
Original Article

Health care as an investment: Implications for an era of ageing populations

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ABSTRACT The relationship between health and economic outcomes such as increased productivity and economic growth is established in both the disciplines of medicine and economics. Increasingly, the reciprocal relationship between health and economic growth has been discussed in the context of ageing populations as a compensating mechanism to try and maintain economic growth as the supply of labour starts to contract. As the number of working aged people starts to decline or shrinks proportionally to the non-working aged populations, attempts to maintain productivity will require getting the most out of every available worker to try and maintain economic living standards. The relationship between health and economic outcomes suggests that how health services invest in services can influence critical economic parameters outside the health service. This article will consider the construct of health as an investment and its role in the evaluation of health technologies and the allocation of health-care resources. To illustrate some features of investing in health, we will draw on our past experience developing a government perspective health investment model that considers future tax revenues generated by investing in fertility programmes.

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BACKGROUND

Over the past several decades, demographers have repeatedly described the ageing of populations in industrialised countries, resulting from increasing longevity and falling fertility rates experienced over the past century.¹ While the efforts of humankind to increase life expectancy and avert famine as predicted by earlier demographers should be

applauded, ageing populations pose numerous challenges for all of us – most notable of which is the shrinking numbers of working aged people expected to pay for social programmes. As populations age and increasingly place demands on government-funded social programmes, few easy policy options are available and often include cuts to public spending, increasing taxes to pay for increasing

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demand and in some instances both.^{2,3,4} In many European countries, old-age dependency ratios are expected reach 50 per cent by 2050, whereby two working aged people will be supporting one person over the age of 65 compared with the current ratio of four working aged people to one retired person.²

As the number of working aged people starts to decline, macroeconomic theory suggests growth will start to decline. Increases in physical capital (for example infrastructure, technology) and productivity can partially mitigate the effects of ageing populations.⁵ However, to maintain living standards the rate of productivity increase will need to be greater than the effects of ageing. This increasingly looks unlikely, considering that productivity growth has been declining in many parts of Europe over the past two decades.^{6,7} Labour market reform that encourages people to work longer and delay retirement has also been put forward as one potential option to minimise the impact of ageing on public finances. However, as illustrated by Manton *et al*, increasing the age of retirement is only feasible provided people are healthy enough to remain working.⁸ The demographer Phillip Longman, writing on the subject, suggests that 'With a shrinking labor supply, Europe's future economic growth will therefore depend entirely on getting more out of each remaining worker (many of them unskilled, recently arrived immigrants), even as it has to tax them at higher and higher rates to pay for old-age pensions and health care'.⁹

In this article, we consider the health investment framework and how health status influences economic outcomes. We consider this relationship in the context of ageing populations, as well as options available for assessing the return on investment from health programmes. We also consider who benefits from societal

health gains – in particular, considering the government perspective and the influence of investing in health on future government tax receipts. We will illustrate this point using a previously developed model for infertility and consider its broader application to inform health-care priority-setting.

HEALTH AS AN INVESTMENT

Few people question the positive correlation between health and economic growth that serves as one of the cornerstones of development economics, although the direction of the relationship is often debated. The traditional belief has been that wealthier nations have more command over health-care resources and as a consequence were healthier. However, this view has gradually changed and health as an important economic determinant has become recognised.¹⁰ Perhaps one of the best-known examples is the relationship between life expectancy and economic growth.^{11,12} However, the relationship is more than simply keeping people alive for longer, but also recognises that economic growth is driven by the healthy that are able to supply labour to the market.^{13–15} Therefore, the manner in which health influences labour force participation, labour productivity and creativity, and the absolute number of hours on the job can influence economic outcomes that should be considered when evaluating medical programmes and setting priorities. The necessity to understand this relationship is heightened by the declining numbers of working aged people in many industrialised countries and the desire to maintain current living standards.

The principles of health and wealth have long been championed by organisations such as the WHO. More recently, these ideas have caught on in Europe, as outlined in an independent report to the European Commission published in 2005, in which it was noted

that 'policy-makers who are interested in improving economic outcomes (for example on the labour market or for the entire economy) would have good reasons to consider investment in health as one of their options by which to meet their economic objectives'.¹⁶ The authors of the report acknowledge that the subject is often overlooked in wealthier nations, and highlighted the importance of investing in health to achieve economic growth in the context of ageing populations.

The relationship between health and economic outcomes is based on human capital theory and that individuals invest in themselves to improve their economic condition.¹⁷ Human capital takes many shapes but is often thought of in terms of knowledge, skills and experiences, but also includes investments in health. Much of the early human capital work was conducted by Becker to explain monetary returns from educational attainment where he touched on the subject of health.¹⁸ Building on these ideas, Grossman described the demand for health from a microeconomic perspective, using the ideas of human capital where he defined health both as consumption good and as a capital good.¹⁹ According to Grossman, health as a consumption good makes people feel better, and as a capital good health can enhance an individual's earning capacity.

An appreciation of the relationship between health and economic outcomes can also be gained by exploring the drivers of macroeconomic growth, often defined in terms of gross domestic product (GDP). Numerous models have been developed to describe economic growth, however one of the better-known models was developed by Robert Solow in which he defined the key determinants of economic growth in terms of technological progress (A), capital (K) and labour supply (L).²⁰ According to the model developed by Solow, for which he was later awarded the Nobel Prize,

economic growth can occur if either A, K or L or increases.

Although the Solow growth model does not specifically address human and health capital, we know that health can directly or indirectly impact each of the inputs known to influence economic growth.²¹ For example, health influences the supply of labour in terms of both quantity and quality (L). Health also influences educational attainment and creativity, which undoubtedly influences technological progress (A).²² Furthermore, the relationship between improved health and longevity is believed to increase the personal savings rate as people expect to live longer.¹⁰ Consequently, an increased savings rate makes more money available for investing in physical capital (K), which in turn influences economic growth.

HEALTH INVESTMENT VERSUS HEALTH EFFICIENCY

If investing in health is good for the economy, it is worth considering the methodological framework for assessing this relationship. Furthermore, it is important to contrast a health investment framework with the more commonly known cost-effectiveness analysis (CEA) used by many Health Technology Assessment (HTA) agencies that influence product reimbursement and funding decisions.²³

Broadly speaking, the health investment framework seeks to understand how disease and available health technologies impact economic parameters such as labour force participation, productivity, wages or macroeconomic growth. Within this classification we also include cost-benefit analysis as a health investment framework in cases where benefits are defined using labour wage rates. The methodologies and perspectives applied to assess health investments can vary, and in the majority of cases the value of an intervention or disease burden is often defined solely in economic terms. In the

health economics literature, these costs are often referred to as indirect costs. Unlike HTA agencies that emphasise CEA, there are no prescriptive guidelines that define a methodological approach with health investment. For an overview of the different methodological approaches, interested readers are referred to the report prepared for the Commission by Suhrcke *et al.*¹⁶

For many health researchers, defining health benefits exclusively in economic terms has serious limitation because it fails to account for the intangible value that people assign to good health.²⁴ Additionally, valuing health benefits in economic terms also raises concerns because it might favour those employed compared to those not working (for example housewives, retired persons, unemployed).²⁵ In seeking to dismiss the sole valuation of health benefits based on lost earnings, Mishan argued that such an approach could only be rationalised if programme value was defined based on contribution to gross national product.²⁶ Because of the limitations of valuing health in monetary terms, many argued that an optimal method for valuing health benefits should be based on welfare economics. Therefore, it was argued that values assigned to health should be based on societal valuations and what people would be willing to sacrifice to obtain particular health benefits. Because of the perceived weaknesses of valuing health benefits defined purely in economic terms, the approach quickly went out of fashion, although valuing health benefits in economic terms is still recognised as being substantial and an important element for valuing health improvements. However, it is worth noting that few economic studies include indirect costs and there is often confusion among analysts about when and how to include these costs in studies.²⁷

The ensuing years saw increased interest and use of the quality-adjusted life year

(QALY) that captures both morbidity and mortality in a single metric. Because the morbidity component of the QALY was valued using societal preferences for different health conditions – often using multi-attribute utility measures – it was considered to be a more appropriate measure for valuing health conditions. Furthermore, because it reflected patient utility related to different conditions, it was deemed an appropriate measure for informing resource allocation decisions in an effort to maximise social utility.

Over the past two decades the QALY has become the most widely used measurement of health status and has been endorsed by numerous HTA agencies such as the National Institute for Health and Clinical Excellence in the United Kingdom.^{28,29} Although the QALY does reflect societal values for health conditions, it can not be translated into economic outcomes that inform health investment questions like those raised in the previous section. To complicate matters, several government agencies responsible for evaluating technologies fail to consider the societal costs in their decision-making by excluding indirect costs.^{28,29} As a result, questions regarding the economic consequences of many technologies that could inform the health investment debate remain unanswered.

This brief description of methodologies for valuing health benefits underscores the challenges in adopting a health investment framework for valuing medical technologies. The early rejection of human capital methods for valuing health status changes by many health economists has led to the almost universal acceptance of the QALY for valuing health and allocating resources. The need for a formal health investment framework is further underscored by the fact that many HTA agencies and researchers either are not concerned with or fail to estimate the broader economic consequences (that is,

indirect costs) of morbidity and mortality changes. Consequently, questions with regard to the wider economic benefits to society of new health technologies can often remain unknown.

Despite concerns over valuing health in economic terms, there are strong suggestions that maintaining living standards and economic outcomes are important – especially in light of ageing populations and concerns over sustainability of public finances – and health may undisputedly contribute. While maintaining living standards is only one factor important to society, there is much that can be learned about how health impacts the economy using human capital approaches to value health. While Mishan was correct that a comprehensive measure to value health is appropriate, this does not seem to justify the abandonment of valuing health in economic terms that has occurred in many settings. In fact, the choice of methodologies does not have to be mutually exclusive. Rather both approaches – health investment and QALY – should be used to inform resource allocation decisions. Furthermore, if recent interest in health and the economy continues to grow, this may revive interest in human capital approaches for valuing health.

BENEFICIARIES FROM INVESTMENTS IN HEALTH

If health has economic value, it is worth considering who benefits from improved population health. At the individual level, it is clear that the individual experiencing a health improvement is the beneficiary regardless of whether measured in terms of reduced pain, increased quality of life or economics. When health improvements occur at the aggregate level, things are much different with a wider range of beneficiaries across society. This takes into consideration both aggregate measures of health but also the externality of poor

health that can have consequences even for healthy individuals, especially in relation to communicable diseases. On the whole, it is clear that as population health improves then society as a whole will benefit from health status improvements and accrue economic benefits.

Moreover, if health has an economic value then this value will surely be taxed. This point seeks to acknowledge that governments also benefit from economic growth regardless of the causes. As economies expand, whether brought about through natural growth, economic stimulus or improved population health, all things being equal, governments can benefit from increased tax revenue resulting from economic expansion. This seemingly benign point is important, particularly in light of concerns over tax-funded social programmes and a shrinking tax base, and at a practical level could potentially be used to influence government resource allocation decisions in health care, much in the same way that governments invest in technology and education.

Popular belief often suggests that governments can increase tax revenue by increasing rates of taxation. However, this is not necessarily supported by the empirical evidence whereby growth is seen to be a more effective tool. Studies have shown that increasing tax rates can have limited impact on tax revenue, as higher rates of taxation increase incentives for misreporting and increases demand for leisure time. This point is illustrated from an analysis in the United States, which shows that changes to the highest marginal tax rate between 91 per cent and 35 per cent over 40 years did not significantly impacted government tax revenue as a per cent of GDP.³⁰ Supply-side economists make the case for lowering taxes to stimulate economic growth as a more efficient means for governments to increase tax revenues.³¹ The relationship between economic growth and increasing

tax revenues has also been noted in Congressional reports.³²

Applying the growth and tax perspective to health highlights that governments, especially those with tax-funded health systems, might be better positioned to influence tax receipts based on how resources are allocated within the health service. There is nothing sinister about the relationship, and it simply acknowledges that a component of the economic growth attributed to health gains described earlier will be collected in the form of taxes as economies expand.^{8,16,30} The relationship between poor health and reduced government tax receipts is equally applicable as recently acknowledged in a report from the WHO on the economic consequences of disease and injury.³³ Moreover, investing in health programmes that enable people to work longer into retirement, avoid short- and long-term sick leave or avoid illness altogether will increase productivity and stimulate economic outcomes for individuals, but can also benefit government both in terms of increased tax receipts and reduced demand on publicly funded programmes.

THE TAX VALUE OF A LIFE

With the above government tax perspective in mind, the authors of this article previously evaluated the tax value of life in an assessment of fertility treatments. The Lifetime Net Tax (LNT) model that we developed treats medical costs required to conceive a single child using in vitro fertilisation (IVF) as an investment with future economic consequences. Within the LNT model we assessed age-related financial transfers between government and an individual to derive average lifetime net tax revenue. On average, an individual receives an education, medical care, allowances and a pension from government. In exchange, the government is entitled to lifetime tax

receipts once the child enters the workforce.^{34,35} The model estimates average discounted net tax revenue from gross taxes paid minus age-related government expenditure every year over the life course assessed in the LNT model.

Using a tax-based modelling approach, we found that there is a strong economic case for health services to publicly subsidise IVF treatments. Our analysis demonstrates that based on an initial investment of £13 000 in the United Kingdom to produce one IVF child, the present discounted value of the investment in future net tax revenue was approximately £109 000, representing an eightfold return on investment.³⁴ To put these figures into perspective, there were over 11 000 children born from assisted reproduction in 2005 in the United Kingdom.³⁶ Furthermore, because the model emphasises the government perspective, it significantly underestimates the true economic value of an individual to society that results from a lifetime of demanding goods and supplying labour.

The LNT approach described above is not an economic evaluation similar to those typically used by HTA agencies. Because it emphasises tax benefits attributed to improved health status or reduced mortality, it places no value on health; consequently, it undervalues the benefits of improved health status from the societal perspective. The approach solely focuses on individuals as economic entities and how health status changes can influence the manner in which future economic activities take place. In this respect, the health investment model addresses a fundamentally different question and considers the costs and consequences of changes in population health on government accounts. This approach may be useful for evaluating other technologies because it addresses medical intervention costs in relation to increased productivity and sustainability of

public finances (that is, tax revenue) in the same analysis.

The LNT is useful for evaluating fertility treatments because this ultimately leads to an increase in the supply of labour. However, for the methodology to be relevant to health care, decision-makers it needs to be applicable to a broader range of medical interventions. Although it is true that fertility treatments do influence the supply of labour, representing 6 per cent of national births in some countries,³⁷ the same could be said for any medical intervention that saves lives or enables people to work longer. In economic terms, investing health-care resources to create a life, using IVF, or investing resources to save a life is analysed using the same methodological framework for valuing human life, using labour wage rates. Whether you save a life or create a life by investing health-care resources, the end result is the same because there is one additional person alive who would not have been alive if decisive medical care to save or to create life had not been taken. When changes in work capacity or, in the case of fertility treatments, the supply of future labour are viewed in the context of the Solow growth model described earlier, it is possible to see how investments into the health service can influence macroeconomic growth. Consequently, how we prioritise patient groups and allocate health-care resources can directly influence economic outcomes.

RESOURCE ALLOCATION AND RETURNS ON INVESTING IN HEALTH

Because human capital and, in the IVF example, human life have exchangeable economic value, the LNT approach to value health illustrates several points regarding resource allocation decisions and health-care priority-setting. Firstly, programmes like IVF are often perceived

by health services as a low health-care priority requiring costly interventions. In our analysis, we have shown that costs are actually an 'investment' when a broader range of costs and benefits are considered and the time period of the analysis is extended. Secondly, our analysis explicitly builds an economic case for public subsidy of fertility treatments. However, infertility is considered a low health-care priority within many health services and, consequently, often attracts limited funds. Ironically many of the same countries that have concerns over ageing populations fail to fund these treatments that could partially mitigate the effects of an ageing society. Nevertheless, this illustrates the challenges of integrating an economic growth framework into priority setting and resource allocation decisions normally influenced by burden of disease, capacity to benefit and equity concerns.³⁸

Our previous findings, although in some respects intuitive, can be used to contrast differences between where health-care resources are commonly spent and where tax revenues are generated. To illustrate this, we reproduce a figure from our previous work (Figure 1). The trace in Figure 1 illustrates the lifetime cash flow between an individual and their government. In the early stages of life, an individual is a net recipient of government transfers, also viewed as human capital investments. After entering the workforce, financial transfers flow in favour of government, as workers start to pay taxes (for example income taxes, consumption taxes, property taxes and levies). Finally, when individuals exit the workforce, they transition to a stage of reduced tax contributions while increasing demand on public services (for example health care, pension and social services).

In terms of health-care spending, studies often report that health-care consumption and costs are often concentrated in the elderly and younger children.^{39,40} Because

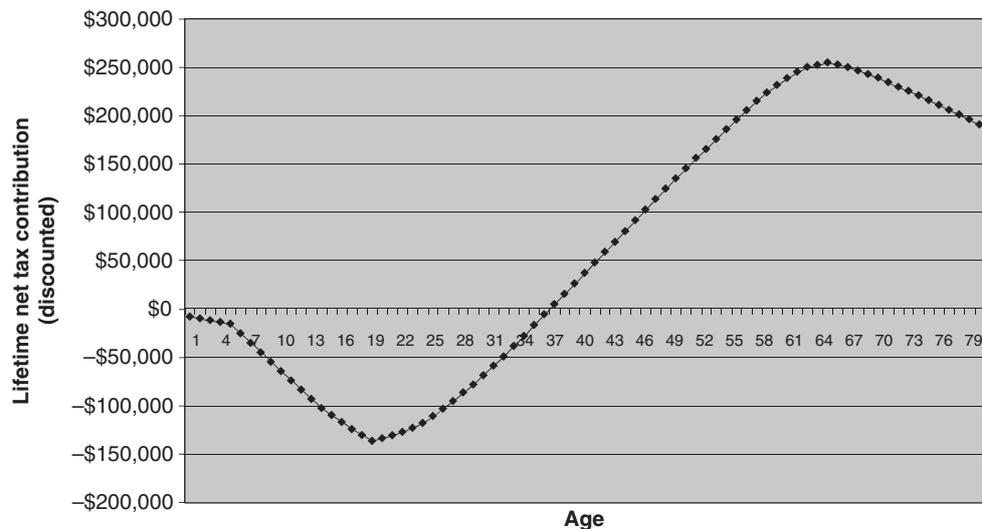


Figure 1: Lifetime fiscal balance sheet between an individual and US government over projected lifetime based on US government financial transfers and project average earnings and longevity.
 Source: Reproduced from Connolly *et al* (2008).³⁵

the need is higher in these groups, and in older persons in particular, current spending simply reflects demand. However, when age-related spending is viewed in the context of the LNT model in Figure 1, these two groups represent extreme ends of the economic life cycle with entirely different returns on investment from health expenditure. This simply reflects differences in future economic capacity between different age groups. Perhaps the more important question to ask is whether current spending on one age cohort is done to the detriment of another age cohort. Furthermore, is it possible to achieve the same level of health gain, while also influencing future tax revenues in a positive direction.

Priority setting and resource allocation decisions are influenced by a range of factors that include medical need, defined in various different ways, equity and increasingly QALYs. If health services seek to influence economic outcomes, then it is conceivable that remaining economic capacity might need to be considered in priority setting in the future.

In this respect, the LNT approach that we have described can help to answer questions about how investing in programmes influences economic outcomes. Although the model we have developed was used to assess fertility treatments, it can easily be adapted to evaluate almost any intervention. In particular, those with an acute intervention cost, and clearly definable outcome, for example vaccination programmes that save lives or surgical interventions that influence future work capacity. However, it needs to be emphasised that this approach should never be used in isolation to influence resource allocation decisions. Rather, it should be used in conjunction with existing criteria for priority setting. Perhaps, it is most useful for pointing out some fairly glaring facts about where resources are allocated or are not being allocated as in the IVF case.

The major weakness in applying the LNT in decision-making is that one might always favour the young and working over the old and non-working. The allocation of resources based purely

on remaining economic capacity is no doubt deplorable for many to contemplate. In fact, precedence already exists for priority setting that favours the young. Previous public assessments have shown that in the allocation of life-saving treatments the public often favour allocating resources to the young compared with the old.^{41,42} The rationale for why public opinion should favour the young over the old is often not explicit but is thought to be on moral grounds and remaining life. While claims over resources for the young are often made on moral grounds, the LNT provides an economic rationale for allocating resources in this manner.

CONCLUSIONS

For many readers, allocating resources on the basis of economic benefits or future revenue for government is a ghastly prospect on which to base disease prioritisation and treatment decisions. On the other hand, we know that sustainability of public finances, economic growth and maintaining living standards are also important to society. The options for maintaining all of these parameters will be challenging, as the number of working aged people decreases at the same time that demands on public pensions, health and social services are increasing. For many nations, difficult decisions have to be made to maintain economic growth, delivering generous health and social programmes, while balancing how much they intend to tax future generations.

In reality, every element of the ageing population problem and all of the possible solutions should not be seen in isolation from one another. If nations can use their health services to improve economic sustainability in the face of ageing populations, then it might be in their interests to do so, particularly if the economic rewards of growth are shared among all members of society. This

suggests there might be a need to take resources away from some health programmes and allocate them to programmes that offer better economic prospects. But, if all members can share from the economic benefits then it is still possible to maximise societal welfare in doing so. Conversely, ignoring opportunities for achieving growth using the health service seems equally objectionable.

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