CRA Charles River Associates

Rebalancing resources for healthcare and medicines: How much is enough?

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Table of contents

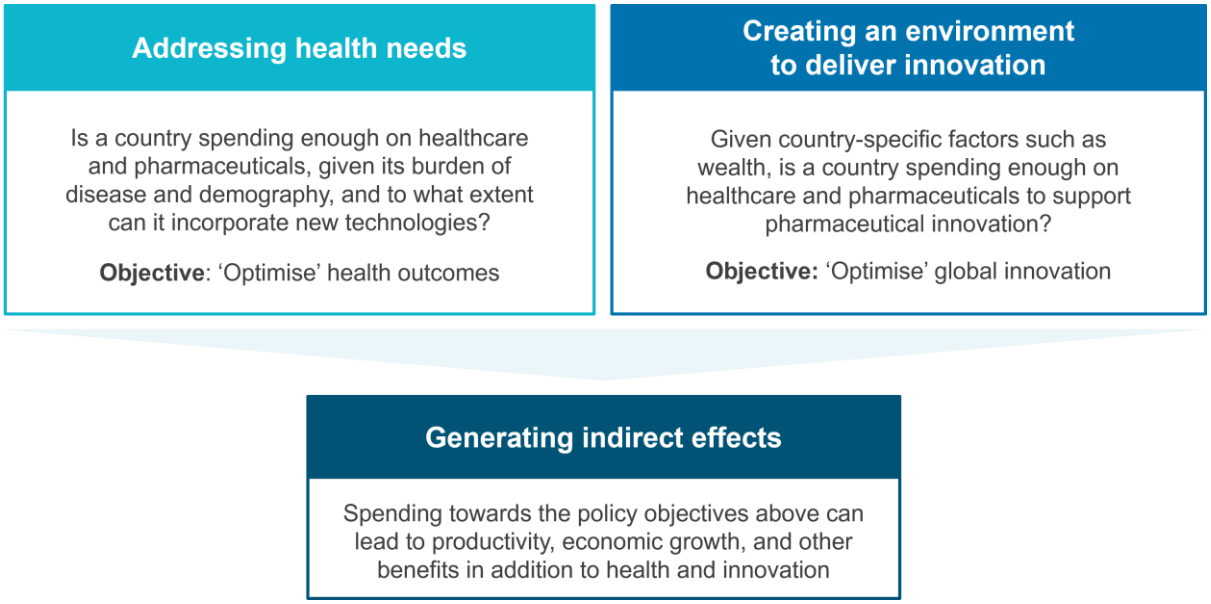
Executive summary

Healthcare systems in middle- and high-income countries are facing a multiplicity of pressures. Populations are ageing, chronic diseases are becoming more prevalent, and expectations for timely access to advanced and often costly treatments continue to grow.[1] At the same time, governments are operating within tight fiscal constraints, prompting questions on whether current levels of healthcare and pharmaceutical spending are set at the right level, whether their mix of spending is appropriate, and how countries can maintain incentives for medical innovation. Recent debates on spending have gravitated towards targets, such as the suggestion that countries should allocate 0.8% of gross domestic product to innovative pharmaceuticals.[2] However, there has been limited debate regarding the economic rationale for how healthcare and pharmaceutical spending should be determined.

In this context, Bristol Myers Squibb commissioned Charles River Associates, in partnership with Professor Margaret Kyle of Mines Paris – PSL, to develop an evidence-based framework to help policymakers evaluate how much their countries should spend on healthcare and pharmaceuticals to meet different policy aims.

Drawing on a structured literature review and interviews with health economists and former policymakers, this report identifies two key policy objectives that can be generated from healthcare and pharmaceutical spending, as well as additional benefits arising from these expenditures, as shown in Executive Summary Figure 1. The policy objectives are addressing health needs and fostering an environment conducive to innovation. The additional benefits, which include economic growth, are recognized and characterized as indirect effects of healthcare and pharmaceutical spending.

Executive Summary Figure 1: Key policy objectives of healthcare and pharmaceutical spending and associated indirect effects of that spending

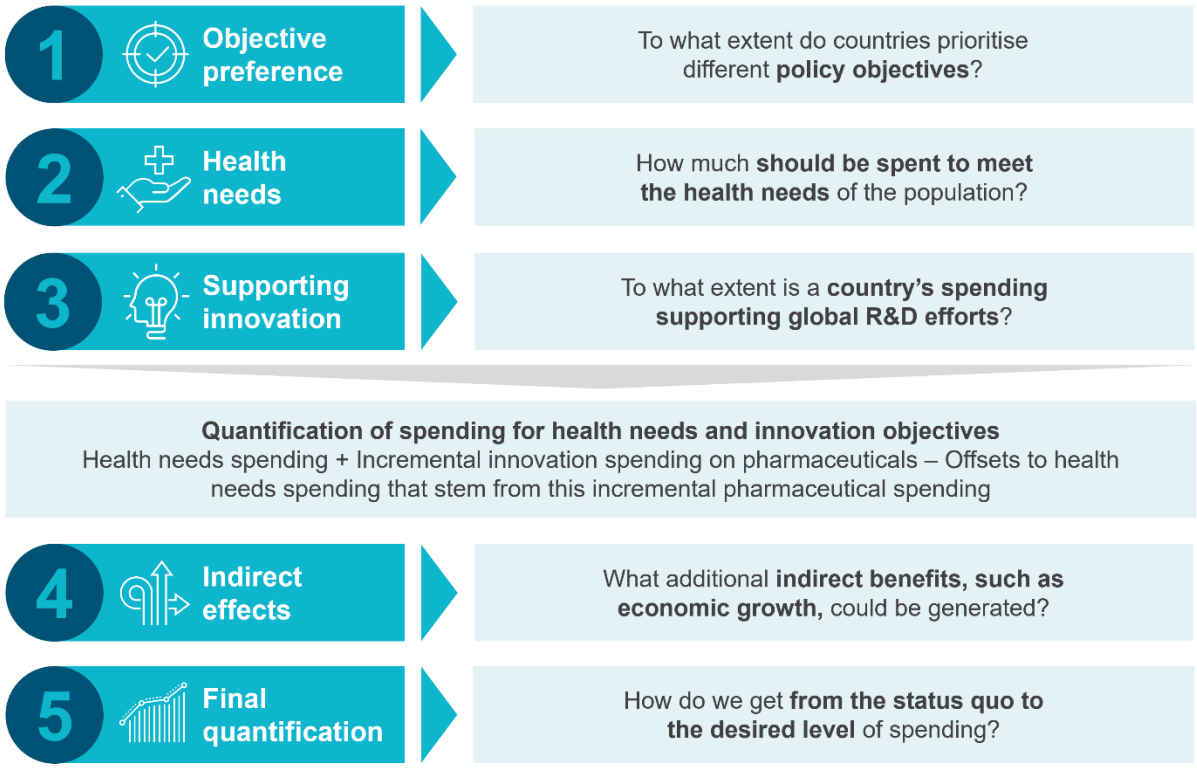


The report then presents a five-step framework, shown in Executive Summary Figure 2, for determining a country's healthcare and pharmaceutical spending. This framework can be used to facilitate policy discussions on spending and highlights the importance of the following:

1. Aligning healthcare and pharmaceutical spending with population health needs
2. Ensuring conditions that stimulate healthcare and pharmaceutical innovation
3. Capturing broader economic and scientific spillovers that arise from this spending

The framework highlights how spending towards the policy objectives of meeting health needs and ensuring medical and pharmaceutical innovation are not in tension, with spending towards one contributing to the other in both the short and long term.

Executive Summary Figure 2: Framework to determine healthcare and pharmaceutical spending



To show how the framework could be applied in practice, we use the United Kingdom (UK) as a case study, illustrating spending needs for 2028–2029. The results demonstrate the need to articulate the policy objectives that can be met with healthcare and pharmaceutical spending, the gaps in current spending allocations given these objectives, and the assumptions that underpin the framework.

Upcoming policy changes in the UK appear to acknowledge the limitations of current healthcare and pharmaceutical spending allocations.[3,4,5] In alignment with the objectives that anchor the framework, they signal a recognition that sustained investment in healthcare and pharmaceuticals is essential to support innovation, meet the UK's future health needs, and reap the benefits of further spillovers.

Beyond the framework itself and its illustrative application using the UK, this report provides a foundation for policy discussions on how to align spending targets with broader healthcare and policy objectives, and how countries can identify opportunities to allocate scarce financial resources more

effectively. Drawing on the insights in this report, we set out six policy recommendations in Executive Summary Table 1.

Executive Summary Table 1: Policy recommendations

1	**Recommendation 1:** Healthcare and pharmaceutical spending should be considered jointly, applying a unified approach to assess total expenditure and the extent to which it supports policy objectives.
2	**Recommendation 2:** Healthcare spending and pharmaceutical spending should be evaluated as an investment.
3	**Recommendation 3:** Health needs approaches to determine and forecast long-term health expenditure should incorporate the expected value and costs of future medical technologies, ensuring resources to efficiently adopt technologies to meet a population's evolving needs.
4	**Recommendation 4:** Health spending should consider the efficient long-term use of resources, as this would allow for increased investment in high-value innovation.
5	**Recommendation 5:** Countries should calibrate relative pharmaceutical spending to ensure a fair contribution to sustaining global innovation efforts.
6	**Recommendation 6:** Countries should invest in healthcare infrastructure and capabilities to unlock economic and other spillovers.

1. Introduction

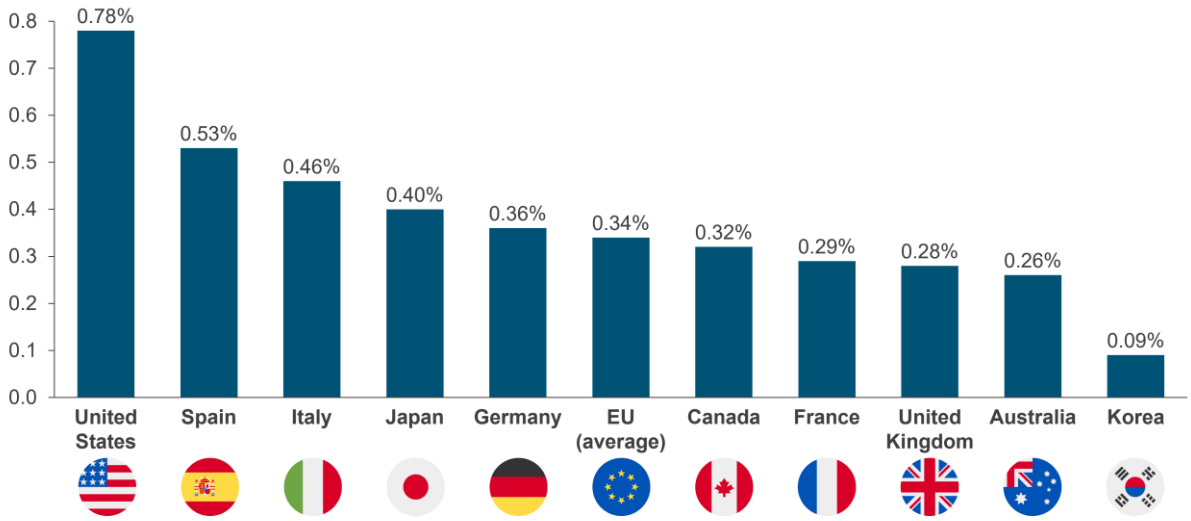
Healthcare systems in middle- and high-income countries face growing, interrelated pressures. The rising demand for care, driven by ageing populations and increased prevalence of chronic disease,[6] is accompanied by increased expectations of timely access to effective and innovative treatments. Longer term, there is a need for governments to sustain incentives for continued medical innovation, so that the most recent treatments are available to patients, and to realise the productivity benefits and economic growth that come from a healthy population.[7]

At the same time, there is a need to manage how healthcare budgets are spent today. Policymakers have long been concerned with how healthcare resources are allocated and whether spending aligns with broader policy objectives, especially given fiscal constraints. Another challenge involves the difficulty in assessing the value, or relative marginal productivity, of different healthcare inputs and hence the composition of spending. These issues have prompted discussion on how to determine the allocation of spending across pharmaceuticals and healthcare.

1.1 A need to reframe the health spending debate

Although pharmaceutical spending accounts for only a small portion of total healthcare spending, pharmaceuticals are among the most visible and scrutinised components, making them a central focus for policy.[8] Over recent years, the debate on pharmaceutical spending has emphasised a geographical imbalance in levels of spending, with a particular focus on spending on innovative medicines. Cross-country comparisons illustrate the variation that exists. For instance, several European countries spend between 0.3% and 0.5% of their gross domestic product (GDP) on innovative pharmaceuticals, whereas the United States (US) spends around 0.8% (Figure 1).[9]

Figure 1: Estimated expenditure on innovative medicines as a percentage of GDP across major markets, 2023[10]



The innovative pharmaceutical industry argues that current spending levels in ex-US countries are not sufficient to support a robust innovation pipeline, calling for increased spending in these markets. As an example, the Pharmaceutical Research and Manufacturers of America (PhRMA) trade association has argued that countries outside of the US should spend 0.8% of GDP on innovative pharmaceuticals.[11] However, a competing perspective contends that existing expenditures are excessive, leading to disproportionate rewards for pharmaceutical innovators and contributing to systemic inefficiencies and waste.[12,13]

To date, there has been little debate about the economic justification for spending targets on pharmaceutical spending, such as 0.8% of GDP, and it is not apparent how factors, including country characteristics, population health needs, preferences over access to technology, and long-term sustainability, should be considered.

Given this, Bristol Myers Squibb Company commissioned Charles River Associates (CRA), in association with Professor Margaret Kyle, a leading health economist at Mines Paris – PSL, to develop a framework that can be used to assess a country's spending on healthcare and pharmaceuticals and how this relates to key policy objectives.

1.2 Project aims and associated methodology

The aim of this report is to provide a structured, robust basis for evaluating national healthcare and pharmaceutical spending and its alignment with broader policy goals by:

1. **Reviewing existing approaches** to assessing health and pharmaceutical spending, including identifying the policy objectives that can be met via this spending.
2. **Developing practical spending indicators** to identify the extent to which countries may be underinvesting in healthcare and pharmaceuticals or may need to redirect resources towards higher-value uses.
3. **Presenting a clear conceptual framework** that maps how healthcare and pharmaceutical spending can be aligned to key policy objectives, accounting for both direct and indirect benefits for countries and populations.
4. **Offering targeted, evidence-based policy recommendations** to guide conversations towards more effective and sustainable spending on healthcare and pharmaceuticals.

To inform these objectives, we draw on a structured literature review of academic papers in economics, public health, and public policy, as well as government reports and other grey literature, with a focus on middle- and high-income countries, including Brazil, France, Germany, Japan, and the United Kingdom (UK). The review was conducted between September 2025 and February 2026 and drew on multidisciplinary databases, including Google Scholar, Scopus, and PubMed. Search terms combined key conceptual domains, including variations of '*healthcare spending', 'pharmaceutical spending', 'spending efficiency', 'value-based spending', 'low-value care', 'health system performance', 'middle-income countries',* and *'high-income countries'.* Searches were iterative, with additional terms incorporated as relevant concepts emerged.

The literature review was used to develop indicators of underspending or low-value spending as well as a conceptual framework on healthcare and pharmaceutical spending. These were validated and refined via semi-structured expert interviews with Professor Margaret Kyle and four health economists and former policymakers from different middle- and high-income countries. To illustrate the framework, we applied it to a case study country. This enabled us to test the availability of data, the framework's ease of use, and its application to derive policy recommendations.

Ultimately, the report aims to go beyond the many assertions that exist on the benefits of increased healthcare and pharmaceutical spending and sets out an evidence-based framework that relies on robustly established links between spending and policy outcomes.

1.3 Structure of the report

The remainder of this report is structured as follows. Section 2 summarises the policy objectives that underpin healthcare and pharmaceutical spending. Section 3 sets out the spending framework and applies it to the UK, and Section 4 makes policy recommendations that follow from the analysis. Section 5 provides conclusions. The appendix details a set of empirical indicators, informed by the literature, that can be used to highlight underinvestment or the misallocation of spending. These indicators may serve to highlight the need to apply the framework developed in this report.

2. Policy objectives: Why spend on healthcare and pharmaceuticals?

To consider how a country should allocate resources on healthcare and pharmaceuticals, we begin with the core policy objectives that can be met via healthcare and pharmaceutical spending, as well as any indirect benefits that accrue to a country when those policy objectives are met.

Two primary, complementary policy objectives resulting from healthcare and pharmaceutical spending emerge from the literature:

1. **Meeting the population's health needs**, which relates to whether a country's spending levels and spending mix (i.e., the mix of healthcare goods and services) are sufficient to deliver effective care and improve health outcomes given a country's disease burden and demographic profile. Here, from an economics perspective, a social planner would be 'optimising' population health.
2. **Supporting an environment for innovation**, which relates to whether a country's spending levels and spending mix are sufficient to sustain medical and biopharmaceutical R&D at the global and local levels. Here, a social planner would be 'optimising' innovation.

In principle, a forward-looking policymaker aiming to improve population health may place value on current and future health outcomes generated by medical and biopharmaceutical innovation. Likewise, policy considerations based on driving innovation support investing in technologies that deliver meaningful health benefits for patients today, as this rewards past innovation and is therefore an important signal on how the healthcare system will reward innovation in the future.

Tensions between the objectives occur for two reasons. Firstly, there is a tension between how much to reward innovation, as in the short term, meeting health needs is easier if future innovation is not rewarded, even though this will have consequences for the longer term. Second, there are practical challenges such as ministries operating with distinct mandates, time horizons, budget constraints, and assumptions.[14] As a result, trade-offs in policy implementation may exist, even when policy objectives are, conceptually, mutually reinforcing.

Whilst governments must allocate resources across a wide range of priorities, including security, infrastructure, and education, the discussion in this report focuses specifically on the healthcare and pharmaceutical sectors. The remainder of this section provides an overview of the literature linking healthcare and pharmaceutical spending to the two policy objectives described above.

2.1 Policy objective: Addressing health needs

The levels of spending required to address a population's health needs hinge on the extent to which healthcare and pharmaceutical systems are equipped to respond to structural changes in population health over time. The literature frames this challenge as one of aligning spending, capacity, and policy design with evolving patterns of demand driven by demographic change, disease prevalence, and medical and technological progress.[15]

2.1.1 Three elements of the health needs objective

The key insights presented below synthesise findings from the literature on how health systems respond to evolving pressures. There are three elements discussed in the literature: growing demand driven by demographic and epidemiological change, the need to adopt new technologies in a timely and sustainable way, and the importance of improving efficiency by reducing low-value activity.

Increased spending is needed to meet growing healthcare demand

The literature consistently concludes that health expenditure will need to increase to keep pace with rising demand. This is driven by several factors, including an expanding population of older adults with higher rates of chronic illness and evolving patient preferences that lead to greater intensity and frequency of care.[16,17,18] The relative importance of these drivers varies across countries.

The literature has focused on different countries and experiences. Baseline projections by the Organisation for Economic Co-operation and Development (OECD) indicate that demographic change and non-income drivers of utilisation, particularly the growing prevalence of age-related morbidity, exert sustained upward pressure on the resources required to maintain existing service levels.[19] Additional analysis by the OECD further corroborates these findings, identifying rising incomes, technological progress, and demographic pressures as key drivers of substantial increases in health expenditure across member countries.[20] The study concludes that meeting future health needs requires additional financial resources alongside structural reforms to ensure fiscal sustainability.

It is common for these analyses to consider the changing needs of the population, with the goal of identifying revised spending levels. Long-term projections for Brazil, Chile, and Mexico suggest that, in the absence of policy reforms aimed at strengthening prevention and improving health system efficiency, governments will be required to raise health spending to preserve access and service quality as population needs evolve.[21]

In Europe, different countries have undertaken reviews to quantify the spending amounts needed to meet projected health needs. A rigorous modelling study by the Institute for Fiscal Studies (IFS) provides a prominent example of a health-needs-based healthcare spending analysis for England and the UK overall, showing that real-term spending growth significantly above historic trends is required even to maintain current standards of care.[22] Similarly, in the Netherlands, the Central Office for Economic Policy Analysis modelled that healthcare spending as a percentage of GDP would need to increase from 11% in 2025 to 18% by 2060 if the system is to maintain status quo levels of care, with increases primarily driven by long-term care demand from the ageing Dutch population.[23]

Overall, the economic and public policy literature finds that healthcare spending must increase if health systems are to meet rising healthcare needs, given demographic and epidemiological trends.

There is room for increased efficiency in healthcare spending

Understanding the extent to which current levels of healthcare spending are efficient is important to anchor a discussion on changes to spending. The literature suggests that a nontrivial proportion of healthcare expenditure delivers limited health benefit relative to the amount spent, and other interventions may, for the same investment, yield increased health outcomes.[24]

More specifically, cross-country analyses by the OECD suggest that approximately 20% of health spending in member states could be redirected through efficiency gains and the elimination of low-value activities.[25] This is supported by evidence from the US, showing that around 25% of total spending may be wasteful, including overtreatment and the provision of services with limited clinical value.[26] Further literature suggests that appropriately designed de-implementation strategies have the potential to recapture a meaningful share of these resources without adversely affecting patient outcomes.[27,28]

Finally, policymakers must balance allocative efficiency (i.e., spending on the right mix of goods and services to optimise health outcomes) with equity goals across therapeutic areas (e.g., rare diseases).[29]

Improvements in healthcare can be facilitated through access to innovative technologies

The provision of healthcare and the use of pharmaceuticals can be viewed as complements in the treatment of specific conditions. Broadly, both are inputs in the production of population health. Improvements in healthcare provision increasingly depend on the ability to incorporate new technologies, treatments, and care pathways, including medicines that target previously untreatable conditions. Looking forward, scientific advances will expand the range and volume of conditions that can be effectively addressed. We note that the impact of new technologies on spending is cyclical: though new pharmaceuticals will often be available at higher costs initially, these may deliver efficiency savings over time, and patent expiration and the emergence of generics greatly decrease expenditures on those products.[30]

Ensuring adequate spending capacity to integrate new, effective treatments appears to be critical to sustaining long-term improvements in healthcare provision and population health outcomes. The empirical literature emphasises the contribution of pharmaceutical innovation to improvements in population health. Studies examining long-run trends in life expectancy find that medicines have played a central role in driving health gains. For example, empirical analysis shows that pharmaceuticals accounted for approximately 35% of the increase in US life expectancy between 1990 and 2015, making them second only to public health measures in overall importance.[31] Thus, in the long term, investing in pharmaceutical innovation can affect the objective of meeting health needs.

The ability to adopt future technologies depends on the broader spending environment. Japan offers a helpful illustration. While the country has historically achieved rapid initial access to new medicines, post-launch price revisions, intended to control spending, may have influenced manufacturers' decisions regarding the timing and scope of product introduction.[32] This experience shows how pricing and reimbursement structures can affect the adoption of emerging technologies and the extent to which patients benefit from them.[33] Similarly, comparisons across countries suggest that lower medicines spending is correlated with reduced attractiveness for drug launches in those markets from R&D-intensive firms.[34]

2.2 Policy objective: An environment to deliver innovation

The health needs of a population are the central drivers of health spending. However, it is also recognised that there is a need to incentivise medical and pharmaceutical innovation, which requires a predictable and favourable policy environment. Innovation is valued for many reasons, including as a source of employment, a source of growth, and the driver of future technologies that may deliver health improvements and efficiencies in the long run.

There is a large body of literature on the environment that is needed for innovation to prosper. It emphasises that pharmaceutical innovation is characterised by long timelines and high uncertainty while requiring substantial upfront investment, and without intellectual property or similar protections, the ability of competitors to 'copy' innovations would quickly drive down rewards to the innovator.[35] This provides the justification for intellectual property protections to ensure that there are returns on this investment. However, intellectual property alone is insufficient to reward innovation, as healthcare systems must ensure that, while under intellectual property protection, margins are sufficient to provide an incentive for innovation. A credible policy environment that is committed to rewarding innovation is therefore necessary. However, since the benefits of innovation extend beyond national borders, the policy environment across countries will, in principle, provide a global R&D incentive.[36]

Innovation is generally driven by the expectation of future returns. Pharmaceutical spending in the present provides a signal as to how future innovations will be rewarded. Since the levels of healthcare

and pharmaceutical spending incentivise innovation by underscoring the credibility of future rewards, this spending can be justified through an innovation lens.

2.2.1 Three elements of the innovation objective

To inform the spending framework, this section considers the evidence to support the relationship between spending and R&D activity by firms, and the extent to which this should be considered in determining spending levels. We reviewed the literature on three key questions: whether spending on healthcare, and in particular, pharmaceuticals, contributes to global innovation; the economics of global R&D funding, including free-rider incentives; and the extent to which increased spending on healthcare and pharmaceuticals is linked to R&D at a local level.

There is a positive relationship between global pharmaceutical spending and R&D

Empirical evidence has long underscored the sensitivity of pharmaceutical innovation to expected revenues, with increases in market size leading to increased innovation and new drugs developed.[37,38] Additionally, a study examining the relationship between market size, pricing policy, and R&D activity finds that reductions in expected revenues lead to lower rates of innovative effort.[39] In particular, it suggests that a 10% reduction in expected pharmaceutical revenues in the US could reduce innovative activity, measured by clinical trial initiation or new drug approvals, by approximately 2.5% to 15% over time.[i] Given the central role of the US in supporting global pharmaceutical R&D, most studies have focused on the role of the US, but the same logic applies to spending in other countries. Furthermore, if rewards to innovation are consistently constrained, pharmaceutical firms may adjust research portfolios and reduce investment in higher-risk therapeutic areas, which may result in fewer new medicines for those conditions.[40]

R&D as a global responsibility, requiring coordination for 'fair' contributions

Pharmaceutical innovation has a global impact. The benefits of new medicines extend beyond the countries in which they originated, both through diffusion of the knowledge generated through R&D and the marketing of both innovator products and eventual generics. In economic terms, pharmaceutical innovation exhibits the characteristics of a global public good.[41] While all countries may potentially benefit from medical progress, regardless of where innovation occurs, incentives to innovate are shaped by the aggregate rewards across markets.[42] As a result, national spending decisions, particularly in large, high-income countries, play a central role in determining global innovation incentives and ultimately the future availability of new treatments worldwide. Higher-income countries with higher ability to pay typically bear a greater share of the costs of pharmaceutical R&D through higher prices.[43]

Because pharmaceutical innovation relies on global revenues, the actions of individual countries influence the overall incentives for R&D. When spending decisions are made independently, there is a risk that innovation may be insufficiently incentivised and rewarded. In such circumstances, there is an incentive to 'free ride', with countries benefitting from therapies whose development was supported by higher revenues elsewhere.[44] If this pattern occurs broadly, total global revenues may fall short of the levels required to sustain current levels of R&D, potentially slowing the pace of new therapy development.[45] This has led to the view that countries could, in principle, achieve better collective

[i] A similar pattern is seen in the oil and gas sector, where revenue pressures during market downturns have led companies to cut investment, delay projects, and scale back innovation activity to preserve financial stability.

outcomes by recognising the shared role they ought to play in supporting innovation, a perspective commonly referred to as the 'fair share' argument.

Fair share principles are often discussed in the context of the development and pricing of novel antimicrobials. Despite growing concerns about antimicrobial resistance (AMR) and the global need for new antibiotics, traditional pricing and reimbursement mechanisms have proven insufficient to incentivise meaningful investment.[46] Antibiotics tend to be reimbursed at lower prices and are used sparingly to preserve their effectiveness. As a result, they generate limited sales volumes, meaning that even scientifically promising candidates struggle to attract backing for development. Because every country benefits from the global availability of effective antibiotics but prefers to minimise spending, the free-rider problem becomes especially acute.[47] Against this backdrop, Textbox 1 draws from the literature to illustrate how contributions to novel antimicrobial R&D might be shared across countries to address this collective-action challenge.

Textbox 1: AMR innovation and fair share principles[48]

AMR problem:

- AMR highlights a long-standing misalignment between the social value of new antibiotics and the revenues generated under current market conditions.
- Stewardship requirements and limited clinical use constrain revenues, resulting in returns that are insufficient to sustain R&D investment. This dynamic contributes to a persistently underdeveloped R&D pipeline for novel antimicrobials.

Proposed model:

- An empirical estimate suggests that an effective global pull incentive would need to provide approximately **$4.2 billion to incentivise one novel antimicrobial**, with plausible ranges of **$3.3–$8.9 billion** depending on modelling assumptions.
- **A fair share allocation distributes this requirement** across countries in proportion to economic capacity, as measured by a country's GDP.
- Under such an approach, high-income regions, including the G7 and EU, would account for most of the contribution; the **EU's fair share** is estimated at **approximately $1.43 billion per product**.

There is empirical evidence that examines the gap between the revenue levels required under a GDP-based fair share allocation and the actual pharmaceutical revenues generated across high-income countries. This research shows that, with limited exceptions, national contributions fall short of modelled fair share targets based on GDP.[49] This misalignment underscores a free-riding dynamic: while all countries benefit from global access to effective pharmaceuticals, only a small subset contributes toward sustaining the innovation system in proportion with their wealth.

Although causal evidence is limited, anecdotal evidence indicates that pharmaceutical and health spending may contribute to the localisation of innovation

Healthcare and pharmaceutical spending may influence where firms choose to locate their R&D activities, as companies may view regulatory environments with predictable and supportive pricing policies as more conducive to long-term investment.[50] Studies show a correlation between local spending and innovative activity, but the empirical evidence causally linking national pharmaceutical

spending to domestic innovative activity remains limited and requires more research to identify and quantify. Though there are plausible mechanisms through which increased spending may lead to localisation of R&D, this needs to be disentangled from proximity to academic research, R&D subsidies and tax grants, access to patients for clinical trials, tariffs and trade policy, among other observable and unobservable considerations.

2.3 Spillover benefits resulting from health spending

Although the health needs and innovation policy objectives seek different outcomes, spending towards one can benefit the other. Furthermore, any healthcare and pharmaceutical spending towards these objectives creates further benefits, which we characterise as spillover or indirect benefits.

2.3.1 Economic spillover benefits from health spending

A health needs approach to spending may consider *economic* needs in addition to health needs. Beyond improving health directly, spending on healthcare and pharmaceuticals generates wider economic benefits: healthier populations are more productive. This spillover strengthens the economy and is an additional rationale for adequate levels of healthcare and pharmaceutical spending.

A growing body of evidence shows that better health reduces absenteeism, lowers disability-related public spending, and raises effective labour supply.[51,52] By reducing the severity of illness, health spending enhances human capital and supports sustained growth.[53] These effects are especially relevant for ageing populations, where maintaining a healthy workforce is of increasing importance.

In practice, health systems are beginning to recognise the linkage between health and employment, with England's National Health Service (NHS) announcing that it will begin tracking the extent to which healthcare leads to returns to employment.[54] Health investment is increasingly viewed as a driver of social welfare and a contributor to economic performance and fiscal sustainability, with ministries of finance and economic institutions incorporating health-related channels into long-term fiscal and macroeconomic models.[55]

A similar shift is visible in Europe. The European Union (EU) has emphasised that, given demographic pressures and weak productivity growth, strengthening economic performance requires investing in human capital, including in health, alongside the promotion of research and innovation, and supporting the uptake of advanced technologies. This framing reinforces how health is both a social priority and a component of economic resilience and competitiveness.[56]

The economic returns to health spending are well documented in the literature.[57,58] There are also estimates of the point at which public spending optimises these returns. Textbox 2 provides an overview of one of these.

Textbox 2: How to optimise productivity spillovers—Evidence from macroeconomics[59]

Given the returns to investment in healthcare via increased productivity, how much should governments spend on healthcare and pharmaceuticals to optimise this spillover? At what point does the marginal benefit of spending on healthcare no longer outweigh the marginal cost? Modelling this is challenging and multifaceted.

Below is an overview of a model that explores this question. An R&D-based endogenous growth model simulates how economic growth and welfare respond to different levels of public spending on healthcare labour and basic research.

Model-based estimates of optimal spending and implications:

- Optimal investment is context-specific, influenced by demographic structure, disease burden, system efficiency, and the strength of health-productivity spillovers.
- Under high spillover conditions, the model places the welfare-maximising spending on healthcare labour and basic research at 15.4% of GDP (12.4% for the baseline scenario).
- The optimal level of public expenditure on healthcare labour and basic research remains higher than current levels observed in many OECD countries.
- In the short term, spending may decrease growth, but over the medium and long term, higher investment yields net gains with greater growth, productivity, and welfare.

2.3.2 Scientific spillovers from health spending

Spending on healthcare and pharmaceuticals may generate scientific spillovers, particularly where new therapies require complementary investments in healthcare infrastructure, skills, and organisational capability. The intuition for this is that healthcare spending may directly upgrade the provision of healthcare while also providing the tools necessary to undertake R&D activities.

One way to illustrate this impact is to consider innovations that are complex to deliver, such as advanced cell and gene therapies. The delivery of these technologies can necessitate the development of specialised clinical ecosystems, potentially creating conditions that support further research and innovation beyond the initial product. This could be through the following, among others:

- The development of evidence: spending on genomic databases that are valuable for diagnosis, but also useful for further evidence generation
- The development of intellectual leadership in the clinical and scientific community: by ensuring access to advanced medicines, the health system develops early adopters who then apply this skill in clinical research

Academic literature provides limited evidence on the causal relationship between health spending and these spillover effects, which we refer to as ‘scientific spillovers’. However, illustrative anecdotes suggest plausible mechanisms through which spending on innovative medicines and healthcare could stimulate complementary investment.

If we look at the example of advanced therapies in Germany, we can observe how the reimbursement of CAR-T therapies was accompanied by the expansion of related research in haematology and immunology, as well as clinical activity.[60] Reimbursement for CAR-T treatments reportedly enabled relatively rapid and broad access following launch, with a substantial share of patients able to receive

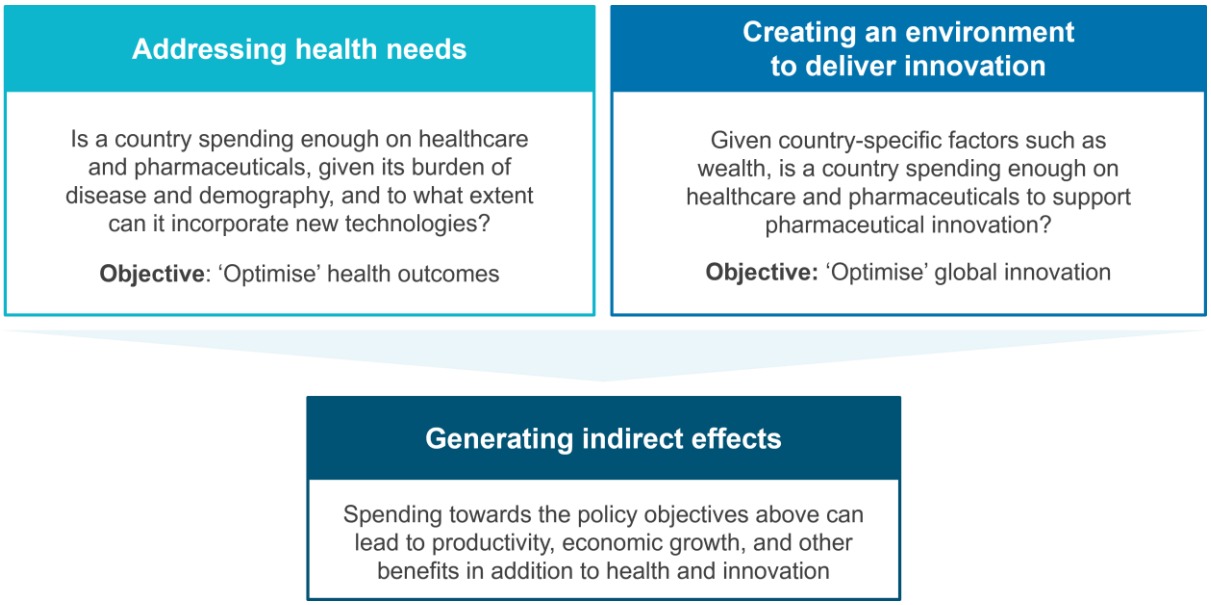
these therapies within the first year of their availability.[61] The delivery of CAR-T therapies requires the training of specialised clinicians, the establishment of accredited treatment centres, investment in diagnostics and manufacturing coordination, and improvements in clinical and organisational readiness. These investments may lower barriers to subsequent R&D and strengthen the broader innovation environment. While such observations do not establish causality, they illustrate a potential channel through which spending on innovative therapies may contribute to scientific spillovers.

2.4 Overview

The literature shows that spending on healthcare and pharmaceuticals contributes to the policy objectives of meeting health needs and delivering innovation. In turn, this spending leads to additional benefits, which we characterize as indirect effects of healthcare and pharmaceutical spending. These policy objectives and indirect effects are summarised in Figure 2.

Furthermore, the evidence shows that appropriate spending on health needs not only benefits countries by increasing a population's health, but also by increasing its productivity and boosting economic growth. Despite reports of spending on pharmaceuticals being associated with increased localised innovation, it is challenging to quantify this impact. However, there are plausible mechanisms that could link a country's spending on healthcare and pharmaceuticals with increased local innovation, which in turn may provide the indirect benefit of economic growth.

Figure 2: Summary of policy objectives related to healthcare and pharmaceutical spending and associated indirect effects of that spending



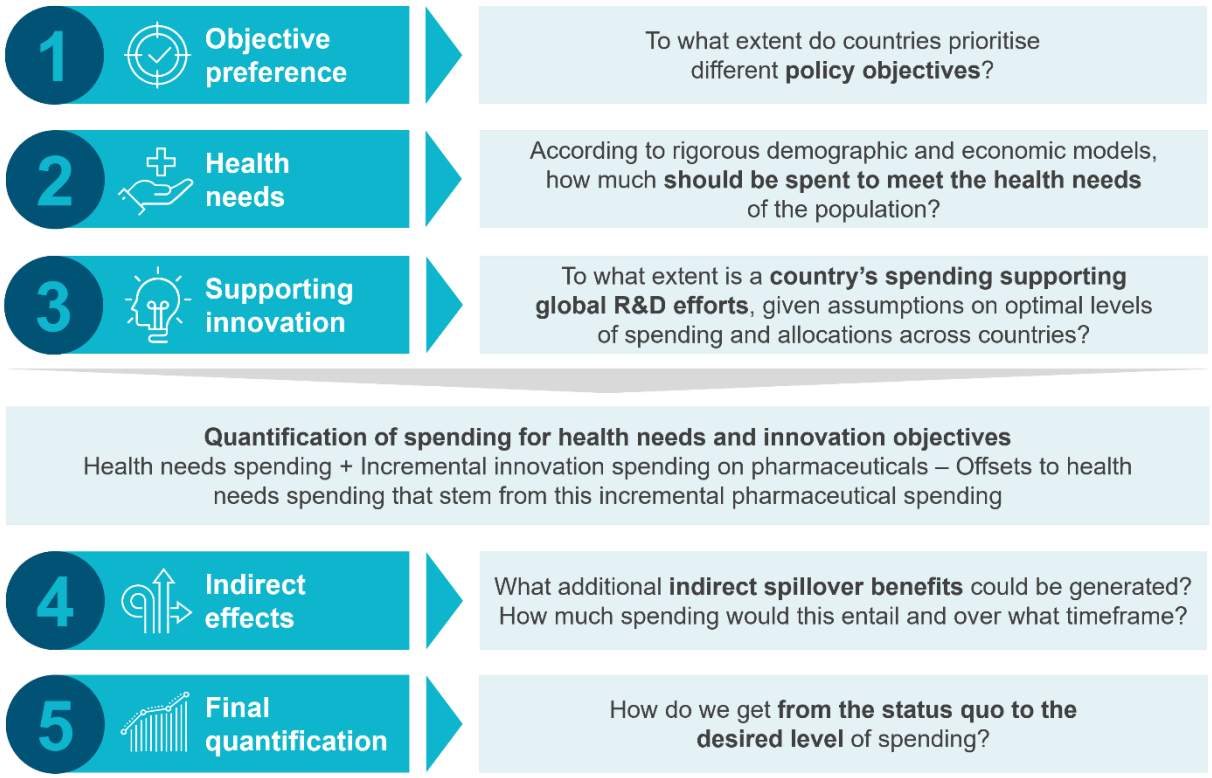
3. Framework to inform appropriate healthcare and pharmaceutical spending

A central question for policymakers is how budgets for healthcare and pharmaceutical spending should be allocated in a way that aligns with broader policy objectives. To support this assessment, and to demonstrate how different categories of spending contribute to multiple policy aims, we develop a conceptual framework grounded in the evidence reviewed in Section 2. This framework is designed to structure thinking around several key considerations:

- How national policy objectives could inform decisions on healthcare and pharmaceutical expenditure
- The extent to which spending decisions could incorporate anticipated demographic and epidemiological changes
- How countries could account for the contributions required to sustain global R&D ecosystems
- The degree to which current spending could reflect the broader economic, scientific, and system-level spillovers generated by investment in health and innovation

Figure 3 provides a high-level overview of this conceptual framework. Below, we examine each of the framework components in detail and illustrate their application using evidence from the UK.

Figure 3: Framework on policy objective-aligned healthcare and pharmaceutical expenditures



3.1 Components of the spending framework

1 The framework begins with country-specific weighting of preferences over policy objectives

To ensure applicability to a wide range of geographies, the framework first encourages national policymakers to consider how they weight the policy objectives to which healthcare and pharmaceutical spending contribute, which may reflect citizens' social preferences. This weighting may also evolve over time as demographic, epidemiologic, and innovation trends impact these preferences.

We expect that addressing the health needs of a country's population is a priority for all nations, which can be addressed through health spending. However, the prioritisation of innovation is likely to differ, both based on a country's capacity and preferences. There are several reasons for this:

- Higher-income countries are generally expected to contribute more to financing innovation because they are more likely to have already addressed foundational public health challenges, such as establishing widespread vaccination programmes, preventive care systems, and reliable access to essential services.[62] Having addressed these issues, they can invest in the institutions needed to support R&D. As countries become wealthier and develop their own innovative capacity, they tend to adopt stronger intellectual property protections, which reinforces the expectation that they will take on a larger share of the costs of developing new technologies.[63,64]
- To the extent that countries have strong innovation ecosystems, and policymakers believe that spending motivates local innovative activity, they may choose to increase spending as a further signal to attract R&D.
- Some countries are more supportive of multilateral international conventions and have a reputation as global participants.

The weighting of both policy objectives will likely be informed by different factors. For example, a country that has a well-established life sciences sector and an ageing population might value both considerations highly.[65,66]

2 Using robust data, estimate spending to meet a population's future health needs

The framework encourages a country to leverage robust empirical evidence from national reports to assess the state of current national healthcare spending relative to the objective of meeting health needs. In Step 2, the framework focuses on the policy objective of improving health outcomes. Additional effects of this spending, such as increased productivity, are assessed in Step 4.

National data and rigorous modelling may quantify the performance of healthcare systems and their resilience to future demographic changes. In many cases, existing academic or policy research provides a foundation for this analysis. At minimum, these studies should:

- Model the expected changes in healthcare demand (i.e., quantities),
- Model the expected changes in prices for different factors of production, and
- Model the healthcare service levels desired in the future (i.e., status quo or improvements).

Additionally, studies may consider the effect of efficiencies in spending and the adoption of new technologies, among other factors.

We note that through spending projections aimed at improving care to meet demographic changes, policymakers can distil and quantify the amount to be spent on healthcare (and pharmaceuticals within healthcare) to maintain at least current levels of provision or increase them if that is a priority.

3 The framework then considers whether spending sufficiently supports innovation in terms of a country's contribution to delivering a global R&D incentive

This step assesses whether a country's spending in support of global innovation is proportional to the size of its economy. Spending on health needs will generally already provide an incentive for innovation. Therefore, this step determines if there is incremental spending needed that would represent a country's fair share of the global revenues required to maintain the status quo.

To assess whether a country is adequately supporting innovation, a useful criterion is whether its spending on innovation-related activities is proportional to a measure reflecting the size of its economy. Because spending on national health needs already creates a baseline incentive for innovation, the key question becomes whether additional, incremental investment is required for the country to contribute its fair share of the global revenues needed to sustain current innovation levels. This fairness principle aligns with the ability-to-pay approach, commonly used in global financing discussions.[67] Under this approach, countries with greater economic capability are expected to shoulder a larger share of collective costs. This principle is also reflected in differential pricing models, in which the prices of medicines are set based on the economic capacity of countries.[68]

Using widely available data, it is possible to calculate a country's fair share of innovative pharmaceutical spending based on its GDP as a proportion of the aggregate GDP of a group of countries. Based on the literature, we recommend using a country's GDP as a proportion of global GDP or OECD GDP (as a lower and upper bound, respectively) as a proxy for a country's fair share. This measure captures relative economic capacity without intensive data requirements.

Aggregating spending from Steps 2 and 3

The spending that stems from Step 3, which relates to innovation, is incremental to the spending allocated to pharmaceuticals to meet health needs. An insight that follows is that, if spending on health needs reflects prices that capture the value of innovation, then the incremental amount needed to meet innovation policy objectives would be smaller (or not exist).

Efficiencies should be considered in determining spending, and this primarily fits into the health needs objective. There are likely to be healthcare cost offsets to the incremental spending on pharmaceuticals that stem from the innovation policy objective, via savings from reduced medical care (see Textbox 3). The framework captures these offsets as savings.

Textbox 3: Assumptions for the calculation of offsets from incremental gains in healthcare spending beyond spending for health needs[69]

- The literature provides examples of cost 'offsets' and estimates parameters to quantify them.
- Focusing on recent innovations, we use offset parameters from increased expenditure on GLP-1 inhibitors. One estimate suggests that 27.6% of total incremental expenditure on GLP-1s is then saved from reduced hospitalisations.
- Considering weight loss as a major contributor to reductions in hospitalisation for conditions such as cardiovascular disease, we consider the parameter an upper bound to the offsets.

4 **The next step is to consider any additional spending that could support the optimisation of economic spillover benefits, such as economic gains due to a healthy population**

The spending set out in the framework thus far is anchored on spending under the health needs and innovation policy objectives. Still, there are potential economic spillover benefits that may not be fully or optimally captured. For example, spending on healthcare may lead to a healthier population that results in greater labour force participation, delivering economic value added and reducing welfare costs, which could justify additional spending. This step of the framework assesses this gap.

Leveraging parameters from the macroeconomic literature (see Textbox 2), the framework sets out a comparison between the spending to optimise spillovers and the spending defined in the framework thus far. For example, if the framework suggests that around 12% of GDP should be spent on healthcare (including pharmaceuticals) but the assumed optimum to capture spillovers is 15%, the framework would show there is space to continue to spend in a way that is still efficient. This spending could ramp up over time, if necessary.

5 **The framework brings each of the above steps together**

Taken together, the framework describes how spending on healthcare and pharmaceuticals can meet the policy objectives of health needs and innovation, as well as setting out the spending ceiling that would optimise spillover benefits.

3.2 Illustrative application of the framework to the UK

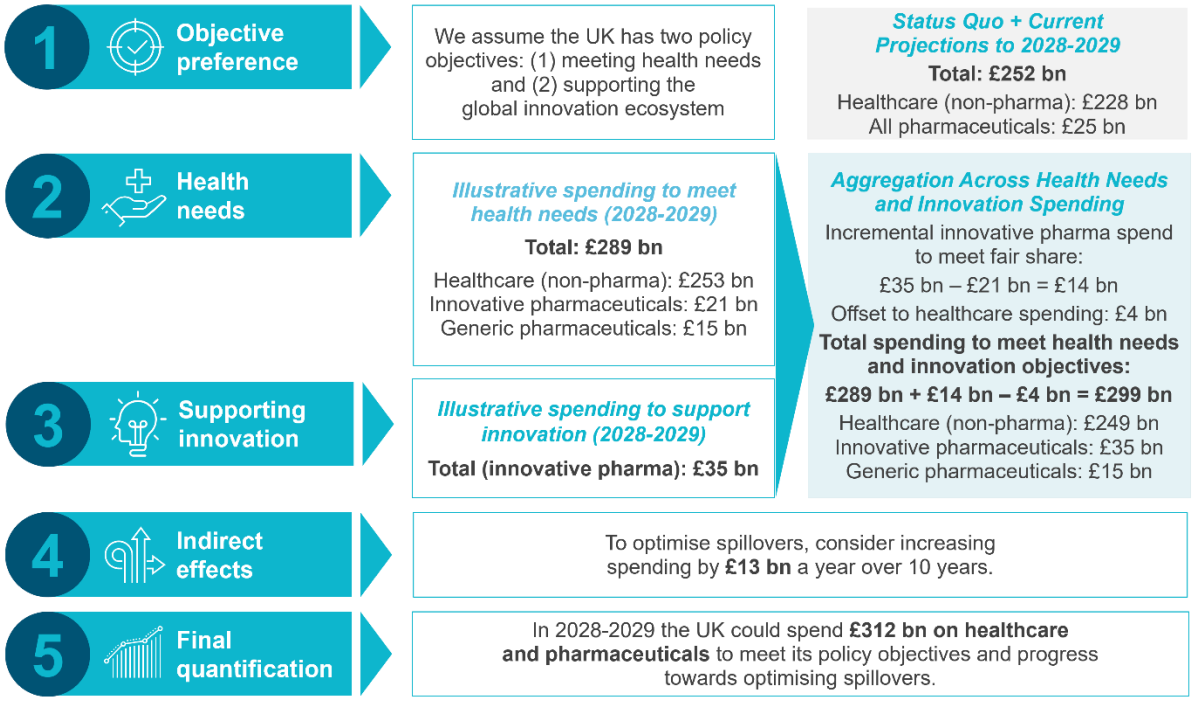
To illustrate how the framework could be used in practice, we use the UK as a case study. The UK is a country where many of the building blocks for the analysis already exist, facilitating the application of the framework.

The objective of this subsection is to show how the framework conceptualises the different policy objectives that can be met by healthcare and pharmaceutical spending and how these interact. Although we draw data from credible sources, some of these are a few years out of date, and we do not aim to provide specific spending predictions. Figures should not be interpreted in that context, but rather to illustrate different considerations and objectives that can be met with healthcare and pharmaceutical spending.

In the UK, debate around the sufficiency of funding allocated to the NHS has become increasingly prominent, and funding pressures are anticipated to increase as the UK's population grows and ages.[70] From an innovation perspective, pharmaceutical expenditure as a proportion of health expenditure in the UK was around 9% prior to recent policy reforms, which was characterised as a significant underinvestment given the UK's fair share spending target.[71]

Below, we apply the framework step-by-step using UK data. All figures are in 2024 currency and estimate spending for 2028–2029. Figure 4 illustrates the application of the framework.

Figure 4: Application of the framework to the UK



Note: The figure shows only the lower bound of spending suggested by the framework in support of innovation.

1 The UK's preference across the key policy objectives

First, we assume that the UK is interested both in meeting its health needs by modernising the NHS and supporting an environment for innovation.[72,73]

2 Robust estimates of spending required to meet the UK's health needs

We apply the framework with a focus on the health needs policy objective by assessing (1) the UK's status quo, (2) how much it would need to spend to meet health needs according to the IFS model for a modernised NHS, and (3) the gap that exists between both amounts.

The UK's status quo and projection to 2028–2029

- Excluding health spending during the COVID-19 pandemic, spending on the NHS in the UK has steadily increased over the past decade.
- In 2024–2025, total NHS spending across the UK amounted to approximately £227 billion,[74,75,76,77] of which approximately £20 billion (9%) was allocated to pharmaceutical spending.[78] Approximately 0.3% of GDP was spent on innovative medicines.[79]
- Total NHS spending is expected to grow to £252 billion in 2028–2029.[80] Within this, pharmaceuticals are predicted to consume a higher proportion of total NHS spending by 2028–2029 at approximately 10% of total NHS expenditure (£25 billion). Given recent policy updates, 0.35% of GDP is expected to be spent on innovative pharmaceuticals.[81]

Spending level estimated by the IFS model to meet health needs

The IFS report assumes that overall expenditure on healthcare needs will increase by 4.2% to improve the NHS's quality of care by reaching constitutionally mandated levels. Within this, spending on innovative pharmaceuticals is modelled to grow at 5.5% per annum, whereas spending on generic medicines is projected to grow at 1.5%.[82]

To address the health demand of the UK population, given the status quo and the growth rates estimated by the IFS study, £289 billion would be needed in 2028–2029. This is estimated by applying the IFS growth rates to baseline spending in 2018–2019.[83] Of this figure, total pharmaceutical expenditure would be £36 billion or 12.5% of healthcare spending.

Innovative pharmaceuticals, which are subject to technology-driven price increases, and generics, which are purchased at high volume but with consistently low costs, grow at different rates in the IFS study. Of the £36 billion modelled, £21 billion (60%) is allocated to innovative medicines, whilst the remaining £15 billion fund generics.

While the IFS projections incorporate different growth rates for healthcare inputs, they do not provide a systematic assessment of the relative marginal productivity of these inputs. The model does not explicitly compare how much additional health benefit is generated per pound spent on innovative medicines versus generics, labour, diagnostics, or preventive services. A fuller analysis of the contribution of different inputs to health production, particularly in terms of health outcomes and long-term value, would offer a clearer basis for determining whether these growth assumptions reflect optimal resource allocation. This represents an important area for further research.

Gap between the status quo and the IFS prediction for health needs

The shortfall between the projected 2028–2029 spending that would meet health needs (per the IFS model) and the estimated status quo is about 15%.

3 The UK's proportionate contribution to global pharmaceutical innovation

Below, we describe how the framework accounts for the extent to which the UK's innovative pharmaceutical spending contributes to global innovation ecosystems. To do so, we obtain the UK's fair share in two ways: a lower bound that considers the UK's GDP as a percentage of global GDP and an upper bound that considers the UK's GDP as a percentage of OECD GDP.

The global GDP approach can be justified because pharmaceutical innovation is produced and consumed within a global system; using the UK's share of world GDP reflects its position within the full set of countries that benefit from and contribute to global innovation. Conversely, the OECD GDP approach provides an upper-bound estimate by focusing on the set of high-income economies that account for most of the pharmaceutical R&D investment and innovation activity. We select this group of countries as the denominator for the upper bound as they have a stated mission that includes policy cooperation. We then obtain the UK's share of OECD GDP.

To apply this to the UK setting, we estimated the UK's proportionate contribution to global innovative pharmaceutical spending using World Bank GDP data.[84] To obtain the total global innovative pharmaceutical revenue to which this share should apply, we leveraged estimates from IQVIA.[85] Textbox 4 details these calculations.

Textbox 4: Assumptions and figures for calculating the fair share of pharmaceutical spending[86,87]

Total innovative pharmaceutical revenue:

- By the year 2028, $2.238 trillion is anticipated to be spent globally on pharmaceuticals.
- We assume that 60%, or $1.343 trillion, will be directed to innovative medicines.

Fair share bounds:

- Lower bound: the UK's GDP as a percentage of global GDP is 3.3%.
- Upper bound: the UK's GDP as a percentage of OECD GDP is 5.5%.

The framework suggests that the UK should spend £35 billion to £57 billion on innovative pharmaceuticals in 2028–2029 to contribute to the global pharmaceutical innovation ecosystem. This calculation assumes that current global spending on pharmaceuticals is the target value to be divided into fair shares for countries in support of innovation. We note that assessing the amount to spend globally on pharmaceuticals to optimise R&D is empirically challenging, if not impossible. However, the market failures that exist in innovation suggest that R&D spending may be below the optimal level.[88] Thus, this assumption should be viewed as an illustrative starting point for discussion.

Calculation of combined spending on health needs and innovation

The UK case study illustrates how investment in one policy objective contributes to the other. To estimate the required investment to incentivise innovation, we need to calculate the incremental amount, beyond what is needed for health needs. More specifically, this involves the following:

- The health needs spending illustrative estimate from the framework is £289 billion of which £21 billion is spending on innovative pharmaceuticals.
- Per the framework, the increment on innovative pharmaceuticals to meet innovation objectives is £14 billion to £36 billion. For the lower bound, this is calculated as the lower bound fair share, £35 billion, minus the £21 billion associated with health needs. For the upper bound, this is calculated as the upper bound fair share, £57 billion, minus the £21 billion associated with health needs.
- When accounting for offsets, applying the parameter described in Textbox 3, savings on hospitalisations from the additional innovative pharmaceutical spending range from about £4 billion to £10 billion. These are obtained by multiplying the offset parameter of 27.6% by the incremental expenditure on innovative pharmaceuticals.
- Thus, overall spending is calculated as health needs spending plus incremental innovative pharmaceutical spending to meet innovation policy objectives, minus offsets.
- This would be £299 billion on the lower bound and £315 billion on the upper bound, of which innovative pharmaceuticals are 12% and 18%, respectively.

It is important to highlight that increased spending on pharmaceuticals could stem either through increases in price or access. The framework does not prescribe which mechanism should dominate; rather, it highlights that different combinations of price and volume adjustments could deliver the required investment while having distinct implications for budgets, incentives, and the broader innovation ecosystem.

4 Indirect effects from increasing the UK's spending

The previous sections set out the direct justification from a health needs and innovation perspective. However, increased health expenditure may be justified due to the accrual of further socioeconomic benefits beyond health, including increased productivity, reduced absenteeism, and reductions in early retirement.

Using the macroeconomic parameters described in Section 2 of this report, it is estimated that the UK could spend up to 15.4% of GDP to optimise these spillovers. A more conservative parameter from the same model, 12.4%, is applied in this case study. As an illustration, for the UK to increase the spending set out by the framework to 12.4% of GDP over 10 years, an incremental budget increase of around £13 billion to £14 billion would be required each year between 2025 and 2035. If spending brings in further R&D with scientific spillovers, additional spending to optimise indirect effects may be warranted.

There is a clear need to avoid double-counting. If the health needs approach uses unit costs that already account for this benefit, this additional spending would not be required. For example, in the UK, if cost-effectiveness analysis were to account for the productivity of healthy populations, this additional spending would decrease as it would be captured more directly when spending on health needs. Currently, although there are proposals to take a wider perspective, the UK system of health technology assessment (HTA) does not account for this.

5 Quantification and implications

The framework suggests illustrative spending amounts for 2028–2029. More specifically, the UK could spend between £312 and £328 billion on healthcare and pharmaceuticals (together) to (1) meet health needs, (2) meet innovation targets, and (3) work towards optimising economic spillovers.

With a focus on (1) and (2) only, the framework suggests that the UK could spend between £299 and £315 billion to progress towards those two policy objectives. With the UK currently projected to spend £252 billion on healthcare, the framework would predict a shortfall in NHS spending of 19%–25% if the UK is interested in meeting both policy objectives. The variation is driven by assumptions on the UK's fair share of pharmaceutical innovation.

For pharmaceuticals specifically, we compare the following figures:

- **Current spending (2024–2025)**: £20 billion on all pharmaceuticals (about 9% of healthcare spending); 0.3% of GDP on innovative pharmaceuticals.
- **Forecasted spending (2028–2029),** including the recent UK agreement to begin to increase spending on pharmaceuticals: £25 billion on all pharmaceuticals (about 10% of healthcare spending); 0.35% of GDP on innovative pharmaceuticals.
- **Spending per the framework (2028–2029):** £36 billion on all pharmaceuticals (about 12.5% of healthcare spending). Per the framework, an incremental £14 billion to £36 billion increase on pharmaceuticals would meet both health needs and innovation incentives. It is important to note that the concept of fair share encompasses innovation across the wider health technology landscape, including medical devices and diagnostics; pharmaceuticals are used solely as an illustrative example.

The framework suggests that the UK could spend £35 billion to £57 billion on innovative pharmaceuticals to meet its policy aims in 2028–2029. A back-of-the-envelope calculation shows that this spending would correspond to more than 0.6% of GDP, which is the target spending on innovative medicines that was recently set out by new public policy.[89]

4. Policy recommendations

In Section 3, we set out a framework that could be used when determining appropriate levels of spending on healthcare and pharmaceuticals based on (1) supporting health needs, (2) sustaining global and local innovation, and (3) considering additional economic and scientific spillovers that accrue from this spending. As shown, spending in support of each of these policy objectives is not mutually exclusive, but rather interconnected, and can lead to longer-term benefits. Below, we set out specific policy recommendations on healthcare and pharmaceutical spending that draw from the above research and analysis.

1. Healthcare and pharmaceutical spending should be considered jointly, applying a unified approach to assess total expenditure and the extent to which it supports policy objectives

Healthcare and pharmaceutical expenditures are intertwined, and both may contribute to the same policy objectives. Through an economic lens, the components of healthcare can be viewed as complements or substitutes. For instance, increased pharmaceutical spending can offset expenditure on other elements of healthcare, possibly improving efficiency.[90] At the same time, pharmaceutical spending is most effective when combined with complementary healthcare investments. The effectiveness of pharmaceutical spending depends on the availability of well-funded healthcare services, including skilled healthcare professionals,[91] and adequate diagnostic infrastructure.[92] When these elements are aligned, both types of spending reinforce one another and deliver greater value. In the long run, investment towards the policy objectives of health needs and innovation overlaps, as increased innovation may more effectively meet health needs, and increased spending on health needs may further support innovation.

2. Healthcare spending and pharmaceutical spending should be evaluated as an investment

The analysis highlights the need to strengthen cross-government alignment on the importance of spending to deliver both a healthy population today and a healthy society in the future. Spending also has a wider impact as an economic growth driver. The empirical literature provides robust evidence that improved health contributes to higher productivity, reduced absenteeism, increased labour force participation, and greater economic output.[93,94] These spillovers imply that health spending should be evaluated not only within health sector boundaries but also through the lens of national economic strategy, while balancing equity concerns across the population.

The literature on economic growth as a result of healthcare expenditure further helps to frame this spending as investment, but in practice, it requires coordination across finance, health, business, and science agencies and may be subject to opportunity costs and fiscal constraints. Embedding health spending within broader economic policy and viewing this spending as an investment rather than as a sector-specific cost may enable more coherent long-term planning.

3. Health needs approaches to determine and forecast long-term health expenditure should incorporate the expected value and costs of future medical technologies, ensuring resources to efficiently adopt technologies to meet a population's evolving needs

Health needs are predicted to increase across the board. To address the growing burden of chronic disease associated with population ageing, governments should adopt long-term, strategically planned increases in healthcare expenditure. These spending plans should be grounded in robust demographic and epidemiological projections to ensure that future health needs are adequately met.[95]

However, projections based on current prices risk systematically underestimating required investment. When present-day costs of care or pharmaceuticals fail to account for the value and expected cost profile of emerging medical technologies, funding models will fall short, limiting future access to

innovative treatments. Health systems therefore need mechanisms to anticipate forthcoming therapeutic advances and incorporate their expected value and cost implications into forward-looking spending estimates.

The UK is a good example of this, where healthcare spending projections based on current prices struggle to fully account for the cost and value of emerging pharmaceutical innovations. Despite recognition of demographic pressures and unmet need in areas where effective treatments are lacking, reliance on historical prices and fixed cost-effectiveness thresholds results in modelling that underestimates the level of expenditure required to maintain equitable access and meet population health needs.

One part of closing this gap is updating how HTAs are conducted. HTA frameworks could look beyond immediate clinical outcomes and capture the wider value that innovation brings, such as improved productivity, reduced pressure on caregivers, and long-term efficiencies across the health system, all of which are often missed in current evaluations. Policymakers should therefore prioritise updating modelling and HTA methodologies to better reflect future innovation and the evolving value of medical technologies.[96]

4. Health spending determinations should consider the efficient long-term use of resources, as this can allow for increased investment in high-value innovation

Spending 'wisely' by limiting low-value care can enable the reallocation of funding for other objectives of healthcare, such as coverage of orphan conditions and oncology treatment.[97] A complementary priority is the reallocation of resources from low- to high-value care. The literature indicates that around 20%–25% of healthcare spending in the US generates limited clinical benefit.[98,99] Reducing such spending can free up resources for high-value goods and services while alleviating pressure on system capacity.

The application of the framework to the UK demonstrates how these dynamics may interact: while pharmaceutical expenditure is expected to rise disproportionately as new technologies enter the system, broader inefficiencies within the NHS constrain the ability to absorb these innovations.[100]

Redirecting resources from low-value procedures, diagnostics, pharmaceuticals, and administrative waste could help finance increased investment in innovative medicines and the supporting infrastructure. For example, appropriate use of generics and biosimilars can support the efficient use of limited resources and create headroom to invest in innovative therapies. To get the most from these gains, health systems should use HTA appropriately, applying it to new technologies while also using it to build a clearer, system-wide picture of how different aspects of care contribute to productivity.

Nonetheless, de-implementation of low-value interventions may be politically and operationally difficult: providers may resist changes perceived as limiting clinical autonomy, and patients may object to the withdrawal of familiar interventions. Careful design of de-implementation strategies, coupled with reinvestment commitments, may help overcome these barriers.

5. Countries should calibrate relative pharmaceutical spending to ensure a fair contribution to sustaining global innovation efforts

All countries benefit from pharmaceutical innovation, and present-day spending helps shape the incentives that determine the future pace and direction of that innovation. Spending on pharmaceuticals required to meet health needs anchors this contribution, while incremental investment signals a willingness to pay for future innovation in areas of national relevance.

Because innovation can be viewed as a global public good, countries may perceive that lower investment in healthcare and pharmaceuticals in support of innovation is without consequences. However, too little spending on healthcare and medicines may result in delayed or limited access to innovative medicines,[101] and high-spending countries may seek to link their reimbursement to lower-spending countries. Ultimately, if the countries that currently bear a disproportionate share of global medicine spending were to reduce their contributions without others increasing theirs, overall industry revenues would decline, leading to fewer resources available for innovation.[102]

6. Countries should invest in healthcare infrastructure and capabilities to unlock economic and other spillovers

A further consideration concerns the role of targeted spending, in particular, on inputs that enable both the delivery of healthcare and R&D, as these may crowd in additional R&D and investment. Spending on such goods and services may generate returns that extend beyond their immediate clinical effects.[103] In particular, investments required for the delivery of advanced therapies, such as specialised clinical facilities, skilled workforce training, and research-enabling infrastructure, may create conditions that support subsequent waves of innovation.

By strengthening the technical and organisational foundations of a health system, these investments can enhance a country's broader research environment and potentially increase its attractiveness for future pharmaceutical R&D. While more empirical work is required to quantify the magnitude and persistence of these scientific spillovers, their plausibility provides an additional rationale for evaluating innovation policy within a wider systems perspective rather than focusing narrowly on short-term budget implications.

5. Conclusion

This report set out to develop a framework for determining the levels of healthcare and pharmaceutical spending that enable progress towards different policy objectives, with the goal of providing nuance to the discussions around one-size-fits-all spending targets that are salient in the current policy debate. The proposed evidence-based framework can be used by policymakers when considering healthcare and pharmaceutical spending in relation to health needs, innovation, economic growth, and scientific spillovers. Beyond the framework itself, this report provides a foundation for policy conversations on how to align policy objectives to spending targets and to identify opportunities to target spending more effectively.

Appendix: Indicators of under- and low-value spending

Given the policy objectives of meeting health needs and ensuring innovation, how might a country know if it is spending enough, or spending on the right mix of goods and services, to ensure progress towards those objectives?

Drawing from the literature review described above, we constructed indicators that could signal the need for a country to change its spending to meet policy objectives. Indicators are composed of metrics or statistics, but a crucial distinction is that indicators assess changes over time, geography, or relative to an assumed optimum. They provide valuable information to policymakers and other stakeholders on the extent to which increased or retargeted spending could help progress towards policy objectives.

Below, we set out five indicators for low-value or underspending on healthcare and pharmaceuticals, through the lens of meeting health needs and encouraging innovation. It is important to contextualise indicators as signals that can provide valuable information but can also be imprecise, and they do not definitively encompass healthcare system or pharmaceutical underinvestment, or low-value investment, in isolation. However, when considered collectively, they may indicate where a rebalance of spending may be needed.

Health needs spending indicators

Health needs spending indicator	Description and rationale
$\frac{\%\ \textit{change in healthcare expenditure}}{\%\ \textit{change in population aged over 65}}$	The literature has estimated how different age categories utilise key components of care and how health expenditure is anticipated to change with this demographic shift and chronic disease.[104] Over a specific time frame, this indicator evaluates whether changes in spending have aligned with demographic changes. Comparing this across countries can illustrate whether investment is lagging, not only relative to demography, but also peer countries.
$\frac{\textit{Mean wait for elective procedures, 2019}}{\textit{Mean wait for elective procedures, 2025}}$	Wait times for a basket of high-volume elective procedures are a proxy of the capacity of a healthcare system relative to current resources and health needs.[105] Anchoring the baseline of this indicator to a pre-COVID-19 year, this indicator measures whether current capacity is sufficient to address a population's healthcare needs, proxied by demand backlog. Observing an increase in capacity is a signal that spending is not lagging with respect to health needs.

Health needs spending indicator	Description and rationale
% change in the share of healthcare spending allocated to branded medicines, between 2019 and 2025, relative to peers	Decreasing spending on novel medicines may signal underinvestment in health technology. When aligning pharmaceutical value with spending, the literature emphasises that not all spending is equal, with high spending on low-value interventions crowding out high-value ones. This considers allocative efficiency and whether the mix of spending reflects value, and how this impacts health outcomes.[106]
$\frac{\%\ \boldsymbol{change\ in\ HTA\ cost\ thresholds}}{\%\ \boldsymbol{change\ in\ country's\ GDP}}$	HTA threshold changes are indicative of a country addressing higher levels of spending needed for innovative therapies, highlighting its capacity for reimbursement of novel therapeutics. For most countries, this indicator illustrates that HTA thresholds do not keep pace with population productivity.
Share of prescriptions filled as generic (out of total items prescribed) for a set of products that came off patent in the past three to five years	In conjunction with the indicators above, this indicator captures inefficient spending. As branded drugs come off patent, spending on them instead of generics may not be the best use of those resources. Selecting a cohort of products that came off patent at least three years before the indicator is calculated allows a period for transitioning supply chains and distribution.

Encouraging innovation spending indicators

Encouraging innovation spending indicator	Description and rationale
$\frac{\textit{Country's share of global patented drug sales}}{\textit{Country's share of OECD (or global) GDP}}$	This fair share indicator compares expenditure on patented medicines to economic capacity. It implicitly compares across countries and assumes contributions should be proportional to share of GDP, as the literature has assumed.[107,108] This indicator can also be assessed over time, which provides information on a country's trend regarding its support for global innovation incentives.
$\frac{\Delta \textit{ in country} - \textit{level patented drug sales}}{\Delta \textit{ in global innovative pharma firm sales}}$	In conjunction with the rest of these indicators, a shift towards increasing innovative pharmaceutical sales shows how a country's health spending is moving towards its fair share of R&D investment relative to use of patented therapies.
Whether a country an outlier, relative to peers with similar GDP per capita, in terms of the number of novel drugs reimbursed, with a focus on drugs not yet off patent	This indicator proxies participation in global R&D investments by the number of approved drugs for reimbursement. An outlier on the low end may suggest stringent reimbursement, whereas an outlier on the high end must be evaluated in conjunction with the metrics above.
Compared to economic peers: $\frac{\textit{Country's share of global clinical trial patients}}{\textit{Country's share of global GDP}}$	This indicator does not relate directly to spending but rather to the extent to which there is local innovation in a country, proportional to its wealth and relative to peers. It is a starting point for an analysis on scientific spillovers.
Presence of reimbursement or approval conditions linked to local innovation (e.g., local clinical trials)	This indicator may signal government identification of a concern about the extent to which local innovation is occurring. However, the absence of such policy is not a signal of underinvestment. This indicator must be considered alongside others.

References

1 Organisation for Economic Co-operation and Development (OECD), *Health at a Glance 2025* (OECD Publishing, 2025), https://www.oecd.org/en/publications/2025/11/health-at-a-glance-2025_a894f72e/full-report/pharmaceutical-expenditure_ab82eef9.html.

2 Pharmaceutical Research and Manufacturers of America (PhRMA), "Re: Request for Comments Regarding Foreign Nations Freeloading on American-Financed Innovation," comment submitted June 27, 2025, in response to 90 Fed. Reg. 23105 (May 30, 2025), https://cdn.aglty.io/phrma/global/resources/import/pdfs/PhRMA%20Comments%20Regarding%20Foreign%20Nations%20Freeloading%20on%20American-Financed%20Innovation[10].pdf.

3 Alice Inch, "Changes to Medicines Policy: What You Need to Know," NHS Confederation, December 15, 2025, https://www.nhsconfed.org/publications/changes-medicines-policy-what-you-need-know.

4 Denis Campbell, "Cost of UK's Drug Price Deal with US Will Come Out of NHS Budget," *The Guardian*, February 4, 2026, https://www.theguardian.com/society/2026/feb/04/cost-of-uks-drug-price-with-us-will-come-out-of-nhs-budget.

5 Financial Times, "NHS in England to Be Set Targets on Getting People Back to Work," February 25, 2026, https://www.ft.com/content/69430d69-78e2-4b3b-a0dd-f71678129eed.

6 OECD, *Health at a Glance 2025*.

7 OECD, *New Health Technologies: Managing Access, Value and Sustainability* (OECD Publishing, 2017), https://www.oecd.org/en/publications/managing-new-technologies-in-health-care_9789264266438-en.html.

8 OECD, *Health at a Glance 2025*.

9 Angus Liu, "NATO for Medicines? Pfizer CEO Calls for Higher Drug Spending Outside US amid Trump's MFN Pricing Push," Fierce Pharma, June 10, 2025, https://www.fiercepharma.com/pharma/nato-medicines-pfizer-ceo-calls-higher-drug-spending-outside-us-amid-trumps-mfn.

10 PhRMA, *High-Income Country Spending on Innovative Medicines* (PhRMA, 2025), https://cdn.aglty.io/phrma/Attachments/NewItems/Report%20-%20High-Income%20Country%20Spending%20on%20Innovative%20Medicines%20-%20June%202025_20250716125138.pdf.

11 PhRMA, "Re: Request for Comments Regarding Foreign Nations Freeloading on American-Financed Innovation."

12 The Lancet, "Drug Pricing and Pharmaceutical Innovation: A False Promise," *The Lancet* 406, no. 10514 (2025), 1923, https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(25)02160-9/fulltext.

13 OECD, "Excessive Pricing in Pharmaceuticals," OECD Roundtables on Competition Policy Paper No. 273 (March 2018), https://doi.org/10.1787/8e161f63-en.

14 Santiago G. Moreno and David Epstein, "The Price of Innovation: The Role of Drug Pricing in Financing Pharmaceutical Innovation. A Conceptual Framework," *Journal of Market Access & Health Policy* 7, no. 1 (2019), 1583536, https://doi.org/10.1080/20016689.2019.1583536.

15 Luca Lorenzoni et al. (2019), "Health Spending Projections to 2030: New Results Based on a Revised OECD Methodology," OECD Health Working Paper No. 110 (May 2019), https://doi.org/10.1787/5667f23d-en.

16 World Health Organization Regional Office for Europe, *Avoidable Mortality, Risk Factors and Policies for Tackling Noncommunicable Diseases: Leveraging Data for Impact: Monitoring Commitments in the WHO European Region Ahead of the Fourth United Nations High-Level Meeting* (WHO Regional Office for Europe, 2025), https://www.who.int/europe/publications/i/item/WHO-EURO-2025-12445-52219-80271.

17 World Health Organization, "Ageing and Health," October 1, 2025, https://www.who.int/news-room/fact-sheets/detail/ageing-and-health.

18 "UK Patients Want Fast Access to Good Care," *BMJ: British Medical Journal* 331, no. 7526 (2005), https://doi.org/10.1136/bmj.331.7526.0-d.

19 Lorenzoni et al., "Health Spending Projections to 2030."

20 OECD, *Fiscal Sustainability of Health Systems: How to Finance More Resilient Health Systems When Money Is Tight?* (OECD Publishing, 2024), https://www.oecd.org/en/publications/fiscal-sustainability-of-health-systems_880f3195-en.html.

[21] Amanda Glassman and Juan I. Zoloa, "How Much Will Health Coverage Cost? Future Health Spending Scenarios in Brazil, Chile, and Mexico," CGD Working Paper No. 382 (Center for Global Development, October 2014), https://www.cgdev.org/sites/default/files/CGD-Working-Paper-382-Glassman-Zoloa-future-health-spending-Latin-America.pdf.

[22] Charlesworth and Johnson, eds., *Securing the Future: Funding Health and Social Care to the 2030s*, IFS Report R143 (Institute for Fiscal Studies, 2018), https://ifs.org.uk/sites/default/files/output_url_files/R-143-new.pdf

[23] Rob Aalbers and Anne-Fleur Roos, *Zorguitgaven, ons een zorg?* (Centraal Planbureau, 2022), https://www.cpb.nl/system/files/cpbmedia/omnidownload/CPB-Publicatie-Zorguitgaven-ons-een-zorg.pdf.

[24] William H. Shrank et al., "Waste in the US Health Care System: Estimated Costs and Potential for Savings," JAMA 322, no. 15 (2019): 1501–1509, https://doi.org/10.1001/jama.2019.13978.

[25] OECD, *Tackling Wasteful Spending on Health* (OECD Publishing, 2017), https://dx.doi.org/10.1787/9789264266414-en.

[26] Shrank et al., "Waste in the US Health Care System."

[27] Beth Woods et al., "Achieving Dynamic Efficiency in Pharmaceutical Innovation: Identifying the Optimal Share of Value and Payments Required," *Health Economics* 33, no. 4 (2024): 804–819, https://doi.org/10.1002/hec.4795.

[28] Nouria Brikci et al., "Improving the Efficiency in Spending for Health: A Systematic Review of Evidence," *SSM-Health Systems* 2 (2024): 100008, https://doi.org/10.1016/j.ssmhs.2024.100008.

[29] James A. Asamani et al., "Balancing Equity and Efficiency in the Allocation of Health Resources: Where Is the Middle Ground?," *Healthcare (Basel, Switzerland)* 9, no. 10 (2021): 1257, https://doi.org/10.3390/healthcare9101257.

[30] Sreeram V. Ramagopalan et al., "Is the Price Right? Paying for Value Today to Get More Value Tomorrow," *BMC Medicine* 22, no. 1 (2024): 45, https://doi.org/10.1186/s12916-024-03262-w.

[31] Jason D. Buxbaum et al., "Contributions of Public Health, Pharmaceuticals, and other Medical Care to US Life Expectancy Changes 1990-2015," *Health Affairs* 39, no. 9 (2020): 1546–1556, https://doi.org/10.1377/hlthaff.2020.00284.

[32] Stephen J. Ezell, *How Japan Squandered Its Biopharmaceutical Competitiveness: A Cautionary Tale* (Information Technology and Innovation Foundation, 2022), https://www2.itif.org/2022-japan-life-sciences.pdf.

[33] Wilsdon et al., *Factors Affecting the Location of Biopharmaceutical Investments and Implications for European Policy Priorities* (Charles River Associates, 2022).

[34] Kim Assender, "International Comparisons in Medicines Spending and the Link to Competitiveness," *ABPI Blog*, Association of the British Pharmaceutical Industry, October 29, 2025, https://www.abpi.org.uk/media/blogs/2025/october/international-comparisons-in-medicines-spending-and-the-link-to-competitiveness/.

[35] Ahsan Saeed et al., "Enhancing Biopharma Research & Development: Operational Excellence in Biopharma Research and Early Development," McKinsey & Company, January 9, 2025, https://www.mckinsey.com/industries/life-sciences/our-insights/operational-excellence-in-biopharma-research-and-early-development.

[36] H. E. Frech III et al., "Pharmaceutical Pricing and R&D as a Global Public Good," NBER Working Paper No. 31272 (May 2023), https://doi.org/10.3386/w31272.

[37] Pierre Dubois et al., "Market Size and Pharmaceutical Innovation," *The RAND Journal of Economics* 46 (2015): 844-871, https://doi.org/10.1111/1756-2171.12113.

[38] Daron Acemoglu and Joshua Linn, "Market Size in Innovation: Theory and Evidence from the Pharmaceutical Industry," Quarterly Journal of Economics 119, no. 3 (2004): 1049–1090, https://doi.org/10.1162/0033553041502144.

[39] Darren Filson et al., "The Elasticity of Pharmaceutical Innovation," Schaeffer Center White Paper Series (USC Schaeffer Center for Health Policy & Economics, February 2025), https://schaeffer.usc.edu/research/the-elasticity-of-pharmaceutical-innovation-how-much-does-revenue-drive-new-drug-development/.

[40] Filson et al., "The Elasticity of Pharmaceutical Innovation."

41 Pierre Dubois, "Aligning Drug Prices and Innovation: How Global Spillovers Shape the Future of Medicines," Centre for Economic Policy Research, December 2, 2025, https://cepr.org/voxeu/columns/aligning-drug-prices-and-innovation-how-global-spillovers-shape-future-medicines.

42 Dubois, "Aligning Drug Prices and Innovation."

43 OECD, *Pharmaceutical Pricing Policies in a Global Market* (OECD Publishing, 2008), https://doi.org/10.1787/9789264044159-en.

44 Dubois, "Aligning Drug Prices and Innovation."

45 Dubois, "Aligning Drug Prices and Innovation."

46 Wells et al., "Historicising the 'Empty Pipeline': How Antibiotic Innovation Became a Market Failure (1980–2024)," *Public Humanities* 1 (2025): e163, htpp://doi.org/10.1017/pub.2025.10067.

47 Wells et al., "Historicising the 'Empty Pipeline.'"

48 Kevin Outterson, "Estimating the Appropriate Size of Global Pull Incentives for Antibacterial Medicines: Study Examines Global Antibacterial Pull Incentives," *Health Affairs* 40, no. 11 (2021): 1758-1765, https://doi.org/10.1377/hlthaff.2021.00688.

49 Frech III et al., "Pharmaceutical Pricing and R&D as a Global Public Good."

50 Wilsdon et al., *Factors Affecting the Location of Biopharmaceutical Investments and Implications for European Policy Priorities.*

51 European Federation of Pharmaceutical Industries and Associations (EFPIA), *The Case for Investing in a Healthier Future for the European Union* (EFPIA, 2025), https://www.efpia.eu/media/xpkbiap5/the-case-for-investing-in-a-healthier-future-for-the-european-union.pdf.

52 NHS Confederation and Carnall Farrar, *The Link Between Investing in Health and Economic Growth* (NHS Confederation, 2022), https://www.nhsconfed.org/system/files/2022-10/Health-investing-and-economic-growth-analysis.pdf.

53 EFPIA, *The Case for Investing in a Healthier Future for the European Union*.

54 Financial Times, "NHS in England to Be Set Targets on Getting People Back to Work."

55 Office for Budget Responsibility, *Fiscal Risks and Sustainability*, CP 1142 (Office for Budget Responsibility, 2024), https://obr.uk/docs/dlm_uploads/Fiscal-risks-and-sustainability-report-September-2024-1.pdf.

56 European Commission, *2026 European Semester—Autumn Package: Delivering on the Competitiveness Compass: Pushing Forward with Reforms and Investments*, COM(2025) 955 final, November 25, 2025, https://commission.europa.eu/document/download/d1d3b36b-1af5-42b2-910c-59f68bdef893_en?filename=COM_2025_955_1_EN_ACT_part1_v7.pdf.

57 NHS Confederation, *Analysis: The Influence of NHS Spending on Economic Growth* (NHS Confederation, 2023), https://www.nhsconfed.org/publications/analysis-influence-nhs-spending-economic-growth.

58 David E. Bloom et al., "Health and Economic Growth: Reconciling the Micro and Macro Evidence," *World Development* 178 (2024), https://doi.org/10.1016/j.worlddev.2024.106575.

59 Pintu Parui and Klaus Prettner, "Public Provision of Healthcare and Basic Research: What Are the Joint Effects on Economic Growth and Welfare?," *Journal of Economic Growth* 30 (2025): 383–415, https://doi.org/10.1007/s10887-024-09250-2.

60 Andreas Mackensen et al., "Anti-CD19 CAR T cell therapy for refractory systemic lupus erythematosus," *Nature Medicine* 10 (2022): 2124–2132, https://doi.org/10.1038/s41591-022-02017-5.

61 Jesper Jørgensen et al., "Outcomes-Based Reimbursement for Gene Therapies in Practice: The Experience of Recently Launched CAR-T Cell Therapies in Major European Countries," *Journal of Market Access & Health Policy* 8, no. 1 (2020), https://doi.org/10.1080/20016689.2020.1715536.

62 Qiang Wang et al., "Global Socioeconomic Inequalities in Vaccination Coverage, Supply, and Confidence," *NPJ Vaccines* (2025), https://doi.org/10.1038/s41541-025-01143-8.

63 Theo S. Eicher and Monique Newiak, "Intellectual Property Rights as Development Determinants," *Canadian Journal of Economics* 46, no. 1 (2013): 4–22, https://www.jstor.org/stable/42705861.

64 Rod Falvey and Neil Foster, "The Role of Intellectual Property Rights in Technology Transfer and Economic Growth: Theory and Evidence," Working Paper (January 2006), https://www.academia.edu/29931541/The_role_of_intellectual_property_rights_in_technology_transfer_and_economic_growth_Theory_and_evidence.

65 Boriana Goranova and Santiago Calvo Ramos, "The Impact of Ageing on fiscal Sustainability: EU Health Care Systems—Projections and Policy Responses," European Economy Economic Brief No. 088 (European Commission, 2026), https://economy-finance.ec.europa.eu/publications/impact-ageing-fiscal-sustainability-eu-health-care-systems-projections-and-policy-responses_en.

66 European Commission, "Strategy for European Life Sciences," accessed October 30, 2025, https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/jobs-and-economy/strategy-european-life-sciences_en.

67 Lianbiao Cui and Yuran Huang, "Exploring the Schemes for Green Climate Fund Financing: International Lessons," *World Development* 101 (2018): 173–187, https://doi.org/10.1016/j.worlddev.2017.08.009.

68 Patricia M. Danzon, "Differential Pricing of Pharmaceuticals: Theory, Evidence and Emerging Issues," *PharmacoEconomics* 36, no. 12 (2018): 1395–1405, https://doi.org/10.1007/s40273-018-0696-4.

69 Jennifer H. Hwang et al., "Fiscal Impact of Expanded Medicare Coverage for GLP-1 Receptor Agonists to Treat Obesity," *JAMA Health Forum* 6, no. 4 (2025): e250905, https://doi.org/10.1001/jamahealthforum.2025.0905.

70 Charlesworth and Johnson, *Securing the Future*.

71 Association of the British Pharmaceutical Industry, "UK Tumbles Down Global Rankings for Pharma Investment and Research," September 11, 2025, https://www.abpi.org.uk/media/news/2025/september/uk-tumbles-down-global-rankings-for-pharma-investment-and-research/.

72 UK Government, *Fit for the Future: 10 Year Health Plan for England* (UK Government, 2025), https://assets.publishing.service.gov.uk/media/6888a0b1a11f859994409147/fit-for-the-future-10-year-health-plan-for-england.pdf.

73 UK Government, *The UK's Modern Industrial Strategy: Life Sciences Sector Plan* (UK Government, 2025), https://assets.publishing.service.gov.uk/media/688c90a8e8ba9507fc1b090c/Life_Sciences_Sector_Plan.pdf.

74 Danielle Jefferies and Katie Purbrick-Thompson, "The NHS Budget and How It Has Changed," The King's Fund, December 16, 2025, https://www.kingsfund.org.uk/insight-and-analysis/data-and-charts/nhs-budget-nutshell.

75 Audit Scotland, *NHS in Scotland 2025: Finance and Performance* (Audit Scotland, 2025), https://audit.scot/uploads/2025-11/nr_251204_NHS_in_Scotland_2025.pdf.

76 Welsh Government, *Wales Budget 2024–2025* (Welsh Government, 2023), https://www.gov.wales/sites/default/files/publications/2023-12/draft-budget-2024-2025-leaflet.pdf.

77 Department of Finance, "Executive Agrees 2024–25 Budget," April 25, 2024, https://www.finance-ni.gov.uk/news/executive-agrees-2024-25-budget.

78 Association of the British Pharmaceutical Industry, "UK Tumbles Down Global Rankings for Pharma Investment and Research."

79 PhRMA, *High-Income Country Spending on Innovative Medicines* (PhRMA, 2025), https://cdn.aglty.io/phrma/Attachments/NewItems/Report%20-%20High-Income%20Country%20Spending%20on%20Innovative%20Medicines%20-%20June%202025_20250716125138.pdf.

80 HM Treasury, *Spending Review 2025* (HM Treasury, 2025), https://www.gov.uk/government/publications/spending-review-2025-document/spending-review-2025-html.

81 Department for Science, Innovation and Technology, *Arrangement between the United States of America and the United Kingdom on pharmaceutical pricing*, April 2, 2026, https://www.gov.uk/government/publications/uk-us-arrangement-on-pharmaceutical-trade-and-pricing/arrangement-between-the-united-states-of-america-and-the-united-kingdom-on-pharmaceutical-pricing-html.

82 Charlesworth and Johnson, *Securing the Future*.

83 Charlesworth and Johnson, *Securing the Future*.

84 World Bank, "GDP (Current US$) – United Kingdom," World Bank Open Data, accessed October 30, 2025, https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=GB.

85 IQVIA Institute for Human Data Science, *The Global Use of Medicines 2024: Outlook to 2028* (IQVIA, 2024).

86 IQVIA Institute for Human Data Science, *The Global Use of Medicines 2024*.

87 World Bank, "GDP (Current US$) – United Kingdom."

88 Kevin A. Bryan and Heidi L. Williams, "Chapter 13 - Innovation: market failures and public policies," in Handbook of Industrial Organization, Eds: Kate Ho, Ali Hortaçsu, Alessandro Lizzeri, Elsevier, Volume 5, Issue 1, (2021): 281–388, https://doi.org/10.1016/bs.hesind.2021.11.013.

89 Department for Science, Innovation and Technology, *Arrangement between the United States of America and the United Kingdom on pharmaceutical pricing*, April 2, 2026, https://www.gov.uk/government/publications/uk-us-arrangement-on-pharmaceutical-trade-and-pricing/arrangement-between-the-united-states-of-america-and-the-united-kingdom-on-pharmaceutical-pricing-html.

90 Frank R. Lichtenberg, "The Impact of New Drug Launches on Hospitalization in 2015 for 67 Medical Conditions in 15 OECD Countries: A Two-Way Fixed-Effects Analysis," *Forum for Health Economics and Policy* 21, no. 2 (2018), 20180009, https://doi.org/10.1515/fhep-2018-0009.

91 Parui and Prettner, "Public Provision of Healthcare and Basic Research."

92 Susan Horton et al., "Moving the Dial on Diagnostics: An Update from the Lancet Commission on Diagnostics," *The Lancet* 405, no. 10496 (2025): 2241–2254, https://doi.org/10.1016/S0140-6736(25)00804-9.

93 EFPIA, *The Case for Investing in a Healthier Future for the European Union*.

94 NHS Confederation and Carnall Farrar, *The Link Between Investing in Health and Economic Growth*.

95 GBD 2023 Disease and Injury and Risk Factor Collaborators, "Burden of 375 Diseases and Injuries, Risk-Attributable Burden of 88 Risk Factors, and Healthy Life Expectancy in 204 Countries and Territories, Including 660 Subnational Locations, 1990–2023: A Systematic Analysis for the Global Burden of Disease Study 2023," *The Lancet* 406, no. 10513 (2025): 1873–1922, https://doi.org/10.1016/S0140-6736(25)01637-X.

96 Mike Paulden, "Economic Consequences of Increasing the NICE Cost-Effectiveness Threshold," PharmacoEconomics 44, (2026): 5–8, https://doi.org/10.1007/s40273-025-01579-9.

97 European Commission, Directorate-General for Health and Food Safety, *Identifying, Measuring and Reducing Low-Value Care in the Context of Health System Performance Assessment* (Publications Office of the European Union, 2025), https://doi.org/10.2875/7231733.

98 Shrank et al., "Waste in the US Health Care System."

99 Shrank et al., "Waste in the US Health Care System."

100 National Audit Office, *NHS Financial Management and Sustainability*, Session 2024-5, HC 124 (National Audit Office, 2024), https://www.nao.org.uk/wp-content/uploads/2024/07/nhs-financial-management-and-sustainability.pdf.

101 Tokyo Foundation for Policy Research, "Addressing Japan's 'Drug Loss – Drug Lag': An Analysis and Proposals for Revamp," September 6, 2024, https://www.tokyofoundation.org/research/detail.php?id=978.

102 Filson et al., "The Elasticity of Pharmaceutical Innovation."

103 Jørgensen et al., "Outcomes-Based Reimbursement for Gene Therapies in Practice."

104 See, for example, Charlesworth et al., "Securing the Future: Funding Health and Social Care to the 2030s."

105 See, for example, Laurie Rachet-Jacquet et al., "Long-Term Projections of Health Care Funding, Bed Capacity and Workforce Needs in England," *Health Policy* 132 (2023): 104815, https://doi.org/10.1016/j.healthpol.2023.104815.

106 See, for example, Rahab Mbau et al., "Analysing the Efficiency of Health Systems: A Systematic Review of the Literature," *Applied Health Economics and Health Policy* 21 (2023): 205–224, https://doi.org/10.1007/s40258-022-00785-2.

107 See, for example, Frech III et al., "Pharmaceutical Pricing and R&D as a Global Public Good."

108 See, for example, Andrew Mulcahy et al., *International Prescription Drug Price Comparisons: Estimates Using 2022 Data* (RAND Corporation, 2024), https://www.rand.org/pubs/research_reports/RRA788-3.html.