REAL Supply

TOPIC 8:
Incentives for long-term investment

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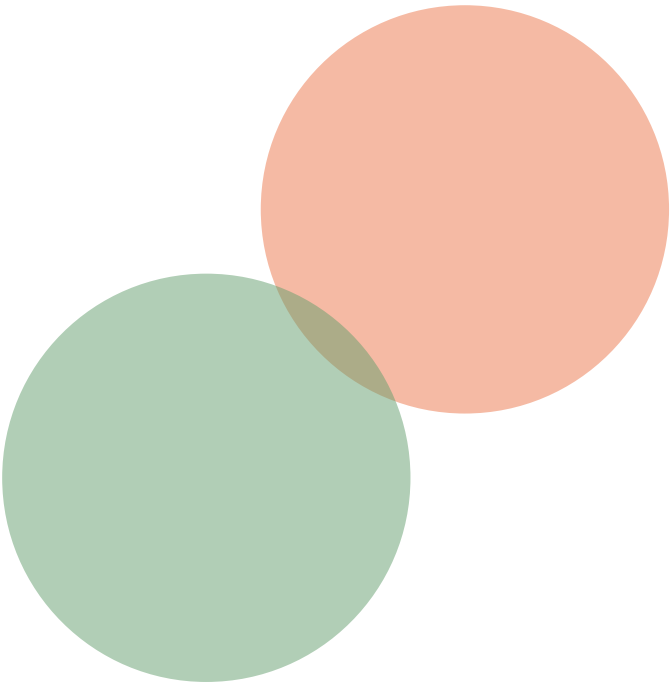

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Plain English summary

Context

The resources available to the health and care sectors must be balanced between addressing current and future needs. Long-term investment decisions may have costs greater than benefits at first, take a long time to pay off, and be to some extent irreversible, meaning that once resources are committed, they cannot be easily reallocated. This review focuses on three key areas characteristic of long-term investment: preventative medicine, working against future poor health; capital expenditure, including purchasing and maintaining buildings and other technology; and preparing for and adapting to climate change. It asks whether the NHS invests appropriate resources in future health, and how we can measure the benefits of further investment.

Knowledge gap

The NHS may underinvest in activities that have long-term payoffs due to several structural and financial challenges. The organisations responsible for funding prevention may not directly benefit from the long-term savings it generates. Capital expenditure often depends on time-limited national funds which are allocated for specific purposes and must be applied for, limiting flexibility. Locally controlled capital funding is often diverted to cover day-to-day operational costs. The future costs of climate change may not be considered in current capital expenditure plans, even though they could be reduced or adapted. There is a need to explore whether current spending levels are not the best and to identify the reasons why long-term investments may be neglected.

Value

This research will investigate if spending more on prevention, buildings and equipment, and adapting to climate change would be better for the NHS in the long run. It will explore different ways of accounting for long-term benefits and costs, if the way the NHS gets its money makes it hard to invest for the long haul, and if there are better ways to encourage long-term thinking. By understanding these issues, policymakers can make better-informed decisions about where to spend money and how to allocate resources for long-term impact.

Impact

Addressing barriers to long-term investment could bring multiple benefits. Prevention efforts could reduce the burden of illness, improving population health and lowering future healthcare costs. Better buildings and equipment could make the NHS more efficient, improve patient care, and make staff more productive. Preparing for climate change (by reducing our impact and adapting to changes) could protect the NHS from future problems and save money in the long term.

Defining the problem

This pathfinder studies how the English health and care economy makes long-term investment decisions. *Ex ante* there is no reason to think it does so optimally. Dynamic allocation decisions are made by different actors within the health and care sector: political parties, doctors, hospitals, GPs, ICBs, and local authorities. Each of these actors make decisions based on the incentives they face, which may not be sensitive to the long-term benefits and consequences of their decisions. In addition, the incentive structures are set (not always deliberately) by a central government which faces political incentives relating to the electoral cycle. Democratic governments may face strong incentives to promote health in the short term in order to secure re-election, while delaying investments in future health which may turn out to be within the remit of a different political party.

This problem is not novel, rather it is a perennial one evidenced by repeated Government reports that repeat the same mantra. Stakeholders across the health and care system speak of how the problem manifests for them and the constraints they face that prevent long-term investment. Hence in part the problem is to determine why this issue persists in the face of widespread stated willingness to address it. This problem is also more complex than a simple choice between actions with immediate benefits versus actions with more long-term consequences. All decisions may be accompanied by both short and long-term consequences, which can make it difficult to assess how much priority is given to the long-term and the extent of any underinvestment.

"In part the problem is to determine why this issue persists in the face of widespread stated willingness to address it."

In terms of economics, the problem concerns the allocation of resources over time periods. Individuals, firms and governments often face trade-offs between using resources to realise benefits in the current period versus deferring those benefits to a later period. This choice between expenditure that produces immediate outcomes and that which provides benefits in future periods implies an opportunity cost of future outcomes in terms of current outcomes. Future outcomes are more uncertain; there is less scope to directly observe the relationship between cause and effect as the time between the two increases, and there is more scope after the investment point for other changes to occur which alter the payoffs. In the health and care sector, the trade-off presents as a choice between treating current needs and addressing future needs. We can think of expenditure or actions that improve future health and care outcomes as an "investment". Future needs can be addressed by investing now in the ability to supply future care, but also by investing now to avert future need. A further challenge in this context is that the current needs are those of knowable and identifiable people, whereas future needs are those of unknown and unidentifiable people. Even if health outcomes are equally valuable for known and unknown people, cognitive biases can lead to the former being overweighted in decision making; identifiable and known current individuals can directly lobby for their needs to be met. Addressing a current need can afford the chance to witness an improvement, whereas averting future needs is invisible. In this way, treating health and care needs once they have occurred can be perceived as more valuable than preventing their occurrence.

More broadly, the wider economy makes health-promoting investments such as building safe housing. This blurs the boundaries of what counts as the supply of health and care. In this pathfinder we primarily focus on the provision of services aimed primarily at altering health and care outcomes, and do not consider the supply of services related to social determinants of health. This leaves public health investment in scope, but housing, education and income redistribution out of scope. We pose the following sets of questions: How should economists measure the share of economic resources devoted to investment in future long-term health and care outcomes? What is the return on such investment? And what incentives does the current regulation of the health and care economy give for investment in future long-term health and care outcomes?

Relevant economic considerations

In economic theory, an optimal allocation decision occurs where the value obtained from investing in future outcomes is equal to the opportunity cost in terms of current outcomes. A given amount of an outcome is worth more if it occurs immediately compared to occurring after a period of time. This difference in value is represented by the discount rate, which is a function of time preference (for benefits now and costs later), how the social value of different outcomes is expected to change with time, and how the amount of available resources might change with time (Claxton et al 2011). Applying a discount rate to the future stream of costs and consequences attributed to different choices allows the payoffs to be compared in terms of net present value. There has been debate around whether health outcomes should be subject to the same discount rate as costs, and whether the same discount rate should apply to choices with very long-term impacts that extend out over decades.

Actors in the health and care system may have to choose between a variety of actions with differential timing of costs and consequences. In order to fix ideas, below we give three more specific examples of long-term investments in the health and care economy that are useful to highlight particular aspects of economic theory and that draw on different evidence for potential misallocation of resources. These are capital expenditure, expenditure on prevention, and expenditure to address the social impacts of climate change.

Example 1 Capital expenditure

In economics, capital is a factor of production alongside other factors like labour and land or natural resources. Capital comes in different forms but typically refers to stocks of goods or resource that will be used to generate other goods. In this pathfinder we focus primarily on physical capital given our other workforce theme pathfinders that focus on human capital. The amount of capital cannot be observed directly: it is a function of the relative price of the asset and the services it produces, which varies over time, by type of asset and age of the asset. In general, the productive value of an asset declines with its age due to physical wear and tear and the onset of obsolescence. This decline in value with age is generally captured through depreciation.

In the public sector in the UK, capital assets are defined as those that will be used for more than one year. This is contrasted with revenue expenditure, which is spent on day-to-day activity. In accounting terms, NHS capital spending concerns tangible infrastructure such as land, buildings and information

technology architecture, as well as intangible physical capital in the form of software and intellectual property rights. Insofar as physical capital (such as buildings and other infrastructure) is an input into health production, NHS capital spending is an investment into future health. The decision to invest in the maintenance and repair of existing hospitals and build new hospitals instead of treating more patients now is a decision to transfer health from the present to the future. Investing in capital can incur an adjustment cost, where resources are diverted from producing immediate output to install and adapt to the new capital assets. New forms of capital may take even longer to produce returns as they rely on system adaptation and complementary investment (David 1990). Since the lag between capital spending and resulting payoffs can be in terms of decades, this transfer can in effect push health benefits a long way into the future. Some policy levers can alter the timing of costs, smoothing costs so the time path of expenditure aligns with the time path of outcomes. Other policy levers mitigate uncertainty, for example risk-sharing payments schemes that recoup costs if outcomes are not realised.

The Darzi report (2024) notes significantly lower capital spending in English healthcare than in comparable countries. This low level of investment impacts on the capacity to deliver health and care services, and on the costs of supplying those services. In particular:

- Since 2010, the share of GDP devoted to capital healthcare spending has been lower in the United Kingdom than in other EU countries, Nordic countries, and the average of the United States, Canada, Ireland and Australia.
- The Department of Health and Social Care regularly transfers money from the capital budget to the revenue budget, which can be understood as a transfer of health from the future to the present.
- There is a maintenance backlog of almost £12bn, £2.4bn of which is in the high risk category. Over 4000 clinical incidents per year are caused by estates and facilities failures.

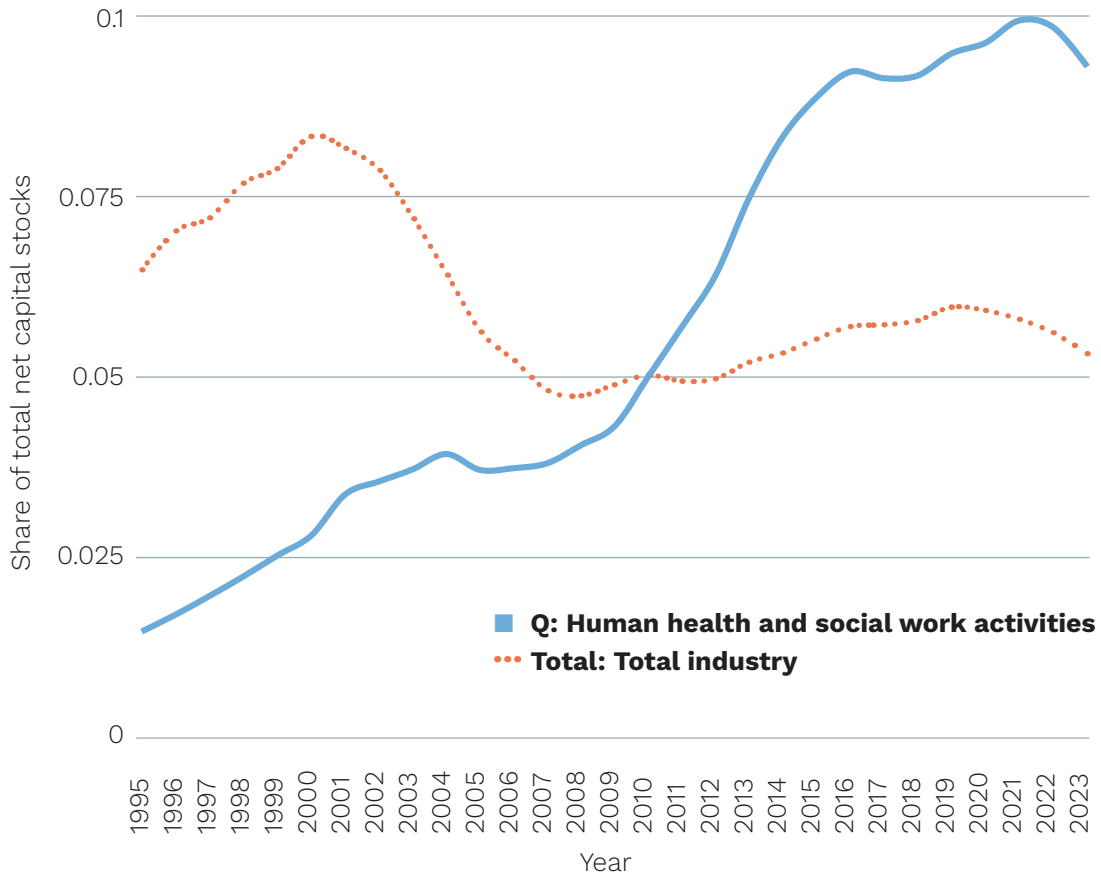
While the Darzi report notes especially low levels of capital spending from 2010 onwards, low levels of investment have been a persistent feature of the NHS; for example, in the 1990s, NHS capital spending was net negative (i.e., any capital investment was funded through land sales) and from the late 1990s, capital charges meant trusts' capital depreciation was counted against their income, which disincentivized ownership of capital and created strong incentives for leasing via the Private Finance Initiative (PFI) instead (Gaffney et al., 1999). These findings underscore the tendency of the NHS to invest small amounts of money into capital. In effect, it transfers health from the future to the present. However, there are broader implications to consider in terms of what this means for risk and sustainability of supply, and for costs of supply.

The level of capital investment in the NHS in England can be understood as a function of central government policy: the UK government sets capital budgets, including NHS capital budgets, and thereby imposes a constraint on the level of capital expenditure. In the NHS this is the capital departmental spending limit, which is intended to avoid the accumulation of risk in the public sector. However, if risk is also increased by underinvestment of capital, net impact requires consideration of the risk implications from any underinvestment. If this constraint is set too low, Government restrictions will drive providers to invest less than they would like. Liquidity constraints have been estimated to result in underinvestment in general capital (Kim et al 2022). This can be exacerbated by the existence of disincentives against overinvestment such as financial penalties and reputational damage that are not balanced by disincentives to underspend allowances, causing providers to strategically underinvest.

For many providers the Government determines the time period for the budget constraint, which restricts the period over which the value of an investment will impact on accounts. Similarly, the Government places limits on the ability to transfer money from one financial period to the next. This introduces uncertainty in the ability to continue investment beyond the budget period, which can discourage investments that require long-term commitments. Another means of centrally controlling capital is through nationally allocated funds to which providers can apply for specific types of investment, or which are awarded for achievement of certain targets. To access these providers must incur costs. Many NHS trusts find alternative ways to secure access to fixed capital, including using leasing to avoid the approval process many find to be bureaucratic (Williams et al., 2018). Leasing may provide capital at a lower risk, but in doing so is typically more expensive.

Investment in information technology infrastructure is subject to repeated Government initiatives for the promise of increased quality of care, increased productivity and lower operating cost. Information technology can lower operating costs within a provider by reducing transaction and coordination costs. It can improve productivity by increasing information sharing and thus improving the spread of innovation, a topic that is explored in our pathfinder on the diffusion of technology. Bronsoler et al 2022 review the medical and economic literature and find that the majority of studies suggest improvements in health outcomes with information technology adoption. The economics literature also suggests positive impacts on productivity in both hospitals and from electronic record adoption

Figure 1: Computer hardware, ICT equipment and software assets as a share of net capital stocks



in nursing homes. As might be expected from capital investment, the studies they review suggest that adoption of information technology is accompanied by an initial increase in operating costs, but that over time these costs start to decline. Finally, they find few studies that examine the impact of information technology adoption on the health and care workforce[1].

As we have noted, physical capital comprises assets of different types and accounting for the different economic consequences of each may be important. ONS data shown in Figure 1 illustrates how the share of information technology in net capital stock across UK industry has remained relatively stable since 2005 but has been rising in both the health and care sector.

Information technology may have a higher rental to asset price versus other forms of physical capital and may have a shorter lifetime due to increased risk of obsolescence despite being less vulnerable to physical wear and tear (Oulton and Srinivasan 2003). Das et al 2011 investigate the lag between investment and improvement in productivity, and impact on operating costs, and the durability of the effect for different types of information technology investments. They also differentiate between impacts on medical labour productivity and administrative labour productivity. In all they find important differences between investment in patient management systems, transaction systems, communications and administrative technology which suggest that different types of capital should not be aggregated when evaluating investment cases.

A final consideration with regard to investment is investment in other forms of capital. The health and care system as a whole faces two intertemporal trade-offs with respect to human capital: firstly, there is the allocation of resources between training future staff and hiring trained staff (for example, through agencies). The former has payoffs for future health at the expense of current health output. Secondly, the health and care sector has to trade off the intensity of its use of current staff against the risks of burnout at retirement: the more intensively it uses its labour resources in the current period, the more workers are likely to take sick days or drop out of the healthcare labour market. We discuss some of these concerns in the pathfinder [Recruitment and Retention].

Example 2 Expenditure on prevention

Preventative care can be defined as any intervention which prevents rather than treats sickness. With respect to healthcare, preventative care reduces the risk of occurrence of health reducing events and/or death. With respect to social care, preventative care reduces the risk of loss of independence and need for care. The distinction between preventative care and curative care is not precise; for example, treatments for chronic conditions such as type two diabetes might both be curative in the sense of managing symptoms and preventative in the sense that they reduce the risk of complications such as nerve damage and heart disease. However, lots of treatments have a preventative element, and these treatments can be considered an investment in health stock and thereby future health. For interventions such as smoking cessation services, the benefits in terms of future health could be decades in the future. Health promotion is similar to prevention, and could be viewed as activity that aims to improve current health stock instead of or as well as reduce the risks of decline in future health stock.

1 Skill mix and working conditions are addressed in other pathfinders in our workforce theme, and the impact of information technology on tasks is explored in our automation pathfinder

Estimates of the effect of preventative care on future health typically suggest that the returns are high. These preventative interventions include interventions in primary care, such introducing care plans (Ride et al., 2019); and public health interventions (Master et al. 2017). In addition to interventions strictly within the healthcare sector, the Local Government Association (2024) notes a case for early interventions through local government provided services including falls prevention and investment in housing repairs. Notably, the high return on investment in falls prevention indicates a potentially preventative role for social care.

The high level of return on preventative medicine is *prima facie* evidence that the UK under invests in preventative medicine. Unlike with capital spending, however, the share of NHS investment in preventative activities cannot be easily traced to the intentions of government policy. ICBs, GPs and local authorities can choose levels of spending on preventative activities. The explanation for low shares of spending therefore requires an understanding of how this range of individual actors respond to their incentives for spending on preventative activities. The feasibility of policy levers to alter these incentives depends on the ability to appropriately attribute and share the benefits of preventative activity. We explore some of these factors in detail in the sections on fragmentation.

"Unlike with capital spending, however, the share of NHS investment in preventative activities cannot be easily traced to the intentions of Government policy."

Example 3 Expenditure to address climate change

Given the size of the NHS, it is responsible for 4% of England's total carbon footprint, and 40% of public sector emissions. Many aspects of climate correspond to the considerations of capital investment and prevention already covered. These would include investment in climate appropriate infrastructure and prevention of illness that is expected to increase with climate change. That is, some aspects of climate change will be captured by predictive modelling and positive assessment of its impact on the expected costs, expected health and care outcomes, and the associated decision uncertainty of different resource allocation decisions. Initiatives such as the Sustainable Healthcare Alliance and supplementary Green Book guidance show how these calculations should be performed to reflect the economic consequences and social cost of carbon emissions. However, there is still limited understanding of some of the potential impacts, such as the increase in the depreciation of capital and reduction in productivity due to increases in temperature and the rate of extreme weather events.

However, climate change may also bring to the fore normative questions in terms of intergenerational transfers and the willingness to trade health for other intangible but intrinsically valuable social outcomes. These normative questions may be especially important with respect to climate mitigation policy, as they inform the willingness to trade between health and care and environmental goods (Graham et al 2019, Poltimäe et al 2024).

What is already known

We have established the stylized fact that the English healthcare economy tends to devote resources to health in the present period at the expense of future health. In this section, we discuss factors which affect how resources are allocated across periods, and review the literature which explains low investment in future health.

Incentives for the development and adoption of technology

In England, a wide range of healthcare technologies and interventions are evaluated by the National Institute for Health and Care Excellence (NICE). In principle, NICE approves technologies which generate outcomes and a rate lower than a cost effectiveness threshold, normally measured in the monetary cost per QALY. There are dynamic considerations in the approval of interventions, since different treatments produce health over different time horizons. For example, drugs such as statins have a primarily preventative role, and their health effects are generated over years; on the other hand, drugs such as antibiotics might be considered primarily curative. Current NICE guidelines discount future health at a higher rate than the expected long-run cost of government borrowing (NICE, 2020), which will tend to bias drug approvals towards those which have a greater impact in the short run. One reason why NICE maintains this position is that higher discount rates can compensate for a cost-effectiveness ratio threshold which tends to lead to approval of drugs which are less cost-effective than spending on NHS services (O'Mahony et al. 2021).

Furthermore, the menu of potential health technologies are endogenous to the policy environment. Of the potential projects which private investors might choose to develop, they may choose those projects which develop drugs which are curative rather than preventative to a greater extent than policy-makers desire. Economists have provided two main explanations for this tendency. Firstly, preventative medicine may be less remunerative than medicine which manages existing illnesses. Weisbrod (1991) defines three stages of technology in the treatment of illness: one which manages symptoms with limited technology (e.g., palliative care); one which treats existing conditions (e.g., chemotherapy or transplants); and a third stage in which technology treats underlying causes of illness. He notes that these stages form an "inverted U-shape" with respect to costs, such that treating existing conditions is the most costly, and conjectures that inefficient payment systems may incentivize the invention of expensive medicines for treating existing conditions rather than cheaper medicines which effectively treat illness. Since many preventative treatments fall into the latter category (e.g., vaccines), this effect may tilt new drug Research and Development (R&D) towards the development of curative medicine.

Secondly, the structure of patents may incentivize the invention of curative medicine at the expense of preventative medicine. This feature occurs because the lifetime of a patent begins at the discovery of a new compound, rather than commercialisation. As a result, private companies have an incentive to develop drugs which will take a shorter time to test the effectiveness of. In many cases, these drugs will tend to be curative drugs, since at the time they are administered the short-term path of the disease with existing treatments is more certain. Budish et al. (2015) present evidence to support this theory in the case of cancer drugs, showing that public R&D tends to have a longer lag between discovery and commercialisation than private R&D, and that where cancer drug trials can show

success using some intermediate outcomes, private R&D is no more likely to invest in treatments administered at short expected survival times.

While the misaligned incentives of the pharmaceutical sector are not necessarily the outcome of English policy- the NHS is likely too small a purchaser for its policy to affect the global market- if drugs are disproportionately curative then there are nevertheless important policy implications. Specifically, if drugs are disproportionately curative, then this implies that a shift in spending away from drugs to other healthcare services can constitute a shift towards prevention.

Externalities across actors and time periods

Decisions about investments in prevention of poor health are made by a widely dispersed range of actors, who face differing incentives. As a result, the agents best-placed to make preventative investments do not always face appropriate incentives to equate the marginal benefits. In particular, spending on preventative medicine often has positive externalities, because the financial benefits are at least partially reaped by different agents to the agents who spend the money. As such, there is an incentive for underprovision.

One case where this dynamic is particularly stark is in the financial incentives for GPs. Historically, GPs were paid through capitation, i.e., a payment per patient registered with the GP surgery. Capitation creates financial incentives for GPs to restrict healthcare provision conditional on ensuring patient survival. Crucially, although reducing provision of preventative healthcare may increase future healthcare costs, many of those costs are borne by the hospital sector, rather than the GP surgery. The structure of GP incentives may therefore be inadequate to sufficiently encourage spend on prevention.

Governments have made some attempts to reform incentives for GPs to increase the provision of preventative care. Most notably, the Quality Outcomes Framework (QOF) provides financial rewards for GP surgeries who meet particular criteria.[2] Notably, GPs receive financial incentives for increasing rates of vaccination and immunization, improving blood pressure, smoking and obesity indicators for their patient population, and ensuring regular cervical screening. In principle, this policy serves to rectify the market failure associated with the benefits. However, in practice, the QOF is insufficiently generous to compensate GPs for the cost savings to other agents within the healthcare system produced by their preventative interventions. Fleetcroft and Cookson (2006) analyse eight effective preventative activities. They find that two of their interventions do not receive any incentive in the QOF. In addition, there is no statistically significant association between the return to preventative spending and the reward under the QOF. Similarly, Ride et al. (2022) study the incentives for preventative care for people with serious mental illness. They find that GPs' payments are only worth a fraction of the savings to the hospital sector delivered by care plans and annual reviews for people with severe mental illness. Outside of the QOF, McManus et al. (2021) study the effect of incentives provided by a national diabetes prevention program. They exploit the fact that ICBs used a variety of different incentives to encourage referrals. Notably, they find that the majority of incentives used were not statistically significantly associated with referrals to the programme. Overall, therefore, historically, policies designed to incentivize prevention in primary care have been insignificant to correct the structural disincentives to spend on prevention.

2 QOF 2023-24 | NHS Digital

In addition to the poor incentives for prevention in primary care, there is a much wider range of actors outside of the NHS who may engage in prevention, but who do not reap the financial benefits of the effects of preventative care. One such set of agents is local authorities, who have the potential to engage in a wide range of potentially preventative interventions (Local Government Association, 2024). In particular, local authorities are responsible for social care, which may have a preventative role for health.[3] Similarly to primary care providers, local authorities are not financially incentivised to consider the potential benefits to the healthcare sector of additional spending in these areas.

Prevention of poor health is also a positive externality of much private sector activity. To give two examples, poor quality housing is associated with worsening health and use of healthcare services (Curl et al. 2014, Curl and Kearns 2015, Farias et al. 2023). In the labour market, working conditions are increasingly understood to drive health outcomes, especially mental health (e.g., Michaud and Wiczer 2018, Belloni Carrino and Meschi, 2022, Spearing, 2024). In both these cases, the preventative benefit of improving housing or working conditions does not mostly accrue to landlords or employers, though they are likely to face the majority of the cost. The textbook solution to this problem is for the government to appropriately regulate the economy to account for the externalities imposed by the housing and labour market. Whether it does so is a question of the political economy of trading off health over time. We discuss this further in the next section.

Overall, therefore, the picture is one in which the agents who are mostly responsible for preventing poor health are split from the agents who financially benefit from better population health. This means the reward to the former for investing in preventative care is lower than the value the preventative care would supply, which disincentivises appropriate investment.

"The agents responsible for preventing poor health [do not] financially benefit from better population health."

The political economy of trading off time

As we explained in our discussion of capital spending, a significant driver of low capital spending in healthcare is government decision-making. The UK government sets overall healthcare capital budgets. In recent years, these budgets were cut during fiscal austerity.

Healthcare is not an anomaly within government investment. Government investment as a share of GDP is generally low in the UK, compared to international counterparts (OBR, 2020). Low capital spending on healthcare is partially explained by low overall government capital spending. The UK government in general favours spending on current consumption instead of investing in assets which will increase future consumption.

A large macroeconomic literature studies the tendency of democratic governments to be "present-biased" (e.g., Kim and Lee 2023), focusing mostly on explaining why government debt has increased in developed countries. A number of explanations have been given for governments' "deficit bias", that is, their tendency to run a higher deficit than is optimal: politicians exploit voters' lack of knowledge

3 In the pathfinder, "Social care in England: towards an understanding of need and demand", researchers from the REAL demand unit discuss how far there is a preventative role for social care, and what further evidence might be required.

about the cost of borrowing ("fiscal illusion"); voters who know that they have finite lifetimes might prefer to consume today and impose the costs of lower consumption on future generations ("intergenerational distribution"); use of deficits as a strategic commitment to limit opposing parties' future spending ("debt as commitment"); use of deficits by different factions of the same government to force their preferred method of fiscal adjustment ("distributional conflict"); and the incentives of politicians representing particular areas to lobby for spending in their area, paid for by deficit spending that other geographical areas will have to contribute to paying off ("geographically dispersed interested") (Alesina and Perotti, 1995). While these studies tend to suggest that the government is likely to overspend relative to a normative benchmark, some of the same arguments might suggest that the composition of government spending might tend towards consumption at the expense of investment. For example, fiscal illusion and intergenerational distribution could both be reasons for a democratically elected government to reduce investment in order to increase consumption.

There is some evidence that governments favour government consumption over investment. Fiscal illusion could lead to a preference for consumption, since the benefits are more obvious and immediate (Rogoff, 1990). For example, fiscal rules which do not make an explicit exemption for public investment have tended to lead to public investment being squeezed (European Fiscal Board, 2019). Public investment as a share of public spending declines during fiscal consolidations (Jacques, 2021). Public investment also tends to follow the political cycle, with public investment being cut in the lead up to elections (Gupta et al., 2016).

In addition, inter-generational conflict can influence how governments use public investment to allocate resources between periods. In overlapping generation models, democratic governments are influenced by older generations who prefer bringing public investment forward and younger generations who prefer to reduce consumption today in order to increase welfare in the future (e.g., Gonzalez, 2018). Tamai (2023) shows empirically that public investment responds particularly strongly to changes in demographic profiles, and constructs a model in which younger generations value public investment more than private investment because it delivers them direct utility. Governments therefore use public investment to a greater extent than deficit spending to satisfy younger generations' preferences for transferring utility to the future. This model explains why public investment is sensitive to population ageing.

Can these factors explain the particularly low level of public investment in the UK? The UK has several factors which will tend to push public investment lower. Firstly, the UK is experiencing an ageing population with slow productivity growth. This has the effect of increasing demands on public services and lowering the tax base, requiring fiscal consolidation. Secondly, as the population ages, the incentive for the government to spend on capital decreases. The combination of these two effects will tend to push public investment lower. Thirdly, as a result of these two effects the UK government has tended to impose fiscal rules which require them to balance current spending and contain government debt, thereby constraining their ability to invest. Finally, the UK political system has the potential for frequent elections because the prime minister has the right to call an election at any time. This feature reduces the ability of governments to institute policies which might have benefits which are realized in future periods, because they have less ability to weather periods of unpopularity than governments in democracies with fixed terms.

While, as we have discussed, the extent of preventative spending can be partially explained by the incentives facing individual providers, overall spending on preventative medicine can be influenced by political economy considerations as well. In particular, there is direct government spending through public health authorities (e.g. previously Public Health England). In addition, governments make active

decisions about how to regulate the heath economy, placing greater or lesser weight on the effect of those decisions on future population health. These decisions include regulation of the private sector (discussed in the previous section), as well as spending on and regulation of the welfare state. The latter include investment in early years which reduces later life use of health services (Cattan et al. 2022), and punitive welfare reform which worsens population mental health (Brewer et al. 2023).

Jacques and Noel (2022) discuss political economy considerations relevant to spending on preventative medicine. Many are similar to those involved in capital spending. For example, they regard preventative medicine as more "quiet" than spending on curative medicine, in the sense that voters are less likely to notice preventative spending. They also regard preventative medicine as a kind of investment which trades off health today and in the future. Both of these considerations are analogous to fiscal illusion. However, in addition, Jacques and Noel (2022) consider preventative medicine to have a greater distributional effect than curative medicine, in that while everyone benefits from the implicit insurance of having curative medicine covered by the government, certain groups within society predictably have lower lifetime benefit from preventative medicine.

Unlike in the case of public investment, the UK may not be an outlier in its low spending on preventative healthcare. Table 1 presents preventative spending on healthcare in 2019 in the UK and selected comparator economies, both as a share of GDP and as a share of total healthcare spending. The UK spends just under 5% of its total healthcare budget and 0.5% of its GDP on preventative care, which encompasses educational programmes, immunisation, early detection programmes, healthy condition monitoring programmes, epidemiological risk surveillance, emergency response programmes. These numbers compare relatively favourably to most similar economies. Jacques and Noel (2022) derive important results about the drivers of preventative care, including that national health services tend to spend a greater share of money on preventative medicine and that preventative medicine is especially vulnerable to fiscal consolidations. An important caveat is that these results are limited by the data, since classifying spending as preventative versus curative is contested (see section on measuring preventative healthcare effort). However, the available evidence suggests that low spending on prevention is a more international feature than low public investment.

Table 1: Preventative spend as a share of total health spend and as a share of GDP

	Canada	Germany	Italy	Portugal	Sweden	Australia	USA	UK	Average
% of health spend	5.67%	3.46%	4.72%	1.77%	3.18%	2.02%	3.24%	4.96%	3.63%
% of GDP	0.63%	0.41%	0.41%	0.17%	0.34%	0.21%	0.54%	0.49%	0.40%

Source: World Health Organization Global Health Expenditure Database[4]

4 Health accounts

In summary, we can think of inefficiencies in how governments value and invest in future health as a special case of political economy concerns about whether governments appropriately discount the future.

Public views on climate change

Existing methods of accounting for climate change primarily focus on estimating the tangible costs such as adverse health outcomes, operating costs and productivity losses. However, less consideration is given to intangible costs. Researchers have considered the capacity for understanding the impacts among the public and stakeholders, and willingness to pay for policies to reduce the impact of climate change on future generations (Nordeng 2024, Graham 2019). Ongoing research in this area may provide guidance specific to health policy and net zero (Loria-Rebolledo 2024).

What are the gaps?

Many have suggested that the low level of capital spending in the health and care sector suggests dynamic inefficiency. Some suggestive evidence is given by statistics such as the number of available hospital beds and medical equipment in the UK relative to other similar countries (Pope et al., 2024). However, in order to demonstrate that low investment is underinvestment, we need to show that the marginal product of capital is higher than the marginal product of other inputs. To our knowledge convincing estimates of this kind do not currently exist. Better understanding of the lag and durability of effects of different types of expenditure on health and care outcomes will be important to be able to appropriately specify such a model.

The measures of preventative healthcare spending we have used in this pathfinder come from the System of Health Accounts methodology, and OECD classification used for comparisons across countries. However, there may be concerns that this measure may underestimate preventative spending. Firstly, preventative care comprises educational programmes, immunisation, early detection programmes, healthy condition monitoring programmes, epidemiological risk surveillance, emergency response programmes. There may be many preventative interventions which do not fit into these categories. Home-based care and primary care services may include, and may even have as their primary intention, the prevention of future illness. Pharmaceutical interventions are not considered preventative spending in the System of Health Accounts methodology, but include important interventions such as statins, which are used for primarily preventative purposes.

Secondly, a lot of medicine which has a primarily curative purpose also has a preventative component, that is, preventative and curative medicine is closer to a spectrum than a binary distinction. One example is the management of chronic diseases, such as diabetes. A key example of (underfunded) interventions which may have a preventative effect is social care. While the primary purpose of social care is to help patients maintain independence, many have posited a preventative role for social care.[5]

5 The evidence for a preventative role for social care, and the further evidence which is required, are discussed in the REAL demand unit's pathfinder, "Social care in England: towards an understanding of need and demand".

The misallocation of spending on capital and on prevention and the prospect of climate change has implications for the level of risk and the sustainability of health and care supply. However, in our review we did not find economic studies that estimated the level of risk in the English health and care sector.

What is the opportunity for the research unit

There is a fairly extensive literature measuring the return on various preventative interventions, and discussing the reasons governments may invest insufficiently in projects which have high future payoffs. However, we have pointed to a number of areas of uncertainty. Here, we discuss these further, and build a case for a further research programme.

Measurement of preventative healthcare effort

There may be scope for taking an alternative, economics-based approach to measuring preventative effort. Economists typically refer to the Grossman (1972) framework to model health and healthcare activity. In the Grossman framework, consumers have a stock of health, which is valuable for three reasons: firstly, health is valued directly, such that a healthy consumer has more utility ("health as consumption"); secondly, health is valuable instrumentally because it increases labour market productivity ("health as investment"); and thirdly, when the stock of health declines below a certain level, the consumer dies (thereby loses any future streams of utility). Grossman models health as depreciating each period, while consumers make "investments" (i.e., purchase healthcare) which increases their stock of health.

In this framework, there is no distinction between preventative and curative healthcare: both increase the stock of health. In order to introduce a difference between preventative and curative healthcare, Ozkan (2024) models health as consisting of physical health capital and preventative health capital. A consumer can purchase curative healthcare to prevent a decline in physical health capital, or they can invest in preventative health capital, the stock of which (negatively) influences the probability of large adverse shocks to physical health capital. This understanding of preventative healthcare is much broader than the definition of preventative healthcare in the System of Health Accounts methodology. The definition of preventative healthcare is sufficiently broad that it includes treatments such as disease management. Rather than defining certain healthcare as preventative, Ozkan infers what share of healthcare spending is preventative from a structural model in which the curvature of the utility function drives the distribution of spending by income groups. Crucially, this approach does not necessarily compartmentalize all interventions as preventative or curative: it allows spending to have both preventative and curative components.

To our knowledge, a similar, more economically founded, approach has not been implemented in an English context. While it will not be possible to implement Ozkan's strategy exactly, an economic approach might be able to use more formal modelling to categorize the share of health or care effort which can be considered preventative. While an ambitious proposal, the payoff would be a more precise accounting of the relative balance of preventative and curative spending and which activities contribute most to preventative effort.

One approach would be to expand Martin et al.'s (2023) approach to measuring the productivity of different healthcare expenditures. Martin et al. estimate the effect of different types of spending on overall healthcare outcomes. In principle, one can extend this approach to consider the effect of spending in different sectors of the health and care economy on different aspects of health and care outcomes. For example, we might define "preventative capital" and "physical capital" as in Ozkan's model.

Marginal product of capital in the NHS

To our knowledge, while empirical studies have estimated the marginal productivity of different categories of health spending, including primary and secondary healthcare, local public health and social care (see body of works including e.g., Lomas et al. 2019), no research has specifically investigated the marginal product of capital.

Following Martin et al. (2023), we can think of health output in a given NHS trust, , as a product of multiple inputs:

$$y_1 \exp(a) k_i^{\alpha} l_i^{\beta} N_i^{\gamma} \exp(e_i)$$

k_i refers to capital, l_i refers to labour inputs, N_i is a measure of healthcare need, and e_i is an error term which encompasses other determinants of health. Note that this specification allows the value of capital to depend on how much labour is currently employed and vice versa, i.e., recent increases in the size of the NHS may increase the productivity of additional capital investment. Typically, this equation is estimated by taking logs:

$$\log y_i = a + \alpha \log k_i + \beta \log l_i + \gamma \log N_i + e_i$$

There are two major additional challenges in estimating this equation: firstly, measuring health output and the capital stock of individual NHS trusts may be difficult. Data on historical capital investment and existing facilities are available from the Estates Returns Information Collection. However, converting these data into a measure of the capital stock requires the selection of a depreciation rate reflecting the fact that older capital is less productive than newer capital. This decision will likely be a key source of uncertainty about our estimates. With regard to health outputs, we might consider measures such as mortality rates as a measure of health, but this is a noisy measure of output, because it does not account for other aspects of health.

One option is to estimate the rate of depreciation explicitly. Formally, we could set:

$$k_i = \hat{k_i}(1-\delta)^{t_i}$$

Here $\hat{k_i}$ is the capital stock of trust i without depreciation, δ is the rate of depreciation, and t_i is the age of the capital stock. The equation we estimate is then:

$$\log y_i = a + \alpha \log \hat{k_i} + \lambda t_i + \beta \log l_i + \gamma \log N_i + e_i$$

We can then infer that $\log(1-\delta) = \lambda/\alpha$.

Secondly, estimating this equation poses significant endogeneity problems, since unobservable facts about trusts which affect health will tend to be correlated with inputs. In order to circumvent this problem, researchers typically use an instrumental variable, a variable correlated with inputs, labour and capital, but by assumption otherwise unrelated to health. We would require instruments for the capital stock and the age of the capital stock to appropriately estimate our coefficients of interest. Constructing such variables will be a key challenge for research investigating the marginal product of NHS capital.

Finally there are challenges of lag: when evaluating health outcomes with respect to capital expenditure, how long is the lag between the two.

Conclusion

The topic of this pathfinder could be considered a wicked problem in the supply of health and care. Economic theory and political economy offers insight into why long-term investment decisions may depart from the social optimum. However, we have identified important evidence gaps in terms of whether and how far current expenditures are misallocated.

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