HealthPathways

HEALTH ECONOMICS CONSULTING

Modelling the economic value of HealthPathways

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Executive summary

Health systems must strategically allocate limited resources to achieve the best health outcomes for their local population. HealthPathways is a care pathways platform that can help to optimise whole-of-system resource allocation. The platform requires ongoing investment for successful implementation. This paper introduces an economic model of the value of HealthPathways to help health systems understand potential outcomes and to inform ongoing investment decisions.

The model employs cost-minimisation analysis over five years, based on global evidence of impact, allowing for variability and uncertainty of real-world implementation. Case studies of HealthPathways from England, Wales, Australia, and New Zealand demonstrate optimised use of diagnostics, effective management of patients in primary care, and decreased secondary care demand. The model adapts these evaluations to a hypothetical OECD country with a population of 5 million, considering factors such as population and disease growth, health system specific costs, and HealthPathways expenses including establishment, membership, writing services, and local programme team costs.

Over 500 simulations, the model shows an average net economic saving of $442.92 million across a five-year period, corresponding to a return on investment (ROI) of 876%, or $9.76 returned for every $1 invested.

This model serves as a starting point for capturing, translating, and understanding the economic value of HealthPathways. While the model includes the full cost of implementation, it only captures the fraction of the value to the health system where there is established evidence and does not account for accumulated value beyond the first five years. This means the estimated value is likely to be conservative. Unmeasured benefits relating to other diseases and time-savings for primary and secondary care, are not captured. Non-monetary benefits such as improved patient and clinician experience, building relationships and trust across the system, and enabling a learning health system to embed change are also not captured. Future modelling can build on this analysis through global collaboration on evaluation across the HealthPathways Community, incorporating long-term benefits, and exploring non-monetary benefits.

Introduction

In a world with finite resources and growing patient needs, health systems must decide how to best allocate resources. Investing resources in one healthcare activity inevitably means sacrificing activity somewhere else in the system. To make consistent and reliable decisions, health systems need to adopt a framework for decision-making. Economic evaluations allow for the systematic comparison of costs and outcomes between the status quo ("what already happens") and a newly proposed course of action, investment, or intervention ("what will/could happen").

HealthPathways provides a health system with a collaborative approach to defining local care processes between primary and secondary care teams. The platform provides a foundation for agreeing and embedding system change to support the quintuple aim of improved patient experience, improved clinician experience, improved population health and outcomes, improved health equity, and best use of health system resources.

This paper, developed alongside a functional and adaptable economic model, lays the foundations for capturing, translating, and understanding the economic value of HealthPathways. The intention is that the adopted approach allows health systems to:

- Understand of the value of HealthPathways from a health system perspective.
- Understand how model inputs and outputs are connected.
- Simulate different scenarios based on local and available data.
- Have meaningful conversations about investment in local implementation.

We recognise the inherent complexity and variability within and between health systems, and that benefits often arise in a non-linear manner. We also appreciate that comprehensive evidence is not yet available and that this is an ongoing process. Irrespective of these hurdles, we aim to adopt a reliable methodology that initiates a conversation around value and ROI. Our team is dedicated to fostering openness and transparency, and is committed to ongoing community collaboration to extend and refine this analysis.

Methodology

Our modelling approach uses well-established health economics tools that are tailored for rapidly modelling and testing alternative hypotheses. It is designed to be flexible for customisation and local implementation while maximising the use of real-world data. The model employs a cost-minimisation analysis (CMA) conducted from a health system perspective over 5 years. We chose a CMA as a practical initial approach given the limited available data on long-term outcomes.

HealthPathways is a whole-of-system intervention that can lead to improvements across multiple facets of the healthcare system. To effectively evaluate its impact, we require a pragmatic starting point. We have chosen to begin by examining global evidence of impact to date, focusing on established and measured implementations of HealthPathways. By combining these case studies, we can measure potential system-level impact and value. It is important to emphasise that while these case studies are specific to certain systems, and may not translate directly to other health systems, they are indicative of potential value. Our model also allows for real-world variability in the measured value.

This section outlines our methodology, including modelling decisions, data and literature, adoption methods, parameter uncertainty, discounting, and model parameters.

Global evidence of impact

The following table summarises case studies from England, Wales, Australia, and New Zealand in several disease and system-level areas. This evidence demonstrates the impact of HealthPathways in:

- Reducing duplication of investigations.
- Reducing secondary care demand as patients are effectively managed in the community.

Notably, these case studies reflect real-world implementations of HealthPathways. They do not assume ideal conditions, or 100% adoption of pathways by clinicians.

DOMAIN	IMPACT	VALUE	REGION
Disease-specific	Diabetes - Decrease in outpatient referrals	**42.5%**	Mackay, Australia[1]
Disease-specific	Orthopaedics - Decrease in shoulder ultrasounds with no increase in physiotherapy referrals	**92%**	Cardiff & Vale, Wales[2]
Disease-specific	Orthopaedics - Decrease in spine MRIs with <5% increase in orthopaedic referrals	**70%**	Cardiff & Vale, Wales[2]
Disease-specific	Orthopaedics - Decrease in knee MRIs with no increase in orthopaedic or physiotherapy referrals	**82%**	Cardiff & Vale, Wales[2]
Disease-specific	Colorectal cancer - Decrease in urgent referrals	**8%**	Cardiff & Vale, Wales[3]
Disease-specific	COPD - Decrease in emergency department presentations	**7%**	Dartford, England[4]
Disease-specific	Diabetes - Shift of referrals seen via specialist outpatient clinic seen via nurse outpatient clinic seen via dietitian outpatient clinic returned to GP with advice	**78% → 47%** **4% → 23%** **0% → 5%** **18% → 25%**	Cardiff & Vale, Wales[3]
System-level	Decrease in acute bed days – conservative estimate set at one third of the 30% reduction achieved in Canterbury.	**10%**	Canterbury, New Zealand[5, 6]
System-level	Decrease in planned care referrals	**21%**	Cardiff & Vale, Wales[3]
System-level	Decrease in planned care admissions	**10%**	Cardiff & Vale, Wales[3]

Table 1 *- Global evidence of HealthPathways disease and system-level impacts.*

Modelling

Our cost-minimisation analysis extrapolates global evidence of impact to a hypothetical OECD country with a population of 5 million. This scale and context allow the model to factor in:

- Population growth.
- Growth in disease prevalence.
- Health system-specific costs (emergency department, specialist, nurse, medical and surgical, general practice, dietitian, radiology, etc).
- HealthPathways-specific costs (establishment and membership fees, writing services, local team costs).

Data sources for model health system

This section describes the data sources used to build our model health system:

- **Diabetes:** Diabetes prevalence is drawn from the Virtual Diabetes Register (NZ). Referral rates for diabetes are informed by publicly available information from the former Auckland and Canterbury District Health Boards.

- **Orthopaedics:** Orthopaedic prevalence and referral rates are sourced from the Joint Registry (NZ) and the Elective Services Patient Flow Indicators Web Tool (NZ).

- **COPD:** Prevalence and emergency department visitation rates for COPD are derived from Barnard & Zhang's study in 2021[8], offering recent insights into the impact and management of this condition.

- **Colorectal cancer:** Prevalence data for colorectal cancer is sourced from the recent research by Waddell and colleagues in 2024[9], supplemented by Statistics New Zealand. Referral rates for colorectal cancer and planned care interventions are validated through data from the National Data Warehouse (NZ) and sensitivity analysis.

- **Planned care:** Parameters such as intervention rates and average length of stay are informed by datasets from the NZ National Data Warehouse and demographic insights from Statistics New Zealand.

- **Acute care:** Bed day utilisation metrics for acute care settings are derived from Statistics New Zealand.

Adoption methods

The impact of HealthPathways takes time to be fully realised. Through modelling, we can simulate how and when health systems benefit from their successes. We have used a phased benefit approach to model the progression of the HealthPathways impact over time. This approach recognises that the full impact of HealthPathways may not be immediate but rather accumulates over time as processes become optimised, healthcare professionals adapt, and patient flows improve. Below is a breakdown of the phased benefits, highlighting the progression from initial implementation to full realisation over the designated years.

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Realised benefit	0%	33%	66%	100%	100%

***Table 2** - Phasing of benefits over time.*

Parameter uncertainty

Stochastic modelling is a technique that introduces elements of random variability into the modelling process to capture the natural variability and uncertainties of input data. This method is useful because it allows the model to more accurately reflect the unpredictability found in real-world scenarios.

Discounting

Discounting costs is a fundamental practice in economic evaluation, essential for ensuring accurate and meaningful comparisons of costs over time. By discounting future costs to present value, we account for the time preference of individuals and society, reflecting the principle that resources have greater value when received sooner rather than later.

Cost of implementation

Costs associated with implementing HealthPathways include an establishment fee, membership fee, writing services, and local programme team costs. The establishment and membership fees are standard for all members. Writing services and local programme team costs are based on the recommended resourcing levels. This is a conservative estimate because many programmes are not resourced to the recommended levels. These expenses have been scaled to align with the operational scale of the model health system. The costs of implementing the Acute Demand Management Service model of care to enable reduction in acute bed days are included in the system-level costing[6].

Parameters

Parameters capture the essential components of our economic evaluation model for a HealthPathways implementation. They include costing parameters associated with health system resources and with HealthPathways, and all other parameters deployed in the modelling process.

Note: All costing data is presented in 2024 New Zealand dollars.

Costing parameters – health system resources

To model the financial implications of implementing HealthPathways we have assumed the following costing parameters associated with each aspect of medical care. The costs associated with various medical services are often modelled using probability distributions to capture the variability and uncertainty in real-world scenarios. In this context, we used a gamma distribution due to its flexibility in representing skewed and strictly positive data.

Parameter	Deterministic value
Emergency department visit	$370
Hospital inpatient bed day	$1,200
Specialist outpatient clinic consultation	$350
Nurse outpatient clinic consultation	$180
Dietitian outpatient clinic consultation	$120
General practice consultation	$80
MRI scan	$1,750
Ultrasound scan	$400
Acute Demand Management Service cost per capita per annum	$15.40

***Table 3** - Costing parameters for health system resources based on New Zealand's PHARMAC cost resource manual[7] and implementation costs of the Acute Demand Management Service[6]. Note that general practice consultation is estimated to be lower cost than nurse outpatient clinic consultation due to overheads of secondary care services.*

Costing parameters – HealthPathways

This section outlines the costing parameters specific to the HealthPathways programme, to enable modelling of anticipated expenses during its first 5 years of implementation. Unlike health system-specific costing parameters, HealthPathways costing is not subject to stochastic modelling (i.e. gamma distribution is not applied), however, these parameters are discounted (see Discounting section above) and scaled to a population size of 5 million.

Parameter	Scaled Year 1	Scaled Year 2	Scaled Year 3	Scaled Year 4	Scaled Year 5
Establishment	$1,234,678	$0	$0	$0	$0
Membership	$2,057,796	$1,995,082	$1,934,280	$1,875,330	$1,818,177
Technical writing	$1,843,785	$1,787,594	$1,733,114	$1,680,296	$1,629,087
Local programme team	$6,584,947	$6,384,263	$6,189,695	$6,001,056	$5,818,167

***Table 4** - HealthPathways implementation costs, adjusted over time as per Discounting section.*

Health system impact parameters

These parameters represent the likelihood of specific outcomes outlined in the Global evidence of impact section above. We have modelled the uncertainty inherent in predicting healthcare changes and outcomes using statistical distributions such as Beta and Dirichlet.

Other parameters

In addition to costing and probability parameters, certain overarching parameters play a critical role in the economic evaluation and modelling process for a HealthPathways implementation. These parameters encompass factors such as discounting rates, population growth projections, disease growth trends, and the handling of uncertainty through stochastic simulations. While not directly tied to specific healthcare services or outcomes, these parameters provide the framework for conducting robust economic analyses and scenario planning. Making sure we understand and include these factors correctly helps the economic evaluation reflect wider trends and uncertainties, which improves its accuracy and usefulness for making decisions.

Parameter	Value
Discounting	5%
Population growth (linear)	1.8%
Disease growth (linear)	1.8%
Standard deviation (if not available)	20%
Stochastic simulations (# of iterations)	500

***Table 5** - Other model parameters.*

Results

This section provides an overview of the findings derived from our modelling.

The results of our analysis are multifaceted and are presented as follows:

1. Net economic effects:

The value is depicted as the difference between total costs before and after implementing HealthPathways, commonly referred to as 'new' minus 'old.' This calculation shows the net economic effects of adopting HealthPathways within the healthcare system (across the five-year period).

> Note: Stochastic modelling provides a snapshot of these net economic effects. To capture the uncertainty surrounding these effects, we repeat the sampling process 500 times. This repetition allows us to understand the distribution around the outcomes, providing a more robust understanding of the potential economic impact of HealthPathways. Through these 500 samples, we can gauge whether the outcomes are cost saving, cost neutral, or cost incurring.

2. Return-on-investment ratio:

The ROI formula, expressed as a percentage, compares the net gains or losses generated by an investment to the initial investment cost. ROI analysis helps stakeholders understand the financial implications of adopting the programme.

3. Breakdown by domain:

- Disease-specific costing: This segment evaluates the economic impact of a HealthPathways implementation on specific disease areas, including diabetes, orthopaedics, COPD, and cancer.
- System-level costing: Here, we examine the economic implications of adopting HealthPathways on the broader healthcare system, focusing on acute and planned care impacts.
- Combined costing: Combining disease-specific and system-level costing, this section offers an assessment of the overall economic impact of HealthPathways.

The following table represents the average net economic effects over 5 years by domain, its associated confidence interval, and an ROI percentage (across 500 simulations).

> Note: The net economic effects show the difference between total costs post-HealthPathways implementation and total costs pre-implementation, so a negative figure indicates that pre-implementation costs are higher and therefore reflects a cost saving.

	Disease-specific Costing	System-level Costing	Combined Costing
Mean	$9,715,068	−$402,069,321	−$442,921,597
95% Confidence Interval	−$16,049,373 to $35,611,636	−$874,774,035 to $73,059,520	−$916,853,647 to $33,440,874
ROI	-19% $0.81 return for every $1 invested	795% $8.95 return for every $1 invested	876% $9.76 return for every $1 invested

***Table 6** - Summary of disease-specific, system-level, and combined costings and return on investment (ROI). Negative numbers reflect a net saving. The combined cost saving is greater than the sum of the parts because the implementation costs are spread across both disease and system-level cost savings.*

Across 500 simulations of the model:

- Disease-specific costing resulted in cost savings in only 19% of simulations.
- System-level costing resulted in cost savings in 99% of simulations.
- Combined costing resulted in cost savings in 100% of simulations.

Discussion

The economic model presented here is our first attempt to translate health system outcome evaluations of HealthPathways into economic value. Recognising the limited scope of existing evaluations of HealthPathways, the model amalgamates results from the most significant global evaluations to date. The amalgamated results do not cover all aspects of potential health system impact, so the model is likely to be a conservative estimate of the economic value of HealthPathways. Further evaluations are needed to increase the breadth of coverage of potential impacts and to strengthen the transferability of the findings between countries.

Despite these limitations, this model suggests that effective implementation of HealthPathways can have a significant economic benefit for a health system. In practice this may not translate directly into immediate savings for the health system. This is due to inflexibility in how system resources are allocated and underlying growth trends in population and disease prevalence. The savings are more likely to manifest as preservation of existing service levels despite underlying growth trends, reduction in waiting times for priority conditions, and greater flexibility in the allocation of any new resources.

Evaluation of equivalence of patient outcomes

Cost-minimisation analysis assumes equivalence of patient outcomes before and after the intervention. While some of the evaluations included in this model reported on balancing measures to suggest that changes in service utilisation did not have adverse effects on patient outcomes, longer-term follow-up is needed. For example, reduced utilisation of musculoskeletal radiology in Wales did not lead to increases in referrals to orthopaedic or physiotherapy services, however, there was no follow-up of individual patients.

Evaluation of non-monetary benefits

While cost-minimisation analysis provides a useful initial insight into value, to comprehensively understand the value of HealthPathways we will need to explore the broader non-monetary benefits that extend beyond economic considerations (cost-utility analysis). Through interdisciplinary collaboration and patient-centred research approaches, we can potentially develop methodologies to quantify and evaluate these benefits, including improvements in patient satisfaction, quality of life, and clinician experience.

Long-term value

While our current evaluation offers insights into outcomes over 5 years, the long-term value of HealthPathways implementation is an important area for ongoing exploration. This will require partnering with community members to engage in longitudinal studies.

Opportunity to collaborate

The HealthPathways Community is already collaborating on pathway development. There is an opportunity for greater collaboration on the methodology and research needed to build a more comprehensive model of the economic value of HealthPathways. This paper is presented as a starting point for this discussion. By pooling resources and expertise, we can potentially develop globally standardised protocols and tools to streamline data acquisition and analysis. We can also potentially collaborate globally to make the most of routine operational health system data, alongside specialised data collection efforts. This will enable a more robust assessment of the impact of HealthPathways across diverse healthcare settings.

Adaptation to local context

All parameters in the model including population, disease prevalence, impact, cost, and phasing of benefits can potentially be adapted to local context if there is more relevant local data available. We intend to iteratively refine and localise the model in partnership with the HealthPathways Community.

Relevance to Australian context

This model includes relatively little evidence from Australia due to the limited available evaluations of health system impact in Australian implementations. Nevertheless, the disease-specific outcomes achieved for diabetes in Mackay, which are consistent with similar outcomes achieved in Wales, hint that outcomes can translate to an Australian context with effective implementation of HealthPathways. As noted above, there are opportunities to broaden and strengthen the model through collaboration with Australian members to complete evaluations of Australian implementations.

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