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Healthcare Capital Investment in Ireland Series:

Strategic Considerations for Future Capital Investment in Healthcare.

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Paper Summary

1. This is the second of 3 papers in the series "Healthcare Capital Investment in Ireland".

2. The paper reviews the policy literature on the general and healthcare specific challenges that frequently occur in the delivery of infrastructure projects, to support and inform policymakers in implementing the objectives of the National Development Plan (NDP) for Healthcare in Ireland.

3. The paper evaluates relevant strategic documents to complement the literature review included in the paper. From this, a number of potential criteria are identified for a Strategic Investment Framework for healthcare.

4. This paper analyses planned healthcare investment under NDP 2018-2027 to project how capital investment would be spent by 2027 if implemented as planned. It then evaluates this prospective expenditure in healthcare with reference to the proposed strategic investment criteria and the existing NDP objectives.

Key Findings

1. Based on the literature, there are a number of general and healthcare specific challenges associated with the delivery of infrastructure projects which need to be considered by policymakers;

    - Political influence on project development can lead some projects to be subject to enhanced timelines and criteria, weakening ex-ante review.
    - The long-time horizons involved in the development of infrastructure projects can lead to issues related to cost overruns and multi-annual budgeting.
    - Capital projects need to be subject to increased levels of ex-post review, with data collected to enable evaluation of a project's performance.
    - Projects can often be subject to an over-focus on short term (tactical) rather than long run (strategic) outcomes, with the strategic success of a project ignored in favour of evaluation of whether it was "on time" and "within budget".
    - New healthcare infrastructure projects often fail to be adequately integrated into the overall health system, with appraisal of projects often evaluating performance in the context of a certain care setting rather than the effect on the system as a whole.
    - Healthcare projects are often insufficiently flexible to incorporate changes to the delivery of care, highlighting the need to incorporate more flexible architecture to account for varying technical lifespans of different components of a hospital or residential facility.

2. Potential criteria are identified for a Strategic Investment Framework for healthcare:
    a. Patient Safety and Quality
    b. Value for Money
    c. Resilience
    d. Accessibility
    e. Regional Diversity
    f. Alignment with Sláintecare
    g. Future Healthcare Demand
    h. Adaptability

3. The analysis of the Health Sector NDP 2018-2027 reveals a number of areas where prospective investment may not align with our expectations or the proposed criteria for the Strategic Investment Framework. In each case, detailed analytical work will be required to support decision-making between different investment priorities in line with proposed criteria.

- **Care-Setting Balance / Sláintecare Alignment:** The majority of planned healthcare capital investment is in the Acute care setting, with a 70% Acute to 30% Community Care expenditure ratio across the NDP 2018-2027 health portfolio.

- **Regional Diversity / Accessibility**: Even when "National" investment is excluded, Dublin continues to account for the majority of capital investment in the Health NDP portfolio at 47% of overall investment. This is followed by Galway (7%), Cork (6.5%), Limerick (5.5%) and Sligo (2%). This may run counter to expected investment under the National Planning Framework, which calls for balanced regional growth.

- **Value for Money / Long-term Feasibility**: 76% of expenditure under the NDP 2018-2027 has yet to take place (Construction, Commissioned, Installation, Complete). This may present scalability challenges for the sectors capacity to deliver such a substantial proportion of investment in a short timeframe.

- **Value for Money / Long-Term Feasibility**: Over €4bn (42%) of the planned investment is in the "appraisal" stage. The literature finds that cost estimate uncertainty is greatest before the Tender stage, due to the absence of a detailed design brief and market engagement. Therefore, the uncertainty around this €4bn estimate is large and presents risks in the form of noise, underestimation bias, and optimism bias. These risks can be observed in the growth in cost estimates of the National Children's and Maternity Hospitals. (Cost variance risk and solutions are discussed in the 3rd paper in this series).

- **Patient Safety / Long-term Feasibility / Adaptability / Accessibility / Regional Diversity**: A significant proportion (35%) of the total NDP allocation is in "Maternity" and "Paediatric" care, which may not align with the demand implied by current population projections. Conversely there is a considerably lower spend on "Older People" Care, despite the current aging of the population and need for increased capacity in this care setting. (Lindberg and Mccarthy 2021).

Policy Implications:

1. **Development and Implementation of a Strategic Investment Framework:**

   This analysis underpins the need for the development of a Strategic Investment Framework for healthcare to ensure that future health capital funding allocations align with National (NDP) and sectoral (Sláintecare) objectives. Such a strategic investment framework can be conceived as a dynamic multi-criteria analysis, where projects are scored against each criterion to provide a comprehensive assessment. Development and implementation of such a framework would result in a more transparent and coherent process by which health investment priorities are selected.

2. **Further Development of Data and Evidence related to Healthcare Capital Investment:**

   A significant limitation of the analysis undertaken in this paper is the lack of availability of a healthcare capital stock database. This means the analysis can only identify areas where investment may be not aligned with our expectations or the proposed criteria for the Strategic Investment Framework. From an operational perspective, detailed healthcare capital stock data and the evaluation of investment requirements by care setting and region will be required to implement the framework in practice. It should be noted that the incorporation of stock data was underway but interrupted by the cyber-attack on HSE systems in May 2021. The stock data will instead be the subject of future analysis.

3. **Greater Alignment of Healthcare Investment Priorities with Health and Overall Government Strategies:**

   The analysis presented in this paper identifies potential issues related to the distribution of expenditure by care setting, region, and project stage. Any non-alignment of investment priorities with Sláintecare, and overall government strategies, may present challenges to the deliverability of policy objectives including the transition to Primary and Community based services.

Contents

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Please note, the group is made up of personnel from a number of organisations, but the individuals and/or their critical review do not represent the views of their organisations.

All errors are the authors' own.

1 Introduction and Paper Objectives:

In line with Project Ireland 2040 and government priorities related to increased infrastructure investment, the Department of Health has now embarked on an unprecedent capital investment programme, with €10.9bn allocated for new health capital projects in the National Development Plan 2018-2027.[1] To ensure that this spend is allocated in an effective and strategic manner, and building on the analysis provided in the first paper of the "Healthcare Capital Investment in Ireland" series, this paper aims to explore in detail the creation of a strategic investment framework for healthcare in Ireland.

To achieve this aim, this paper approaches the creation of the framework from two perspectives. The first half of the paper offers a theoretical, literature-based approach to the development of the framework, including an evaluation and identification of the general and healthcare specific challenges associated with infrastructure projects. This section then identifies government strategic documents that can feed into the Strategic Investment Framework, before offering a list of potential criteria derived from this combined analysis. The second half of the paper set out in sections three, four and five offers analysis of investment policy as it stands under the existing NDP allocation. The paper utilises an extensive dataset of investments that have been undertaken or are planned in the health sector from 2018-2027, offering insight into the composition of the health investment portfolio at a high level, and possible recommendations for improvement.

Through the provision of both of these perspectives it is hoped that health policymakers will be better able to approach the task of the creation of the first Strategic Investment Framework for healthcare, with the integration of both theoretical and on the ground insights important in determining healthcare capital investment strategy going forward.

This paper is structured as follows:

- Section 2 outlines the objectives and structure of the analysis.
- Section 1 outlines the objectives and structure of the analysis.
- Section 2 reviews the relevant policy literature and overall government strategies to gain a greater understanding of how strategic investment can be utilised in the context of Irish healthcare provision.

[1] Analysis completed prior to the publication of NDP 2021-2030. This new NDP allocates €5.7bn to health investment from 2021 to 2025, though no figure for investment to 2030 is specified.

- Section 3 outlines the data collection exercise undertaken to facilitate the analysis, including a brief description of the underlying data quality, and limitations / further work that could be undertaken to complement the data collected.
- Section 4 examines NDP 2018-2027 investment at a portfolio level, analysing expenditure in aggregate and identifying key trends in the allocation up to 2027.
- Section 5 examines healthcare investment by project size in order to inform active risk management considerations.
- Section 6 provides policy implications emerging from the analysis.
- Section 7 concludes.

2 Strategic Investment Principles:

Paper one of the "Healthcare Capital Investment in Ireland" series identifies the need for the development of a Strategic Investment Framework for Healthcare in Ireland. To build on this objective, and to offer more specific insights into how it can be developed, this section reviews relevant policy literature on capital investment management, examining the characteristics of prudent and strategic investment that maximises social benefits and minimises risk and cost.

While the identification of infrastructure needs is one element of effective capital delivery, it is also important to emphasize the common challenges that can emerge in the management and delivery of major infrastructure projects. The Public Spending Code (2019) provides a good institutional platform for addressing many of these risks, but it remains important to identify areas where strategic and operational improvements can be made.

2.1 General Challenges in the Delivery of Infrastructure Projects

A wide array of multilateral organisations (e.g OECD (2017), IMF (2018), World Bank (2014)) have commissioned reports on the effectiveness of investment management globally. A review of these reports reveals several consistent drivers of inefficiencies in public investment. Increased awareness of these challenges will be important in mitigating the emergence of more consequential risks in an Irish context.

Political considerations: The World Bank (2014) identifies how political influence can negatively impact the degree to which appropriate project selection and appraisal methodologies are utilised. In particular, the World Bank posits that the enhanced timelines and criteria that politically supported projects are subject to may disrupt established processes and weaken the credibility of institutions undertaking ex-ante evaluations. The IMF (2020) supports this view, describing how political influence can in some cases override technical appraisal, generating significant inefficiencies. Political decisions in this space are also noted to be opaque, producing further issues related to accountability and weakening ex-post evaluation of selection and appraisal decisions.

Fiscal risk & multi-annual budgeting: The long-time horizons involved in the planning, implementation and operation of large infrastructure projects can give rise to a myriad of risks with a financial impact. In general, cost over-runs are common, with the IMF (2020) identifying that Governments pay 33% more than originally budgeted for roads, railways, tunnels, and bridges. Additional costs can emerge through aspects directly linked to project design, construction, and operation. These include market-related changes, and wider unanticipated developments such as

natural disasters and civil unrest. In this context, planning risk related to unrealistic costing, poor scoping, and failures to deliver adequate appraisal constitute the largest source of variance from a projects initial cost (IMF 2020). As Flyvbjerg (2009) further observes, unrealistic costing of projects can emerge strategically even in otherwise well managed institutions, with deliberate optimism bias on the part of policymakers increasing the likelihood of a supported project receiving funding. A further issue relates to multi-annual budgeting of infrastructure projects, with the affordability of capital projects often reliant on uncertain economic conditions (OECD 2017). The IMF (2017) identified that in the case of Ireland, the planning process remains inadequately linked to decisions on funding, with the viability of some projects likely to be threatened by fluctuations in capital financing.

Lack of data collection and ex-post review: Several issues are identified with respect to collection of cost and performance data for capital projects, as well as the extent to which projects are subject to ex-post review. In general, unsystematic data collection and a failure to evaluate the performance of capital projects after delivery is identified in several reports, indicating that it is a widespread concern (World Bank 2014, OECD 2017). The OECD (2017) for example recognises that many institutions involved in capital project planning and delivery are only responsible for these initial phases, rather than ensuring that the asset delivers value over its lifecycle. This limits the extent to which issues that only arise over a long-time interval, especially strategic issues, are identified and resolved. The IMF (2017) identified a similar issue in its appraisal of Ireland's Public Investment Management institutions. In particular, Ireland is said to have limited data on the value of public infrastructure held. Furthermore, weaknesses related to ex-post review and monitoring of public assets are highlighted as key areas in need of reform.

2.2 Healthcare Specific Challenges in Infrastructure Development and Delivery

In addition to the general challenges associated with the delivery of infrastructure projects, a number of challenges related to healthcare specific infrastructure also emerge from the literature. While healthcare capital investment remains a relatively under-studied field, seminal work from the European Observatory on Health Systems and Policies from Rechel et al. (2009) provides an overview of some of the issues that can emerge in this sector.

Over-focus on tactical rather than strategic outcomes: Samset & Dowdeswell (2009) make an important distinction between tactical and strategic outcomes of a given healthcare infrastructure project. In particular, they discuss how over-focusing on "tactical" outcomes, such as delivery of a project on time and within budget can override any evaluation of the long-term strategic performance of a given infrastructure project. While tactical outcomes are of course important, in the context of

the overall lifespan of an infrastructure project strategic performance is paramount to a project's success. This is particularly true in the case of hospital investment, where the annual cost of operating the asset can be 20-30% of the overall capital cost (Bjorberg and Verweij 2009).[2] Despite this, political and media focus is often preoccupied with underperformance in tactical terms, with the strategic potential or performance of a given project going un-noticed in many cases. In general, a successful hospital is one that can adapt to changing service demand, rapidly changing clinical technologies and the re-appraisal of health priorities where necessary.

Lack of integration of healthcare infrastructure projects within the whole health system: The effectiveness of healthcare capital investment can often be influenced and hampered by the structural design of a healthcare system as a whole, and in particular the integration between hospital, primary, community and social care (Degeling and Erskine 2009). While a given healthcare capital project can be effective in improving narrow performance indicators, such as waiting times or length of stay, this can come at the cost of more effective investment in other areas of care within the system. While it is widely acknowledged that modern healthcare delivery should have a greater focus on non-acute care services, capital interventions in this space are often still too narrow in their focus, evaluating only outcomes in a given modality of the overall healthcare system. Fragmentation between service areas in a healthcare system can also lead to worse outcomes, with actors within each modality seeking to maximize investment in their area to the detriment of overall healthcare delivery. Successful investment in this context requires integration between stages of care, with a blurring of boundaries between hospital, primary, community and social care.

Lack of flexibility in delivered healthcare projects: A key challenge identified by Rachel et al. (2009) in healthcare capital investment is the failure to incorporate flexibility into healthcare capital projects. The continual development of clinical practice and patterns of care in health means that healthcare capital projects need to allow for flexibility through their fundamental design. This flexibility can come in many forms, such as in the scale and scope of facilities, supporting infrastructure, definitions of services to be provided on and off site, and the relationship with the rest of the healthcare system. The need for flexibility also emerges from the mismatch in lifespan of core and periphery functions in a hospital. It is generally the case that areas providing 'core' functions of a hospital, such as operating theatres and intensive care are particularly expensive to build and tend to have a comparatively short technical lifespan relative to other features of a hospital (Bjorberg and Verweij 2009). To remedy this mismatch in lifespan, Rechel et al. (2009) proposes a variety of reforms to hospital construction, such

[2] *"The operating costs of a hospital often consume the equivalent of the capital cost every 2–3 years"* (Bjorberg and Verweij 2009)

as the inclusion of removable inner walls and partitions, or the inclusion of acuity-adaptable rooms which are configured such that different intensities of care can be delivered from the same space. Rechel et al. (2009) conclude that healthcare capital projects are at present inflexible, leading to delivery of care in not fit for purpose facilities, impacting hospital efficiency and effectiveness.

2.3 Considerations for a Strategic Investment Framework in Healthcare

As recommended by the first paper in this series, there is a need to develop a more strategic approach to healthcare investment. The development of a framework underpinning the principles of strategic investment is a common approach to facilitate this type of transition, having been successfully employed in other governmental organisations domestically and internationally. For Ireland, two key immediate strategic priorities are alignment with national (NDP) and sectoral (Sláintecare) objectives. To enable this, it is envisioned that the Department of Health will publish a strategic investment framework providing guidance for the prioritisation of different healthcare capital projects. In addition to the literature-based analysis above, the following section considers relevant strategic documents for the development of the health framework, before considering some sample criteria which may feed into prioritisation decisions for different healthcare capital projects.

2.3.1 Material to inform Ireland's Strategic Health Investment Framework

There are numerous documents which offer lessons for the Department of Health Strategic Investment Framework. These constitute documents that provide guidance for the Department in its strategic investment aims, and other successful examples of capital investment frameworks.

Sláintecare Implementation Strategy: The Sláintecare Implementation Strategy contains several relevant strategic actions that should feature in any strategic investment framework for healthcare.

- Strategic action 3 aims to provide for integrated models of care based on population need, indicating that a future investment strategy should account for demographic change and changes in demand based on new models of care.
- Strategic action 4 aims to expand community-based care, ensuring that community-based services offered in a locality are based on population need and size.
- Strategic action 5 meanwhile indicates a need to address current capacity challenges, as well as increasing integration between hospital and community-based care. All three of these strategic actions, as well as this document have direct implications for Ireland's healthcare capital investment strategy.

National Development Plan 2018 – 2027: The National Development 2018-2027 provides a number of strategic objectives that are relevant to the development of a strategic investment framework for healthcare including strengthened rural economies and communities, access to quality healthcare, and the transition to a low-carbon society. A primary implication from these objectives is that health investment should be regionally diverse, with capital funding allocated relatively evenly across identified regions accounting for demographics and socio-economic characteristics. The National Planning Framework has set the objective of accommodating one quarter of population growth in Dublin, one quarter in the other four cities, and the remaining half in towns and rural areas. New healthcare investments should therefore take into consideration this intended population growth when deciding on a location. The framework should also be mindful of the objectives of accessibility, in terms of transport connectivity, and of whether a given investment is aligned to a transition towards a low-carbon economy.

Department of Transport Strategic Investment Framework: The Department of Transport (2021) has already published a draft of its own strategic investment framework for investment prioritisation in the transport sector for the next ten years. It offers two important contributions to the structure of the strategic investment framework for healthcare. Firstly, the framework offers a designated list of criteria for the prioritisation of different transport projects. While these criteria are transport specific, the mechanism of prioritisation through criteria is one that could be emulated. Secondly, the framework offers investment hierarchies, designating the relative priorities for new projects. In particular, the framework aims to encourage investments that promote active travel rather than private vehicle use. In addition, the framework also designates maintenance and optimisation of existing infrastructure as a higher priority than investment in new projects, an important consideration for health given the aged nature of Ireland's health capital stock.

NHS Improvement Capital Regime Guidance: NHS Capital Guidance can be used to inform our own proposed strategic investment framework for healthcare. The document provides a broad range of requirements that new capital projects in the UK must satisfy to be eligible for funding. In particular, the requirements to satisfy section 2, "Health service need" provides a range of considerations for our own strategic framework. Requirements for this section include;

- Demonstrating a health service need for major capital investment, including forecasting the impact of a proposed investment on existing service configuration;
- Meeting the strategic needs of a locality or wider region, including improving service quality and departmental links;

- Meeting national & regional policy imperatives, with an emphasis towards a primary care shift;
- Providing better access to services, such as reducing travel times by public and private transport and improving equality of access for different care/disability/socio-economic groups;
- Improving the environmental quality of services, such as addressing the backlog of maintenance requirements related to a given estate and;
- Making more effective use of resources, to improve the productivity and realise other benefits for generating income and transferring risk cost effectively.

In particular, the requirements around forecasting the impact of investment on existing service configuration, and accessibility are particularly novel relative to the criteria suggested by other documents.

2.3.2 Potential Criteria for Ireland's Strategic Health Investment Framework

To allow for proposed healthcare capital projects to be considered in relation to wider strategic health objectives, the Department should consider criteria which will align capital funding with the delivery of system-wide outcomes. Once this list of criteria is firmly established the Department will then be able to better prioritize funding between different capital projects, ensuring that projects scoring best across the criteria included are the first to be funded. Based on our consideration of the literature in the preceding sections of this paper, a number of potential criteria for the Strategic Investment Framework for healthcare have been identified. These criteria encapsulate both the stated strategic objectives of the Department, and considerations around optimisation of health service delivery in light of identified sectoral challenges. The proposed list of criteria are as follows;

Patient Safety and Quality – Does the proposal provide better healthcare outcomes for patients, prevent the deterioration in quality of services, facilitate improvements in the scope of clinical practice, address clinical problems in healthcare? Policymakers should also be aware of the higher quality services that can be delivered through centralised complex care facilities, such as in the context of cancer treatment. (Sláintecare Implementation Strategy) (NDP 2018-2027)

Value for Money – Is the project a cost-effective method of achieving a given set of policy objectives? Will the project be expensive to operate once complete? Is there a significant risk with respect to estimating the cost of the completed project? Is this project likely to detract from the efficiency of healthcare delivery in the system as a whole? (NDP 2018-2027) (Public Spending Code 2019)

Resilience – Does the project provide additional strength to the health system in the face of unanticipated demand shocks? As analysis in the first paper in the series highlights, the high levels of occupancy in the Irish hospital system at present limit the ability of the sector to respond to an unforeseen medical emergency. Surge capacity is essential for the delivery of healthcare during crisis periods, as the COVID-19 pandemic illustrates. This criterion could also encompass the resilience accruing to health service and wider society from environmental co-benefits, such as the decarbonisation initiative for public sector buildings featured in the Climate Action Plan. (Hick, et al. 2014) (Government of Ireland 2019), (Cirillo and Taleb 2020), (Flyvbjerg 2020)

Accessibility – Will this proposal reduce the travel time by public and private transport for patients, staff and visitors for a given service? Does this proposal allow for greater equality of access to healthcare from different socio-economic, disability, ethnic groups? Will this proposal make care more responsive to patient's needs? (NDP 2018-2027) (NHS Improvement Capital Guidance Regime) (Sláintecare Implementation Strategy)

Regional Diversity – Does the proposed project align with the priority to provide regionally diverse capital investment as set out by the National Development Plan? Does the composition of projects within the capital portfolio align with demand in each respective region, taking account of future demographic and non-demographic factors and the existing healthcare capital stock in a region? ESRI research identifies the need for national funding allocations for healthcare based on population need. (NDP 2018-2027), (Sláintecare Implementation Strategy) (Smith, et al. 2019)

Future Healthcare Demand - does the project facilitate meeting long-run forecasted healthcare demand based on demographic need or does it satisfy a short-term surge in demand? The use of HIPPOCRATES and other models may be most appropriate to gauge long term demand for services to understand population trends and the suitability of these projects in the long term. This could also extend to Climate Action based investment, with future proofing of major infrastructure in this context. Aligning with National Adaptation Framework objectives. (NDP 2018-2027), (Walsh, Keegan, et al. 2021), (Lindberg and Mccarthy 2021) (Government of Ireland 2019)

Alignment with Sláintecare – Does the capital project align with the objectives of Sláintecare? For example, an acute care project can be assessed in the short term on whether it will address waiting list times and improve access. In the medium term, the project can be assessed in terms of whether it will facilitate or compliment greater care in the community care setting. Developments in other care settings can be assessed along a similar rationale with diversification and improvements in primary

care being essential to new capital projects in the long run. (Rechel, Wright, et al. 2009), (Sláintecare Implementation Strategy)

Adaptability – are the facilitates able to adapt to changes in practice and purpose without the need for significant re-modification? This would enable the optimisation of facilitates for multi-purpose use, enabling greater access to various services by the population. (Rechel, Wright, et al. 2009)

The framework could also encompass separately a hierarchy of spending for achieving other related objectives. For example, prioritisation of maintenance and refurbishment of existing facilities over the construction of new facilities, where possible. This could also extend to care setting prioritisation, with new projects favouring community and primary care delivery over acute care where possible to ensure the objectives of Sláintecare are being met.

In practice, a number of issues will need further exploration before criteria can be finalised and the strategic investment framework can be implemented. The weighting and scoring of the above criteria is still to be decided, with the strategic priorities of the Department and wider stakeholders likely to determine which criteria if any should be prioritised. The Department of Health are beginning a process of engagement with relevant stakeholders to address this issue, with the application of the strategic framework to new investment projects requiring further development of the concepts outlined in this paper. Engagement with a wide variety of stakeholders during the development of the strategic investment framework will secure early stage buy-in to the principle of top-down strategic investment. This will then allow implementation on a system-wide basis, ensuring prioritisation of projects which best meet the strategic objectives of the health sector.

3 NDP Health Sector Analysis

While the literature review provided in the first half of this paper is useful in identifying general best practice for future strategic investment in healthcare, it is also worthwhile to analyse and identify the performance of the health sector as it stands relative to desired strategic outcomes. The following sections take a top-down view of healthcare investment, identifying on both a portfolio and project basis key trends related to health capital allocations for 2018 – 2027. These trends can then be compared to our identified strategic objectives and best practice in Section 2, allowing for further discussion about how the portfolio allocation as it stands can be improved.

3.1 Data, Methodology and Limitations

The analysis undertaken in the following sections is derived from a novel dataset constructed by the HSE and Department of Health between 2020 and 2021. The dataset consists of 400 project references. The variables include information on overall care category, county, sub-programme, the stage at which the project has progressed to, and expenditure. The data has per-year information on the cost of projects between 2018 – 2027, with observations past 2025 combined into one observation. The total HSE Capital Plan equates to approximately €15bn. Excluding placeholders for non-funded and to be confirmed categories, the sum of the 400 remaining projects is €13.5bn. This is a greater amount than is currently allocated for Health in the NDP, again highlighting the need for internal prioritisation due to scarce resources.

The data can be considered a "flow" i.e., incremental investment into an existing "stock" of investment that has been accrued over time. Viewing "flow" and "stock" data simultaneously would be far preferable for this analysis, as it would allow for an understanding of both the existing healthcare infrastructure deficiencies in various care settings and regions, and the forthcoming investment into these contexts. Without healthcare capital stock data, this analysis can only highlight areas where investment may be inappropriately allocated, in every case requiring further investigation to determine whether or not investment in a care setting or region is warranted. It was originally intended to also include stock data in this analysis, however the cyber-attack on HSE systems[3] prompted significant delays in the collection of this data. The stock data will instead be the subject of future analysis.

[3] On the 14th of May 2021 the HSE and Department of Health suffered a ransomware cyberattack which caused significant delays to the progression of many workstreams including the sourcing of Healthcare Capital Stock Data.

Because of the limitations regarding healthcare capital stock data, the paper instead uses NDP flow data to project how capital investment would be spent by 2027 if implemented as planned. The analysis presented here is therefore mainly forward looking. It presents the scenario of fully invested and completed investment programme by 2027, on-time and on budget. This is not to assume that this will be the case, but it facilitates the development of a scenario that is fully aligned with the current implementation intentions, in accordance with the HSE Capital Plan. The authors then evaluate prospective NDP spend to the end of 2027, with reference to the potential strategic objectives proposed and NDP objectives.

4 NDP Health Sector Analysis 2018 – 2027 Portfolio

In terms of planned healthcare investment, the NDP 2018-2027 health investment portfolio provides a complete picture of the evolution of healthcare capital investment over this period. HSE provided data allows for detailed, specific analysis of spending across a broad range of care settings and localities. While not exhaustive, the analysis in this section aims to provide an overview of some of the most significant trends within the current NDP cycle at a portfolio level, thereby greatly enhancing understanding of where healthcare investment is currently being focussed. This will be complemented by analysis in the subsequent section of the NDP at a project level. In total, planned expenditure to 2027 constitutes €10.9bn in healthcare investment.

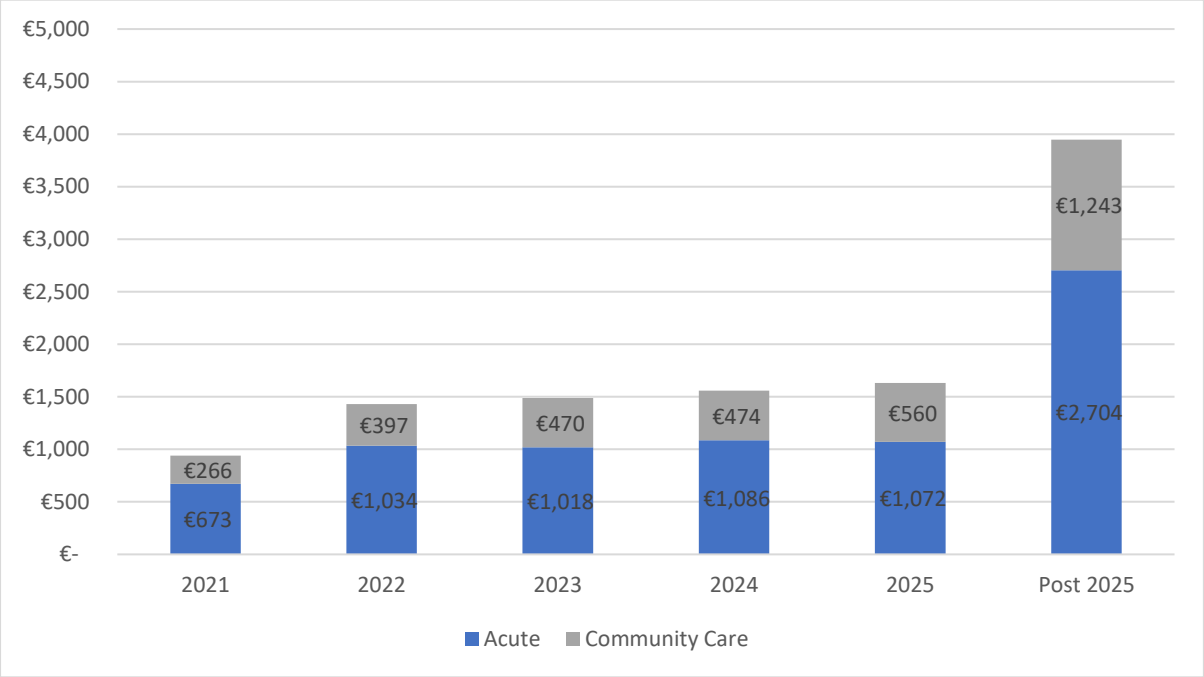
4.1 NDP Allocation by Care Setting

Figure 1: NDP Overall Allocation by Care Setting

Care Setting	€ millions	%
Acute	€9,845	71%
Community Care	€3,790	27%
Corporate	€79	0.5%
Other	€86	1%

Firstly, in terms of allocation of the NDP 2018-2027 healthcare portfolio by care setting, the amount of money allocated to community versus acute care is significant, with 71% of investment dedicated to acute care, versus 27% to community care up to 2027. The distribution of planned investment across time is also informative. Figure 2 illustrates this distribution, highlighting that over 80% of investment in expenditure terms is intended for delivery post 2020, with €10.9bn of investment outstanding for 2021 onwards.

Figure 2: NDP Allocation by Community vs Acutes, by Year.

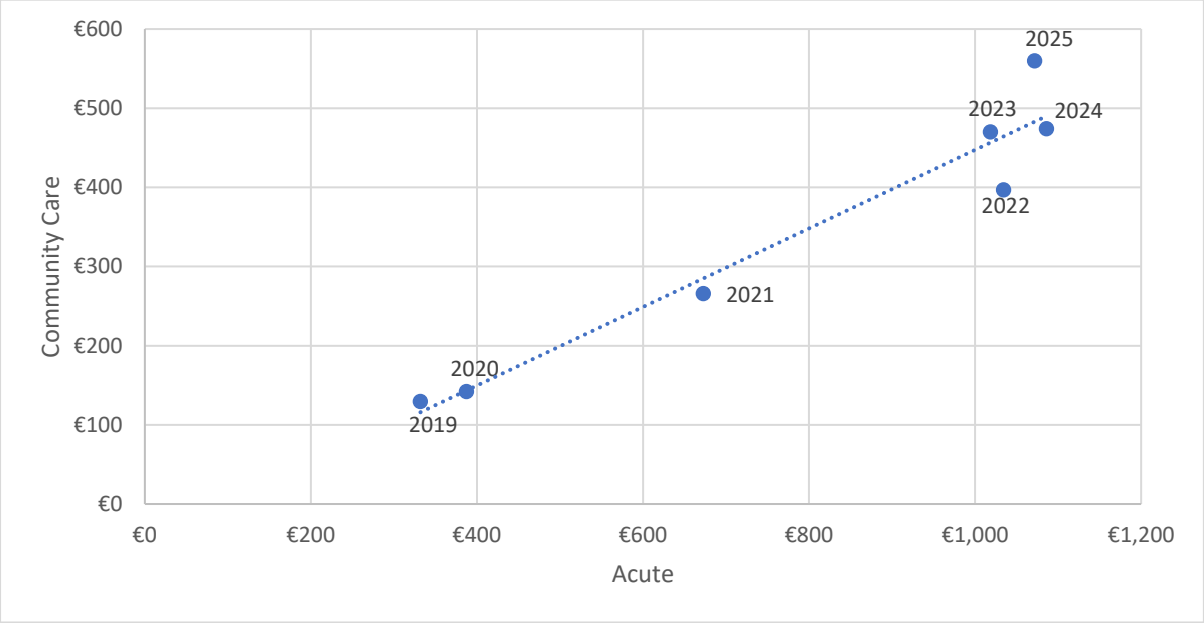


Source: Internal NDP Data

The relationship between acute and community residential care spend in a given year is also worth highlighting. Throughout the NDP portfolio, spend on these two categories are highly correlated, indicating no immediate prioritisation of one care setting over another. Even when per-year funding allocations increase, such as for 2022 onwards, no change is made to the proportion of money dedicated to community versus acute care infrastructure. While this relationship may be natural in the context of a system with an adequate balance of infrastructure across the two care settings, this may contravene expectations under a Sláintecare transition, which envisions a move towards enhanced community provision of health services as a mechanism for alleviating acute-care demand pressures (Department of Health 2018)[4].

[4] An additional caveat outside the scope of this analysis is whether community care can alleviate demand for acute care services. For example, Walsh (2020) demonstrates that formal homecare provision has a low impact on acute care bed needs.

Figure 3: Acute & Community Investment by Year – Correlation

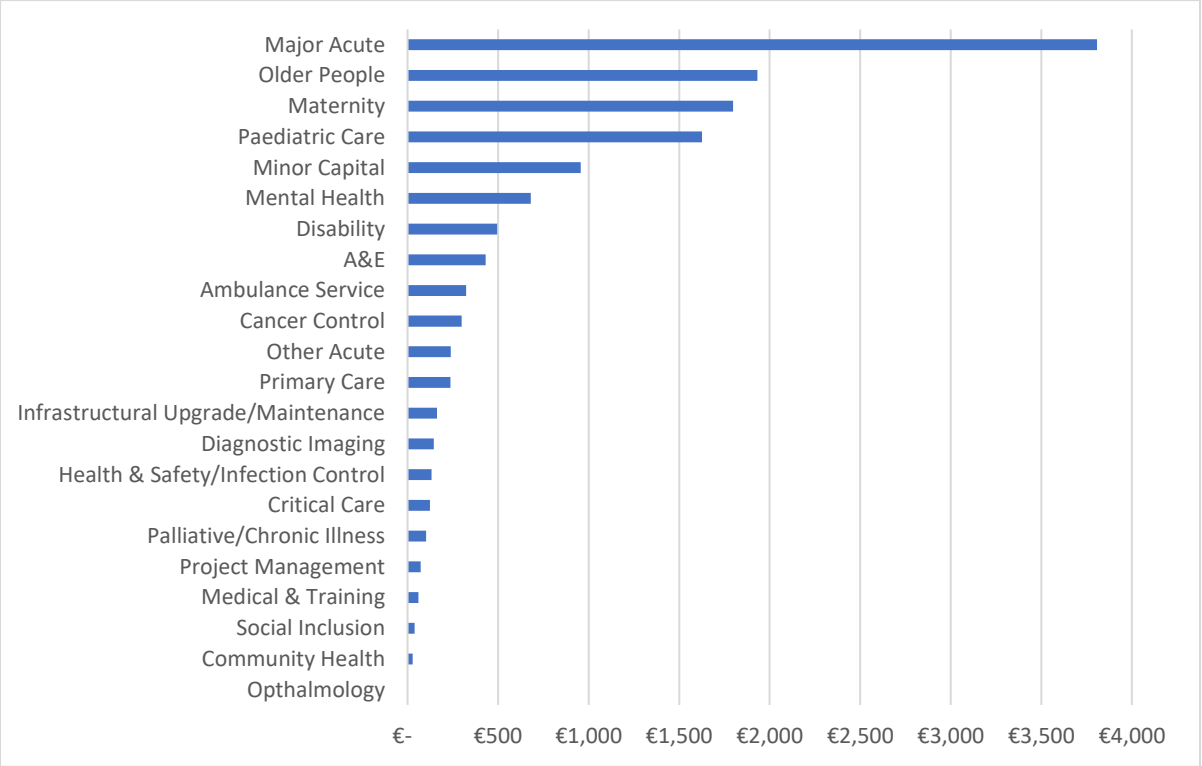


Source: Author's calculations of administrative data.

4.2 Investment by Health Sub-Programme

In addition to the distribution by acute and community care, we can also examine the healthcare capital portfolio on a sub-programme basis to gain additional insight into which areas are being prioritised over the current NDP cycle.

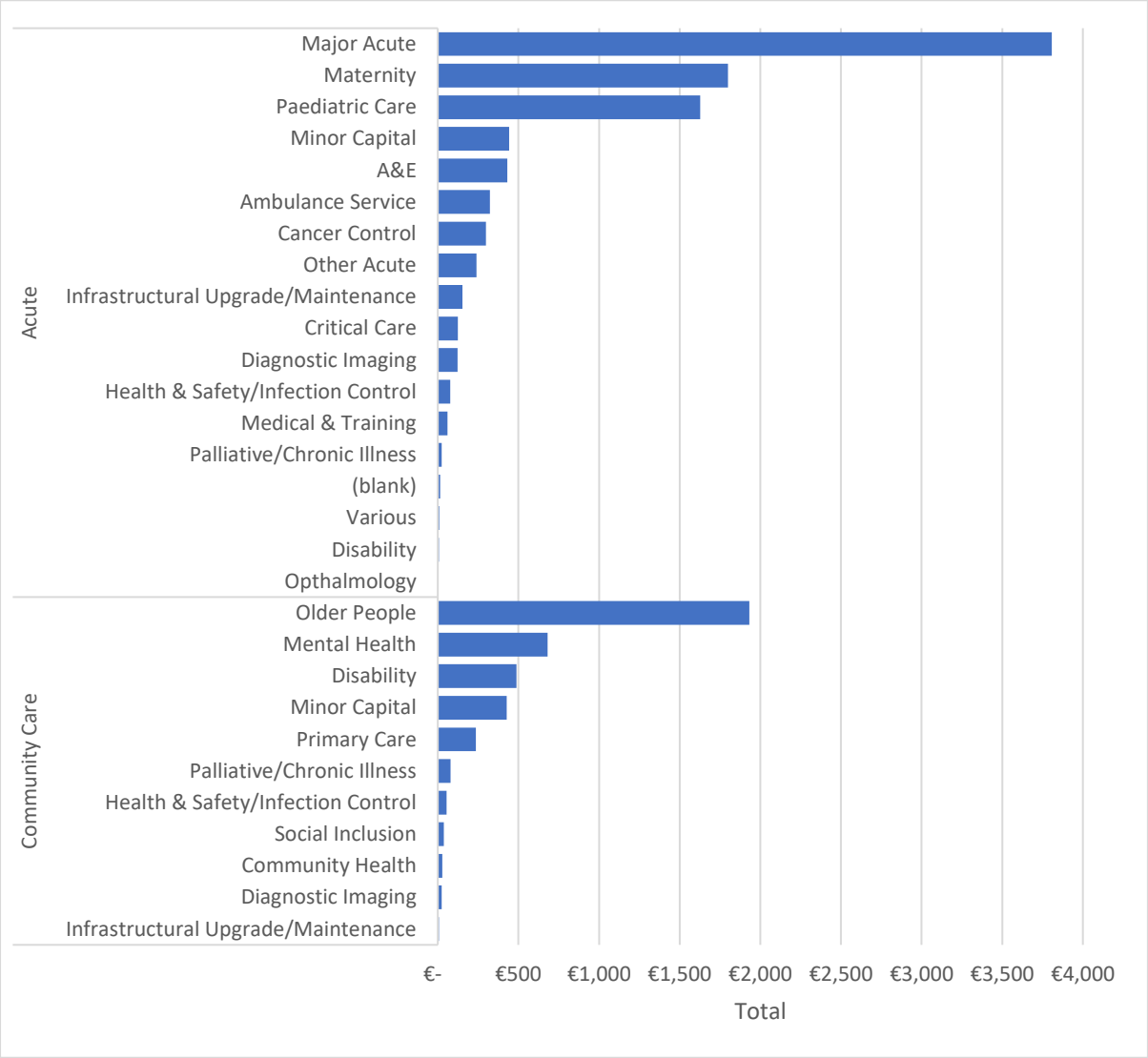
Figure 4: 2017-2027 Healthcare Investment by Sub - Programme



Source: Internal NDP Data

In terms of expenditure by sub-programme, we can observe that just three areas, Major Acutes, Maternity and Paediatric Care make up 53.4% of the overall funding envelope to 2027. The older persons sub-programme makes up a further 14.3% of expenditure.

Figure 5: Community and Acute Care Expenditure by Sub-Programme



Source: Internal NDP Data

Exploring the division between acute and community care sub-programmes provides further clarity on some key trends. On the acute side, we can see that 36% of total acute care expenditure is focussed on the delivery of maternity and paediatric care. This level of investment may not align with Ireland's future demographic projections, with the CSO forecasting that the share of under 15s will drop from 21% in 2016 to 15% by 2036 (CSO 2017). This is likely to impact demand for these services in the future. While a lack of detailed data on Ireland's underlying healthcare capital stock means that

inferences related to appropriate care setting allocations are limited[5], the high level of expenditure on maternity and paediatric care in light of future demographic projections warrants further investigation.

On the community side, we can see that investment prioritises the older people sub-programme, with 48.4% of total community care expenditure allocated to this area. This aligns with the prioritisation implied by the 2018 Capacity Review, which projects by 2031 a need for 12,000 additional community residential care beds. The present NDP allocation is forecast to currently deliver 4,500 beds[6], meaning substantial non-public delivery will also have to take place.

A final observation is respect to maintenance in the portfolio. Maintenance of existing facilities is delivered through both capital and current expenditure. In terms of capital expenditure, €155m maintenance expenditure is dedicated to acute care, while a further €6 million in dedicated to community care, comprising 1.2% of the overall €13.5bn allocation. A significant proportion of maintenance is also delivered via current expenditure, with an average of €113m of expenditure annually dedicated to this purpose between 2017-2019.

4.3 Regional Distribution of Investment

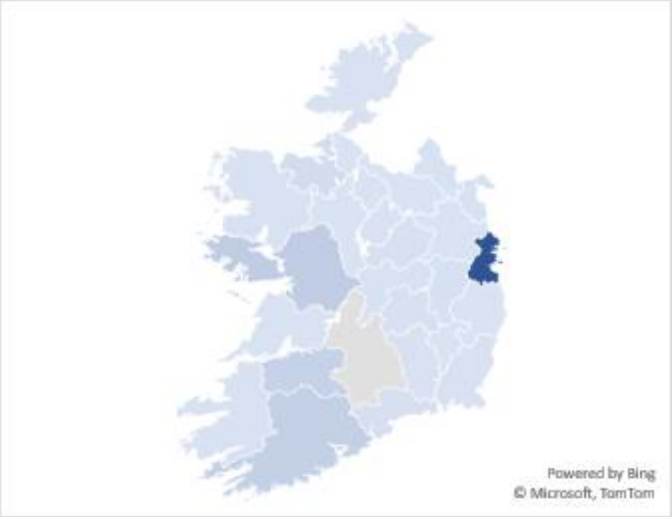
Many of the objectives of the National Development Plan 2018-2027 highlight the need for a more balanced level of spend across Ireland, with public services supporting and in many cases facilitating this development. In addition, researchers from the ESRI have identified significant regional inequities in the supply of non-acute services, advocating for a resource allocation system that relates supply to population need (Smith, et al. 2019).

As explained previously, the National Planning Framework has set explicit objectives for population growth, with one quarter of growth intended to take place in Dublin, one quarter in the other four cities, and the remaining half in towns and rural areas. In this context, it makes sense to examine the existing NDP allocation on a regional basis to see how it fares relative to this key strategic priority.

[5] For example, the stock of maternity and paediatric healthcare infrastructure could be sufficiently low to justify a large investment in these service areas for this investment cycle.
[6] Based on Internal Data

Figure 6: Regional Distribution of NDP Healthcare Investment 2018-2027

County	% of Total Investment
Dublin	63%
Galway	10%
Cork	9%
Limerick	7%
Sligo	3%



Source: Internal NDP Data

In terms of cross-county expenditure, one can see that investment is highly concentrated in only a few counties, with Dublin alone making up 63% of total expenditure. While this distribution may favour a greater level of consolidated healthcare delivery in Ireland, it draws into question whether the existing NDP health portfolio will be able to meet the goal of balanced regional development. As has been highlighted within the NDP, substantial additional investment in the Greater Dublin Area is likely to lead to an *"Intensification of major congestion and bottlenecks that would be expected to arise from a continued concentration of economic and population growth"* in the area.

Issues related to the value for money delivered by healthcare projects may also arise from this distribution, with localised inflationary pressures in Dublin likely to increase the cost of construction projects in this county relative to investments elsewhere. In both cases, policymakers will need to ensure that investment in Dublin versus the counterfactual on a project basis is justified, ensuring that the benefits of Dublin as the choice of location outweighs the known challenges. This is particularly relevant to the decisions around where to locate future National Centres of Excellence for certain healthcare services, with many of these centres currently located in the Dublin region.

4.4 Investment by Project Stage

It is also informative to look at planned investment by project stage, as it has a direct link to the deliverability of projects and the risk associated with the portfolio. As we can see from Figure 7, the majority of projects within the existing NDP are still at their early stages, with 42% of planned expenditure, or €4.2bn of expenditure at the initial appraisal stage. Just 0.18% of projects meanwhile are designated as complete under best available data. At the outset this gives rise to concerns regarding the deliverability of the portfolio in the event of an economic shock. As has been demonstrated through the analysis in paper 1 of the Healthcare Capital Investment in Ireland series, the pro-cyclical nature of Ireland's capital investment position has previously resulted in major changes to planned investment following an adverse economic event. This analysis has the possibility of being relevant in this case, with the large quantity of undelivered projects giving rise to the risk of revisions in the event of an unforeseen adverse event.

Figure 7: NDP Healthcare Projects by Project Stage

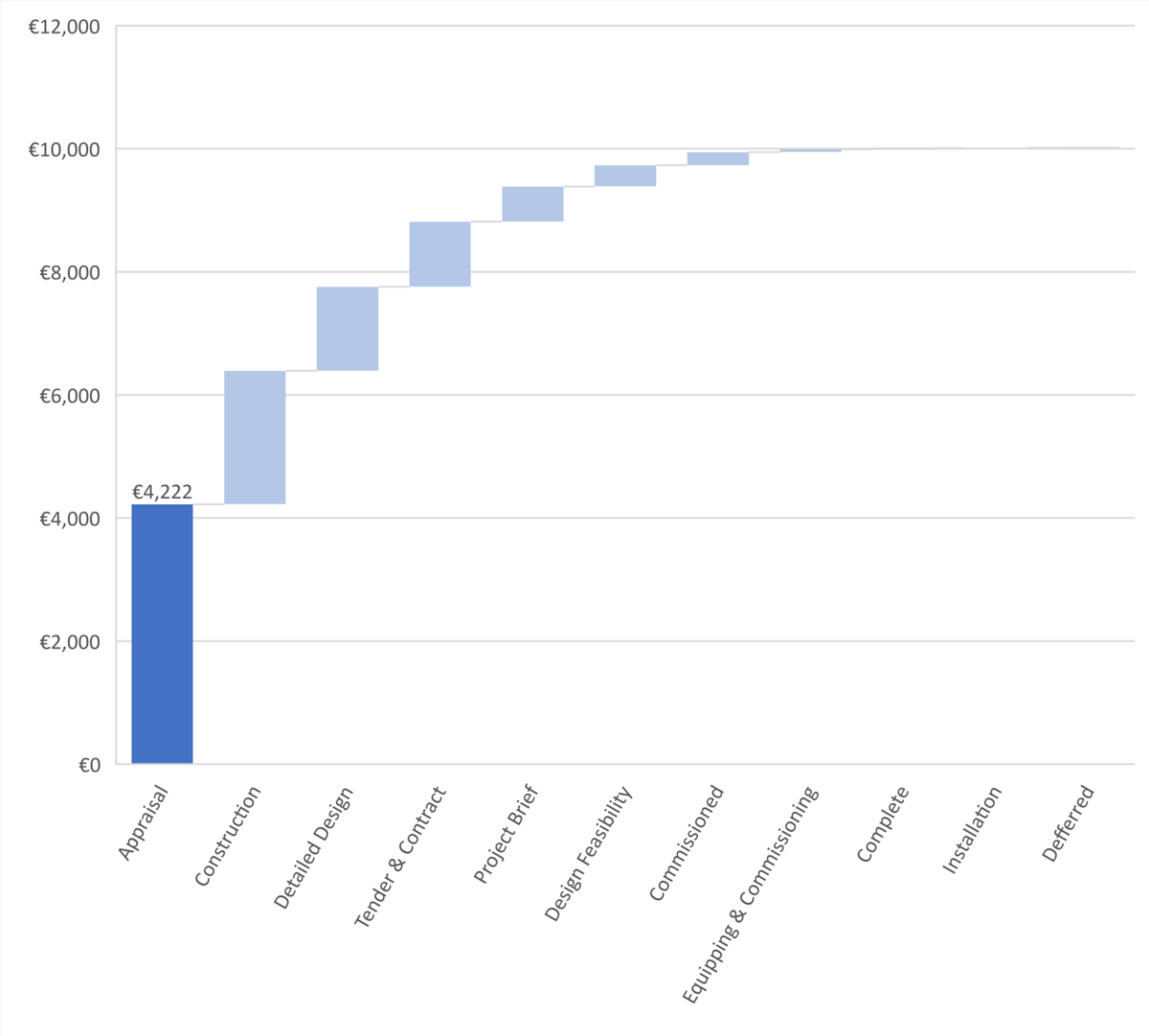
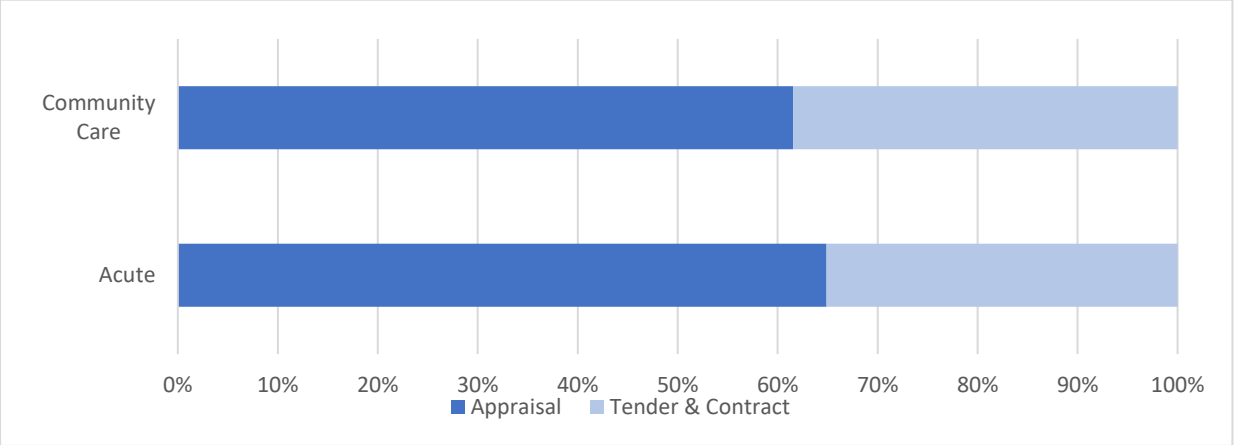


Figure 8: NDP Healthcare Projects by Project Stage, Community & Acute



Source: Internal NDP Data

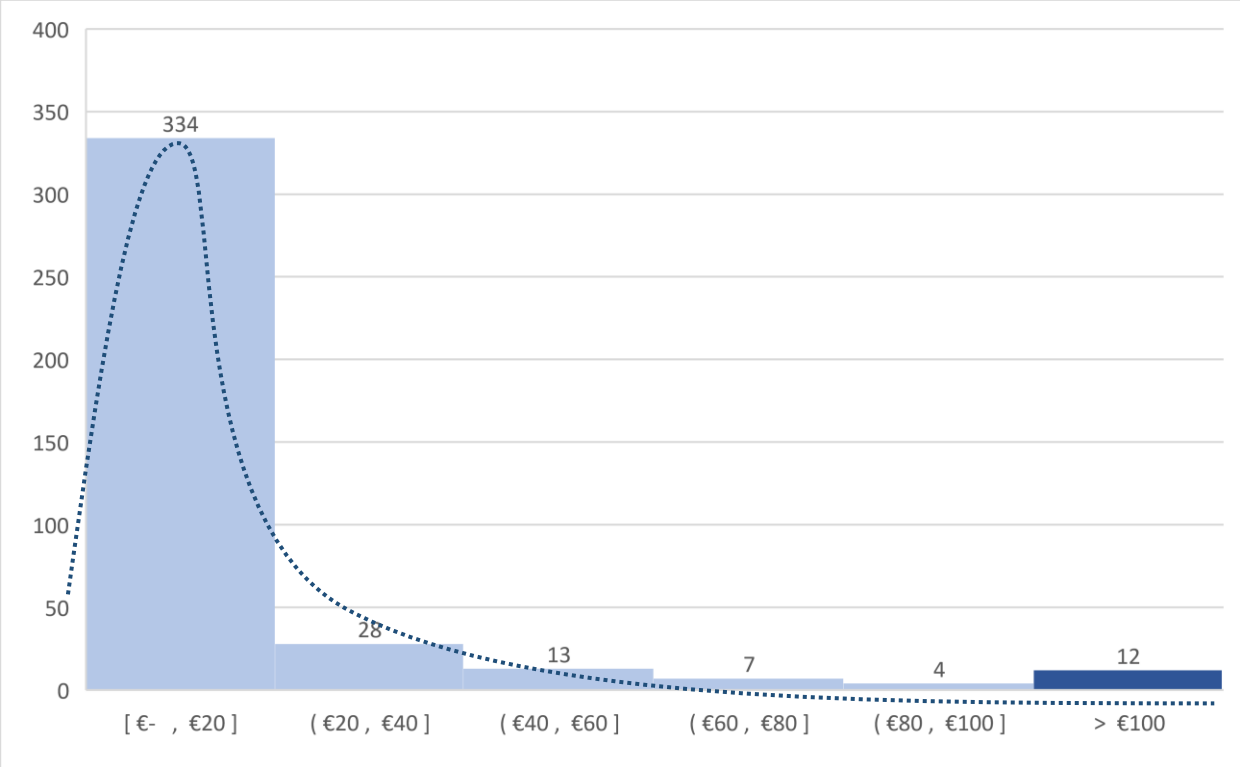
On a project basis, a number of additional risks arise which are also worthy of consideration. One concern arising from this distribution is that policymakers may face a strain on their resourcing as these projects are developed and Public Spending Code requirements are met. As previously highlighted, failures to deliver an adequate appraisal of capital projects constitutes the largest source of variance from a project's initial cost (IMF 2020). In the context of the large number of appraisals needed to deliver the NDP portfolio, it is necessary to ensure that project appraisals remain adequate in spite of this resourcing challenge. In addition, the desire to see health projects completed may see their progression through Public Spending Code guidance subject to *"politically enhanced timelines"* as highlighted by both the World Bank (2014) and Rachel et al. (2009). This also gives rise to additional risk around adequate appraisal, likely increasing cost variance.

A second concern relates to the likelihood of expenditure variance resulting from this distribution of project stage due to forecasting biases. Because so many projects are still in the early stages of development, variance between budgeted and actual spend is likely to be high. As highlighted in the third paper of this series, cost overruns, particularly for projects that are at their early appraisal stages is common. As a consequence, it is likely that a contingency will need to be put in place in the event that cost overruns occur across the outlined portfolio of investments.

A final concern is the limited number of ex-post evaluations that will be available to policymakers from the large number of uncompleted projects. As most projects will be delivered in tandem with each other, there will be limited opportunity to learn from completed projects, weakening the ability of policymakers and project managers to learn from past mistakes. Given that the importance of ex-post evaluation has already been highlighted by the OECD (2017), World Bank (2014) and IMF (2017), it is important to ensure that where possible learnings from completed projects are communicated downstream before the conclusion of the NDP portfolio for this period.

5 Expenditure by Project Size:

Figure 9: Distribution of Projects by Expenditure (€ Millions)



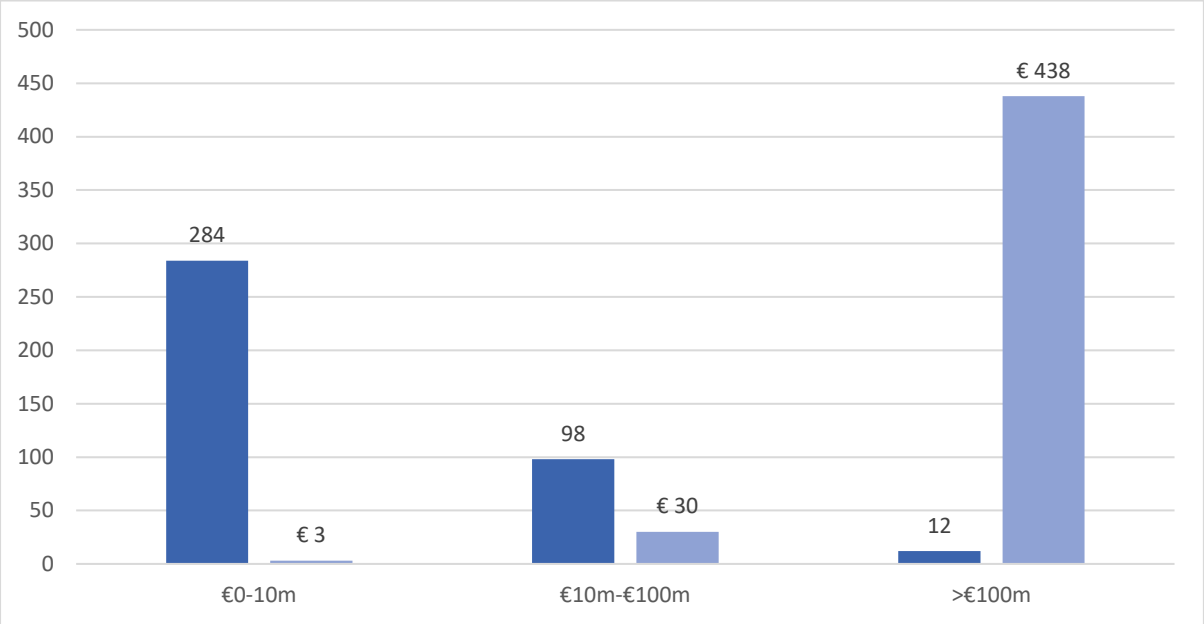
Source: Internal NDP Data

The distribution of projects by expenditure amount can also be examined to inform their management. One can see firstly that the data has a strong right skew, with 344 projects falling into the €0-20m category, comprising just 2% of the total budgeted allocation. In contrast, there are just 12 planned projects in the >€100m category, with an average project value of €438m, making up 53% of the total budgeted allocation. These observations have important implications for the allocation of project management resources across the portfolio. With respect to the high number of low value projects, the large number of these projects may place significant pressure on project managers with respect to their oversight, including answering queries related to ongoing progress. Meanwhile, the relative value delivered through this engagement will be low, given that these projects make up only a small part of the overall healthcare capital portfolio. The low number of high value projects meanwhile may require intensive engagement to ensure that risks are adequately managed, and timelines are adhered to. Overall, the large number of projects combined with the wide variation in project values means it may be necessary for a prioritisation framework to be established over the healthcare NDP portfolio. In doing so, resources may be better targeted towards those projects which are the highest cost and risk.

5.1 Project Size by Care Settings & Public Spending Code Thresholds:

Examining projects on a more minute basis, it is clear that the average cost of the projects within the portfolio is small, with 72% of projects having a total cost of under €10m and only 3% having a total cost above €100m. The average value of projects over €100m is also very high, with a mean value of €438m euros across the twelve projects.

Figure 10: Breakdown of Projects by Cost Estimate 2021

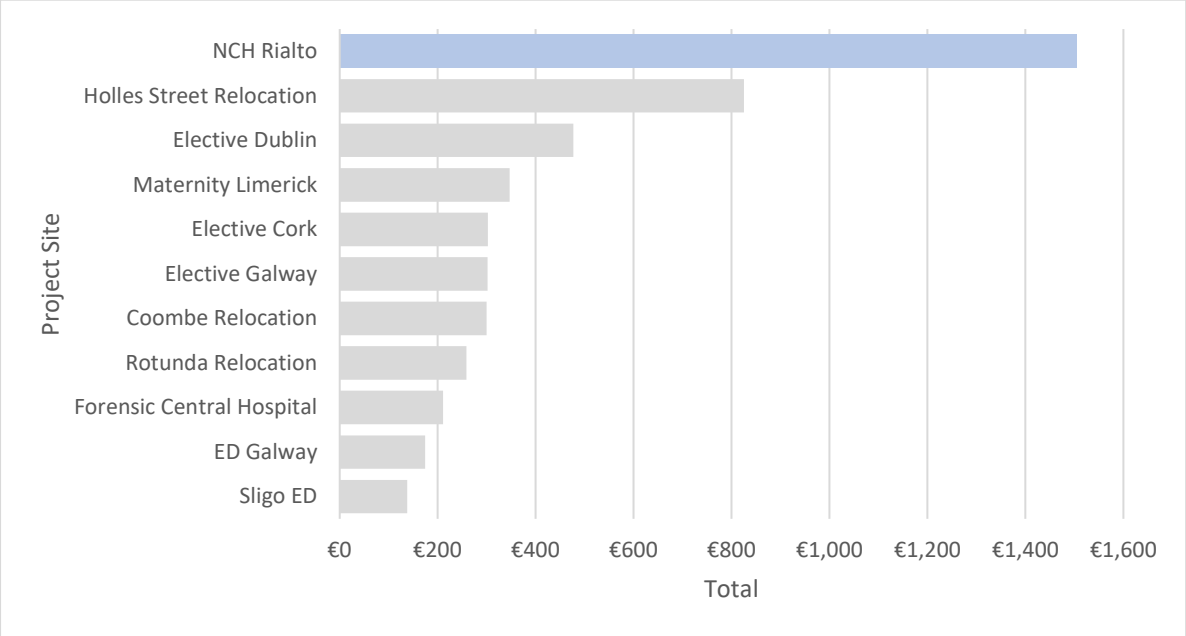


Source: Internal NDP Data

5.2 Projects Over €100m:

In terms of the portfolio as a whole, a clear risk emerges from the very large size of large projects within the portfolio. As will be emphasised in the third paper of the Healthcare Capital Investment in Ireland series, larger projects tend to be subject to increased risks, with even small cost variances likely to have an outsized influence on expected project cost and time to delivery. This analysis can be extended to this particular case, with some projects likely to face similar challenges to delivery as the National Children's Hospital project.

Figure 11: Distribution of Projects with Cost Estimates over €100m



Source: Internal NDP Data

In terms of the specification of large projects, we can see that many of the large projects to be delivered within this investment cycle are similar, with eight of the twelve large projects[7] related to Maternity and Elective Care. The similarity of projects in this context is advantageous, as learnings from the development of a given project can be used to inform other projects of a similar type. In addition, design of these facilities can also be anatomically similar, with elective hospitals in Dublin, Cork, and Galway all likely to have similar builds and systems once operational. In addition, the integration of these new hospitals into the overall health system is also likely to be easier than with a conventional hospital, as new pathways can be designed for their relevant groupings (such as in the case of elective care) rather than on a per hospital basis.

[7] One project of €112m has been omitted from Figure 11 as it relates to enabling works to facilitate the National Maternity Strategy.

6 Policy Implications

6.1 Strategic Investment Framework Development and Implementation

The creation of a strategic investment framework for healthcare will formalise criteria for the prioritisation of capital projects in the health sector. This should allow for a more evidence and needs based approach to healthcare capital investment to ensure that future health capital funding allocations align with National (NDP) and sectoral (Sláintecare) objectives. Such a strategic investment framework can be conceived as a dynamic multi-criteria analysis, where projects are scored against each criterion to provide a comprehensive assessment. Development and implementation of such a framework would result in a more transparent and coherent process by which health investment priorities are selected.

The development of this framework should be completed with a broad data driven approach including engagement from an early stage by all key stakeholders. The implementation and success of such a policy intervention is core to the objective of providing equitable health coverage across the system. Without the development of such a strategy, infrastructure will continue to be built with no coherent distribution by region or care setting across the State.

6.2 Further Development of Evidence related to Healthcare Capital Investment

A significant limitation of the analysis undertaken in this paper is the lack of availability of a healthcare capital stock database. This means the analysis can only identify areas where investment may be not aligned with our expectations or the proposed criteria for the Strategic Investment Framework. From an operational perspective, detailed healthcare capital stock data and the evaluation of investment requirements by care setting and region will be required to implement the framework in practice. It should be noted that the incorporation of stock data was underway but interrupted by the cyber-attack on HSE systems in May 2021. The stock data will instead be the subject of future analysis.

6.3 Greater Alignment of Healthcare Investment Priorities with Health and Overall Government Strategies

For each area of the NDP analysed in this paper, an associated proposal for an improved allocation of healthcare capital investment can be recognised. In each case, further scrutiny of the allocation as it

stands is merited, with potential changes to the NDP allocation helping to better align spending to strategic health objectives and overall government policy. A summary of concerns are as follows:

- The strong correlation between acute and community care expenditure is worth further examination given the desire to move towards more intensive community care service provision under Sláintecare.
- 35% of spend is dedicated to maternity and paediatric care, which may not align with the demand implied by current population projections .
- The regional distribution of health NDP expenditure with the majority of capital investment is planned in Dublin. This is a concern as Project Ireland 2040 clearly targets "Balanced Regional Development" as a strategic priority.
- The large number of NDP projects at their initial stages gives rise to risks associated with the deliverability of these projects, particularly in terms of appraisal and project management expertise.
- The large number of small NDP projects may result in a less than optimal amount of resourcing being dedicated to the management of projects over €100m, potentially exacerbating the risks of delays and cost overruns.

All concerns identified from this analysis are limited by the lack of detailed healthcare capital stock data available to healthcare policymakers. Without further information on the regional and care setting balance of existing health infrastructure, we can only identify potential issues with the planned portfolio of healthcare investments. Further investigation of these issues, especially in light of already existing infrastructure is needed to fully evaluate their appropriateness.

7 Bibliography

Bjorberg, Svein, and Marinus Verweij. 2009. “Life-cycle economics: cost, functionality and adaptability.” In *Investing in Hospitals of the Future*, by Bernd Rechel, Stephen Wright, Nigel Edwards, Barrie Dowdeswell and Martin McKee, 146-166.

Cirillo, Pasquale, and Nassim Nicholas Taleb. 2020. *Tail Risk of Contagious Diseases.* Nature Physics.

CSO. 2017. “Regional Population Projections 2017-2036.” *Central Statistics Office.* Accessed May 13, 2021. https://www.cso.ie/en/releasesandpublications/ep/p-rpp/regionalpopulationprojections2017-2036/.

Degeling, Pieter, and Jonathan Erskine. 2009. “New models of long-term care and implications for service resdesign.” In *Investing in Hospitals of the Future*, by Bernd Rechel, Stephen Wright, Nigel Edwards, Barrie Dowdeswell and Martin McKee, 27-45.

Department of Health. 2018. *Health Service Capacity Review 2018 Executive Report.* Dublin: Department of Health.

DPER. 2018. *Public Spending Code Value for Money Review and Focused Policy Assessment Guidelines.* Dublin: Department of Public Expenditure and Reform.

Flyvberg, Bent. 2019. *The Oxford Handbook of Megaproject Management.* London: Oxford University Press.

Flyvbjerg, Bent. 2009. “Survival of the Unfittest: Why the Worst Infrastructure Gets Built - and What We Can Do About It.” *Oxford Review of Economic Policy* 344-67.

Flyvbjerg, Bent. 2020. “The Law of Regression to the Tail.” *Environ Sci Policy* 614-618.

Government of Ireland. 2019. *Climate Action Plan 2019.* Dublin: Government of Ireland.

Government of Ireland. 2019. *Health Climcate Chnage Sectoral Adaptation Plan 2019-2024.* Government of Ireland.

Government of Ireland. 2018. *National Development Plan 2018-2027.* Government of Ireland.

Government of Ireland. 2018. *Sláintecare Implementation Strategy.* Government of Ireland.

Hennessy et al,. 2021. *Analysis of Historical Capital Investment in Healthcare.* IGEES Spending Review, Dublin: Department of Health.

Hick, John L., Sharon Einay, Dan Hanfling, Niranjan Kissoon, Jeffrey R. Dichter, Asha V. Devereaux, and Michael D. Christian. 2014. “Surge Capacity Principles Care of Critically Ill and Injured During Pandemics and Disasters.” *CHEST* 15-165.

IMF. 2017. *Ireland - Technical Assistance Report - Public Investment Mnagement Assessment.* International Monetary Fund.

IMF. 2020. *Well Spent: How Strong Infrastructure Governance Can End Waste in Public Investment.* Washington DC: IMF.

Lindberg, Clara, and Tiago Mccarthy. 2021. *Impact of Demographic Change on Health Expenditure 2022-2025.* Dublin: Government of Ireland.

NHS Improvement. 2016. *Capital regime, investment and property business case approval guidance for NHS trusts and foundation trusts Annex 4: Strategic outline case - technical requirements.* NHS.

OECD. 2017. *Getting Infrastructure Right A Framework for Better Governance.* Paris: OECD.

Rajaram, Anand, Tuan Minh Le, Kai Kaiser, Jay-Hyung Kim, and Jonas Frank. 2014. *The Power of Public Investment Management.* World Bank Group.

Rechel, Bernd, Stephen Wright, Nigel Edwards, Barrie Dowdeswell, and Martin McKee. 2009. "Conclusions and critical success factors." In *Investing in Hospitals of the Future*, by Bernd Rechel, Stephen Wright, Nigel Edwards, Barrie Dowdeswell and Martin McKee.

Rechel, Bernd, Stephen Wright, Nigel Edwards, Barrie Dowdeswell, and Martin McKee. 2009. "Conclusions and Critical Success Factors." In *Investing in Hospitals of the Future*, by Bernd Rechel, Stephen Wright, Nigel Edwards, Barrie Dowdeswell and Martin McKee, 247-263.

Rechel, Bernd, Stephen Wright, Nigel Edwards, Barrie Dowdeswell, and Martin McKee. 2009. *Investing in Hospitals of the Future.* European Observatory on Health Systems and Policies.

Samset, Knut, and Barrie Dowdeswell. 2009. "Concept Planning: Getting Capital Investment Right." In *Investing in Hospitals of the Future*, by Bernd Rechel, Stephen Wright, Nigel Edwards, Barrie Dowdeswell and Martin McKee, 67-84.

Smith, Samantha, Brendan Walsh, Maev-Ann Wren, Steve Barron, Edgar Morgenroth, James Eighan, and Seán Lyons. 2019. *Geographic Profile of Healthcare Needs and Non-Acute Healthcare Supply in Ireland.* Dublin: ESRI.

Walsh, Brendan, Conor Keegan, Aoife Brick, Sheelah Connolly, Adele Bergin, Maev-Ann Wren, and Seàn Lyons. 2021. *PROJECTIONS OF EXPENDITURE FOR PRIMARY, COMMUNITY AND LONG-TERM CARE IN IRELAND, 2019–2035, BASED ON THE HIPPOCRATES MODEL.* ESRI.

Walsh, Brendan, Seán Lyons, Samantha Smith, Maev-Ann Wren, James Eighan, and Edgar Morgenroth. 2020. "Does formal home care reduce inpatient length of stay?" *Health Economics* 1620-1636.