



International Economics Programme

**HEALTH EXPENDITURE:
AN 'INVESTMENT' RATHER THAN A COST?**

IEP WP 05/01

Rifat Atun, Director, Centre for Health Management,
Tanaka Business School, Imperial College London and Associate Fellow, Chatham House
Ipek Gurol-Urganci, Research Fellow, Centre for Health Management,
Tanaka Business School, Imperial College London

10 St James's Square, London SW1Y 4LE, UK
www.chathamhouse.org.uk/internationaleconomics

iep@chathamhouse.org.uk

July 2005

Chatham House is an independent body which promotes the rigorous study of international questions and does not express opinions of its own. The opinions expressed in this publication are the responsibility of the authors.

© The Royal Institute of International Affairs, 2005

This material is offered free of charge for personal and non-commercial use, provided the source is acknowledged. For commercial or any other use, prior written permission must be obtained from the Royal Institute of International Affairs.

In no case may this material be altered, sold or rented.

Summary

- There is a two-way relationship between economic growth and health. Life expectancy and adult survival rates exercise a positive impact on human capital formation and hence on economic growth. In turn, sustained growth rates allow for better health conditions.
- Improved health supports labour productivity; by augmenting life expectancy, it encourages savings and private investment on education; finally, it attracts foreign direct investment, thus being an important support to development in the Third World.
- Considering the significant contribution of improved health to economic productivity and growth, governments should think of health expenditures as an investment, and not as a cost. It is crucial that they adopt a long-term perspective.
- Government intervention needs to be balanced with market forces. The latter have been shown to lead to market failure if there is unfettered competition in health systems. Instead, government leadership is critical to create an enabling environment where appropriate investment in health is ensured and people's health needs are met. Governments need to rise to this challenge.

1. Background

In 1979, Theodore W. Schultz, Nobel Laureate for Economics, argued that population quality was the ‘decisive factor’ of production and emphasized the merits of investing in education and health, while identifying the main channels through which health could boost economic productivity and growth.¹ A decade later, Robert W. Fogel, the Nobel Laureate for Economics in 1993, argued that improvements in health and nutrition contributed to about one-third of income growth in Britain between 1790 and 1980 (Fogel, 1994). The impact of human capital formation on productivity has been well demonstrated but earlier empirical work had mainly stressed the importance of educational attainment in developing human capital. Since the early 1990s, health, as measured by life expectancy and adult survival rates, has been shown to be just as important as educational attainment, and cross-country growth estimations, in almost all cases, have demonstrated that improved health has a positive and significant impact on economic growth.² Hitherto, the emphasis has been on the impact of economic growth on improved health. There is now strong empirical evidence to suggest a two-way relationship: improved health significantly enhances economic productivity and growth.

This paper provides a summary of the evidence to date on studies which demonstrate a positive and significant link between improved health and economic growth, and briefly explores the direct and indirect economic consequences of poor health at population level. The paper presents summary of studies which show enhanced economic growth as a result of increased health expenditure and the consequences of inadequate health spending. Given the demonstrable benefit and return, the paper argues that governments should begin to consider expenditure on health not as a ‘cost’ but as an ‘investment’ which enhances economic productivity, growth and competitiveness.

2. The rationale for investing in health

2.1 Macro-level empirical evidence

Macro-level economic studies have explored links between health and economic growth in two areas: first, to explain how changes in population health levels account for the variations/deviations in growth patterns of specific countries or regions; and, second, to identify and quantify the various channels through which health affects economic growth.

Increase in the life expectancy of the young age group in the population has a positive and significant effect on the steady-state growth rate of the economy, with a weaker effect observed for improved life expectancy for older population groups (Ehrlich and Lui, 1991). The adult survival rate is a significant predictor of economic growth, especially in countries with low GDP levels (Bhargava et al., 2001; Mayer, 2001). The Russian mortality crisis in the first half of 1990s, which led to a decline in life expectancy from 70 to 65 years, was

¹ <http://nobelprize.org/economics/laureates/1979/index.html> (accessed 15 June 2004); Schultz (1980)

² For a review and calculated growth impacts of five-year increase in life expectancy for a country with a life expectancy of 63 (average in developing countries, 1990), see Bloom, Canning, and Sevilla (2004).

estimated to have resulted in a loss of income equal to 1.8–2.7% of Russian GDP in 1990, or a decline in the annual rate of per capita income growth of one-third of one percentage point (Bloom and Malaney, 1998).

Studies from OECD and sub-Saharan African countries show that the stock of health human capital has a quadratic effect on the growth rate of per capita income and that ‘investment in health human capital’ significantly enhances GDP growth (Gyimah-Brempong and Wilson, 2004). Growth tends to be higher in countries with a medium level of human capital as compared with those with very low or very high levels (Sachs and Warner, 1997).

2.2 The channels from health to economic development

Health affects economic growth by enhancing worker productivity, increasing savings over the individual’s life-cycle, boosting education and encouraging foreign direct investment. Each additional year of increase in life expectancy increases economic output by 4%, even after controlling for work experience and education (Bloom et al., 2004). Higher life expectancy adds to the stock of human capital by increasing the number of years during which individuals participate in the labour force, enhancing the productivity of the workers, reducing the number of days lost due to illness and boosting motivation and aspiration (Ram and Schultz, 1979).

In societies with low life expectancy, individuals have low incentives to save (Doshi, 1994). Low public expenditure on health contributes to increased mortality rates, which in turn reduces the rates of return on investment and creates disincentives to invest in health and education for future earnings. The vicious cycle of low investment and high mortality leads to ‘development traps’ and accounts for 42% of all cross-country variation in economic growth (Chakraborty, 2004). Increases in longevity generate a higher savings rate at every age, as individuals are encouraged to save for their retirement income. This helps explain the observed increase in national savings during the East Asian growth, but also implies that decreases in life expectancies in Africa will result in a decline in savings (Bloom et al., 2002; Asian Development Bank, 1997; Bloom and Williamson, 1998; Lee et al., 1998).

Reductions in mortality and morbidity and the consequent increase in longevity raise the rate of return for investments in education, encourage increased educational investment and in the long run encourage greater economic output (Ram and Schultz, 1979; Ehrlich and Lui, 1991; Kalemli-Ozcan et al., 2000; Meltzer, 1992; Preston, 1980).

2.3 Micro-level empirical evidence

Improvements in health result in enhanced labour productivity, improved hours of work, higher hourly wage rates and lifetime earnings, increase the probability of being in the labour force and may have a larger impact on productivity than formal schooling in some contexts (Ranis et al., 2000). Conversely, poor health history and illness lead to reduced productivity, with lower wage rates, annual hours of work and earnings and an increased risk of poverty (Chirikos and Nestel, 1985; Schultz and Tansel, 1993; Parker, 1999; Ribero and Nunez, 1999).

Improved health reduces absenteeism and increases cognitive ability at school, leading to better educational outcomes (Bhargava et al., 2005; Hanushek and Dongwook, 1995; Kremer and Miguel, 2001; Politt, 1997; Politt, 2001; Schultz, 1999a).

3. Consequences of not investing in health

3.1 Increase in growth gap and inequality

The ‘growth gap’ between African and non-African countries can be explained by a number of factors such as geography, demography, health, economic policy and governance. Around 35% of the gap is attributed to variations in life expectancy – the largest individual impact among the measures used (Bloom and Sachs, 1998).

The devastating micro- and macro-economic impact of widespread malaria and HIV/AIDS on Africa is well described (Chima et al., 2003; Gallup and Sachs, 2001; McCarthy et al., 2000): eliminating malaria completely would lead to additional annual growth in GDP of 2.6%, whereas unchecked HIV-AIDS may lead to a reduction of 15–30% in GDP levels by 2010 (see Case 1).

Case 1: Impact of HIV/AIDS on economic growth and welfare in Eastern Europe and Central Asia

Studies which measured the impact of HIV in Eastern Europe and Central Asia on economic growth suggest that from 2000, GDP will cumulatively decline by 3.3% by 2010 and 9.5% by 2020, with an annual decline in GDP growth by one half per cent by 2010 and one per cent by 2020 (Ruhl et al., 2002).

3.2 Direct economic costs of disease

With four million deaths a year, cardiovascular disease is the main cause of death in Europe,³ closely followed by cancer. Survival rates for both conditions have improved in recent years. For instance, five-year survival rates for cancer have improved from 10% to 20% for the cases diagnosed in the 1980s to 47% for cases diagnosed in the early 1990s (Sant et al., 2003).

The incidence of other chronic illnesses is growing. In particular, the economic burden of obesity, diabetes mellitus, neurodegenerative and musculoskeletal disorders is substantial (see Cases 2–4).

Case 2: The economic burden of obesity

Obesity in Europe is increasing at an alarming rate: an estimated 205 million Europeans are

³ European health for all database <http://hfadb.who.dk/hfa/>, accessed July 2004.

obese. The annual direct costs of obesity on the economy are estimated to range from €820 million in the UK to around €11 billion in Germany (International Obesity Task Force, 2003).

Case 3: The economic burden of diabetes

Diabetes affects 150 million individuals worldwide, with an estimated prevalence, in 1995, of 4%. This figure is expected to double by 2020 (King et al., 1998) The economic cost of diabetes to the society is huge. In eight European countries, the total direct medical costs of type II diabetes were estimated to be €29 billion a year, with an estimated average annual cost per patient of €2,834 a year. Hospitalizations accounted for the greatest proportion of these costs (55%, range 30–65%) totalling €15.9 billion. In contrast, drug costs were relatively low, accounting for only 7% of the total healthcare costs for type II diabetes (Jonsson, 2002).

Two large landmark studies (DCCT Research Group, 1993; UKPDS Study Group 1996) demonstrate that the health risks of diabetes mellitus can be controlled by appropriate lifestyle and treatment.

Case 4: The economic burden of neurodegenerative illnesses

Alzheimer's affects approximately 5–10% of all adults over the age of 65 – an estimated 4.5 million people in the US and 3.7 million in the EU. Estimates of the economic cost of Alzheimer's in the EU vary between at €64 billion and €149 billion, and the cost is projected to grow annually, on average in real terms, by around 1.9% between 1985 and 2020 and by 2.6% between 2020 and 2040 (Wimo et al., 1998). Dementia is estimated to affect as many as 16 million people in Europe. It accounts for 19% of total health care costs in Sweden and around 5.6% in the Netherlands.⁴

3.3 Indirect economic costs of poor health

Poor health imposes indirect economic costs by decreasing worker productivity (Case 5).

Case 5: The economic burden of low back pain

In the Netherlands, in 1991, short-term indirect costs of back pain were estimated to range between US\$1.5 and US\$4.6 billion, accounting for 2.8% of GDP (Hutubessy et al., 1999). For the USA, in 1998, the annual cost of lost work time associated with chronic low back pain was US\$1,230 per male and US\$773 per female, amounting to an annual productivity loss of US\$28 billion (Rizzo et al., 1998). For the UK, in 1998, the direct costs were estimated to be £1.6 billion, and overall costs between £6.6 and £12.3 billion (Maniadakis and Gray, 2000).

Indirect costs can also relate to loss of foreign direct investment and declining tourism, especially in countries with a high prevalence of HIV/AIDS. High prevalence leads to a

⁴ <http://www.accesseconomics.com.au/reports/dementiafull.pdf> accessed July 2004.

shortage of skilled workforce and substantial costs due to illness, treatment and retraining of workers who are employed to substitute for those lost to the workforce (Malaney et al., 2004; Sachs and Malaney, 2002).

4. Health expenditure: an ‘investment’ rather than a cost?

There are economic and welfare benefits of increased investment in health. Through appropriate investment, health-led economic development is possible. The benefits of health investment on economic growth have been demonstrated. Therefore, health expenditure should be considered as an investment rather than a cost. However, despite the growing body of evidence on the benefits of health investment, in most developing countries it remains low. Many European countries are increasing the proportion of GDP spent on health, but expenditure in many countries still remains well below EU average of 9–10% (Annex 1).

A recent review of future UK NHS expenditure concluded that, to deliver the high-quality services envisaged by the government, total NHS spending in the UK needed to rise from £68 billion in 2002 to between £154 billion and £184 billion by 2022–3 (in 2002–03 prices). This implies, across the 20-year period, an average rate of real increase of between 4.2% and 5.1% per annum.⁵ Much of the planned increase will be invested in family health services, which also include the budget for pharmaceuticals, and community-based diagnostic and ambulatory care centres, rather than hospitals.

Europe is ageing. The demographic changes are striking. These demographic changes brings with them an epidemiological transition (Frenk et al., 1991), leading to an increase in chronic illnesses and consequent changes in health needs and demand patterns, which require different care delivery patterns. Ageing, *per se*, does not increase health expenditure, but an ageing population with poorly managed chronic illness does. General Electric estimates that between 1995 and 2005 changing demographics will have resulted in an incremental health care spend of \$US1 trillion in the United States, \$US170 billion in Germany, \$US100 billion in Japan and \$US100 billion in China.⁶

Demographic and epidemiological changes, better-informed citizens and the increased availability of innovative medical technologies will all lead to increased demand by people for health care services and growing health expenditures. Increased investments in health are needed to simultaneously enable effective management of the chronic illness in the ageing population and to sustain economic growth. Governments need to use scarce resources to achieve macro- and micro-level efficiency by adopting policies which encourage innovative and cost-effective health interventions to augment health outcomes and make possible health-led economic growth.

Enhancing allocative and microeconomic efficiency will demand structural changes, new

⁵ The Wanless Report: Securing Our Future Health: Taking a Long-Term View. http://www.hm-treasury.gov.uk/Consultations_and_Legislation/wanless/consult_wanless_final.cfm (accessed 4 June 2005).

⁶ Hogan J. GE Medical Systems. 'Growth through innovation', presentation on 4 December 2003. http://www.ge.com/files/usa/company/investor/downloads/gems_presentation_120403.pdf, accessed 4 June 2005.

health care delivery models and investment in innovative health technologies. There needs to be a shift away from mainly hospital-based inpatient care to the more cost-effective domain of primary care – with a greater emphasis on screening, early diagnosis, health promotion, disease prevention and greater involvement of users to maintain and improve their own health). This structural shift will help release resources to invest in innovative and cost-effective health technologies and pharmaceuticals.

5. Policy implications and lessons for policy-makers

There is growing empirical evidence demonstrating the economic and welfare benefits of investing in health. Given this evidence, governments should begin to view health expenditures as an investment and not just a cost.

An inappropriately regulated health sector with unfettered competition can lead to market failure. Therefore, government intervention is needed – not to strangle a dynamic health sector with excessive regulation but to create an enabling environment which encourages investment in innovative technologies and care delivery models to meet the changing health needs of citizens, to increase investment returns, and to enhance economic growth.

Government leadership is critical to create such an enabling environment, clearly identify priorities and implement health policies which enable investment and the uptake of innovative interventions to allow efficient utilization of system resources. This requires evidence-based decision-making.

Improvements in population health take time. They require a focus on the long-run benefits of health investment and the avoidance of short-sighted policies with undue emphasis on cost-containment which lead to apparent budgetary benefits in the short run at the expense of economic growth and welfare benefits in the medium and long term.

Reorganization of health systems to enhance allocative and technical efficiency should be a priority for governments. A shift from hospital-intensive health systems, characterized by supply-push, to new organizational arrangements which encourage the growth of community-based delivery systems and augment demand-pull through greater involvement of users would yield benefits to all the key stakeholders (Atun, 2004). Governments need to achieve better symmetry between the health system objectives of equity, efficiency, effectiveness and user choice by learning to listen to their citizens.

Governments have an important stewardship role to ensure increased investment in health, to reap economic and welfare benefits. They need to rise to this challenge.

References

- Adeyi, O., Baris, E., Chakraborty, S., Novotny, T., and Pavis, R. (2003), *Averting AIDS Crises in Eastern Europe and Central Asia: A regional support strategy*, World Bank, Washington DC.
- Arndt, C. and Lewis, J. D. (2000), 'The Macro Implications of HIV/AIDS in South Africa: A Preliminary Assessment', *World Bank Working Paper*.
- Asian Development Bank (1997), *Emerging Asia*, Manila.
- Atun R.A. (2004), 'What are the advantages and disadvantages of restructuring a health care system to be more focussed on primary care services?', World Health Organisation Health Evidence Network, WHO Regional Office for Europe, Copenhagen.
- Berrino, F., Sant, M., Verdecchia, A. et al. (eds) (1995), *Survival of Cancer Patients in Europe: the EURO CARE Study*, IARC Scientific Publications No. 132, Lyon, France: IARC.
- Bhargava, A., Bundy, D. A. P., Jukes, M., and Sachs, J. (2005), 'Modeling the effects of health status and the educational infrastructure on the cognitive development of Tanzanian school children', *CMH Working Paper Series WG1: 2*.
- Bhargava, A. (2001), 'Nutrition, Health, and Economic Development Some Policy Priorities', *CMH Working Paper Series WG1: 14*.
- Bhargava, A., Jamison, D. T., Lau, L. J., and Murray, C. J. L. (2001), 'Modeling the effects of health on economic growth', *Journal of Health Economics*, vol. 20, no. 3, pp. 423-440.
- Bloom, D. E., and Canning, D. (2003), 'The health and poverty of nations: from theory to practice', *Journal of Human Development*, vol. 4, no. 1, pp. 47-71.
- Bloom, D. E., Canning, D., and Graham, B. (2002), 'Longevity and Life Cycle Savings', *NBER Working Paper no. 8808*.
- Bloom, D. E., Canning, D., and Jamison, D. T. (2004), 'Health, Wealth and Welfare', *Finance and Development*, pp. 10-15.
- Bloom, D. E., Canning, D., and Sevilla, J. (2004), 'The Effect of Health on Economic Growth: A Production Function Approach', *World Development*, vol. 32, no. 1, pp. 1-13.
- Bloom, D. E., and Mahal, A. S. (1997), 'Does the AIDS epidemic threaten economic growth?', *Journal of Econometrics*, vol. 77, no. 1, pp. 105-24.
- Bloom, D. E., and Malaney, P. N. (1998), 'Macroeconomic consequences of the Russian mortality crisis', *World Development*, vol. 26, no. 11, pp. 2073-85.

- Bloom, D. E., and Sachs, J. D. (1998), 'Geography, Demography, and Economic Growth in Africa', *Brookings Papers on Economic Activity*, vol. 2, pp. 207-295.
- Bloom, D. E., and Williamson, J. G. (1998), 'Demographic Transitions and Economic Miracles in Emerging Asia', *World Bank Economic Review*, vol. 12, no. 3, pp. 419-455.
- Bobadilla, J.L., et al, 'Epidemiological Transition and Health Priorities' in Jamieson, D.T., Moseley, W.H., Measham, A.R. and Bobadilla, J.L. (1993) *Disease Control Priorities in Developing Countries*, New York, World Bank, Oxford University Press.
- Bonnel, R. (2000), 'HIV/AIDS: Does it Increase or Decrease Growth in Africa', *World Bank Working Paper*.
- CAREC/UWL (1997), 'Modelling and Projecting HIV and its Economic Impact in the Caribbean: The Experience of Trinidad and Tobago and Jamaica', *Summary Report*.
- Casas-Zamora, J. A. (2000), 'Investment in Health and Economic Growth: a perspective from Latin America and the Caribbean', *Pan American Health Organisation*.
- Chakraborty, S. (2004), 'Endogenous lifetime and economic growth', *Journal of Economic Theory*, vol. 116, no. 1, pp. 119-37.
- Chima, R. I., Goodman, C. A., and Mills, A. (2003), 'The economic impact of malaria in Africa: a critical review of the evidence', *Health Policy*, vol. 63, no. 1, pp. 17-36.
- Chirikos, T. N. and Nestel, G. (1985), 'Further Evidence on the Economic Effects of Poor Health', *The Review of Economics and Statistics*, vol. 67, no. 1, pp. 61-9.
- Coast, J., Inglis, A., Frankel, S., 'Alternatives to hospital care: what are they and who should decide?', *British Medical Journal* (1996), 312: 162-6.
- Cuddington, J. T. (1993a), 'Further results on the macroeconomic effects of AIDS: the dualistic, labor-surplus economy', *World Bank Economic Review*, vol. 7, no. 3, pp. 403-17.
- Cuddington, J. T. (1993b), 'Modeling the macroeconomic effects of AIDS, with an application to Tanzania', *World Bank Economic Review*, vol. 7, no. 2, pp. 173-89.
- Cuddington, J. T. and Hancock, J. D. (1994), 'Assessing the impact of AIDS on the growth path of the Malawian economy', *Journal of Development Economics*, vol. 43, no. 2, pp. 363-8.
- DCCT Research Group,(1993), 'The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus', The Diabetes Control and Complications Trial Research Group, *N Engl J Med.*, September 30; 329(14):977-86.

Department of Health,(2000), 'Shaping the future NHS: Long term planning for hospitals and related services', Consultation document on the findings of the National Beds Inquiry, London, Department of Health .

Doshi, K. (1994), 'Determinants of the Saving Rate: An International Comparison', *Contemporary Economic Policy*, vol. 12, no. 1, pp. 37-45.

Ehrlich, I. and Lui, F. T. (1991), 'Intergenerational Trade, Longevity, and Economic Growth', *Journal of Political Economy*, vol. 99, no. 5, pp. 1029-59.

Fogel, R. W. (1994), 'Economic Growth, Population Theory, and Physiology: The Bearing of Long-Term Processes on the Making of Economic Policy', *The American Economic Review*, vol. 84, no. 3, pp. 369-95.

Frenk, J., Bobadilla, J.L., Stern, C., Frejka, T., Lozano, R. (1991), 'Elements for a Theory of the Health Transition' *Health Transition Review* , 1(1), pp. 21–38.

Gallup, J. L. and Sachs, J. D. (2001), 'The economic burden of malaria', *American Journal of Tropical Medicine and Hygiene*, vol. 64, no. 1-2 Suppl, pp. 85-96.

Greener, R. (2004), 'The Impact of HIV/AIDS on Poverty and Inequality' in *The Macroeconomics of HIV/AIDS*, M. Haacker, ed., International Monetary Fund, Washington.

Gutierrez, E. and Kendall, C. (2001), 'The Globalization of Health and Disease: The Health Transition and Global Change', in Albright, G., Fitzpatrick, R. and Scrimshaw, S. (eds), *Health Transition and Global Change*, , London; Sage.

Gyimah-Brempong, K. and Wilson, M. (2004), 'Health human capital and economic growth in Sub-Saharan African and OECD countries', *The Quarterly Review of Economics and Finance*, vol. 44, no. 2, pp. 296-320.

Hanushek, E. and Dongwook, K. (1995), 'Schooling, labor force quality, and economic growth', *NBER Working Paper no. 5399*.

Haveman, R. and Wolfe, B. (2000), 'The Economics of Disability and Disability Policy', in J. Newhouse and A. Culyer, eds, *Handbook of Health Economics*, North Holland, Amsterdam.

House of Commons Health Committee (2002), Delayed discharges. Third Report of Session 2001-02 (HC617-I). London, The Stationery Office Ltd..

Hutubessy, R. C., van Tulder, M. W., Vondeling, H., and Bouter, L. M. (1999), 'Indirect costs of back pain in the Netherlands: a comparison of the human capital method with the friction cost method', *Pain*, vol. 80, no. 1-2, pp. 201-7.

International Obesity Task Force (2003), 'Obesity in Europe. A case for action', London.

Jonsson, B. (2002), 'Revealing the cost of Type II diabetes in Europe', *Diabetologia*, vol. 45, no. 7, pp. S5-12.

Kalemli-Ozcan, S., Ryder, H. E., and Weil, D. N. (2000), 'Mortality decline, human capital investment, and economic growth', *Journal of Development Economics*, vol. 62, no. 1, pp. 1-23.

King, H., Aubert, R. E., and Herman, W. H. (1998), 'Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections', *Diabetes Care*, vol. 21, no. 9, pp. 1414-31.

Kremer, M. and Miguel, E. (2001), 'Worms: identifying impacts on education and health in the presence of treatment externalities', *NBER Working Paper no. 8481*.

Lee, R. D., Mason, A., and Miller, T. (1998), 'Savings, Wealth and Population', *University of California at Berkeley*.

Maetzel, A. and Li, L. (2002), 'The economic burden of low back pain: a review of studies published between 1996 and 2001', *Best Practice and Research Clinical Rheumatology*, vol. 16, no. 1, pp. 23-30.

Malaney, P., Spielman, A., and Sachs, J. (2004), 'The malaria gap', *Am J Trop. Med Hyg.*, vol. 71, no. 2 Suppl, pp. 141-6.

Maniadakis, N. and Gray, A. (2000), 'The economic burden of back pain in the UK', *Pain*, vol. 84, no. 1, pp. 95-103.

Mayer, D. (2001), 'The Long-Term Impact of Health on Economic Growth in Latin America', *World Development*, vol. 29, no. 6, pp. 1025-33.

McCarthy, F. D., Wolf, H., and Wu, Y. (2000), 'Malaria and Growth', *World Bank Policy Research Working Paper no. 2303*.

Meltzer, D. (1992), *Mortality decline, the demographic transition and economic growth.*, PhD, University of Chicago.

Naylor, Mary D., Brooten, Dorothy, Campbell, Roberta, Jacobsen, Barbara S., Mezey, Mathy D., Pauly, Mark V., Schwartz, J. (1999), 'Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial', *JAMA: The Journal of the American Medical Association*, 281(7), pp. 613-20.

Over, M. (1992), 'The Macroeconomic Impact of AIDS in Sub-Saharan Africa', *World Bank Working Paper*.

Parker, S. (1999), 'Elderly Health and Salaries in the Mexican Labor Market', *Latin American Research Network, Working Paper R353. Interamerican Development Bank*.

- Politt, E. (1997), 'Iron deficiency and educational deficiency', *Nutritional Reviews*, vol. 55, pp. 133-40.
- Politt, E. (2001), 'The developmental and probabilistic nature of the functional consequences of iron deficiency in children', *Journal of Nutrition*, vol. 131, pp. 669-75.
- Preston, S. H. (1980), 'Causes and consequences of mortality declines in less developed countries during the twentieth century', in R. Easterlin, ed., *Population and Economic Change in Developing Countries*, Chicago, IL. University of Chicago Press.
- Ram, R. and Schultz, T. W. (1979), 'Life Span, Health, Savings, and Productivity', *Economic Development and Cultural Change*, vol. 27, no. 3, pp. 399-421.
- Ranis, G., Stewart, F., and Ramirez, A. (2000), 'Economic Growth and Human Development', *World Development*, vol. 28, no. 2, pp. 197-219.
- Ribero, R. and Nunez, J. (1999), 'Productivity of Household Investment in Health, the Case of Colombia', *Latin American Research Network, Working Paper R354, Interamerican Development Bank*.
- Rizzo, J. A., Abbott, T. A., III, and Berger, M. L. (1998), 'The labor productivity effects of chronic backache in the United States', *Med. Care*, vol. 36, no. 10, pp. 1471-88.
- Rooney E., Studenski S., Roman L. A. (1997), 'Model for Nurse Case-Managed Home Care Using Televideo', *Journal of the American Geriatric Society*, 45(12), pp 1523-8.
- Ruhl, C., Pokrovsky, V., Vinogradov, and V. (2002), *The Economic Consequences of HIV in Russia*, World Bank.
- Sachs, J. (2001) 'Macroeconomics and Health: Investing in Health for Economic Development', Report of the Commission on Macroeconomics and Health, World Health Organization, Geneva.
- Sachs, J. and Malaney, P. (2002), 'The economic and social burden of malaria', *Nature*, vol. 415, no. 6872, pp. 680-5.
- Sachs, J. D. and Warner, A. M. (1997), 'Fundamental Sources of Long-Run Growth', *The American Economic Review Papers and Proceedings of the Hundred and Fourth Annual Meeting of the American Economic Association*, vol. 87, no. 2, Papers and Proceedings of the Hundred and Fourth Annual Meeting of the American Economic Association, pp. 184-8.
- Sant, M., T. Aareleid, F. Berrino, M. Bielska Lasota, P. M. Carli, J. Faivre, P. Grosclaude, G. Hédelin, T. Matsuda, H. Møller, T. Möller, A. Verdecchia, R. Capocaccia, G. Gatta, A. Micheli, M. Santaquilani, P. Roazzi, D. Lisi, and the EURO CARE Working Group (2003), EURO CARE-3: survival of cancer patients diagnosed 1990–94—results and commentary. *Ann Oncol* 14: v61-v118.

- Schultz, T. P. (1999a), 'Health and schooling investments in Africa', *Journal of Economic Perspectives*, vol. 13, no. 3, pp. 67-88.
- Schultz, T. P. (1999b), 'Productive benefits of improving health: evidence from low-income countries', *mimeo*.
- Schultz, T. P. and Tansel, A. (1993), 'Measurement of returns to adult health', *LSMS 95. World Bank, Washington DC*.
- Schultz, T. W. (1980), 'Nobel Lecture: The Economics of Being Poor', *The Journal of Political Economy*, vol. 88, no. 4, pp. 639-51.
- Sen, A. (1999), 'Health in development', *Bulletin of the World Health Organization*, vol. 77, no. 8, pp. 619-23.
- Sharp, S. (2002), *Modeling the macroeconomic implications of a generalised AIDS epidemic in the Russian Federation*, PhD, University of Colorado, Boulder, Department of Economics.
- Theodore, K. (2001), 'HIV-AIDS in the Caribbean: Economic Issues Impact and Investment Response', *CMH Working Paper Series WG1 : 1*.
- Thomas, D. and Frankenberg, E. (2002), 'Health, nutrition and prosperity: a microeconomic perspective', *Bull World Health Organ*, vol. 80, no. 2, pp. 106-13.
- Thomas, D. and Strauss, J. (1997), 'Health and wages: Evidence on men and women in urban Brazil', *Journal of Econometrics*, vol. 77, no. 1, pp. 159-85.
- UKPDS Study Group (1996), A nine-year update of a randomized, controlled trial on the effect of improved metabolic control on complications in non-insulin-dependent diabetes mellitus. UKPDS Study Group. *Annals of Internal Medicine* (1996); 124, pp 136-45.
- Walker, B. F., Muller, R., and Grant, W. D. (2003), 'Low back pain in Australian adults: the economic burden', *Asia Pac.J Public Health*, vol. 15, no. 2, pp. 79-87.
- Wimo, A., Jonsson, B., Karlsson, G., and Winblad, B. (1998), *Health Economics of Dementia* Wiley, UK.
- World Bank (1994), *World Development Report 1993*, Washington.

Annex 1: Total health expenditure as a proportion of GDP

Country	Total health expenditure as a proportion of GDP (2003)
Switzerland	11.2
Germany	10.9
Norway	10.0
Iceland	9.9
France	9.7
Greece	9.5
Portugal	9.3
Sweden	9.2
Belgium	9.1
Netherlands	9.1
Denmark	8.8
Italy	8.5
Austria	8.2
Hungary	7.8
Slovenia	7.7
United Kingdom	7.7
Spain	7.6
Czech Republic	7.3
Ireland	7.3
Finland	7.3
Poland	6.2
Estonia	6.1
Lithuania	6.2
Slovak Republic	5.7
Latvia	4.8

Sources: OECD Health Database, WHO Health For All database, country statistics.