as in the private sector and the self employed. Whereas negligible effects were found among public workers, it suggests that health effect on wages is larger when productivity and wages are connected, either by observance or the design of the remuneration policy. The results in females indicated the need to better develop the model to express female participation in the labor market.

In the study, schooling appeared as a very important determinant of health status. Rural background in younger males is correlated with poorer health status, due to poorer environmental and economic conditions, but the relationship reverses for older men, possibly reflecting the positive effect of the economic condition of the individual as a child. There was the conclusion that there was a need for more and better information on health status, such as objective

[34] Ribero, Rocio, Nunez, Jairo, op. cit
[35] Cortez, Rafael, op cit

measures of health, in order to separate the biases of self-reporting, such as those related to changes in self-reporting due to changes in health service prices. Returns to primary schooling were slightly reduced when instrumental health measures were added into the wage equation, suggesting that when health is omitted, part of the educational effect on wages is due to the increased health and its associated productivity. The potential effects of better health are significant, but are especially large among those less endowed with human capital and hence lower earnings. If policy makers consider health as a relevant human capital measure, health packages could be considered as part of the programs designed to reduce poverty, or improve living conditions. Overweighing education as the single human capital variable and not taking proper care of health outcomes may lead to wrong targeting of development and income programs for the less favored individuals in Peru.[36]

Age at menarche is a factor that can be used to estimate labor market returns to childhood investments in health and nutrition. Average age at menarche has been decreasing in Mexico over the past 40 to 50 years, somewhat slower than in the developed world. Factors associated with the decline include urbanization, increased levels of education and improved living conditions, including access to public services and quality of housing (flooring, toilets), whereas access to personal health services has marginal impact on the age at menarche. Nutrition and cumulative health status, measured by age at menarche, have significant impact on the labor productivity of Mexican women, younger ages of menarche being associated with higher wages, a decline of one year being associated with an increase of 23-26% in wages, suggesting the possibility of higher returns to some health investments among the healthier segments of the population. This finding contrasts with the existing evidence that suggests that health has a larger return at lower levels of health, and that the importance of health investments as inputs into labor productivity will decline with economic development. The paper concludes with the importance of investing in health and early nutrition, particularly through sanitation and housing conditions, in order to improve individual and family well being and to reduce poverty. Health has an independent, important impact on human capital investment, in addition to education. For the purposes of economic analysis, age at menarche should be considered a complement to adult height as a measure of secular changes in the health and nutritional condition of women.[37]

The main conclusions for policy making from this set of studies was summarized by Savedoff as follows:[38]

- Investing in health is economically productive and potentially income equalizing
- Investing in health does not necessarily mean hiring medical personnel, building hospitals and providing health services, but rather investments in child nutrition, sanitation and housing conditions appear to be more effective in promoting health improvements. The cost-effectiveness of these investments would still have to be evaluated to determine the priorities among these different interventions.

[36] Murrugarra, Edmundo, op. cit
[37] Knaul, Felicia Marie, op cit
[38] Savedoff, William D., Productivity and Household Investments in Health, IDB, mimeo, 2000

- Collecting better health indicators in household surveys would provide a better basis for conducting and evaluating health policies.

Demographic Impacts

Health also affects economic growth through its impact on demographic factors. Shorter life expectancies inhibit investment in education and other forms of human capital, since there is greater risk that each individual will not survive long enough to benefit from investment. In addition a larger proportion of the population which is dependent has a detrimental effect on rates of savings and capital investment, and hence on subsequent growth.[39]

In the case of East and Southeast Asia, the precipitous decline in mortality that occurred in the late 1940s produced a marked decline in fertility rates a generation later, producing a population 'bulge' with better health prospects than any generation before. This "demographic gift, as described by Bloom, provoked unprecedented economic performance from the 1960s to 90s, and may have been responsible for as much as 0,5-1.3% in annual growth over the period 1965-1990, equivalent to 15-40% of the region's total growth performance.[40]

In Latin America and the Caribbean, the ratio of children to workers peaked in 1965 at 0.5 and will continue to decline through 2050, whereas the ratio of elderly to workers has been increasing steadily and will rise sharply after 2015. As a result of these two trends the ratio of the young and elderly to the population of workers will decline until about 2015 and then start increasing as the currently large cohorts reach old age. The two decades ahead thus present a significant opportunity, while demands for health services are low relative to the size of the population and the demographic situation provides an opportune moment to expand the coverage and quality of education in the region. These ratios have been improving over time and are similar to those of East Asian economies. In LAC, the issue of the demographic window in the next 20 years is crucial, in the measure in which it may allow for extending the window by increasing productivity and the economically active life span of the elderly. The elderly contribute to social capital, support child rearing and child development, also.[41]

In analyzing cross-country data over the past 25 years, Bloom and Sachs have obtained empirical evidence that health and demographic variables play an extremely important role in determining economic growth rates.[42] In 1965 an increase of life expectancy of one percent accounted for an acceleration of GDP per capita growth of over 3% each year for the subsequent quarter century. Health and demographic variables explained over half the difference in growth rates between Africa and the rest of the world over the period, and the proportion of land area between the tropics accounts for an additional 16% of this gap. Increased infant mortality rates and fertility rates have a very strong negative impact on overall growth. A reduction of infant

[39] Kelley, Allen C. And Robert M Schmidt, Savings, dependency and development, Journal of Population Economics, 9(4) 365-86, 1996
[40] Sachs, op cit, P.11
[41] IDP, op cit
[42] Bloom, David E., Sachs, Jeffrey D., Geography, demography and economic growh in Africa, Brookings Papers on Economic Activity, 1998 (2) 207-95

mortality by two per thousand live births accounts for a one percent acceleration of growth rates over the subsequent quarter century in the 75 countries for which data are available. If fertility rates are added to the equation, the magnitude and fit of the infant mortality variable is slightly reduced, suggesting that some of the growth dampening effect on infant mortality may operate by inflating fertility rates. High fertility rates appear to be among the best predictors of poor economic growth performance; reducing fertility rates by two children per women appears to account for a one percent acceleration of growth each year.

In a recent paper Behrman et al used a panel of 96 countries covering the period 1965-1995 to decompose the differences in fertility rates between developed and developing countries and for several developing regions and 22 countries in Latin America. They found that the main correlations of fertility differences across space and over time are female schooling and health, with the former having larger associations with differential fertility among regions/countries at a point of time and the latter having larger associations with fertility declines over time. This suggests that the importance of association of increased female schooling relative to those of improved health may be overstated in the literature, which is substantially based on inferring longitudinal relations from cross sectional data. In the case of Latin America 33% of the observed differences in fertility rates were associated with differences in health, vs. 58% associated to differences in female secondary schooling and 21% in female primary schooling.[43]

4. INVESTMENT IN HEALTH AND ECONOMETRIC EVIDENCE

Long term impact of health on economic growth

Economic historians have begun to consider the importance of trends in health in determining patterns of economic growth. One well documented historical example of the relationship between one dimension of health and human capital formation, nutritional status and the corresponding capacity for physical effort, is that provided by Robert William Fogel's work on what he denominates as 'technophysiological evolution", i.e. the increase in the thermodynamic efficiency of the human engine that has occurred as a consequence, as well as decisively contributed, to the growth of Western economies over the past two centuries. [44]

According to Fogel, between 1780 and 1979 British per capita income grew at an annual rate of about 1.15 percent. The increase in the amount of calories available for work over the past 200 years made a substantial contribution to the growth rate of per capita income in France and Britain, by increasing labor force participation rate of the 20% bottom of the consuming units (eliminating the large class of beggars and paupers), contributing 11% of the annual British growth rate between 1780 and 1980. The increased supply of calories raised the average consumption of calories of those in the labor force and the average amount of calories available

[43] Behrman, JR. Duryea, S. Székel, M. Decomposing Fertility Differences across World Regions and over Time: Is improved health more important than women's schooling? Working Paper 406, Washington, IDB, 2000

[44] Fogel, Robert W., The Relevance of Malthus for the Study of Mortality Today: Long run influences on health, mortality, labor force participation and population growth, Historical Paper No. 54, National Bureau of Economic Research, March 1994, P.36

for work by 50%, contributing 23% per annum to the annual growth rate of per capita income. Thus, in combination, bringing the ultra poor into the labor force and raising the energy available for work by those in the labor force, explains about 50 percent of the British growth in per capita income over the past two centuries.

Consequently, Fogel concluded that populations of poor countries in the past and today have adapted to their low levels of average food consumption by keeping their body sizes low, by having a large proportion of the population that is excluded from effective labor, and by limiting the intensity of the labor of those who are effectively participating in the labor force. This is a feasible but costly adjustment to population pressure on food supply. It impedes economic growth, and undermines health by making individuals more vulnerable to killer infectious diseases, increasing rates of chronic diseases among those who survive acute infections and reducing life expectancies at all stages of adult ages.

A more recent study by Suchit Arora[45] constructed a 100-125 year time series for various industrialized economies (Norway, Denmark, Holland, France, Italy, Japan, Sweden, Finland including variables for 720 diseases, stature and life expectancy, and investigated the relationship of these variables with economic growth. The results overwhelmingly support the hypothesis that health of the population has influenced economic growth and that it should be an integral component of the productivity of economies, as well as provide evidence that support endogenous growth. Arora found strikingly similar results to those reported by Fogel, in that the influence of different health related variables were remarkably similar: measured as gains in life expectancy the contribution to growth was 34%, measured in terms of decline in morbidity due to infectious diseases contributed 26%, all diseases put together 41%; if adult stature is used as a representation of health, 34% of growth is attributable to it, on average, across countries. In summary, Arora found that 30 to 40% of the total growth attained by these countries is attributable to various health related variables in the period studied, with effects that are robust for the three sets of health related variables considered.

Cross- country and/or time series studies

The work on endogenous growth has been primarily empirical and econometric in nature. Robert J. Barro's research has been especially influential in this regard, as has that of others. The EGM research measures the impact of various inputs on aggregate production. Barro's work has identified the following variables as being the most positively correlated, in macro-econometric terms and within a neoclassical economic model to explain inter-country differences in rate of growth of GDP:[46]

- Lower initial GDP
- Initial human capital, measured by
  - Male secondary and higher schooling

[45] Arora, Suchit, Health and long-term economic growth: a multi-country study, Dissertation, Ohio State University, 1999

[46] Barro, Robert J., Determinants of Economic Growth: a cross-country empirical study, MIT Press, Cambridge, MA, 1997

- Life expectancy
- Lower fertility rate
- Lower government consumption ratio
- Rule of law
- Terms of trade
- Lower inflation rate

With this model, Barro found a significantly positive effect on growth from initial human capital in the form of health, higher even than that attributable to male schooling. From his work and other similar research, it can be surmised, if all other conditions are equal, a five year advantage in life expectancy will give a country 0,3 to 0,5% higher annual growth of GDP than its less healthy counterparts. This would represent a significant boost to growth, given that in the last 25 years, average per capita income growth in the world has been only 2% per annum. As Bloom and Canning point out, such a gain of five years is well within the reach of most developing countries.[47]

There are persistent debates regarding the statistical importance of income effects of health on wage and its consistency with favorable results derived under the framework of Barro-type cross-country growth regression. Since human capital includes three elements: education, health care and nutrition, these elements tend to have a synergistic effect on each other. Some of the effects of health on poverty run through directly by influencing the other two elements, i.e., nutrition and education, and vice versa. The independent effect of health has to be disentangled from the effects of education and nutrition. A failure to control for the effects attributable to non-health elements of human capital may yield biased estimates of the influence of health on income, wage or productivity. This is the basis for T. P. Schultz's critique of the Barro type cross-country growth regressions, which typically have health (life expectancy) and education variables on the right hand side. Growth regressions can try to deal with this problem by controlling for fertility and mortality while estimating the effect of education on wages and productivity, but if fertility and mortality are themselves affected by female and male education, this approach will not work well.[48] This critique does not deny the aggregate independent impact of health and education on productivity and economic growth, but rather states that, econometrically speaking, specification problems exist when we try to deal simultaneously with education, health and nutrition variables.[49]

A PAHO funded study on Barro type regressions on Latin America, Brazil, Colombia and Mexico[50] found that health plays a stronger role than education in economic growth in LAC, with a lag period of between 15 to 20 years. One of the main findings was that improvements in health depend more on public policies and on technological and behavioral changes such as

[47] Bloom, David E., Canning, David, "The health and wealth of nations", Science, 287(5456):1207, 2000.
[48] Schultz, T Paul, Health and Schooling Investments in Africa, Journal of Economic Perspectives, Vol 13, No. 3, 1999, pp.67-88.
[49] Behrman, Jere, Wolf, B.L., How does mother's schooling affect family health, nutrition, medical care usage and household sanitation, Journal of Econometrics, Vol 36, 1987.
[50] Mayer, David, Mora, Humberto, Cermeno, Rodolfo, Duryeau, Suzanne, Health, Growth and Distribution in Latin America and the Caribbean, Research in Public Health Technical Papers No. 18, PAHO, 1999.

fertility, more than on income growth. One of the limitations of the study was the difficulties encountered when trying to find consistent and significant results in studies with less information, such as at state level or using samples of countries. With more available information, as was the case for Brazil, a consistent picture emerged wherein the role of health is more evident. The pathways by which health increases growth were found to be productivity, education and economic participation, particularly by women. The magnitude of the effect of health status on growth was estimated to be as high as 2% per annum over the long run, in which the most important component was acting on education (1%) and the magnitude of the other two being half that of education. Health was found to increase fertility at low and average income levels, tending to reduce income and schooling, perhaps by preventing women's employment outside of the household. Health was also found to have an impact on income distribution. The distribution of health improvements, when inequitable, as was found to be the case in Brazil, actually led to divergence in incomes among the lowest 40% of the population. The main conclusions of the study were that since improvements in health may actually increase fertility and through this mechanism curb the increase in income and education, consistent policies in health, education and fertility were required, in order to support women during motherhood, making the choice between working inside or outside the home easier. The LAC context, characterized by high levels of inequality and poverty for its level of economic growth, may mask the positive effects of health and education that are evident in data from East Asian countries; the prevalence of malnutrition may reduce the positive impact of better health conditions.

Health policies must also take distributive aspects into account: if health benefits do not reach the lower income population, the consequent polarization of income will reduce any positive effects on those sectors of the population for whom these health investments could produce the greatest yield. In other words, achieving greater equity in health status among different socio-economic groups will have a beneficial effect on growth, in the measure in which will improve human capital among the lower income groups.

It is clear from the data by Mayer that alternate measurements of health status are highly correlated with economic growth, by the most stringent tests, such as extreme limits, which shows a high level of robustness. But the data does not explain the pathways of this relationship, which affects, not only growth, but also education, women's participation, fertility and others. The return on health status is actually higher than for education. But we do not have evidence that spending on health, in the abstract, will actually provide more returns than spending on education. The pending issue is to demonstrate what kinds of public expenditures on health can produce improved health outcomes, which have a positive impact on growth.

One of the issues identified by the Mayer study is the scarcity in Latin American countries of the data required for this kind of analysis. The results of the econometric analysis of health are as robust as for any other variable. The precision of measurements in economics is in question, and that must be taken into account for further studies in this field. There is a need to adjust the theory to explain the relationships that have been identified, but further empirical evidence is also needed.

The health indicators used are mortality indicators, not morbidity or welfare data, which is an issue to take into account. It would be useful to link health status to labor productivity, educational attainment and household productivity, as intervening channels between health status and growth, as years of schooling would be with human capital. The policy levers are through health improvement, not health expenditure per se.

The study combines empirical growth relationships (Barrow type) with production function approach (Solow model), mainly because of the difficulty in identifying proxies for production factors. For example, increases in health status are not considered as investments in national accounts systems. That is why there is a need for new information and for more efforts in establishing aggregate growth models. In Latin America there is insufficient historical data for good estimates even of savings. There is a need for groups of information such as education, health, provision of public services, household access to services, labor force participation, subsidy transfers, which could only be collected through micro-level household surveys that can capture household level dimensions of these variables.

Finally, the issue of efficiency in the allocation of resources among age groups was also addressed. The study found evidence that it is primarily the health indicators of the young, and secondarily those of adults that correlate to increases in income, economic participation and education, i.e., to human capital formation, whereas the health of the elderly did not show a significant correlation. This implies that priority weight should be given to the health of these groups for the formulation of health life year type indicators, in order to estimate the benefits of rationalizing public spending. Whereas this a delicate issue, in essence differentially valuing different stages of human life, it follows from the above considerations that the rationale for investing in health for economic growth necessarily implies developing criteria for the most efficient allocation of public resources, i.e., for spending on those interventions and services which will provide the highest rate of return on human capital formation and income growth. Moral considerations begin to surface when we are faced with these dilemmas and the emergence of more evidence on the relationship between health status and economic growth may well be signaling the need for a new field of bio-ethical consideration.

Another caveat is the need to achieve proper balance in the research strategy and the consequent advocacy strategy coming out of the research. This sort of econometric analysis can produce different results if one uses different data sets, different variables, and different countries. These exercises are useful for stimulating a discussion on possible mechanisms, but are probably not the best approach for a precise empirical quantification of the impact of health on economic growth. Studies must clearly identify the channels by which health variables impact on growth, which is complicated by the two way causality between health and growth. Policy makers want to have some kind of model of the relationships behind the coefficient values. The studies must clarify the mechanisms, in order to determine the returns to investing in health. It is also necessary to better identify the lag time, be it of 15 or 20 years, in order to better value the impact of the studies. These must be more specific recommendations in terms of returns on specific health interventions.

5. ADDITIONAL RESEARCH QUESTIONS ON INVESTING IN HEALTH FOR LATIN AMERICA AND THE CARIBBEAN

Can Investing in health and reducing health inequities be a means of reducing inequalities and stimulating long term growth in the Region?

It is now a common place to state that LAC is the most inequitable region of the world. It is also necessary to be aware that this is not a new situation, but rather one that goes back almost to the very beginning of the European colonization of the New World. Failure to account for historical factors of inequality and economic dysfunction could be as foolhardy as denying the evident determination of geography or climate on disease ecology, agricultural productivity, health and nutrition.

Latin America fell into relative backwardness between 1700 and 1900. At the beginning of the period, the economies of the Iberian colonies in the New World were roughly as productive as those of the British. For most of the ensuing 200 years the LAC economies stagnated while those of the North Atlantic achieved sustained increases in productivity. As early as 1800 most of the LAC economies had fallen well behind the US and by 1900 most had fallen far enough behind to qualify as underdeveloped by contemporary standards. In the 20th century, LAC economies have achieved respectable rates of growth, equal on average to that of the US, thus the relative gap between LAC and US has not changed in the past 100 years. The distribution of legal and civil rights, assets such as landed wealth, income from wages and property, and human capital such as education and health affects and is affected by economic performance.

LAC lagged far behind the North Atlantic in equality of rights and in human capital formation throughout much of the modern era. The caste and slave systems of the colonial era made inequality in legal and civil rights fundamental to the juridical structure of the two empires. On the other hand, the region was not more unequal in the distribution of assets or income than the developed world, until the onset of economic growth at the end of the 19th century. Throughout the Spanish and Portuguese empires, and in the nation states that succeeded them, the accumulation of human capital lagged behind the North Atlantic. Since the colonial era, Latin America's public and private investment in education, public health, nutrition and health related infrastructure (potable water) has lagged far behind the North Atlantic at comparable levels of GDP per capita.

Lack of human capital can retard economic growth, while pronounced inequality in human capital investment sharpens inequality in the distribution of income. Both of these effects appear to have had an impact on the economic performance of the Latin American economies, though possibly more in the 20th century than earlier. Nearly every LAC country has made serious efforts to catch up in human capital over the past 100 years. But convergence to the standards of the developing world has lagged because of past neglect, high rates of population growth, and the frequent and periodic breakdown of democratic governance in many countries. The contradictory but positive accumulation of legal and civil rights in LAC contrasts with the

sharp increases in inequality of wealth and income that occurred as growth began in the late 19th Century.

The Region's historic neglect of human capital was reinforced by the relatively low cost of importing technology and technicians (as opposed to producing or training them) from other countries. Eventually economic growth allowed for higher wages, physical welfare improved and schools and clinics were built, but with the exception of the more ethnically homogeneous of the former Spanish colonies (Argentina, Uruguay, Costa Rica), much more slowly than in other regions. Persistent inequality has had a double negative effect on economic growth in 20th century LAC. The direct effects include the reduced productivity of perhaps a third of the contemporary workforce due to malnutrition, illness and lack of education. The indirect effects include the substantially higher risks of political and social upheaval that have discouraged investment and further dampened growth. [51]

The achievement of more equitable social and economic structures continues to be a priority in Latin America and the Caribbean.[52] Nevertheless, health is not always perceived by most of the regional economic and social policy fora, such as CEPAL or IDB, as a policy lever for achieving greater social and economic equity. The countries of LAC recently declared in the Copenhage plus 5 meeting held in Santiago that the main policy initiative for the reduction of poverty in the Region is universal basic education, with progressive extension to include complete secondary level.[53] Health was only mentioned with regards to the health sector reform process. There seems to be a need to provide evidence that health is not only a key component of human capital formation, but also a crucial element for reducing inequalities in the Region.

Some of the favorable impacts of early child health and nutrition on reducing inequalities have been described above. Adverse socioeconomic conditions in childhood are associated with mortality in later life. Mortality from stroke and stomach cancer is particularly dependent on social circumstances in early childhood. Adverse socioeconomic circumstances in childhood have a specific influence on mortality from stroke and stomach cancer in adulthood, which is not due to the continuity of social disadvantage throughout life. Deprivation in childhood influences risk of mortality from coronary heart disease and respiratory disease in adulthood whereas mortality from lung cancer, other cancers and accidents and violence is predominantly influenced by risk factors associated to adverse social circumstances in adulthood. The increase in child poverty in many developed countries may herald unfavorable future trends in adult health.[54]

A range of nutrition problems, including protein energy and micronutrient malnutrition, reduces human capital and economic growth. Pregnancy and the first few years of life are critical

[51] Coatsworth, John H., Economic and Institutional trajectories in Nineteenth-Century Latin America, in Latin America and the World Economy since 1800, Harvard University Press, Cambridge, 1998 P. 23-54
[52] CEPAL, Equity, development and citizenship, 28th Period of Sessions, Mexico, April 2000
[53] ECLAC, Declaración de Santiago, Segunda Conferencia Regional de Seguimiento de la Cumbre Mundial sobre Desarrollo Social, Santiago, Chile, May, 2000
[54] Smith, GD, Hart, C, Blane, D, Hole, D, Adverse socioeconomic conditions in childhood and cause specific adult mortality: prospective observational study, BMJ, V.386, May 1998, P.1631-1635

stages of human development that present opportunity for significant improvement in human capital through direct health and nutrition interventions. Governments must adopt economic policies that benefit the poor and fund programs in nutrition, health, and education to improve human resources. It should also combine short- and long-term economic development strategies and create opportunities for the poor to earn a livelihood and increase capacity to take full advantage of these opportunities to become productive members of society.[55]

Longitudinal research such as the INCAP study mentioned before could provide valuable insights into the effect of better health status early in early childhood on life opportunities and disparities in adult life. Our hypothesis is that investing in the health and welfare of the poorest children will have substantial impact over a generation in "leveling the playing field" and reducing social and economic disparities in our societies, improving human capital throughout, and catalyzing health's positive impact on economic growth even more intensely. The growing awareness of the need to reduce growing inequalities in the Region must also begin to understand the leading role the reduction of health inequities could have on growth and overall social and economic equity.

Is investing in health services the most efficient way to invest in health?

The relationship established by Psacaropoulos between education and growth is about a linkage between growth and a measure of use of educational facilities (enrollment rates), not educational outcome (such as test scores). The policy lever here is how long to keep people in school. In health we need a similar linkage, i.e., not only a relationship between health outcomes and growth, but rather on the levers we have to improve health outcomes and their ultimate impact on growth. We need to see the links between levers, programs, expenditures and growth.

Some goods and services have the sole purpose of improving health. The most obvious are those provided by medical personnel. Because data are limited, it is often necessary to analyze the effects of medical care on health outcomes at highly aggregated levels, usually relying on gross medical care expenditures per capita and a few other variables (number of physicians, clinics, hospital beds, other resources per capita). Nevertheless, the direct output of medical care is diverse, and such aggregation might hide important micro-economic effects both in terms of efficiency and equity. In basic micro-economic theory models, we describe the alternative production possibilities available to a production unit (i.e. a firm) by a production function y=f(x), which gives the output y produced for a given combination of inputs, x=(x1,.xn), a vector. From this a cost function is derived, c(w,y) that gives the minimum cost of producing y units of output when the vector of prices of the inputs is set at w=(w1,.wn). In ordinary production theory, the production decision is mainly independent of the marketing decision, whereas health care is produced and consumed coincidentally, and once allocated to a patient, it is not transferable to another individual."[56]

[55] Martorell, Reynaldo, The role of nutrition in economic development, Nutrition Reviews, vol 54, April 1996, P.566-572

[56] Jack, William, Principles of Health Economics for Developing Countries, WBI, 1999, p.39

The extensive and intensive margins in the production of health care [intensive being the measure of input (drugs, hospital stay) used in the treatment of a particular individual or group, extensive being the increase in the number of patients or conditions being treated (number of women provided birth control, rate of immunization)] are both means of increasing the productivity of the health system, although it is likely that extensive increases will probably have the most impact on health conditions of the population. In both cases, the marginal and average costs will tend to decrease initially and then increase on the margin.

Over time, there will be decreasing returns associated with medical care, as described by Preston: he found that 50% of the improvement in life to expectancy in developing countries from 1940 to 1970 (an average increase of 17.6 years) was potentially the product of improvements in health care. Between 1965-69 and 1975-79 life expectancy grew by only 3.9 years on average and improvements in medical care could only account for 28% of this increase. Various cross-country analysis have difficulty finding much of a link between medical care and health outcomes, suggesting that at an aggregate level, medical care has a low marginal productivity. Controlling for income and education, Filmer and Pritchett and Hammer have found little effect of public medical care on health[57] [58]

In a more recent paper, Filmer and Pritchett have again presented data to prove that the impact of public spending on health on determining infant and child mortality is quite small. In fact, the cross-national analysis sustains that 95% of cross-national variations in mortality can be explained by income per capita, inequality of income distribution, extent of female education, level of ethnic fragmentation and predominant religion.[59] Their analysis is based on an aggregate health production function that assumes that health outcomes depend on a country's income, knowledge and social capability. One striking finding is that of the effect of female schooling, in which roughly 10% lower mortality per additional year of female education. This confirms the evidence from household surveys showing that mothers with secondary education have approximately 36-40% lower under-5 mortality than primary educated mothers. They did not find other variables that are thought to be important, such as level of urbanization, location in the tropic, and percentage of population with access to safe water, as having significant explanatory power for under-5 mortality. Public spending on health was found to explain very little of the variation in under-5 mortality over and above that which can be explained by non-health sector variables, i.e., only one seventh of one percent of all mortality variations are explained by differences in spending. The variation between the ten "best" and ten "worst" health performers conditional on socio-economic factors is very small, and in fact, when comparing medians, the worst actually spend more.

[57] Filmer, Deon and Lant Pritchett, Child Mortality and Public Spending on Health: How much does money matter?", Policy Research Working Paper 1864, World Bank, Washington DC, 1997

[58] Filmer, Deon, Pritchet, Lant and Jeffrey Hammer, "Health Policy in Poor Countries: Weak links in the Chain", Policy Research Working Paper, 1874, World Bank, Washington DC, 1998

[59] Filmer, Deon, Pritchett, The impact of public spending on health: does money matter?, Social Science and Medicine, 49, 1999, 1309-1323

Other studies such as Anand and Ravallion [60] have consistently found on impact of public spending on the poor, but not for the non-poor, but these findings do not contradict the insignificant impact of spending on aggregate health status.

The impact of public spending on health is much more complicated than the effectiveness of the services purchased. There are three possibilities as to why, even though there is the potential for reducing deaths cheaply, it has not happened in practice, as a chain from public spending to health status:

- *Health production function*: the change in health status is affected by changes in the consumption of various health services, some of which are more and some less, effective in improving health.

- *Net public sector impact*: even if particular services are cost-effective in improving health, this does not mean that public spending on these would be cost-effective in improving health. It is necessary to account for the change in the consumption of health services as a consequence of changes in effective public supply of these services.

- *Public sector efficacy*: the impact of public spending will depend first on the degree to which public spending is able to create effective public services.

For public spending to improve health cheaply, three things must happen: first, public spending must create effective health services; second, the existence of those new public services has to change the total amount of effective health services consumed and by the population, and third, the additional services consumed have to be cost-effective in improving health. This simple framework has important policy implications, and at least three schools of thought emerge. One group focuses on the cost-effectiveness of public spending and advocates changes in the composition of public spending towards more cost-effective services, another focuses on the net impact of public sector supply, emphasizing the role of the government to supplement and not replace the market for low cost services. A third group emphasizes public sector efficacy in improving the operational performance of public sector health care providers. All three are important and complementary perspectives, with different relative priority in any given situation.

Will improved health conditions among a growing number of older adults increase wage-earning capacity of the elderly and constitute an extension of human capital formation beyond retirement age?

Age specific rates of chronic conditions above age 65 are generally falling in a long-term trend since 1910. Part of the explanation is in the changes of life styles, such as, reduction in smoking, improvement in nutrition, increasing exercise changes (cardiovascular and respiratory),

[60] Anand, S., Ravallion, M., Human development in poor countries: on the role of private incomes and public services, Journal of Economic Perspectives 7(11), 1993, 133-150

and increasing effectiveness of medical intervention in simple surgical procedures (hernias, etc), hypertension control, reduction of stroke incidence, surgical removal of osteoarthritis, knee and hip joints replacement, cataract removal, chemotherapy, reducing osteoporosis and heart disease. Instead of debating whether to provide to paupers who might otherwise die, as in Malthus time, we are now discussing how to distribute services that have proven successful in raising the quality of life of the aged and in extending life expectancy. The growing opportunity to improve health at younger ages, reduce the incidence of chronic diseases at late ages and cure or alleviate disabilities associated with chronic diseases. It poses policy issues regarding growing elderly population and rising health care costs (because total medical costs may rise sharply even if cure rates continue to improve), as well as pension costs. Even if improved health would make it possible to delay retirement age, it is not worsening health that, since 1890, has driven the steep decline in labor force participation of males over 65. Rather, it has been the rise in income and a decline in the income elasticity of retirement, and the vast increase in the supply and quality of leisure time activities for the working class.[61]

If this assessment by Fogel is correct, the improvement in the health status and longevity of the elderly will not necessarily become a pathway for increased income growth, given the consumption patterns and expectations for additional leisure time. Of course, it remains to be seen if such a “developed country” pattern would establish itself in the context of Latin America and the Caribbean, where the fragility of social safety nets, social security, pension systems, health care insurance markets, and other institutions (that cushion the elderly in more affluent countries) would probably lead to more self-reliant, autonomous income generating activities by the able bodied among the aged. It remains an issue that requires careful investigation, given the future trends in population aging.

[61] Fogel, op cit.,