Aide-Mémoire

Waikato Medical School Cost Benefit Analysis – additional talking points

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To:	Minister Dr Shane Reti		

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Purpose

This memo follows our meeting of Friday 2nd August, 2024, and provides notes that might be used as talking points on: key assumptions and uncertainties; likely critiques; the key differences between the options; and a full list of non-monetised benefits.

Talking points

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Key differences between the options

	Option 1	Option 2	Option 3
Intake student-type	Undergraduate (68%) and postgraduate (32%)	Undergraduate (68%) and postgraduate (32%)	Postgraduate only
Length of medical training	6 years (5 years for postgraduate entrants)	6 years (5 years if postgraduate)	4 years
Medical training programme description	Status quo medical training programme.	New interprofessional school of rural health, within provincial and rural areas. Administered by Universities of Auckland and Otago with partners	New provincial and rural-focused graduate entry medical programme operated by a new medical school at the University of Waikato.
Medical curriculum	Status quo	Status quo	s 9(2)(f)(iv) [redacted]
Length of medical training spent on rural or provincial placement	Status quo	1 year	2 years
Additional doctor FTEs by 2042	**1,424 FTE**	**1,499 FTE**	**1,551 FTE**
Propensity to be a GP	23%	35%	42.5%
Exit rate of GPs (We are tracking down the "current rate")	Current rate (as per status quo)	¾ of current rate	½ of current rate
Additional GP FTEs	**130**	**206**	**258**
Additional rural GP FTEs	**29**	**82**	**115**

We can provide further information summarising the differences in assumed costs and benefits if that would be helpful.

List of non-monetised benefits included qualitatively in the CBA report

14. Improvement in access, health and wellbeing outcomes of the additional doctors (who do not become GPs - the CBA includes only GP-related benefits)

15. The health and wellbeing benefits of greater continuity of care, and delivery using changed models of care such as Health Care Homes.
16. The economic impacts of improved health and wellbeing (although partly captured through the Value of a Statistical Life, used to value reduction in mortality).
17. Reduction in Ambulatory Sensitive Hospitalisations (ASH), and other impacts on the wider health system including on referrals for specialist appointments and on acute admissions.
18. Benefits to primary care practices from student placements
19. Impact on quality of medical education of increased competition for students
20. Real option value of increasing capacity, allowing for the possibility of future changes.

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Waikato Medical School cost-benefit analysis

Prepared for the Ministry of Health

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Glossary

Abbreviation	Stands for
ASH	Ambulatory sensitive hospitalisations
BCR	Benefit-cost ratio
CAPEX	Capital expenditure
CBA	Cost-benefit analysis
CFI	Call for information
ED	Emergency department
FY	Financial year (1 July of the prior year to 30 June of the calendar year stated)
GPs	General practitioners
Health NZ	Te Whatu Ora | Health New Zealand
HEAP	Health economics analytical plan
LCI	Labour cost index
MR	Mortality rate
NPV	Net present value
OPEX	Operating expenditure
PGY	Postgraduate year
The Ministry	The Ministry of Health
RNZCGP	Royal New Zealand College of General Practice
UPC	Usual provider of care
VOSL	Value of a statistical life

Acknowledgements

We acknowledge the input from the Ministry of Health (the Ministry) and, through it, Te Whatu Ora | Health New Zealand (Health NZ), those working on the Better Business Case elements for the Waikato Medical School, the Universities of Auckland, Otago and Waikato as well as the panel of experts who helped test our approach and assumptions. That panel included: Gregor Coster (Chair, Emeritus Professor at University of Auckland and previously at Victoria University), Luke Bradford (The Royal New Zealand College of General Practitioners), Jo Scott-Jones (Pinnacle Health), Ross Lawrenson (University of Waikato), Phillippa Poole (University of Auckland), and Peter Crampton (University of Otago).

These people were generous with their time and their input helped inform the analysis underpinning this report. However, the views expressed in this report are those of the authors only and should not be taken as representing the views of any of the individuals engaged with during the process, nor any of the organisations they are associated with.

Executive summary

Our CBA fits as part of a wider business case process

We have been engaged to provide a cost-benefit analysis (CBA) of a proposed new medical school at Waikato University. Our CBA forms part of a wider business case process, with investment objectives and options agreed by Cabinet.

We focus on medical training in the context of existing arrangements

Doctors are regulated in New Zealand and the Crown has a significant role in terms of funding domestic training. Cabinet approves the number of domestically trained doctors.

We consider four options in relation to medical training ranging from status quo to a new medical school

We considered four options:

- Status quo (option zero)
- Option one: increasing the current intake of medical students by 120 per annum under current operational models, including the expansion of rural immersion programmes.
- Option two: establishing an interprofessional school of rural health AND increasing the annual intake of medical students by 120.
- Option three: establishing a new primary care-focused medical school at the University of Waikato AND increasing the annual intake of medical students by 120.

Our analysis is informed by Cabinet's investment objectives, looking to the anticipated impacts

The investment objectives for this project primarily relate to increasing the coverage of the primary care health workforce in rural communities and ensuring responsiveness and 'quality of fit' to New Zealand's health sector needs. Rural communities experience lower rates of coverage across many health professions. Due to the nature of primary care, low coverage can have pronounced impacts on health outcomes (Tham et al., 2010). However, increasing or decreasing the number of general practitioners (GPs) is an input, rather than a benefit per se. Nevertheless, alongside our CBA results, for each option we present the estimated change in the number of GPs practising, and the setting in which they are expected to practise, to align with the investment objectives.

Options one, two and three all provide benefits expected to exceed costs, with the highest net present value coming from option three

Table 1 shows that option three generates a monetised net present value (NPV) of between $0.5 billion and $4.6 billion (with a central estimate of $2.5 billion). Under our central estimate, option three provides the greatest overall net monetised benefits—that is, its monetised benefits exceed its monetised costs (both in today's terms) by the greatest amount. This is consistent with it producing the most additional GPs (both rural and urban) and doctors by 2042. Option three also has the highest non-monetised benefits, and under our central estimate, provides the most monetised benefit per unit of monetised cost, with a benefit-cost ratio (BCR) of 2.7.

The monetised benefit is the decrease in mortality attributable to general practitioners. The NPV is highly sensitive to the assumptions made about the amenable mortality reduced because of the intervention, and the discount rate applied. Even under our most pessimistic one-way sensitivities, each option still results in a positive NPV.

Table 1: Results summary ($millions or as stated)

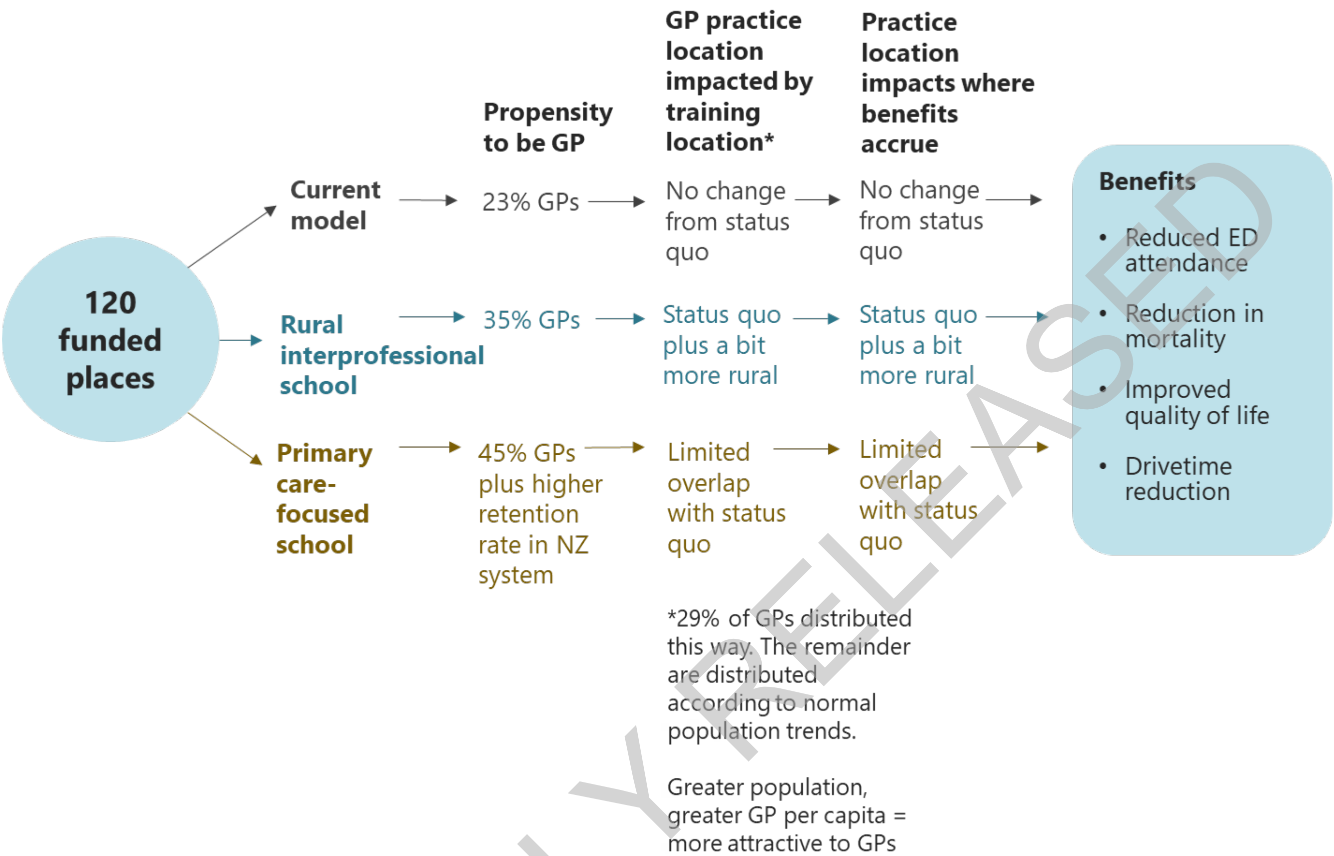
	Option one	Option two	Option three
Monetised costs	$667 - $1,108	$843 - $1,538	$1,009 - $1,882
Monetised benefits	$994 - $3,066	$1,558 - $4,810	$1,951 - $6,023
NPV (central estimate in brackets)	$106 - $2,179 (**$1,099**)	$368 - $3,619 (**$1,926**)	$1,015 - $4,577 (**$2,457**)
BCR (of central estimate)	**2.2**	**2.6**	**2.7**
Non-monetised benefits	Least benefit	Benefits in matching, continuity of care and health access	Greatest benefits from matching, continuity of care, competition and option value
Total additional GP FTE (2042)	131	206	258
Total additional doctors FTE (2042)	1,420	1,500	1,550

The monetised costs incorporated above include operating expenditure and capital expenditure as well as the costs of additional GP care and other economic costs. A terminal value is also estimated. While operating expenses are lower for option three, it has higher capital expenditure. The costs of providing care from the additional GPs are the most significant component and are highest under option three and then option two.

Option three is successful as it has the highest proportion of GPs

The investment objectives make it clear that additional general practitioners are the goal of the investment and option three leads to the largest number of general practitioners. From that larger number of practitioners flows both monetised and non-monetised benefits. The flow through of these assumptions is shown in the chart below.

Figure 1: Non-monetised benefits flow chart



Option three has the highest cost, but GP numbers increase sufficiently to overcome this

Option three represents the largest capital investment, and therefore the highest onus is on this option to produce sufficient benefits to outweigh this cost. Our base case assumptions lead to noticeably higher GP numbers, while there is a more marginal increase in the number of doctors when all specialities are considered. When considering break-even analysis, option three requires the most life-years to be saved (as it has the highest cost). However, as it produces relatively more GPs, it requires the least life-years to be saved *per GP*. This illustrates the degree to which the assumptions underpinning this analysis increase the number of GPs in the system, and therefore the number of life-years that can be saved. The ability to realise the assumed additional benefits under option three is key to this more expensive option providing good value for money.

Non-monetised benefits are likely to exceed monetised benefits

The non-monetised benefits include other health effects such as additional quality of life, increased health systems resilience (including lower overall costs such as reduction in pressure on emergency departments and increased general practice resilience), distributional effects (including addressing amenable mortality and morbidity in the areas directed by the investment objectives), and dynamic effects which might emerge over time.

Those non-monetised benefits flow in direct relationship with increased general practitioner numbers. In other words, the options do not change in order of preference. The NPV for each of options one through three do not include non-monetised benefits that are material and therefore are understated.

Our results need to be considered in the context of the wider investment logic, level of uncertainty, and number of dependencies

There is a high degree of uncertainty in our estimates given the nature of the investment and the time available. Key uncertainties and limitations include the following:

- The causal link and timing of impact between the location and approach for training medical students and improvements in health outcomes.
- The applicability of prior findings to the future context in New Zealand.
- Reliance on information available to us and limited review in the time available.

The modelling of benefits and the operational costs associated with additional GP visits extends to 2072, while all other modelling extends to 2042. This is due to our workforce modelling only including the workforce impacts of training an additional 120 medical graduates per annum out to 2042, while acknowledging that those trained will continue to provide benefits over the course of their careers.

Table 2: Options comparison

All dollar values are in millions. The presented rounding may result in numbers not aggregating perfectly.

	Option one: Increase current intake	Option two: establish an interprofessional school of rural health	Option three: establish a new medical school at the University of Waikato
Description			
	Funding for additional medical students across the existing medical schools and current training programmes and including the expansion of rural immersion programmes.	Establish an interprofessional school of rural health, providing undergraduate and postgraduate training experiences for medical students (and a range of other health professionals) in provincial and rural areas. It would be run by (one or both of) the Universities of Auckland and Otago medical schools (potentially with partners).	Establish a provincial and rural-focused graduate entry medical programme operated by a new medical school at the University of Waikato.
Course			
Entry	Same as existing, undergraduate and post-graduate		Post-graduate
Structure	Same as existing	A coordinated approach to rural health professional learning and research embedded in rural areas.	A medical program focusing that aims to produce graduates who work in rural and remote areas by focusing on rural origin and rural clinical exposure during their training
Length	5-year medical school course (plus a one-year entry course, or qualifying degree)		4-year medical school course (plus qualifying degree)
Placement	80 weeks HNZ 18 weeks GP Total: 98 weeks		68 weeks HNZ 36 weeks GP Total: 104 weeks
Rural schooling	Same as existing, primarily via RMIP	1 year	2 years
Additional students	120 additional medical students		
Academic costs			

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Workforce Outcomes			
Workforce assumptions			
Propensity to be a GP	23.0% Assumed to be the same as status quo	35.0% Reduced from Wollongong outcomes as not quite full replication	42.5% Based on Wollongong outcomes
GP Exit rate	Current rate	75% of the current rate Decreased rate evidenced by Kwan et al (2017)	50% of the current rate Decreased rate evidenced by Kwan et al (2017)
Rurality rate for GPs	21.9%	40.0%	55.4%
Workforce outcomes 2042			

GP FTE Rural Urban Rounded to nearest 1	131 29 102	206 82 123	258 143 115
Total doctor FTE	1,420	1,500	1,550

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[redacted]

Benefits Per GP FTE benefits are assumed to be the same, therefore GP benefits are proportional to the number of additional GPs generated from each option			
Reduction in mortality (to 2072)	$1,987M	$3,117M	$3,903M
Breakeven points			
Life year break-even: These results show the additional life required to break-even, with no further benefits			
Life-years	6,735	9,022	10,959
Life-years per GP FTE	1.7	1.5	1.4
Additional life-days per year per patient	0.45	0.38	0.37
	Assumes a 30-year GP career with a practice size of 1,400 patients		
Additional GP FTE break-even: These results show the additional number of GP FTE required to break-even based on mortality benefits			
Additional GP FTE by 2042	32.6	32.7	36.5

1. Introduction

The Ministry of Health (the Ministry) and the University of Waikato have signed a memorandum of understanding to develop a programme of work related to a new medical school (Ministry of Health, 2024b). The Coalition Agreement between the New Zealand National Party and ACT New Zealand noted that a "full cost-benefit analysis must be presented before any binding agreement is made with respect to the Waikato Medical School" (New Zealand National Party & ACT New Zealand, 2023).

As part of the wider business case for a new medical school, we have been engaged by the Ministry to do the following:

1. Produce a cost-benefit analysis (CBA) of a new medical school.
2. Produce an economic case within the detailed business case for a new medical school.[1]
3. Contribute to the economic case of the programme business case for a new medical school.

This report contains a CBA of the short-list of options to increase general practitioner (GP) coverage in rural New Zealand via additional medical students.

1.1 Context, problem definition and investment objectives

New Zealand has a medical professional shortage

Nationally, there is a shortage of medical professionals in New Zealand. These shortages are forecast to increase in a number of areas (Te Whatu Ora, 2023). In addition, current training and overseas recruitment are forecast to be insufficient to meet current levels of service provision in the future.

GP shortages are particularly acute, with a Royal New Zealand College of General Practitioners (RNZCGP) survey suggesting that 44 per cent of the 2022 GP workforce will retire by 2027, placing additional pressure on an already strained health system (The Royal New Zealand College of General Practitioners, 2023).

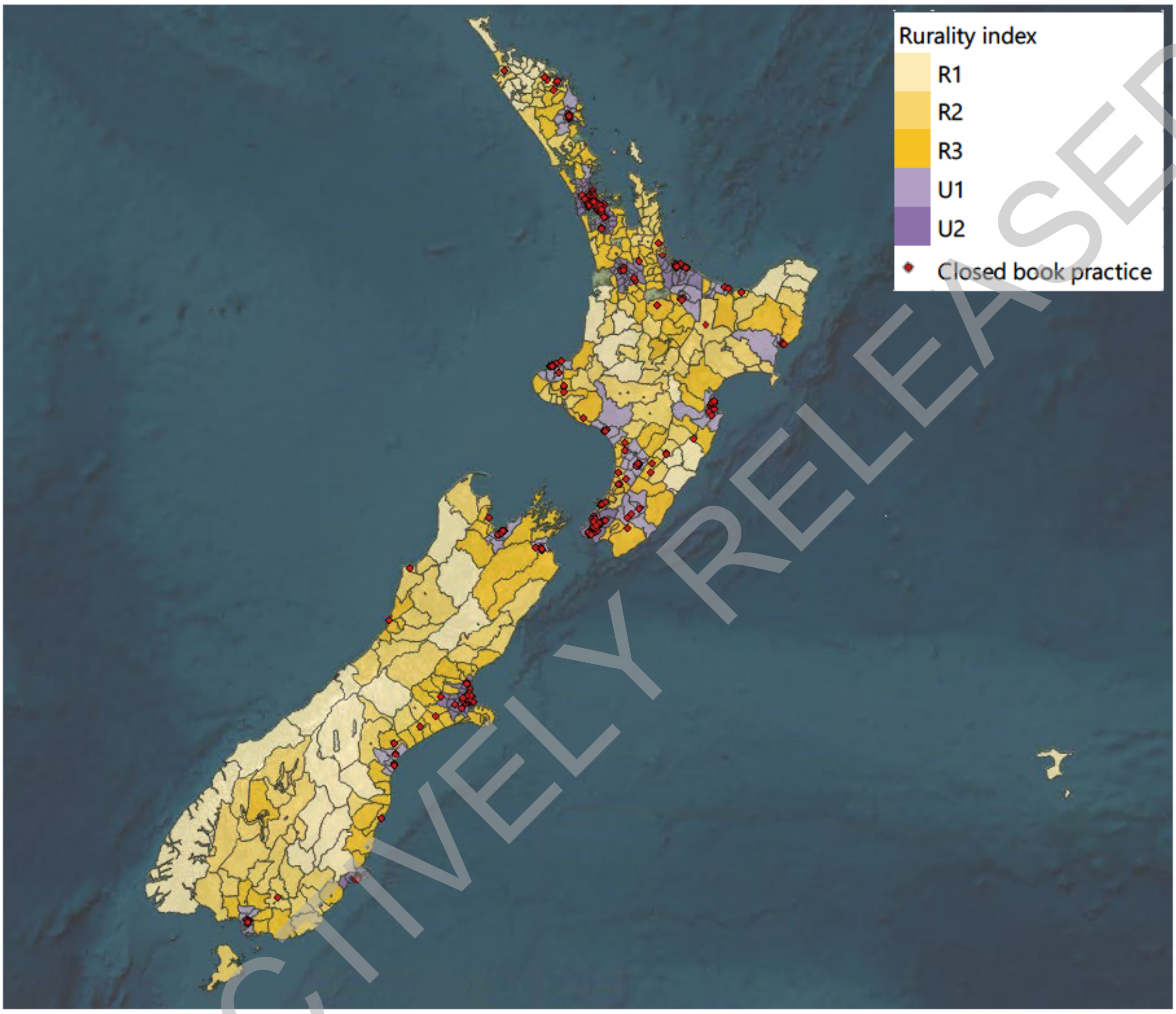
There are lower rates of GPs per capita in rural communities than in urban areas. Around 16 per cent of GPs in New Zealand are working in rural communities, compared with a population proportion of 24.3 per cent, while 71 per cent of GPs work in urban areas serving 65.5 per cent of the population (Bagg et al., 2023). 58 per cent of rural practices are advertising GP vacancies, and an increasing number of rural hospitals are reporting withdrawing from afterhours and twenty-four seven emergency services due to staff shortages (Hauora Taiwhenua Rural Health Network, 2023; Hauora Taiwhenua Rural Health Network et al., 2022).

Further evidence of the GP shortage may be seen in the level of practices that are not taking on new patients ('closed book' practices). Of the 1,082 GP practices nationwide, 31 per cent have closed

[1] See (The Treasury, 2023).

books.[2] When isolating analysis to rural practices only, this number is 23 per cent. Figure 2 displays the distribution of closed book GP practices, and the rurality of the practice location (based on the Geographical Classification of Health).

Figure 2: Distribution of closed book GP practices, 2023



Arrangements are not currently meeting, or expected to meet, these needs

The arrangements in the health system include restrictions, for public safety reasons, on who is able to undertake regulated medical roles, and their scope of practice (Health Practitioners Competence Assurance Act 2003 No 48 (as at 15 June 2023), n.d.). This necessitates registration requirements for different medical professionals, impacting what is needed to supply these services in New Zealand. A further influence is the number of domestically trained medical professionals, with Cabinet approving the number of domestic medical students that are funded each year (given the interface with both tertiary funding and the health system more broadly to support training). The Crown also agrees

[2] Data provided by the Analytics and Forecasting team, National People Services, Health NZ.

funding arrangements for general practices receiving Crown co-payments and for other Crown-funded medical services and negotiates pay for medical professionals it employs in the public sector.

The current arrangements are struggling to produce sufficient medical graduates and attract them to practise primary care in rural communities. While medical students from rural backgrounds have greater odds of working in rural practice after their studies have been completed (Kwan et al., 2017), the evidence is that New Zealand is training predominantly urban students who prefer to live and work in urban areas once they graduate (Hauora Taiwhenua Rural Health Network et al., 2022). The rate of medical programme admissions for rural students is half the urban rate. This applies equally to rural Māori and rural non-Māori.

Health outcomes could be improved by greater access to care

Greater access to primary care could significantly improve the health outcomes of the population at large, and particularly so for rural and certain ethnic populations (Tham et al., 2010). With further workforce shortages forecast, increasing the number of doctors, particularly GPs serving rural communities, is paramount. The options analysed in this report all act to increase the number of medical graduates. With differing student selection methodologies and teaching models that improve retention rates, the propensity of graduates to become GPs and/or work in rural areas also differs.

We assess specified options, consistent with agreed investment objectives

Our analysis considers the costs and benefits of options identified to increase medical school graduates. Ultimately, the main outcome of interest is the improvement of health outcomes of populations living in rural and other underserved communities. An interim or proxy measure of this is the number of primary care doctors operating in these communities.

Investment objectives

- More doctors who are trained in New Zealand.
- A high-quality medical graduate cohort that has the skills and experience to meet the needs of local communities.
- A medical curriculum that is aligned to health system needs, providing the skills and capabilities to: i) meet the needs of people in rural, provincial, and high-needs communities, and ii) work effectively within interdisciplinary teams.
- Clinical placements that provide greater exposure to rural areas and in primary care settings.
- Consideration and management of students' academic, cultural, and broader wellbeing needs.
- Increased training and placement capacity and capability in health settings with: i) clear expectations, resources, infrastructure, training, and time for the health workforce to provide clinical supervision and mentorship, and ii) more health providers across the full breadth of health settings providing clinical placements.

We specify our assumptions and test sensitivities, noting benefits and outcomes are influenced by key dependencies and external factors

Where assumptions have been made, we have applied the principle of conservatism. We also test the sensitivity of the results to key assumptions. There are several dependencies and key external factors relevant to achieving the resulting health outcomes. Most of these are beyond the investment objectives and beyond our scope to consider as individual options.

- Relative pay and broader funding for general practitioners/primary care practices.
- Incentives and operating models for general practitioners to work in rural locations.
- Any support for access to the health system.
- Regulation of medical training and who is able to practice medicine in New Zealand.
- Potential changes in models of service provision (such as the role of online consultations or nurse practitioners relative to GPs).

1.2 Scope of our CBA and its limitations

Our cost-benefit analysis (CBA) aligns with the New Zealand Treasury's guide to social cost-benefit analysis (The New Zealand Treasury, 2015).

Our CBA focuses on the costs and benefits of each option at the national level. This includes both measurable and monetisable costs and benefits, and non-monetiseable benefits. We also consider sensitivity to key assumptions and inputs.

1.2.1 Limitations

The limitations of our analysis, given the time available, include the following:

- The key outcomes and benefits, such as improved health outcomes, arise indirectly. The options provide for additional medical students compared to the status quo, differing predominantly by their location and curriculum. While a causal link is logical and expected, the benefits accrue over time and at a system level. This results in significant uncertainty, exacerbated by the delay between making the investment and an increase in the size of the health workforce.
- Our analysis relies on past research both in New Zealand and overseas. The findings observed historically and/or internationally might not replicate themselves in the future New Zealand context. Our sensitivity analysis and a degree of conservatism in assumptions attempt to address this, among other limitations.
- This work has been undertaken rapidly due to a short timeframe. This has limited the level of (peer) review, analysis and checking of information provided to us. Some of this information has been provided by key stakeholders. The timeframe has also limited the scenarios/sensitivities able to be considered.
- Workforce modelling by Health NZ, a key input into our modelling, only extends to 2042. Any investment decisions made today, especially capital investments, provide benefits well past this timeframe.

Where there are limitations relevant to certain aspects of our analysis, we highlight these as these aspects are discussed.

1.3 Key inputs drawn on when developing this CBA

In developing this CBA report, we have:

- reviewed existing relevant literature and material available in relation to the identified options. This includes the Cabinet paper, materials provided by the Ministry of Health and other government agencies in relation to respective options, literature scans, and draft business case material
- submitted a call for information (CFI) for key inputs needed in developing the CBA
- outlined, and obtained feedback on, our overall analytical approach by way of a health economics analytical plan (HEAP). The HEAP, key assumptions, analysis, and results were also tested with our expert panel.

1.4 Outline for the remainder of this report

The remainder of this report sets out:

- options assessed (section 2)
- methodology (section 3)
- workforce modelling outputs (section 4)
- costs under each option (section 5)
- benefits under each option (section 6)
- CBA results (section 7).

2. Options assessed

We were instructed on options to be considered in the CBA. These options align with the drafts of the programme business case and its economic case, which outline the options in greater detail and their expected pros and cons. Our CBA draws on these documents when estimating the costs and benefits but is undertaken independently from them. The draft business case also considered a wider set of options for different kinds of interventions, such as different incentives to attract doctors to general practice and rural settings. However, these options were not short-listed and therefore have not been analysed in our CBA.

Below, we outline the status quo and the three options under consideration in the CBA for addressing New Zealand's doctor and GP shortage issues. The status quo, or option zero, is the counterfactual which we compare the alternative options to. It includes the factors that currently exist in New Zealand's health system, or that have already been announced.

Table 3: Options assessed

Option	Description of option
Zero: Status quo	This includes current trends for GP workforce training and any already planned policy or operational changes, e.g. the two medical schools' curriculum, capacity, duration of medical qualification and student selection criteria, and rural immersion programmes with limited places.
One: Increase current intake	Funding for an additional 120 medical students across the existing medical schools and current training programmes and including the expansion of rural immersion programmes.
Two: Establish an interprofessional school of rural health	Establish an interprofessional school of rural health, providing undergraduate and postgraduate training experiences for medical students (and a range of other health professionals) in provincial and rural areas. It would be run by (one or both of) the Universities of Auckland and Otago medical schools (potentially with partners). It is assumed that an additional 120 medical students are trained under this option as well.
Three: Establish a new medical school at the University of Waikato	Establish a provincial and rural-focused graduate entry medical programme operated by a new medical school at the University of Waikato. This would be a four-year post-graduate programme; one year at the University and three mainly on placement/internship. It is assumed that an additional 120 medical students are trained under this option as well.

3. Methodology

This section outlines the six steps underlying our CBA (including components to come in subsequent versions):

1. Review counterfactual and options.
2. Define the scope and analysis period.
3. Identify costs and benefits.
4. Measure and (where possible) monetise costs and benefits.
5. Conduct sensitivity analysis and risk assessment.
6. Compile CBA report.

The CBA has sourced information from drafts of the programme business case, and the strategic and financial case of the detailed business case, including:

- investment logic mapping, including the anticipated outcomes and objectives
- current state and three specified options
- the estimated cost of the do-minimum (current state) and three alternative options
- data collected from stakeholders by the Ministry.

We have added to these inputs by gathering further evidence from our own literature review, information provided by stakeholders (including following our CFI), and input and assumption testing by an assembled panel of experts. Details of our key assumptions, key context and modelling are set out in the appendices.

3.1 Steps in approach

Below we provide further detail on the six steps outlined above.

Step one: Review the counterfactual and options

This step consisted of the following tasks:

- Assessing the current state of medical education and the healthcare workforce.
- Determining assumptions based on trends in healthcare demand, educational capacity, and workforce needs.
- Detailing the scope, objectives, expected outcomes, and educational capacity for each option.

Information was drawn from:

- a review of the literature and key project and options documentation
- discussions with the Ministry of Health
- information obtained from the CFI
- targeted research.

Step two: Define the scope and the analysis period

Our analysis period extends to FY 2072. This was determined based on the timing of the initial investments, when the options would commence operations, and the limitations on the time horizon of the workforce modelling.

- Timing of initial investment and the start year for each option: this includes timelines for planning, construction, and initial setup, and needs to be consistent with the financial case's assumptions. Based on the costing information we were provided, the initial investment period for each option is assumed to span FY 2026 – FY 2029.
- Operational commencement year for each option: this is the first year in which benefits of the project start to accrue. We assume that the commencement year is FY 2028, which is consistent with the information received from the Ministry on each of the options.
- Economic analysis period: this determines the period of analysis for the costs and benefits. The timeframe for economic analysis begins with the initial investment year above. The end is somewhat limited by the time horizon of the workforce modelling provided to us by Health NZ which extends to FY 2042. We assume the additional GPs produced by each option continue to provide benefits until FY 2072, when these GPs start to retire. As any capital investment is likely to continue to produce benefits and have value past 2042, we incorporate the terminal value of assets as at 2042 in our analysis.
- Discount rate for economic analysis: we use the Treasury's recommended (real) discount rate of 5 per cent and test sensitivities of 3.5 per cent (consistent with the approach taken by Pharmac) and 0 per cent (undiscounted). We note that under Treasury's discount rate, by FY 2072, costs and benefits are discounted to approximately 10 per cent of their value. Therefore, extending the time analysis period further is unlikely to have a material impact.

Table 4: Time periods used in the CBA

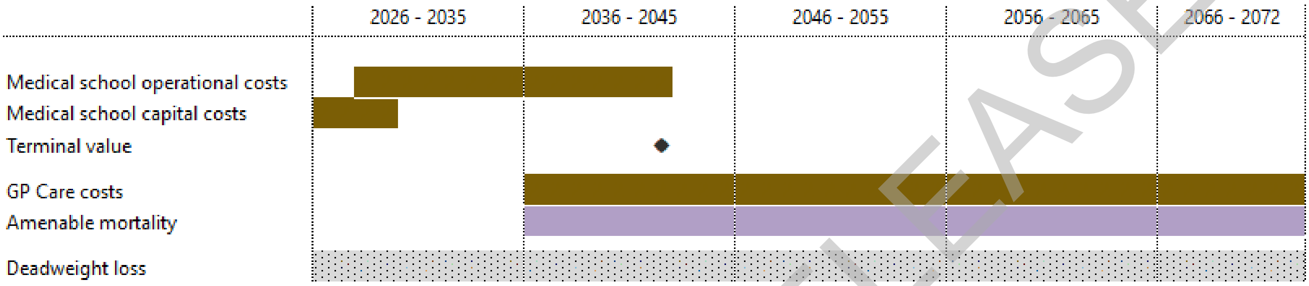
Component	Date
Investment	FY 2026 – FY 2029
Operation	FY 2028 onwards (which is captured by way of incorporating operational impacts up to 2042 and applying terminal values for capital investments at 2042)
Economic analysis	FY 2026 – FY 2072 (with terminal values at 2042 incorporated)

Step three: Identify costs and benefits

In this step, we engaged with the Ministry, other agencies via the Ministry, and a panel of experts to identify and test costs and benefits. The costs and benefits are categorised by monetised (direct and indirect) costs and benefits as well as non-monetised benefits (with key workforce outcomes also separately identified and estimated).

For information, we set out the time profile of costs and benefits in the figure below.

Figure 3: Distribution of quantified costs and benefits over time



Step four: Measure and monetise costs and benefits

In this step, we measured the difference between each option and the status quo for each of the measurable costs and benefits. We then converted measured costs and benefits into monetary values for comparison and calculated the present value. This step was broken down into the following:

- Identify costs and benefits by literature review.
- Engage with our expert panel to test the costs and benefits.
- Apply economic valuation approaches, by using market prices, and shadow pricing where applicable for benefits like improved health outcomes
- Use an appropriate discount rate for present value calculations over the analysis period (5 per cent as per Treasury's guidance, testing sensitivity at 3.5 and 0 per cent).

We included non-monetised benefits. We incorporated non-monetised benefits in the CBA by presenting their impacts qualitatively.

We calculated economic metrics. We present two summary metrics to provide a basis for comparing the project options:

- Net present value (NPV) for each option to assess total economic value.
- Benefit-cost ratio (BCR) to determine the efficiency of spend on a per dollar basis.

To fully assess the options, these metrics should be considered in conjunction with the non-monetised social impacts.

Step five: Conduct sensitivity analysis and risk assessment

We identified the key factors that influence the CBA results using a deterministic sensitivity analysis. This process involved collaboration with the project team at the Ministry and incorporated input from the expert panel. In this step we:

- identified key variables such as amenable mortality reduction, propensity for medical students to train as GPs, retention rate within the New Zealand health workforce, accuracy of estimated capital and operating expenditure, and placement of new GPs.
- focused on variables with high uncertainty or significant impact on the outcomes.

Step six: Compile CBA report

This report presents the results of the process undertaken, described above.

4. Additional doctor estimates

A key investment objective of each of the options is to produce more locally trained doctors, with the emphasis on total GPs and rural GPs. The number of additional GPs produced is the key driver of both costs and benefits. As such the workforce output modelling is central to our cost-benefit analysis. In this section, we present an overview of the primary data sources, models, and information from the literature that underpin the workforce outcomes.

4.1 Number of additional medical students

We have been instructed to assume a cohort of 120 new entrants under each option. The main assumptions include each programme's annual retention rate:

- 99.16 per cent for medical students in their undergraduate years.[3] In other words, 0.84 per cent of these students leave the programme each year.
- 99.03 per cent for medical graduates undertaking PGY1 and PGY2.[4] In other words, 0.97 per cent of these students do not complete their postgraduate year annually.

Under these assumptions, we derive the number of graduates per cohort and present these in Table 5.

Table 5: Number of graduates per cohort under each programme and option

Students	Option	Programme Duration	Number completing stage (per cohort of 120)
Medical degree undergraduate years	One and two	6 years	116
	Three	5 years	117
Medical graduates undertaking PGY1 and PGY2	One and two	2 years	115
	Three	2 years	116

4.2 Number of additional doctors

Increasing the number of medical graduates in training leads to an increase in the number of practising doctors.

We have used health workforce modelling provided by the Analytics and Forecasting team, National People Services, Health NZ. This modelling forecasts the status quo for the health workforce, and the impact of each of the options. For the status quo, this modelling is considered to have high forecast accuracy in the medium term, with 98 per cent accuracy over five-year projections. While accuracy is not as high for later periods, the forecasts provide a reasonable basis for workforce numbers in total, and by health specialty. Further detail is provided in Appendix A.

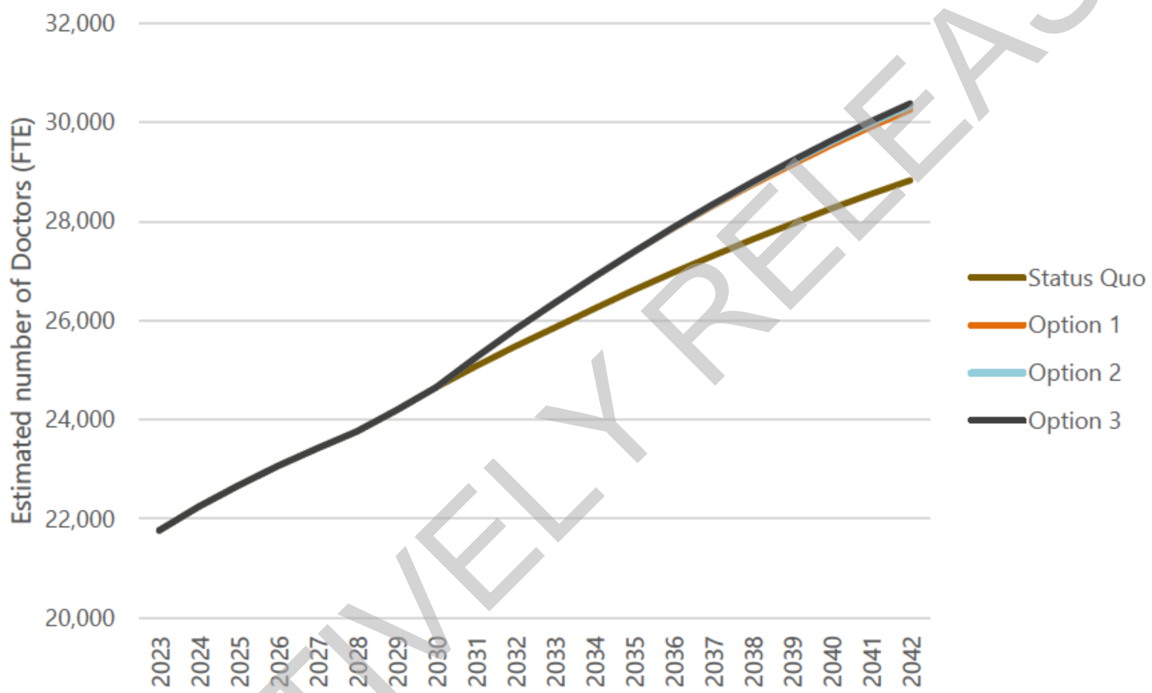
[3] Based on average completion rates.
[4] Based on doctor retention rates for year one NZ graduates, retrieved from mcnz.org.nz.

Compared to the status quo, each option produces a health workforce with significantly more doctors in it by 2042. Each option has a similar impact on the estimated number of doctors in the workforce as each option increases training rates by 120 medical students per annum. In 2042, compared to the status quo and rounded to the nearest 10, there are an estimated:

- 1,420 additional doctor FTEs under option one
- 1,500 additional doctor FTEs under option two
- 1,550 additional doctor FTEs under option three.

Figure 4 displays the estimated growth of the health workforce under each option.

Figure 4: Total doctors under base-case assumptions (FTE), 2023 - 2042



4.3 Number of additional GPs

The primary lens through which each option is differentiated is their impact on GP training rates, the propensity to go into rural practice, and the rate at which GPs trained are assumed to exit the New Zealand medical workforce. A key output of all the options consistent with the investment objectives is an increase in the number of GPs trained and working within the New Zealand primary care workforce. Key assumptions used in the GP workforce modelling are shown in Table 6 below being first, the propensity to become a GP and second, the exit rate of GPs from general practice. Exit rates refer to the likelihood that doctors leave the medical profession in New Zealand, and are based on observations of behaviour for each age and gender group. Both option two and option three are assumed to have lower exit rates, as a function of providing training that better meets the needs of the workforce.

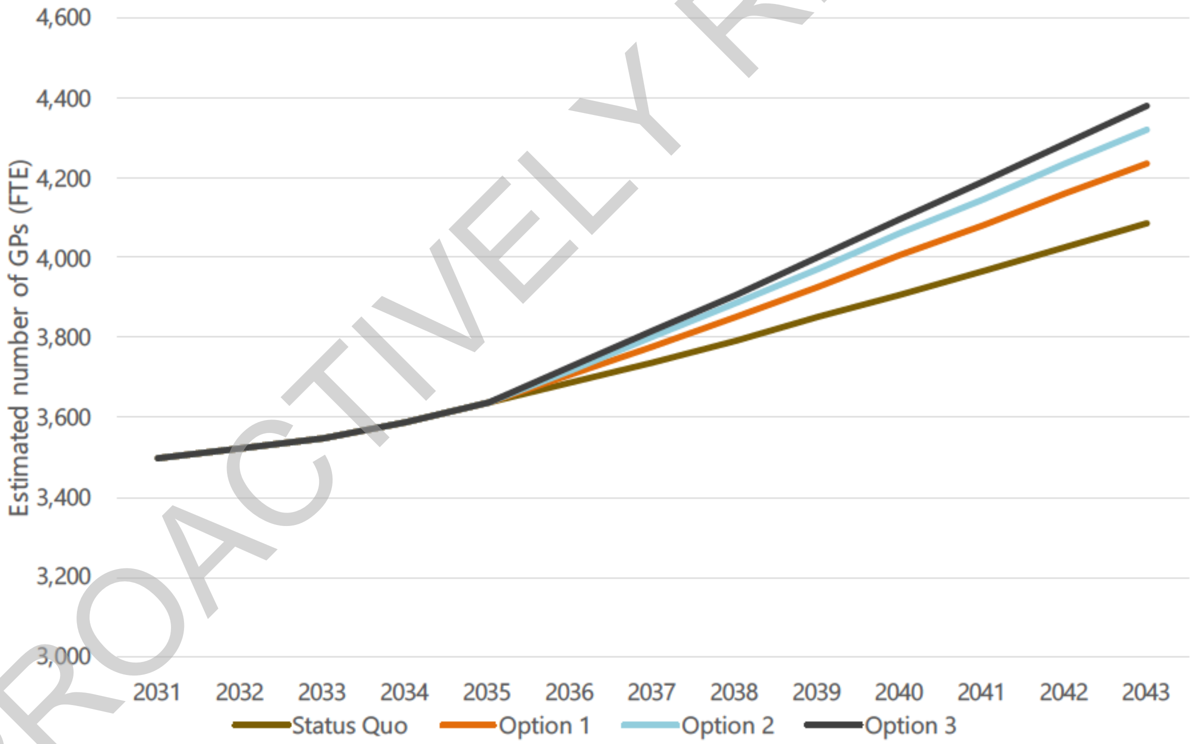
More detail on how these assumptions were derived is presented in Appendix A.

Table 6: Key values for GP workforce modelling

Option	Propensity to be a GP	Exit rate
Option one	23.0%	Current rate
Option two	35.0%	3/4 of the current rate
Sensitivities	32.5% - 37.5%	-
Option three	42.5%	1/2 of the current rate
Sensitivities	40.0% - 45.0%	-

The number of GPs is estimated using health workforce modelling provided by the Analytics and Forecasting team, National People Services, Health NZ and is displayed in Figure 5.

Figure 5: National GP workforce base case estimates (2031 – 2043)



Each option has a different impact on the number of GP FTEs estimated to enter the workforce at the national level. Under the base case assumptions, by 2042, an additional:

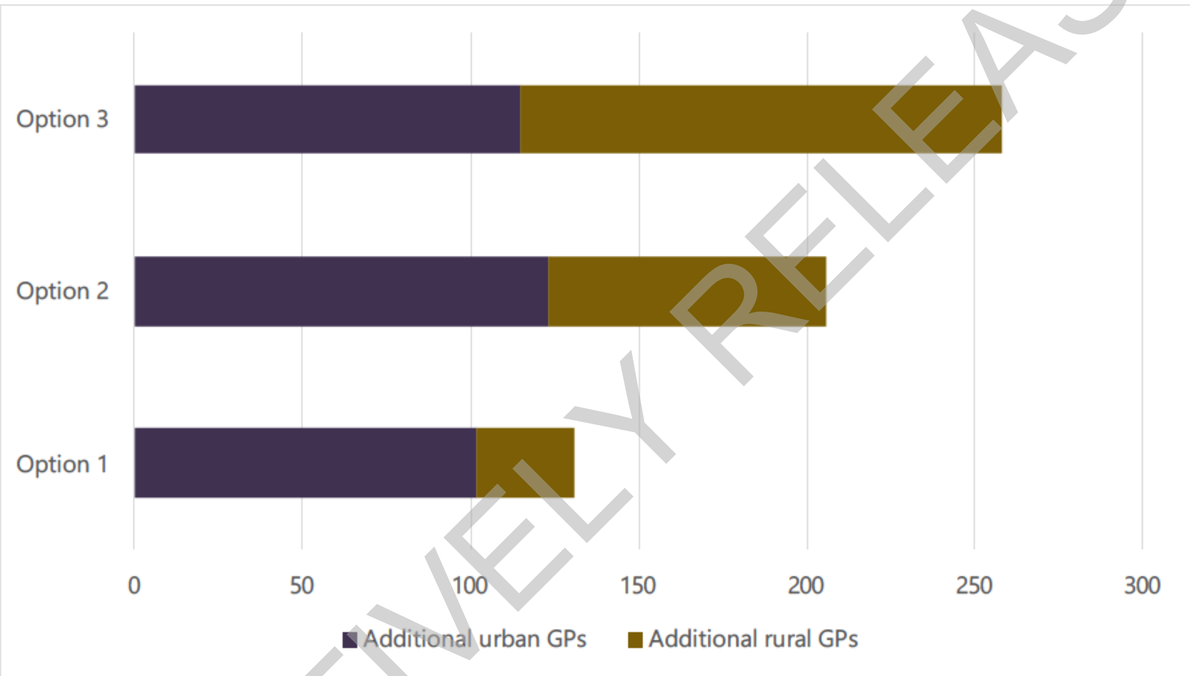
- 131 GP FTEs are estimated to be operating in New Zealand under option one
- 206 GP FTEs are estimated to be operating in New Zealand under option two
- 258 GP FTEs are estimated to be operating in New Zealand under option three.

4.4 Estimated rural-urban GP split

To allocate health benefits to society, assumptions need to be made about where trained GPs will practice. Having estimated the increase in the total number of GPs produced by the options, there are two key assumptions that need to be made to answer this question:

1. What is the rural-urban split?
2. Once a GP has chosen to practise in an urban or rural environment, where will they choose to practise?

Figure 6: Estimated additional GPs by rural-urban split under each option (versus status quo) by 2042



Kwan et al. (2017) identified independent predictors of GPs to establish or work in rural practice. This study provides the basis for our estimate of rural GPs arising from each option.

Predictor	Odds ratio
• Rural background	2.10
• Rural clinical school (one year)	2.85
• Rural clinical school (two years)	5.38

We convert these odds to a probability in the New Zealand context by factoring in the baseline probability a GP will establish or work in rural practice (0.199—based on an odds ratio of 0.166 from an estimate of 16.6 per cent of GPs in New Zealand currently operating or working in a rural practice (Bagg et al., 2023)).

For option two, we assume medical school students receive one year of rural clinical schooling, while for option three we assume two years of rural clinical schooling. In both options, we assume 21 per cent of medical school students come from a rural background.

sapere

Following this approach, we estimate the number of additional rural and urban GPs associated with each option, set out in Table 7.

Table 7: Increases in rural and urban GP FTE estimates

Options	FTE 2036	FTE 2037	FTE 2038	FTE 2039	FTE 2040	FTE 2041	FTE 2042
Rural GPs option one	4.73	9.17	13.38	17.40	21.26	24.99	28.64
Rural GPs option two	13.13	25.66	37.69	49.28	60.51	71.44	82.23
Rural GPs option three	22.07	43.45	64.21	84.45	104.24	123.64	142.89
Urban GPs option one	16.84	32.68	47.69	62.00	75.75	89.03	102.05
Urban GPs option two	19.69	38.48	56.51	73.89	90.73	107.12	123.29
Urban GPs option three	17.78	35.00	51.72	68.02	83.96	99.59	115.10

Source: Sapere analysis

4.5 Regional distribution of additional doctors

We also model where additional GPs under each option will choose to practice geographically under three broad assumptions, as an extension of the discussion in sections 4.2 and 4.3.

- Clinical placement location can influence choices for practice location post-graduation. This is consistent with the findings in a review of the Pukawakawa rural immersion programme (Matthews et al., 2015).
- GPs tend to locate where the population is largest, following general population trends.
- GPs will be influenced by the balance of supply and demand in any given location and be drawn to areas where vacancy rates in the previous year are higher.

We model GP location choices at the district level and estimate the impact on primary care coverage as a result. While the second two points above remain the same across the options, clinical placement locations differ between the options. Therefore, the geographic distribution of resulting GPs is also different across the options. For more detail on how we model the distribution of GPs, see Appendix D.

s 9(2)(f)(iv)

[redacted]

s 9(2)(f)(iv)

[redacted]

4.6 Clinical placements

An increase in clinical placements that provide greater exposure to rural areas and primary care settings could reduce churn and associated training costs in subspecialties.

There is a considerable gap between the rates at which medical students intend to become GPs while studying (13.4 per cent in 2020) (Wilkinson et al., 2021) and the rate who become GPs (23 per cent, as per our modelling). A similar dynamic is detected in Australia, where around 13.1 per cent of medical students signal an intention to become a GP in 2022, (Medical Deans Australia and New Zealand, 2024) compared to 27.7 per cent who become GPs (Cortie et al., 2024).

The gap between intended career path and actual career path suggests that career outcomes can be influenced by interventions—such as exposure to practice types—during study. To the extent that the greater exposure to rural GP settings enables students to better understand their options, they will be better matched to their innate interests. Consequently, medical graduates may be less inclined to pursue subspecialties that are not fully aligned with their interests.

Clinical placements are critical and can have capacity limits. Finding practices taking placements from students may experience a benefit through appropriate task shifting. Some research has indicated that placements are beneficial to existing practices (Yiend, et al., 2016). Other research on regional and rural placements suggests a 'turning point' where placements can become net financially beneficial to the practice after about two months (Hudson et al., 2012). Hosting clinical placements can impact existing practices through three paths:

- cost in time spent training rather than doing
- benefit in dollars received from the government for hosting placements
- benefit in labour from the extra pairs of hands.

We expect that there will be a benefit to practices for hosting placements, noting that the placement model for option two and option three is different—both requiring more practice time while option three has a greater rural focus. As each option trains the same number of additional medical graduates, we cannot differentiate between the expected impact here. Options two and three will have more placements at medical centres compared to larger hospitals than under option one. We have not found evidence as to whether the benefits to a provider from taking placement students differ based on the size or type of the facility they are placed at.

For this CBA, we assume clinical placements are available.

5. Costs

The cost perspective is that of economic costs. The focus is on valuing the total resource loss—in this case the resources incurred to establish the training programmes, train the students, and facilitate the additional doctors. Economic costs differ to financial costs by taking a societal perspective (rather than an individual or enterprise perspective), meaning the focus is on the impact to society, and any transfers between members of society are excluded. For example, in the case of a student undertaking a course, the payment of course fees are a transfer from the student to the University. The resource cost is the cost of teaching (lecture time, cost of facility etc.). Using this lens, sunk costs, transfers, depreciation, interest, and taxes are excluded from the analysis. Economic costs are also in real terms, that is, inflation is ignored.

Costs for the three options are summarised in Table 8. Costs are estimated from FY 2026 to FY 2072 in present value terms using a discount rate of 5 per cent. All costs are reported incremental to the status quo. Terminal values are presented as negative figures because they offset the costs presented.

Unsurprisingly, as option three involves capital expenditure while other options assume existing capital can be reused, option three has the highest costs. The higher capital expenditure (CAPEX) occurs because of the resource costs associated with a new medical school's establishment.

Option three also has the highest GP costs for outyears for provision of additional GP care. The higher GP care costs are caused by higher numbers of GPs entering the workforce.

On the other hand, option three has a shorter training period. Option three's lower operating expenditure (OPEX) occurs because the course under this option has one less year and therefore requires comparatively less resourcing. Higher other economic costs arise from the extra funding, and associated deadweight loss, required for students—as a combination of higher CAPEX but lower OPEX than other options.

The biggest driver of costs under each option is the cost of additional GP visits expected over the 2036 – 2072 period (what we call GP care costs). This cost is substantial, as it models the additional costs required to fully fund and support GPs produced under each option over their working lives. This is the only cost incurred post-2042.

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[redacted]

s 9(2)(f)(iv)

[redacted]

Non-monetised costs are not shown in the table. These costs include the opportunity cost of foregone earnings and the health system costs associated with postgraduate year one (PGY1) and PGY2 students. Both costs are not monetised because we are unable to monetise the offsetting benefit. That is, for the opportunity cost of foregone work, we cannot monetise the private benefit, and for the health system costs for PGY1 and PGY2 students, we are unable to monetise the health system benefits.

Costs were calculated from data provided by the Ministry as well as the best available data found through desktop research. Where required, conservative assumptions have been made, requiring subjective judgement that has been reviewed by the expert panel. Detailed assumptions are outlined in Appendix B.

5.1 Monetised costs

The following subsection details the estimated monetised costs.

5.1.1 Operating expenditure

OPEX is associated with the resource cost of running the universities' operations. It is comprised of seven categories:

- Academic staff
- Non-academic staff
- Non-CAPEX equipment
- Clinical placement costs
- Academic subscriptions such as digital learning resources, journal subscriptions, and professional registrations etc.
- Premises costs
- Other OPEX costs.

The assumptions for the seven categories of OPEX are outlined in Table 25.

For consistency with the draft business case, option three's nominal OPEX figures are observed from the financial case. Inflation is then removed to estimate OPEX in real terms.

Option one and option two's OPEX figures (excluding clinical placement costs) are scaled based on the total years of medical school currently in the course designs. That is, there is five years of medical school for options one and two, relative to four years in option three.[5] We therefore estimate option one and option two's OPEX as 25 per cent greater than option three's.

Option one and option two's clinical placement OPEX costs are estimated to be 6 per cent less than option three's. This clinical placement cost is based on option three's programme requiring 6 per cent more weeks of placement compared to option one and option two; we would expect less placement requires less placement-related OPEX.[6]

The rurally-focused nature of the placement is expected to drive the differences in outcomes. However, while the expert group considered these rural placements are more expensive, we are not aware of any robust cost data to demonstrate this additional expense, particularly against hospital placement. As a result, no adjustment is made for the greater cost of rural placements.

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[5] We acknowledge that there are likely economies of scale for option one and option two, where the existing medical schools can leverage existing resources to accommodate more medical students at lower costs e.g. if existing courses have spare capacity. However, it is unlikely that all 120 students would be able to be accommodated into existing capacity and therefore not incur OPEX. In the absence of data on this, we assume that additional annual OPEX of equal magnitude is required for each option.

[6] We note that the clinical placement time spent in hospitals versus GP practices differs between options one and two, and option three. Option three has double the time spent in a GP practice compared to the other options (36 weeks vs 18 weeks). While the expense to universities is quite different between GP placement and Health NZ hospital placement, we have been unable to ascertain any difference in economic costs of these placements. We therefore assume that the cost per week is the same.

Options one and two have the highest OPEX with a present value of s 9(2)(f)(iv) [redacted] The cause of these comparatively higher figures is the additional year of study under option one and option two. Table 9 displays the summary of OPEX.

The estimated teaching cost increases in medicine are not offset by a coinciding teaching cost decrease in other courses. The logic is teaching costs of other courses are mostly fixed, being composed largely of salaries,[7] so that students diverted away from these courses would not materially influence existing OPEX. This is a simplifying assumption and is the same across all options. Further detail regarding this assumption is provided in Appendix B.

s 9(2)(f)(iv)

[redacted]

5.1.2 Capital expenditure

In a social CBA, all costs and benefits are included, regardless of who they are borne by or accrue to. For example, we have been informed that capital funding under option two will be allocated from existing funding sources and therefore represents no additional direct cost to the Crown. While this is true, the opportunity cost for those funds still exists and must be accounted for. We have therefore included the total capital cost associated with this option.

CAPEX is made up of the one-off costs incurred to acquire, construct, and equip the facilities required under each option. The five main components of CAPEX are:

- facilities, including construction of a new medical school
- clinical placement capacity, to develop the capital required to accommodate additional student placement in existing hospitals
- curriculum development costs
- infrastructure development support
- capacity to support new placements (over three years).

[7] For example, salaries accounted for 53 per cent of Otago University's operating expenditures in 2023 (University of Otago, 2023).

Option three incurs the highest facilities CAPEX because of the construction of a new medical school. Option one and option two do not incur costs for new buildings. The implicit assumption is that existing facilities would be able to accommodate the additional students without incurring any establishment costs. However, option one and option two do incur facility costs for equipment and the associated contingency. Table 10 summarises CAPEX across options.

All options incur clinical placement capacity CAPEX costs of s 9(2)(f)(iv) [redacted] Stakeholders suggested that additional students undergoing clinical placements in the Waikato region would displace current students undergoing placements in this area from Auckland University. Therefore, there is no further cost for clinical placement capacity in option one.

s 9(2)(f)(iv)

[redacted]

s 9(2)(f)(iv)

[redacted]

s 9(2)(f)(iv)

[redacted]

Further details of our assumptions for the CAPEX estimate are provided in Appendix B, Table 26.

5.1.3 Terminal value of assets (offsets CAPEX costs)

In a CBA, the terminal value of assets refers to the value of the asset at the end of the analysis period. It represents the residual value of the asset that can be used or sold. These costs are presented in negative terms because they offset the CAPEX costs incurred at the project.

The terminal value of the asset is estimated by subtracting depreciation incurred over the analysis period from the book value of the asset post construction. Depreciation was applied using the straight-line method. That is, it assumes the asset loses value at a constant rate over its useful life.

The results of the terminal value estimate are presented in Table 11. Values are reported as negative numbers because they offset the CAPEX costs. Terminal values range from s 9(2)(f)(iv) [redacted] for option one and option two, to s 9(2)(f)(iv) [redacted] for option three. Option three has a higher terminal value (in absolute terms) because it incurs CAPEX for new building and refurbishments, which then results in an associated terminal value. Equipment is not included because it is fully depreciated by FY 2042.

The depreciation figures differ to those reported in the draft financial case for two reasons. Firstly, our depreciation figures are reported in real terms, that is, excluding inflation. Secondly, the draft financial case attributes 75 per cent of the premises costs for option three to the medical programme (because the medical programme will initially consume 75 per cent of the building's space). However, the full value of the buildings must be used here to accurately reflect the terminal value from a societal perspective.

Table 11: Terminal value, present value to FY 2042 (millions)

s 9(2)(f)(iv) [redacted]

The assumptions underpinning this analysis can be found in Table 28 in Appendix B. They have been chosen to be consistent with the draft financial case.

5.1.4 Cost of additional GP care

The options will result in more GPs working in New Zealand than otherwise would be the case under the status quo. The additional GP care will incur operating costs, for example GP and supporting staff salaries, and overheads.

The first step is to assess whether the additional GPs will require additional general practice supporting infrastructure or not. To assess this, we examine vacancies for GPs in the health system today. To the extent that GPs are filling vacancies, there is existing capacity in the system. Supporting staff and overheads will therefore not be required to the same extent as when new supporting infrastructure is required.

Nearly 60 per cent of GP practices reported a vacancy in 2023 (New Zealand Doctor, 2023), up from 31 per cent in 2018 (The Royal New Zealand College of General Practitioners, 2018). Combining the 31 per cent lower bound (to be conservative) with the 951 reported practices in New Zealand (Cumings, 2023) estimates that there are at least 295 GP vacancies currently.

We can compare these vacancy numbers with the number of additional GPs provided to New Zealand under each option, over the period of our analysis. By FY 2042, we estimate that there will be between 131 (option one) and 258 (option three) more GP FTEs in New Zealand than there would be in the status quo.

We do not know the number of vacancies through to FY 2072. Currently, there are 295 GP vacancies. In the short term, we may expect this to continue because 37 per cent of the GP workforce is expected to retire in the next five years (The Royal New Zealand College of General Practitioners, 2022). However, forecasting out to FY 2072 is extremely uncertain.

For conservatism, our base case assumption is to assume that 50 per cent of GPs are filling vacancies, with 50 per cent requiring additional supporting infrastructure. Our sensitivity testing models both 100 per cent of GPs requiring supporting infrastructure, and zero per cent of GPs requiring supporting infrastructure.

s 9(2)(f)(iv)

[redacted]

s 9(2)(f)(iv)

[redacted]

Key assumptions underpinning our estimate are summarised in Table 27.

5.1.5 Other economic costs

The deadweight cost of taxation arises from government funding from taxation. Taxation results in an efficiency cost to society because it encourages people to move away from things that are taxed towards things that are more lightly taxed. The Treasury provides the example on income tax in the market for labour and leisure. Income tax on labour income discourages working in favour of leisure or home-based activities i.e. without income tax, people would work more because the pay-off is higher (The Treasury, 2015). This distorted choice represents a loss in economic efficiency.

Key assumptions underpinning the analysis in this subsection are listed in Table 29, located in Appendix B.

Deadweight cost of taxation for option one and two is [redacted] and for option three is [redacted]

The Treasury recommends that a deadweight cost of taxation of 20 per cent is added to project costs that are funded by general taxation (The Treasury, 2015). A deadweight cost of taxation is generated to the extent that funding is greater than it would be under the status quo. We highlight the importance of the status quo. If an expense would have been generated under the status quo, there would be no additional cost to the government and therefore deadweight cost of taxation.

The deadweight cost of taxation is applied to:

- the Medical Trainee Intern Grant (MTI grant)
- tuition subsidies.

For tuition subsidies the deadweight cost of taxation is estimated for two groups of students:

- Postgraduate students that only continue to study because they are accepted into medical school (some students in option one and option two, and all students in option three).
- Undergraduate students who would have entered the workforce after completing their undergraduate degree if they had not been accepted into medical school.

While these undergraduate students would have been studying in the status quo, their undergraduate course would likely have been three (or four) years relative to the six years of medical school. After the three years, some students would not have continued studying. These are the relevant students for the tuition subsidies and write-downs (some students in option one and option two).

Table 13: Deadweight cost of taxation applicability

Source of deadweight cost	Student applied to	Relevant to option one	Relevant to option two	Relevant to option three
MTI Grant – additional MTI Grant required	All students	✓	✓	✓
Tuitions subsidies – additional subsidies required for students that would not have previously been (or continued) studying	Undergraduates	✓	✓	×
	Postgraduates	✓	✓	✓

Medical students in their final year of medical school receive the MTI grant. The MTI grant is funded by the government and concurrently generates a deadweight cost of taxation. The deadweight cost of taxation is estimated by multiplying the MTI grant with the number students in their final year of medical school, and by the deadweight cost of 20 per cent.

The government subsidises a significant portion of students' tuition. The relevant students are multiplied by the government subsidy per student and by the deadweight cost of taxation of 20 per cent. Table 14 summarises the other results for the deadweight cost of taxation.

Option three has the highest costs across all categories, driven by its intake of only students with undergraduate degrees and therefore greater number of students diverted from employment and higher tuition subsidies.

s 9(2)(f)(iv)

[redacted]

5.2 Costs not included

There were two costs not included on our analysis: the forgone earnings from students who now continue to study, and the health system employment costs for PGY1 and PGY2 students.

5.2.1 Forgone earnings from students who continue to study

We did not monetise the economic cost of forgone earnings from students that would have joined the workforce had they not been accepted into medical school. The logic is that the private benefit to the individual—such as personal satisfaction, social status, vocation—approximately offsets the private cost—such as forgone earnings. However, these private benefits are not able to be quantified, and we therefore do not know the extent that the foregone earnings are offset by private benefits. As a result, we do not monetise this cost.

Higher future earnings are not included in the private benefit examples. In this context, salaries are used as a measure of societal benefit (the cost of a student's time is already accounted for). GPs receive salaries from the government as compensation for their services (i.e. a transfer). The output of these services are benefits to the community e.g. better continuity of care or reduced amenable mortality. Estimating both salaries and better continuity of care or reduced amenable mortality would therefore double count benefits.

5.2.2 Health system costs associated with PGY1 and PGY2 students

The health system will incur costs (such as salaries) associated with PGY1 and PGY2 students. Consistent with the financial case, these refer to the employment costs for these students only, i.e. no additional CAPEX is required to create capacity in the health system for these students.

Salaries in this context are a cost, representing compensation for an individual's time. However, we have not monetised these costs. While the economic cost is explicit, the benefits of these services are difficult to determine. We are therefore unable to determine whether there is a net benefit or net cost from PGY1 and PGY2 students' activities.

5.2.3 Offset teaching costs in alternative courses are not included in the CBA

In CBA's, it is best practice to focus on primary market effects only, while secondary market effects are typically excluded, provided that markets are efficient (Boardman et al., 2018). In this context, the primary market refers to the direct impacts on the market for medical education. Secondary markets involve indirect effects, such as changes in other courses due to the introduction of a new undergraduate medicine course.

Counting secondary market effects can lead to inadvertent double counting, if some resources are transferred rather than created or used. Transfers are excluded from CBAs because there is no real change in resource. In addition, estimating all complex interactions and adjustments associated with secondary markets can be challenging and imprecise.

In our case, greater capacity for medicine courses may reduce alternative courses' participation (as students are accepted into undergraduate medicine courses) that may result in these courses having lower OPEX. However, reductions in these courses' OPEX can represent a transfer of resources to undergraduate medicine courses, rather than a reduction in resource use. If we counted both the alternative course's reduced OPEX and the medical school's OPEX, we would double count the same resource. Therefore, the alternative course's OPEX reduction can be seen as a reallocation of an existing resource and should not be counted in the CBA.

6. Benefits

The options produce monetisable and non-monetisable benefits across many areas. Some of these benefits are material and are monetised. Other benefits are material but cannot be monetised. Still other benefits are important but not as material. We provide as much information as possible to assess the magnitude (and level of uncertainty) of non-monetised benefits.

Below, we set out two tables setting out different benefit schema, developed as part of this process.

Table 15: Benefits – monetised ($millions), non-monetised

	Option one	Option two	Option three
Monetised Benefits ($millions)			
Reduction in mortality	$1,987.03	$3,116.80	$3,902.73
Non-monetised benefits	**Confidence**		
Impact on ambulatory sensitive hospitalisations			
Better matching with career interest and lower churn			
Continuity of care			
Clinical placements			
Other improved access to healthcare for underserved communities			
Competitive effects			
Real option value			

Table 16 displays the beneficiary for each identified monetised and qualitative benefit.

Table 16: Benefits by type and beneficiary

	Beneficiary					
	NZ economy/society	Students	Current practitioners	Graduate doctors	Existing rural practitioners	Regional economy
Monetised						
Avoided costs associated with poor patient outcomes, avoided amenable mortality rates (MR)	✓					
Qualitative						
Health benefits from more doctors in non-GP specialties	✓					
Lower whole of system costs through continuity of care	✓					
More resilient general practice	✓					
Reduced travel time for patients whose access to primary care increases	✓					
Improved competition in the market for GPs	✓					
Improved competition in the market for medical education		✓				
Improved wellbeing of the current medical workforce with full books, because of decreased pressure.			✓			
Increased training and placement capacity and capability in health settings with clear expectations, resources, training and time for health workforce to provide clinical supervision and mentorship				✓		
Clinics taking placements from students may experience a benefit, or disbenefit from the additional training workload required					✓	

6.1 Monetised benefits

A key objective of the investment options is to increase the number of GPs, especially in rural and other underserved communities. The main benefit of this is improvements in health outcomes for the affected populations. Health outcomes are commonly described and quantified in two components: mortality and morbidity. Mortality relates to the length (or quantity) of life, while morbidity relates to the health-related quality of life whilst living.

We monetise the avoided mortality benefits under each of the options. While we believe that the value of decreased morbidity is likely the greater benefit, and there is good evidence of decreased morbidity, we are much less able to quantify the benefit of reduced morbidity accurately. As such we have not quantified (or monetised) the quality-of-life benefit, and discuss it in detail qualitatively.

We also attempted to quantify and monetise other benefits, such as:

- reduced burden on other areas of the health sector (e.g., secondary and tertiary care/hospitals)
- efficiency improvements related to higher retention rates and lower churn of GPs
- reduced travel time for patients from more accessible GPs.

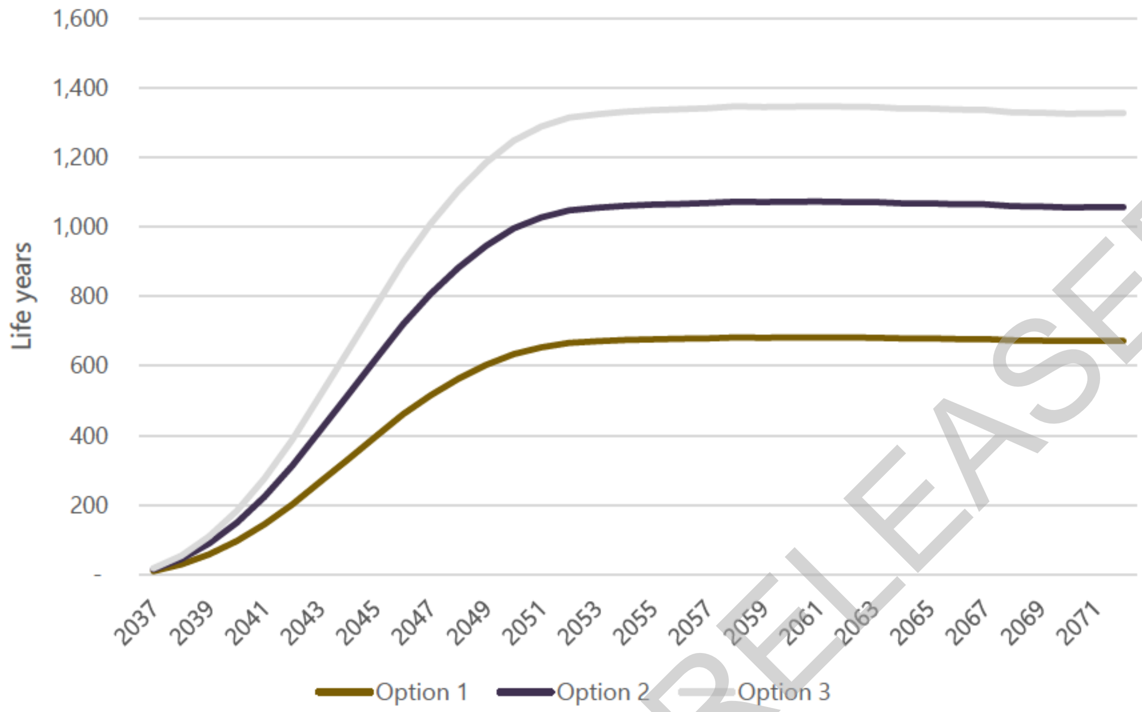
However, in undertaking these estimations, the uncertainty in estimates were large, while the results were fairly immaterial relative to the reduced mortality benefits. Like the quality-of-life benefit, we discuss these other, less material benefits qualitatively.

6.1.1 Reduced mortality benefits

Amenable mortality refers to premature deaths that could potentially be avoided given effective and timely health care. An increase in the number of GPs in communities is expected to improve access to timely primary care. This in turn should lead to improved prevention, early detection and intervention, leading to improved health and ultimately reductions in amenable mortality.

Academic literature provides the basis for the relationship between primary care coverage and amenable mortality. An increase in GP coverage should result in a reduction in mortality, especially where there are shortages and low access. Our base case estimates are modelled using the results of Baker et al. (2024) in England. The authors undertook a cross-sectional, ecological study in England, with life expectancy data in the National General Practice Profiles system for 2015 to 2019. They found that for every additional GP per 1,000 population, life expectancy increased by 0.57 and 0.50 years for females and males, respectively. We use these results to model the impact of additional GP coverage in terms of years of life gained.

Figure 8: Life years gained per annum (2037 – 2072)



Our avoided mortality benefit is based on the additional GP FTEs in the workforce through to 2042. This is a conservative assumption, as it is likely that graduates in the recent years to 2042 would continue to enter the GP workforce in the following years.

The reduced mortality benefits are estimated for the period 2036 (when the first additional GPs enter the workforce), through to 2072 (a period that should be sufficient to capture the majority of the benefits).

We build in a lag of one year after a GP begins practicing in an area to see effects, and a 'ramp up' period of 10 years before the full effects of additional coverage are realised. We also build in a level of GPs exiting the workforce, which reduces the mortality benefits over time. Additional life-years are accrued to the projected deaths in each year, as per Statistics New Zealand forecasts.

Over the 2036 to 2072 period, nationwide and rounded to the nearest hundred, and discounted to present values, our base case estimates:

- 19,200 life-years saved under option one
- 30,100 life-years saved under option two
- 37,700 life-years saved under option three.

The differences in the results above is driven by the number of additional GPs produced from each of the options.

Life-years were monetised using the value of a statistical life from the Treasury's CBAx impact database, converted to the value of a statistical life-year using the time-value of money. This results in present value monetised benefits of:

- $1.26 billion under option one

- $1.98 billion under option two
- $2.48 billion under option three.

6.2 Qualitative benefits

There is considerable evidence for the benefits of continuity of primary care, which general practitioners are central to. Many of these important areas of benefit are difficult to measure, and even more difficult to value. That difficulty of measuring and valuing does not mean the benefits are immaterial. We identify several material benefits in the following section. We do not, however, seek to measure or monetise them.

We classify these qualitative benefits as follows:

- Other improvements in patients' outcomes in addition to mortality effects
- Health system effects due to reduced cost and increased system resilience
- Regional and distributional effects
- Dynamic benefits, encouraging further change and innovation over time.

6.2.1 Other improvements in patients' outcomes

The mortality benefit that we identify and monetise above comes about through better management of patients' underlying disease processes. There are other benefits to patients from better disease management.

Health and patient satisfaction benefits arise from continuity of care. The health benefits outlined as monetised benefits underestimate the true productivity benefits from improved continuity of care. Any productivity benefits from improved *quality* of health have not been estimated. The health services literature attributes many of these benefits to continuity of care.

Continuity of care is defined as *"the degree to which patients experience consultations as consistent with their needs. An important aspect is whether patients can see their usual or preferred GP"* (Fraser & Clarke, 2023).

More GPs per capita provide better continuity of care. The reverse was observed in the National Health Service in England between 2009 and 2023. Falling GP numbers led to a significant fall in continuity of care over time (Fraser & Clarke, 2023). Continuity of primary care is thus an important benefit for consideration in our analysis. It is, however, hard to isolate and measure quality of life benefits. As continuity of care positively impacts life expectancy, our estimates of GP impacts on amenable mortality naturally incorporate some of its positive benefits. However, our monetised estimates do not include the positive impacts of continuity of care on morbidity.[8]

[8] Various studies have found that better continuity of care reduces hospitalisation for multiple morbidities such as chronic kidney disease, asthma, heart-failure, diabetes, and dementia (Cree et al., 2006; Godard-Sebillotte et al., 2021; McAlister et al., 2013; Wiebe et al., 2014; Worrall & Knight, 2011).

There is literature around the health system effects of continuity of care. An increased number of GPs, and increased retention of GPs in rural areas, promotes continuity of care. Continuity of care is associated with improvements in health outcomes and higher levels of patient satisfaction. Barker et al. (2017), using data from 200 practices in the UK, derive a usual provider of care (UPC) index. This was defined as the proportion of contacts that were with the most seen doctor.

A UPC index increase of 0.2 is associated with a 6.2 per cent (CI 4.9 per cent to 7.5 per cent) reduction in ambulatory care sensitive condition admissions. There is a scattering of health services literature pointing to quality-of-life benefit. For instance, regular screenings and routine check-ups allow for the early detection of conditions such as diabetes, hypertension, and cancer. Emery et al. (Emery et al., 2014) reports that more primary care is associated with higher cancer screening rates. Other studies have found that greater numbers of GPs are associated with earlier detection of breast cancer, colon cancer, cervical cancer, and melanoma (Campbell et al., 2003; Ferrante et al., 2000; Roetzheim et al., 1999). Roetzheim et al. (Roetzheim et al., 2000) reports that one more GP per 10,000 population increases the odds of an early melanoma diagnosis by five per cent.

Primary care also manages chronic disease. Effective chronic disease management prevents complications that would otherwise require acute care (Starfield et al., 2005). It enables both the prevention and treatment of chronic conditions (Reynolds et al., 2018).

We do not attempt to measure quality of life improvement. There is considerable literature that points to continuity of care as a material contributor to management of underlying disease processes and reason, therefore, to argue there is a material, unmeasured benefit from continuity of care.

6.2.2 Health system resilience

We identify three health system resilience effects. In order of priority, they are:

- reduction in whole of system costs through continuity of care
- more resilient general practice
- more doctors across other specialties.

Lower whole of system costs through continuity of care

There is a strong indication in the health services literature that greater GP numbers reduce whole-of-system healthcare costs. GPs provide primary care, which plays a crucial role in the early detection of diseases and therefore early treatment and intervention. Research has consistently shown that robust primary care systems are associated with lower overall healthcare costs, largely due to fewer hospitalisations and emergency care requirements (Bazemore et al., 2015; Starfield et al., 2005). It has been recognised for some time that active and capable primary care reduces costs elsewhere in the health system. Cree et al recognised good continuity of care reduces ED admissions by 60–75 per cent among patients with asthma, an ambulatory care sensitive condition (2006).

As a more contemporary example, Sandvik et al. (Sandvik et al., 2021) in a registry based observational study in Norway examined the relationship between the length of the GP-patient relationship and health outcomes. They found that the length of the GP-patient relationship is significantly associated with lower use of out-of-hours services, acute hospital admissions, and mortality. For example, comparing a fifteen-year GP-patient relationship with a one-year GP-patient relationship, there is a 30 per cent reduction in the odds of using out-of-hours services, a 28 per cent reduction in the odds of an acute hospital admission, and a 25 per cent reduction in the odds of dying.

This finding is common across all health systems. As another example, in a very different health system from New Zealand's, a study from the USA estimated annual average health care savings of US$1,000 (NZ$1,444 in 2018 values) for patients with the highest continuity of care compared to those with the lowest (Bazemore et al., 2018)

The alternative to continuity of care is fragmented care. For example, a recent analysis from England found that decreased continuity of care strongly correlates with increased number of GP visits (Fraser & Clarke, 2023). Each GP visit has an associated opportunity cost of time which we do not measure in our productivity benefits. The alternative to generalist care in the primary care sector in New Zealand is often episodic care in secondary care settings such as the emergency department, with poorer health outcomes.

We have not quantified the health system cost savings in our estimates. We are not aware of existing New Zealand representative data on the continuity of care. A further challenge is different definitions of continuity of care, making it challenging to apply estimates out-of-sample.

More resilient general practice

An increased number of GPs and other health specialists can reduce vacancies and recruitment costs. These costs are particularly high in rural settings with high recruitment costs and mixed outcomes with international medical graduates.

When more GPs are available and willing to work in these regions, health provider entities will face fewer instances of unfilled positions. This larger employee pool allows employers to fill vacancies more quickly. Faster hiring processes reduce the need for extensive recruitment campaigns, which could involve expenditure on advertising, job fairs, and recruitment agencies. Additionally, a steady entry of potential employees can decrease the time and resources spent on interviewing and evaluating candidates.

According to the New Zealand Medical Workforce Survey 2023, 60 per cent of internationally trained doctors leave after two years, compared with just two per cent of locally trained doctors (MCNZ, 2023). Internationally trained doctors also fill a larger proportion of roles in rural practice (48 per cent) than in urban practice (35 per cent). With more locally trained doctors under each of the options, reduced churn may also lead to reductions in recruitment costs.

While a key focus of investment is increasing the number of GPs, it is worth noting that many regulated and unregulated health workforces are currently experiencing shortages. Health NZ's modelling estimated shortages of 5 per cent to 40 per cent per health specialty. Some of these shortages are expected to grow, and none are anticipated to be completely closed under the status quo (Te Whatu Ora, 2023). This wider picture of workforce shortages is in addition to the GP workforce shortages.

More doctors across other specialties

We have focused on the benefits from GP medical specialists and have set aside the benefits of increased non-GP medical specialists. We do not quantify the additional health benefits (or costs) of medical specialists outside of general practice. The focus of the investment objectives is on training GPs.

If we were to measure the benefit of non-GP medical specialists, we expect the net benefits of a non-GP medical specialist to be slightly lower than the net benefits of a general practitioner. Our reasoning is as follows:

- Medical specialists typically receive higher salaries than general practitioners. They also tend to operate in environments with higher overheads and support staff requirements. This results in a higher cost.
- Medical specialists are likely to have lower impacts on amenable mortality or the life expectancies of those around them than general practitioners. Secondary avoidable mortality (where GPs impact life expectancy) has been shown to be much larger than tertiary avoidable mortality in studies of the New Zealand population (Tobias, 2000).
- Specialists are, on average, unlikely to provide as much morbidity benefit as GPs. The more 'upstream' health services tend to have more opportunity to have higher impacts on health, for instance, through prevention, early detection, and early intervention.
- Specialists may not provide the same lower whole of system costs as GPs. Through prevention, early detection and early intervention, GPs are likely to reduce hospital admissions and ED attendances. The downstream impact of specialists on system costs are likely to be much lower.

In summary, non-GP medical specialists cost more, and are likely to have relatively lower impacts on health outcomes. We therefore expect that the size of this unquantified net benefit will be moderately smaller than that provided by GPs. As the net benefit of a specialist is likely to be positive, the inclusion of this benefit would increase the monetised NPV of each of the options, favouring option one, then option two over option three. This is primarily due to option three (then option two) producing more GPs, and therefore less specialists. At some point option one would flip to being least favoured and, if the investment objectives were staffing of hospital and specialist services with doctors, then option one would dominate.

We note that the costs of producing *all* additional medical graduates from universities are already included in our estimates. That is, the medical schooling costs for these graduates that go on to non-GP specialties have already been included in the monetised costs.

6.2.3 Regional and distributional effects

We focus on the impact on improved access to healthcare for Māori, Pacific peoples, and rural residents.

Ambulatory sensitive hospitalisations (ASH) refer to a group of mostly acute admissions that are considered potentially avoidable through interventions deliverable in a primary care setting. An increase in primary care coverage therefore might be expected to lead to a reduction in ASH rates, relieving pressure on the healthcare system.

New Zealand children who face barriers to primary health care have more than twice the probabilty of hospitalisation for an ASH-related condition (Mona et al., 2021). Within the cohort of higher-risk children, Māori and Pacific peoples were at an even greater risk of ASH than other ethnicities. Research has also found that increased funding to primary health care does not reflect a long-term reduction in ASH rates in New Zealand (between 2001 and 2009) (Milne et al., 2015). This suggests accessing primary health care is more than a question of funding, and other barriers need to be investigated. Nevertheless, providing improved and more reliable access to primary care is a recomended intervention for reducing ASH rates, particularly for Māori (C. Barker et al., 2016).

However, while there is some evidence of poor primary care being associated with higher risk of ASH-related conditions, the evidence of a causal link between increased GPs and reduced ASH-related hospitalisations is lacking. As a result, we have not attempted to quantify this benefit.

Option three will improve access to primary care for Māori, Pacific and rural patients. Given each of the options increases the total number of GPs, access to the primary healthcare system should be improved for all New Zealanders. Improved health outcomes for rural residents and Māori will be multiplied when considering that regional and rural training has an impact on preferences of location of practice.

Consequently, rural residents (Māori and non-Māori) may experience improved health outcomes because of increased GPs who have received rural training. With increased GPs and an emphasis on producing rural GPs, we anticipate that option three would have the highest positive impact for rural population and Māori.

Pacific peoples are likely to benefit from the increase in GPs. However, they may not experience the same improvement in health outcomes as Māori. This is because Pacific peoples are largely located in New Zealand's urban centres (Auckland—62 per cent; and Wellington—9 per cent).

Distribution of amenable mortality impacts

Nixon et al. (2023) analysed census and mortality data over the 2013–2018 period to estimate age-stratified sex-adjusted mortality rate ratios for a range of mortality outcomes across urban and rural areas. Their work finds higher rates of amenable mortality amongst rural populations and Māori. We have utilised this work to estimate the amenable mortality gains attainable over the analysis period in each region. Each of our options leads to a different distribution of GPs, and therefore distribution of reductions in amenable mortality. Figure 9 displays the modelled increase in GPs per capita under each option, relative to the forecast level of GP coverage under the status quo. Notable increases

s 9(2)(f)(iv)

[redacted]

Figure 9: Increase in GPs per capita relative to the status quo (2042)

s 9(2)(f)(iv)

[redacted]

Figure 10 applies the results of Nixon et al. (2023) to estimate the amenable mortality attainable in each region on a per capita basis. The largest potential gains from increased primary care coverage

s 9(2)(f)(iv)

[redacted]

s 9(2)(f)(iv)

[redacted]

Reduced travel time for patients

For patients in areas where the nearest GP clinic has reached full capacity, additional local GPs may reduce the need for long journeys. Reduced travel time leads to lower transportation costs and less loss of productive time. Benefits to society arise from travel time savings as a proxy for productivity and/or leisure. We have not measured these benefits as there is clear evidence patients will travel to the GP they prefer, rather than the one that is closest. Further, any saving we can measure is not material.

Impact of clinical placements

Practices taking placements from students may experience a benefit through appropriate task shifting. Some research has indicated that placements are beneficial to existing practices (Yiend, et al., 2016). Other research on regional and rural placements suggests a 'turning point' where placements can become net financially beneficial to the practice after about two months (Hudson, Weston, & Farmer, 2012). Hosting clinical placements can impact existing practices through three paths:

- cost in time spent training rather than doing
- benefit in dollars received from the government for hosting placements
- benefit in labour from the extra pairs of hands.

We expect that there will be a benefit to practices for hosting placements, noting that the placement model for option two and option three is different—both requiring more practice time while option three has a greater rural focus. As each option trains the same number of additional medical graduates, we cannot differentiate between the expected impact here. Options two and three will have more placements at medical centres compared to larger hospitals than under option one. We have not found evidence as to whether the benefits from taking placement students differ based on the size or type of the facility they are placed at.

Regional economic effects

We have not measured regional economic effects. Those effects are not the primary intent of the investment objectives and, therefore, are a useful and positive addition but not relevant to this CBA.

6.2.4 Dynamic effects

The discussion above has been about effects we predict will happen directly through additional GPs. There are other benefits of a more dynamic nature that we note but have not explored.

Improved competition in the market for GPs and the market for medical education

Each option will affect competition in New Zealand markets. Competition effects have the highest impact when the goods or services being considered are substitutable. There are two key markets impacted by the proposal: the market for GPs i.e. from the greater number of doctors in New Zealand, and the market for education. We assess the competitive effects in each of these markets separately. There are also markets for 'all other doctors' that need to be considered.

The market for GPs experiences an increase in the supply of GPs, improving competition. In the market for GPs, GPs exchange their services for a salary and/or profit from their ownership stakes in GP practices. Their services are used to improve the health outcomes for New Zealanders.

GPs are moderately substitutable. While skill levels differ, in general they can be replaced by the services of another GP without a significant impact on the quality of care provided. The degree to which a GP is substitutable decreases with the length of the GP-patient relationship. This is because continuity of care benefits accrue over time. A high degree of substitutability typically increases the competition in a market because patients can more easily switch between GPs.

Greater competition could lead to better outcomes for patients, and the system, for example:

- greater quality of care because GPs know that a patient may switch if dissatisfied
- greater accessibility as GPs can extend office hours, reduce wait times, or offer other services to attract and retain patients
- greater specialisation as GPs look to differentiate themselves by specialising
- greater cost competition as clinics may lower their fees to compete for patients on price.

Increased numbers may result in some of these competitive effects, where the effects will broadly scale with the size of the increase. Each option will have different competitive impacts on the market for GPs because of the training received by the graduates. Options two and three are expected to result in GPs that are trained to better deliver healthcare in rural communities. Markets for GPs in rural communities will therefore experience a larger increase in GP numbers relative to option one. The quality of healthcare in these communities may therefore experience greater competition and associated positive impacts.

Universities will improve the quality and attractiveness of their medical education

Competition for students will likely result in non-price competition. For example, by universities improving the quality of education and extra-curricular services provided to students. This improved education quality may result in better outcomes for society.

It is unlikely that students will receive lower prices from universities. The number of providers of education will increase (under option three), theoretically putting downward pressure on prices. However, there is still expected to be a significant shortage in places in the Bachelor of Medicine and Bachelor of Surgery Programme relative to demand, i.e. students' demand for medical courses will continue to far exceed supply.

In addition, universities are also constrained in their abilities to increase fees. For example, the Ministry of Education set the annual maximum fee movement to 2.8 per cent in 2024 (Ministry of Education, 2023), and 2.75 per cent in 2023 (Ministry of Education, 2022). As a result, current prices are likely below the levels that would be expected without price restrictions.

All options will result in increased competition for students. However, it is likely that option three will result in the greatest competitive benefits for New Zealand. Option three introduces a new university into the market for medical students, whereas option one and two increase capacity from the current schools only. The introduction of a new medical school adds a new market participant, which typically increases competition.

Real option value—option to expand

Real options refer to the choice available to decision-makers to take a particular course of action. Common real options include the following:

- The option to expand: if a project or product line is performing better than expected the option to expand enables decision-makers to boost production or make additional investments.
- Option to abandon: the option to abandon is the option to cease a project, or sell a project's assets to realise their salvage value.
- Option to wait: the option of deferring a business decision to the future.
- Option to contract: the option to downsize a project or product line.
- Option to switch: the option to temporarily halt a project while maintaining the option to resume at a later date.

Option three and, to some extent option two, provide significant additional real option value through adding options to expand the New Zealand health workforce training system in unique ways. This could be especially important in the context of forecast shortages out to 2042 exceeding the additional capacity considered in the options considered in this CBA (Te Whatu Ora, 2023).

7. Results

Table 17 displays the quantified costs and benefits of each option under our base case assumptions. Ranked by monetised costs and benefits, option three has the highest NPV of $2.46 billion.

Given the quantum of non-monetised costs and benefits however, this measure is less insightful on its own than may normally be the case. We believe that it is likely that the qualitative benefits would be much larger in value than the monetised benefit of reduced mortality. The value of these unquantified benefits largely scale with the number of GPs.[9] As such, if we could monetise these benefits accurately, the NPV and BCR for all options would increase considerably. Option three would benefit the most (due to more GPs produced), then option two, and lastly option one.

> s 9(2)(f)(iv) [redacted] nder our central estimate, option three provides the greatest overall net benefits (as shown by it having highest NPV)[10] and the most monetised benefit per unit of monetised cost. Option one is the lowest cost option.
>
> The result is highly sensitive to the assumptions made about the amenable mortality reduced, and the discount rate applied. All options have positive NPVs under the most pessimistic sensitivities. However, the monetised NPV needs to be considered alongside the significant potential non-monetised benefits.

Table 17: CBA results and quantified, non-monetised costs and benefits, present value ($million) in 2023/24 terms (2024 to 2072)

	Option one		Option two		Option three		Notes
	Min	Max	Min	Max	Min	Max	
Monetised Costs							
s 9(2)(f)(iv) [redacted]							

[9] The exception to this is the additional benefit of non-GP medical specialists. This is because this is largely the obverse of the number of GPs produced by each option.
[10] That is the benefits exceed the costs (both in today's terms) by the greatest amount.

Total costs	**$887.69**		**$1,190.39**		**$1,445.64**		
	$667.18	$1,108.20	$843.25	$1,537.53	$1,009.34	$1,881.94	
Monetised Benefits							
Reduction in amenable mortality	**$1,987.03**		**$3,116.80**		**$3,902.73**		
	$993.51	$3,066.40	$1,558.40	$4,809.87	$1,951.37	$6,022.73	
Results							
Effects from GP propensity sensitivities	$ -		-$174.26	$174.26	-$179.38	$179.38	Only included in range estimates
Effects from discount rates sensitivities	$ -	$5,645.83	$ -	$8,858.27	$ -	$11,094.54	Only included in range estimates
NPV	**$1,099.33**		**$1,926.41**		**$2,457.09**		
	$105.82	$2,178.70	368.01	$3,619.48	$505.72	$4,577.09	Excludes discount rate sensitivity range
BCR	2.2		2.6		2.7		
Non-monetised benefits							
Impact on ambulatory sensitive hospitalisations							Evidence suggests a mixed impact. However, where ASH rates decrease, health outcomes tend to rise with them.
Better matching with career interest and lower churn							
Continuity of care							Evidence suggests an improvement in health outcomes. Improvement will be largest in rural communities.
Clinical placements							Small benefit likely for placement attendees.

Other improved access to healthcare for underserved communities				All options improve health outcomes for NZ. Options two and three are likely to have a bigger impact on currently underserved communities.
Competitive effects				Benefits in the market for GPs and for medical education. Greatest under option three.
Real option value				Benefits from increased range of choices to scale up/down to meet future training needs.

In terms of cost-effectiveness analysis, option three has the highest medical school costs (primarily due to CAPEX), but also produces the most additional GP FTE. This results in the lowest cost per GP FTE produced, by 2042. Option one has the medical school costs per GP FTE.

s 9(2)(f)(iv) [redacted]

7.1 Sensitivity testing

The table above displays our central estimates. Figure 11, Figure 12, and Figure 13 display tornado charts that illustrate the sensitivity of each option's NPV from our base assumptions to changes in key modelling parameters. Areas for sensitivity analysis are chosen based on degree of uncertainty and the magnitude of the impact on NPV. The variables and parameters that were sensitivity tested are shown in Table 19.

Table 19: Sensitivity parameters

Parameter	Value/assumption	Comment

Discount rate	Base: 5% Tested: 0%; 3.5%	Much of the benefits occur in the latter years, and therefore are sensitive to the discount rate used. 0% tests the impact of no discounting. 3.5% tests the impact of using Pharmac's default discount rate for their health technology assessments.
Value of a statistical life	Base: $9.83 million Tested: $4.92 million; $15.17million	This value is a key input to our monetised benefits. The Treasury's CBAx values range considerably. We therefore test the impact of different values from the central estimate used in our base case. $4.92 million is half the Treasury's Central CBAx value. $15.17 million is the high CBAx value.
Life expectancy improvement estimate	Base: Female: 0.57 years, Male: 0.5 years Tested: Female: 0.37 years, Male: 0.31 years; Female: 0.77 years, Male: 0.7 years	Our base case monetised benefits are based on the central estimate from Baker et al. (2024). The actual value may deviate from the observed estimate. Low and high values tested are based on the lower and upper bounds of the confidence interval reported by Baker et al. (2024).
Proportion of GPs requiring supporting infrastructure	Base: 50% Tested: 0%; 100%	The actual proportion of additional GPs requiring supporting infrastructure is unknown, and we assume 50% as our base case. 0% and 100% were tested as extreme sensitivities
Propensity to be a GP post-graduation	Base: Option two: 35.0%, option three: 42.5% Tested: Option two: 32.5%, option three: 40.0%; option two: 37.5%, option three: 45.0%	It is unknown how directly the Wollongong experience may transfer to NZ. For options two and three, we test ±2.5 percentage points from the base propensity.

Each option is most sensitive to variance in the discount rate and reduced amenable mortality.

In contrast, each option is least sensitive to the propensity to be a GP, programme OPEX, and CAPEX. For programme OPEX and CAPEX, the magnitude of these figures are small relative to the total costs, meaning that variances in these do not materially impact the NPV.

The one-way sensitivity that has the largest negative impact is if the low value of a statistical life is used for computing the life-expectancy benefits. Under this scenario:

- all options result in positive NPVs and BCRs above one

- the relative ranking by NPV and BCR remains the same.

It would require the combination of both the low estimate of a value of a statistical life (VOSL), and the low rate of life-expectancy improvement to produce a NPVs for the options. Under this very conservative scenario, it would require the non-monetised benefits to be 41 per cent, 20 per cent and 17 per cent of the mortality benefit for options one, two and three, respectively, to be net-neutral. We believe that this is likely the case. Indeed, we believe it is likely that the total quantum of non-monetised benefits would be of higher societal value than the improvement in life-expectancy.

Figure 11: Tornado chart - option one

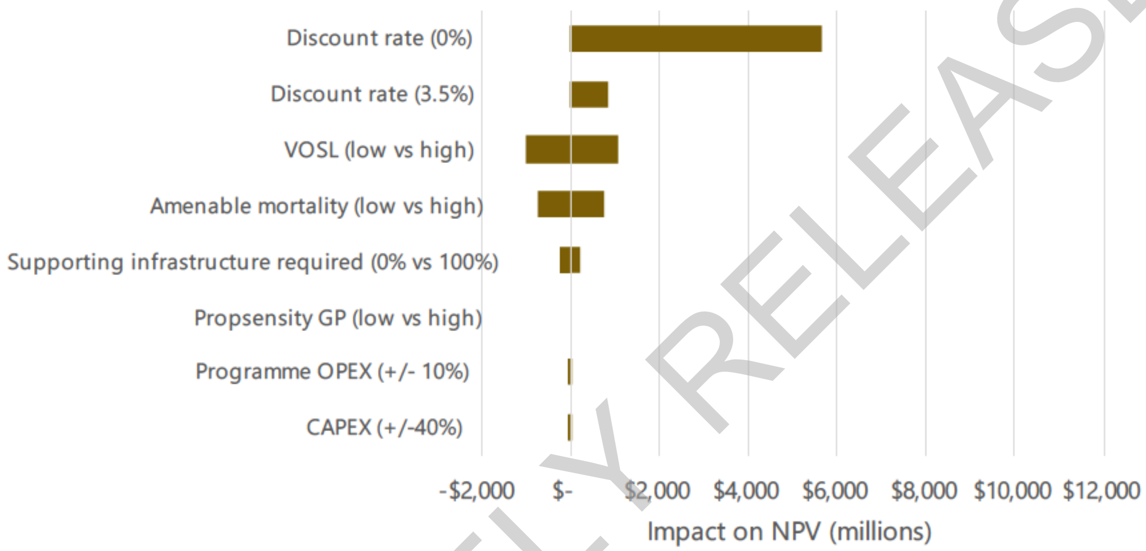


Figure 12: Tornado chart - option two

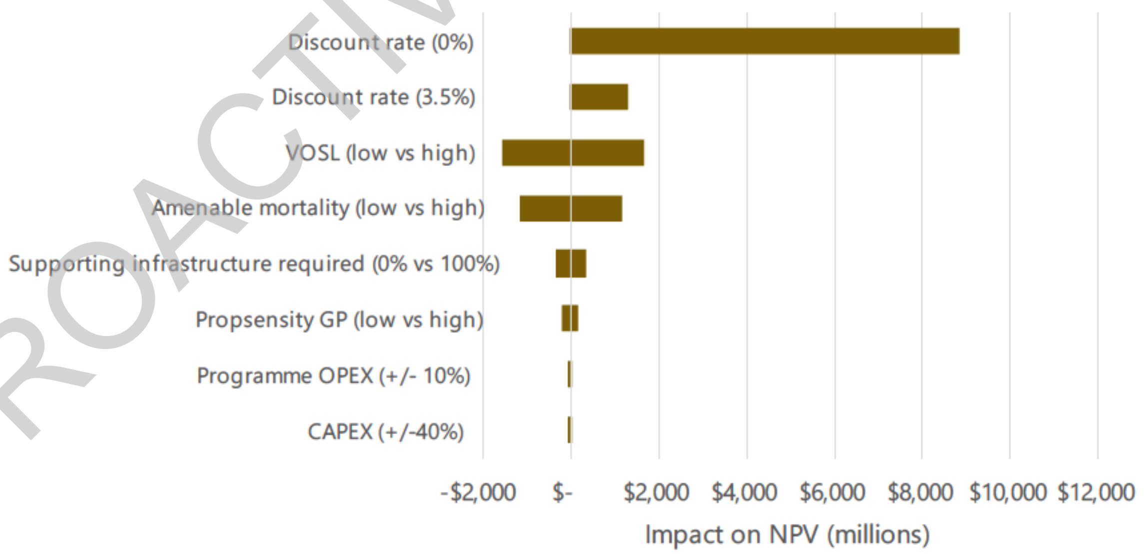
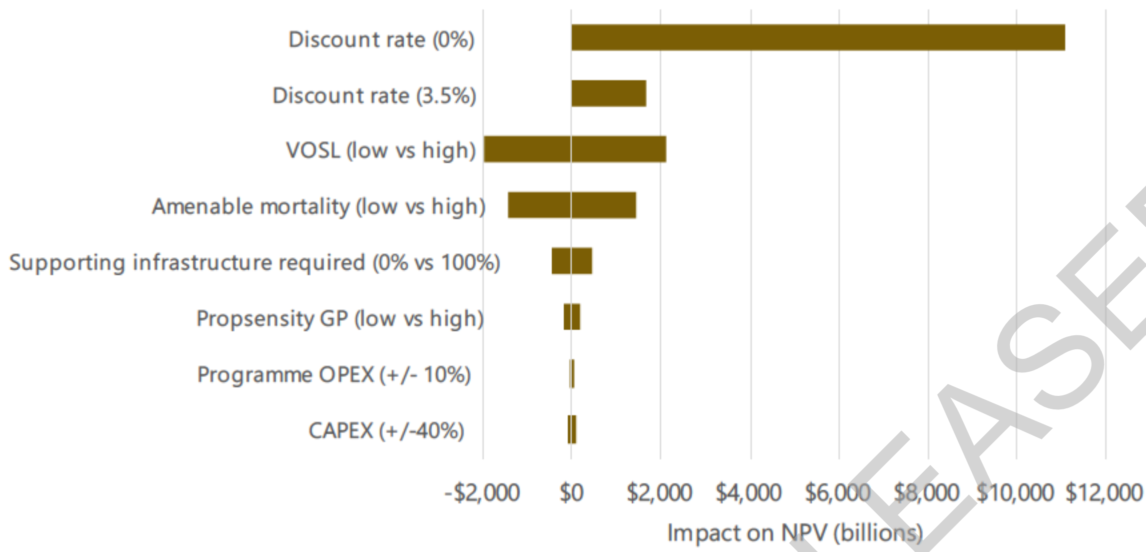


Figure 13: Tornado chart - option three



7.2 Break-even analysis

Two areas of uncertainty that also drive our CBA results are:

- the mortality benefits that arise from additional GPs
- the number of GPs produced under each option.

We conduct a break-even analysis to assess the point at which each option at breaks even for each of these modelling parameters, relative to the status quo.

7.2.1 Life years per GP to break-even

For each of the options, we estimated the additional life-years that would be required to have a NPV of zero (BCR of one), i.e. to break-even. This break-even point is based on the costs, and the number of GPs based on those predicted from the workforce modelling. This analysis overstates the required break-even point for additional life-years as it does not account for any other benefits, monetised or not.

We use the same value of a statistical life-year, approximately $474,000, as in the avoided mortality benefit section. We estimate a break-even point of approximately 1.4 life-years saved per GP FTE for option three, up to 1.7 life-years saved for option one.[11]

To put this in perspective, with an average GP practice size of 1,400 patients and a practising career of 30 years, the break-even point is:

- 0.45 additional days of life per patient per year for option one

[11] Assuming roughly constant life-years saved over the period of 2036-2072, and an average GP working life of around 30 years.

- 0.38 additional days of life per patient per year for option two
- 0.37 additional days of life per patient per year for option three.

Option three results in the lowest required life-expectancy benefit. This is largely driven by this option producing the largest number of additional GP FTE, relative to its costs.

Table 20: Life years required per GP to break-even

	Present value of break-even life years (millions)	Break-even life-years (PV)	Additional GPs, 2042 (FTE)	Life-years per GP per year
Option one	$891.28	6,735	131	1.7
Option two	$1,193.97	9,022	206	1.5
Option three	$1,450.23	10,959	258	1.4

7.2.2 Additional GPs to break-even

For each of the options, we estimated the number of additional GPs that would be required to break-even. This analysis holds the monetised life-expectancy benefit per GP constant, and equal to our base case. This average net-benefit equates to $11.1 million per GP FTE produced by 2042.

We compare this average net-benefit per GP FTE figure against the costs of each option, excluding the costs of additional primary care provision. The break-even point varies between s 9(2)(f)(iv) [redacted] by 2042 for option one, through to s 9(2)(f)(iv) [redacted]. The break-even point for option two is s 9(2)(f)(iv) [redacted]

Table 21: Additional GP FTE by 2042 to break-even

	Costs excluding GP additional care costs (millions)	NPV per GP (millions)	Break-even additional GP FTE (by 2042)
Option one	s 9(2)(f)(iv) [redacted]		s 9(2)(f)(iv) [redacted]
Option two	[redacted]	11.1	[redacted]
Option three	[redacted]		[redacted]

References

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Appendix A Health workforce modelling

Table 22: Key volumes

Category	Description	Assumption / estimation
Volumes	Number of medical school graduates	120 additional students start in the first year of medical school. Each subsequent year is equal to the previous year's students multiplied by the retention rate. This is discussed further in Table 24.
	Number of GPs	We have relied on health workforce modelling undertaken by Health NZ.
	Number of other doctors	We have relied on health workforce modelling undertaken by Health NZ.
	Number of GP visits	Average 3.3 visits per annum, derived from Sapere's proprietary practice model. The weighted average number of consults is 6.6; we assume half of these are nurse consults.

Workforce forecasting methodology

The Analytics and Forecasting team, National People Services, Health NZ has developed health workforce forecasting models for professions including almost all regulated professions and some unregulated professions.

The workforce supply forecasting models are based on data about individual practitioners. Each practitioner's new entries, re-entries and exits are tracked based on annual changes in the work history. Entry and exit rates are calculated for the group of practitioners in each five-year age band; in the forecasting model they are moved between age bands as they age.

In other words, the forecasts are based on 'rates tables' which record the actual numbers entering and leaving the workforce over recent years. The entry numbers include both domestically trained and internationally trained professionals, and include those entering for the first time (new entries, with their first annual practising certificate) and those coming back into the workforce after a break (re-entries). Entries and exits in each five-year age band are treated separately because those age and group-specific patterns vary. For a ten-year forecast, we must allow that current workers will be ten years older and their likelihood of leaving (or having already left) will be different to now, and that new entries and re-entries will be more likely to happen in certain age bands. In other words, the aim is to forecast not just the total numbers but also the age structures of future workforces.

Testing the model's forecasts against what has actually happened in past years shows it to be 98 per cent accurate for five-year projections for a large occupational group, namely all general practitioners.

The basic algorithm and specific models have been reported in academic publications as follows:

- Jo, Emmanuel, Kimberly Mathis and Justin Goh. *Forecasting future medical specialty workforces supply with age distribution using health workforce annual practising certificate data*, Operations Research Society of New Zealand, 2017, 1-12.[12]

[12] http://orsnz.org.nz/conf51/wp-content/uploads/sites/3/2017/12/ORSNZ17_JoE.pdf

- Seleq, Sam, Emmanuel Jo, Phillippa Poole, Tim Wilkinson, Fiona Hyland, Joy Rudland, Antonia Verstappen and Warwick Bagg. *The employment gap: the relationship between medical student career choices and the future needs of the New Zealand medical workforce*, New Zealand Medical Journal, 29 November 2019, 52-59.[13]
- Dunn, Alex, Shaun Costello, Fiona Imlach, Emmanuel Jo, Jason Gurney, Rose Simpson and Diana Sarfati. *Using national data to model the New Zealand radiation oncology workforce,* Journal of Medical Imaging and Radiation Oncology 2022, 1-9.[14]

General assumptions for the forecasting models

The Analytics and Forecasting team's standard (baseline) workforce forecasts are based on patterns which have been evident in the last three or five years, and on projecting these patterns into the future (the next 10 years). These forecasts assume that current patterns of work will continue. That is:

- no changes in technology or models of care
- continuation of age-group-specific patterns of new entry to each specialty, and re-entries after periods of absence
- continuation of current age-group-specific exit rates
- new entrants include those who have completed training in New Zealand as well as fully qualified internationally trained professionals registered for the first time in New Zealand. The model assumes that the historic patterns of entry of the two groups continue.

Modelling assumption deviations to test each option

For the purposes of estimating the impact of each proposed option on the health workforce, we have modified key parameters to reflect the changes we'd expect to see. Parameters changed include:

- propensity to enter general practice
- retention rate for general practitioners.

Table 23 presents the parameters modified, and the value they take under each option.

[13] https://journal.nzma.org.nz/journal-articles/the-employment-gap-the-relationship-between-medical-student-career-choices-and-the-future-needs-of-the-new-zealand-medical-workforce

[14] https://doi.org/10.1111/1754-9485.13448

Table 23: Parameter values under each option

Option	Change in NZ trained graduates per annum	Propensity to be a GP	Exit rate
Option one	120	23.0%	Current rate
Option two	120	35.0%	3/4 of the current rate
Sensitivities	-	32.5% - 37.5%	-
Option three	120	42.5%	1/2 of the current rate
Sensitivities	-	40.0% - 45.0%	-

Propensity to be a GP

The propensity to be a GP is currently modelled at 23 per cent under the status quo. Both option two and option three seek to increase the propensity for medical graduates to enter general practice. Medical schools are infrequently established so minimal contemporary evidence of their impacts exists. However, a recent medical school established in Australia at the University of Wollongong has a similar focus on primary care and rural communities to the proposed options two and three. The propensity to go into general practice for graduates from the University of Wollongong is 42.7 per cent, significantly higher than the average of 27.7 per cent for other Australian medical schools (Cortie et al, 2023).

s 9(2)(b)(ii) [redacted] Our base case assumes a similar level of success, with sensitivities 2.5 per cent either side. The outcome from the University of Wollongong is considered the gold standard for increasing GP numbers. Option two is therefore assumed to have similar, though marginally less, success at turning medical graduates into GPs. The primary care and rural practitioner focused curriculum offered by the University of Wollongong is the key assumption driving this differentiation.

Rates of exit from the medical profession

Exit rates refer to the rate at which people, for whatever reason, exit the New Zealand medical workforce. This may be to move to a different country, work in an area other than medicine, commit to further study, or to make lifestyle adjustments to achieve other goals. Exit rates are explicitly modelled based on observed past behaviour of age and gender groups.

Exit rates are also assumed to be lower for GPs under options two and three. We draw on research from Kwan et al (2017) that shows longer term intentions for rural practice increase, with an increase in the number of years of clinical placement in these settings.

Appendix B Detailed cost assumptions

Quantified cost assumptions, relevant to section 4, are grouped based on the cost they apply to. Table 24 shows the cost assumptions relevant to all costs.

Table 24: Quantified cost assumptions relevant to all costs

Description	Assumption(s)	Source
Number of undergraduate students	For option one and option two, five years of medical school starting in 2027/28. 120 additional students start in the first year of medical school. Each subsequent year is equal to the previous year's students multiplied by the retention rate. For option three, four years of medical school starting in 2027/28. 120 additional students start in the first year of medical school. Each subsequent year is equal to the previous year's students multiplied by the degree retention rate.	Sapere judgement based on the draft programme business case
Degree retention rate	99.16% annual degree retention rate. Auckland and Otago University medical degrees had an average cohort completion rate of 95.04% between 2014 and 2023. This figure implies an annual retention rate of 99.16% for a six-year programme (includes first-year health sciences).	Medical doctor data from the Ministry of Health: cohort-based qualification completion rates for funded medical doctor learners
First-year postgraduate years retention rate	99.17% retention rate for year one of postgraduate medical studies.	(Medical Council of New Zealand, 2023)
Construction start	Starts in 2026/27 and ends by 2027/28.	Sapere judgement based on the draft programme business case
Operations start	First year starts in 2027/28.	Sapere judgement based on the draft programme business case

Table 25 outlines the assumptions relevant to the OPEX costs.

Table 25: OPEX assumptions

Description	Assumption	Source
s 9(2)(f)(iv) [redacted]	[redacted]	Draft programme business case: financial case
OPEX figures (excluding clinical	Option one and option two's OPEX figures (excluding clinical placement costs) are 25% greater than option three's. This figure is scaled based on option one and	Sapere assumption

Description	Assumption	Source
placement costs) for option one and two	option two requiring five years of medical school education relative to option three having four.	
Clinical placement costs for option one and option two	Option one and option two's clinical placement costs are 6% less than option three's. This figure is based on option three requiring more placement weeks (explained below).	Sapere assumption
Gone on to further study	49.3% of individuals who finished their degrees would have gone on to further studies if they had not gotten into medicine. These students are proxied using the number of public health, biochemistry, genetics, human biology, neuroscience, and other biological science students that go on to other studies as a proportion of total graduates.	(Tertiary Education Commission, 2024c)

Table 26 outlines the assumptions for CAPEX.

Table 26: CAPEX assumptions

Description	Assumption	Source
CAPEX costs for option three	CAPEX costs for option three are assumed equal to those stated in the draft financial case.	Draft programme business case: financial case
Existing capacity in hospitals to have student placements	There is no spare capacity in the current system, i.e. all options require clinical placement capacity development.	Draft programme business case: financial case
Contingency	20% of facilities costs.	Draft programme business case: financial case
Clinical placement capacity	Clinical placement capacity costs are the same across options.	Sapere assumption
Curriculum development costs for option two	[redacted] is required because it can be added on to existing work.	Approximation provided by a representative of our expert panel
Curriculum development costs for option one	Option one does not require any additional curriculum development beyond what is occurring in the status quo.	Sapere assumption
Infrastructure development support	Only option three requires infrastructure development support.	Sapere assumption
Capacity to support new placements	Capacity to support new placements is the same across options.	Sapere assumption

Table 27 shows the cost of GP care assumptions.

Table 27: Cost of GP care assumptions

Description	Assumption	Source
Number of additional GPs in New Zealand	The number of additional GPs in New Zealand follows the workforce modelling described in Appendix A: rising from 22, 33, 40 for option one, option two, and option three respectively in FY 2036, to 131, 206, 258 for option one, option two and option three respectively in FY 2042.	Benefits section 4.3

Description	Assumption	Source
FTE provided per GP	Each GP provides 0.82 FTE on average in FY 2036 and outer years.	(Allen and Clarke, 2021)

s 9(2)(f)(iv)

[redacted]

Table 28 shows the assumptions for the terminal value estimate.

Table 28: Terminal value assumptions

Description	Assumption	Source
Depreciation rate buildings and accommodations	Buildings and accommodation have a 2% depreciation rate.	Draft programme business case: financial case
Depreciation rate equipment	Equipment has a 10% depreciation rate.	Draft programme business case: financial case
Useful life	Useful life of all assets begins in 2027/28.	Draft programme business case: financial case
Contingency inclusion	Depreciation has been calculated on capital costs including contingency.	Draft programme business case: financial case
Salvage values	Assets have a zero-salvage value, i.e. when the useful life of the assets ends and they are fully depreciated, their value is zero.	Sapere assumption

Table 29 outlines the assumptions associated with other economic costs.

Table 29: Other economic cost assumptions

Description	Assumption	Source
Students that would have gone on to further study	49.3% of individuals who finished their degrees would have gone on to further studies if they had not gotten into medicine. These students are proxied using the number of public health, biochemistry, genetics, human biology,	(Tertiary Education Commission, 2024c)

Description	Assumption	Source
	neuroscience, and other biological science students that go on to other studies as a proportion of total graduates.	
Undergraduate additional years studying	Undergraduates in option one and option two doing medicine courses would otherwise have spent three years studying.	Sapere assumption
Deadweight loss	Deadweight cost of taxation is equal to 20% of project costs funded by taxation.	(The Treasury, 2015)
The Medical Trainee Intern Grant	The Medical Trainee Intern Grant is equal to $26,756 per final year domestic medicine student.	(Tertiary Education Commission, 2024a)
Government subsidy for undergraduate medicine	Government subsidy of $51,217 per annum for medicine undergraduate programmes.	(Tertiary Education Commission, 2024b)

Appendix C Amenable mortality and primary care coverage

Amenable mortality refers to premature deaths that could have potentially been avoided with effective and timely healthcare interventions.

There are many sources from the academic literature that seek to produce a link between primary care coverage and amenable mortality. Evidence suggests that each additional general practitioner is associated with lower premature mortality, even in health systems with strong primary care (Baker et al., 2016). Each option leads to an increase in the number of GPs operating in the workforce, and therefore a reduction in the mortality rate.

Baker et al. (2024) found that an increase of one GP per 1,000 population was associated with an increase in life expectancy of 0.57 years for females, and 0.50 years for males. Gulliford et al. (2004) found that an increase of one GP per 10,000 population was associated with a 5.2 per cent decrease in all-cause mortality.

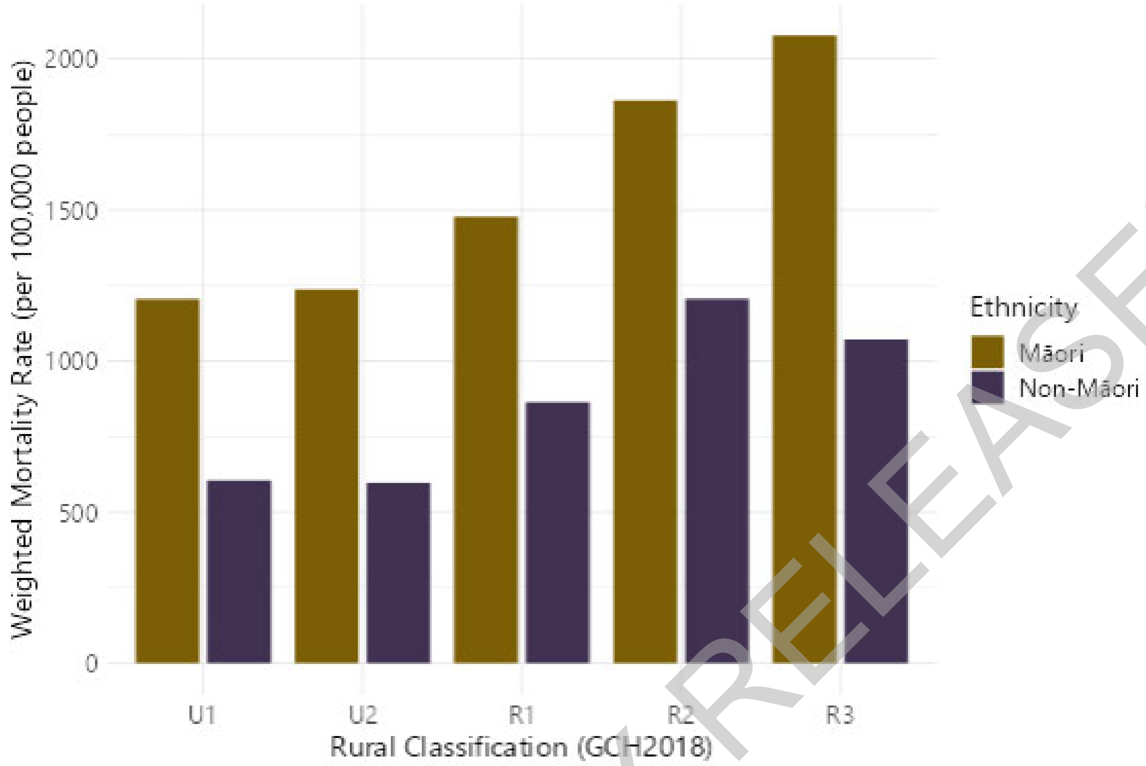
The reductions found by Gulliford et al. (2004) would result in a higher mortality benefit than those in Baker et al. (2024). We apply the findings of Baker et al. (2024) in our CBA for conservativism.

Rural and Māori populations may have more to gain from improved primary care

Nixon et al. (2023) finds higher rates of amenable mortality amongst rural populations and Māori. This is illustrated in Figure 14 which shows age-weighted amenable mortality rates by ethnicity in U1 areas (most urban) to R3 areas (most rural) in New Zealand. The relationships between Māori, rurality, and amenable mortality are indicative of barriers to accessing healthcare.

Given the ethnic and geographic make-up of the country, we estimate Māori account for 28 per cent of amenable deaths, despite only comprising 16 per cent of the total enrolled population. We also estimate that rural populations account for 25 per cent of amenable deaths while only comprising 18 per cent of the total enrolled population.

Figure 14: Age-weighted amenable mortality rate by rural classification and ethnicity



Source: Sapere calculations based on Nixon et al. (2023)

Parameters used in mortality benefit calculation

Table 30: Common modelling parameters

Parameter	Value/ assumption	Comment
Value of a statistical life (VOSL)	$9.83 million	Central value sourced from The Treasury's CBAx guidance
Value of a statistical life year	$473,772	Calculated from VOSL above based on a 4% discount rate (the NZTA discount rate) with an average life expectancy of 45.2 years
Life expectancy increase	For each additional GP per 1,000 population: Females – 0.57 years Males – 0.5 years	Sourced from Baker et al. (2024). Benefit only applied to projected deaths in each year
Lag and ramp up of benefit	One-year lag before any benefits are seen. 10-year linear ramp up to full benefit	Modelling assumption. It is not expected that the benefits of additional GPs on life expectancy will be realised in in full immediately
GP exit rate	Age specific exit rate	Sourced from (Moore et al., 2023)

Appendix D GP practice location modelling

An important outcome of each of the options is where the additional GPs may choose to locate themselves. Our modelling takes the status quo distribution of GPs as the base case, then adds the additional GPs produced under each option.

Status quo modelling

Status quo modelling is undertaken on the assumption that current patterns of GP coverage remain. The current GP per capita ratio in each location is taken as the basis for distribution of GPs. Distribution of GPs is consistent with Equation 1.

Equation 1: Status Quo GP distribution

$$AdditionalGPs_{i,t} = \frac{GPsperCapita_{i,t-1}}{\sum_{j=1}^{n} GPsperCapita_{j,t-1}} \times \sum_{j=1}^{n} AdditionalGPs_{j,t}$$

The same rural-urban split for status quo GPs is assumed to be the current split; approximately 16.6 per cent of GPs currently practice rurally (Bagg et al., 2023).

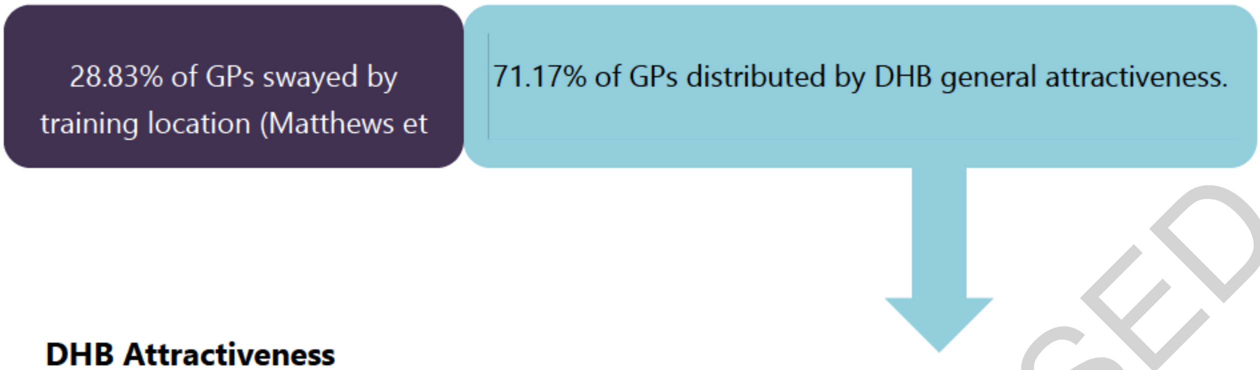
Modelling additional GPs above the status quo under each option

All GP location modelling is undertaken at the DHB level with a simple rural/urban split of GP locations. Our location modelling of additional GPs is based on four key variables that determine the attractiveness of establishing a clinic in any one area.

1) Propensity to practice rurally: the background of a student, as well as the number of years of clinical placement undertaken rurally, impacts the likelihood of graduates choosing to practice rurally (Kwan et al., 2017).
2) Where the GP trained: where a doctor underwent clinical placements can impact where they choose to practice post-graduation (Matthews et al., 2015).
3) The general attractiveness of a location: represented by the forecast population of each DHB, in the previous year.
4) The specific attractiveness of a location to GPs: represented by the GP per capita ratio in the previous year.

Figure 15 displays the overarching approach to distributing additional GPs produced under each option.

Figure 15: Additional GP distribution model



DHB Attractiveness

$$DHBAttractiveness_{i,t} = \frac{Population_{i,t-1}}{\sum_{j=1}^{n} Population_{j,t-1}} \times a + \frac{GPsperCapita_{i,t-1}}{\sum_{j=1}^{n} GPsperCapita_{j,t-1}} \times b$$

$$AdditionalGPs_{i,t} = \frac{DHBAttractiveness_{i,t}}{\sum_{j=1}^{n} DHBAttractiveness_{j,t}} \times \sum_{j=1}^{n} AdditionalGPs_{j,t}$$

where:

$a = 0.71$

$b = 0.29$

the development of 'a' and 'b' is described in more detail below.

Influence of training location

Each option proposes to train medical students in different parts of the country. This includes both the location of campuses, and clinical placements that students embark on. We incorporate the findings of a review into placement location choices post-graduation for participants of the Pukawakawa programme (Matthews et al., 2015). This programme trains doctors in rural Northland currently, through the University of Auckland. This study found that 31 per cent of students chose to work in Northland post-graduation, with 93 per cent of those students stating their clinical placements occurring in that region as a driving force behind their decision. 93 per cent * 31 per cent = 29 per cent. We assume that this result is generalisable and allocate 29 per cent of the additional GPs according to this methodology. Each option will train GPs in several DHB areas. As a proxy for training capacity, we use the current number of GPs in each DHB and distribute the additional GPs under this method proportionately.

s 9(2)(f)(iv)

[redacted]

We assume that under option one, the existing locations used for training continue to be used. Option two is assumed to utilise the same training locations as option one, with the notable exception of the Waitemata district health board due to the difficulties involved in finding rural placement locations within this area. Note that Figure 16, Figure 17, and Figure 18 only refer to the clinical placement locations for the additional 120 students.

s 9(2)(f)(iv)

[redacted]

s 9(2)(f)(iv)

[redacted]

s 9(2)(f)(iv)

[redacted]

Our attractiveness quotient is used to allocate the remaining 71 per cent of additional GPs and considers the relative population sizes of each DHB, and the number of GPs per capita in each DHB.

The attractiveness quotient is a simple average of the attractiveness values we find for the general attractiveness of a location, represented by population, and the specific attractiveness of a location, represented by the GP per capita ratio.

General DHB attractiveness is assumed to have a 50 per cent overall weighting on the distribution of GPs (including training location). To achieve this, population has a 71 per cent weighting of DHB attractiveness, with the remaining 29 per cent coming from the GP per capita ratio (21 per cent overall weighting).

There are two potential schools of thought on how the number of GPs per capita in a given area affects location choices of new entrants. On one hand, a low GP per capita ratio in a given DHB represents an underserved market which is attractive to new entrants. GPs establishing themselves in this market are likely to experience high demand for their services. In practice, this low GP per capita ratio may result in large signing bonuses or higher salaries in an effort to attract staff.

On the other hand, high GP per capita ratios may be a signal of successful business practices. Other work undertaken by members of this team has found that short-staffed practices struggle to attract additional staff, while those that are doing well receive many offers. Additionally, a high GP per capita ratio may be indicative of a location being highly attractive to GPs, containing a lot of qualities that GPs find attractive.

Our base case assumptions are that these two effects offset each other to some extent, but that a higher GP per capita ratio being attractive, rather than not attractive, dominates. 29 per cent of the attractiveness quotient is therefore driven by this value.

Propensity to practice rurally

Once allocated at the DHB level, GPs are then allocated between rural and urban settings as discussed in section 4.3.

About Sapere

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