A Future Capitation Funding Approach

Addressing health need and sustainability in general practice funding

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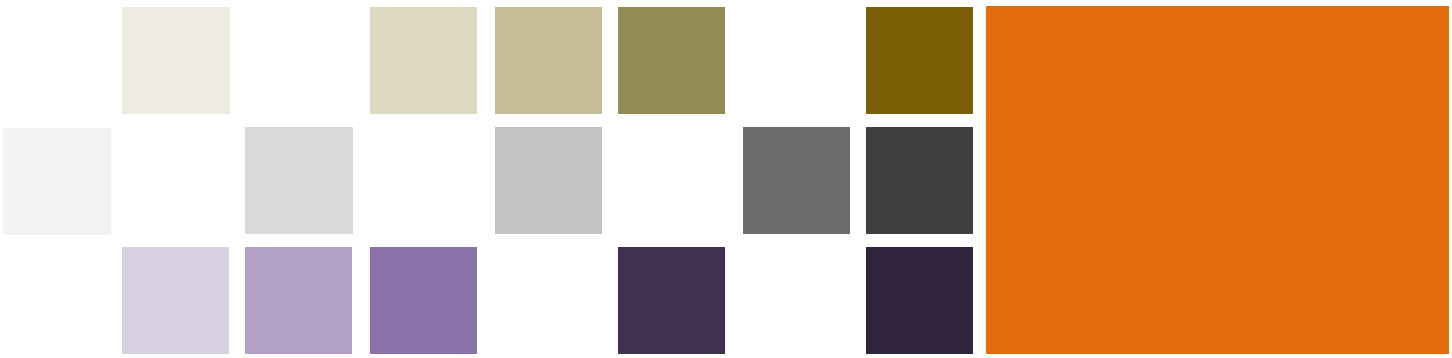

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Executive summary

We were commissioned by the Health Transition Unit within the Department of Prime Minister and Cabinet to conduct analysis to support the development of a capitation formula for general practice services. The goal was to address a number of fundamental problems with the existing formula, and particularly to find an approach that responds to health need appropriately. The Wai 2575 claim has established clearly that the current funding mechanism for primary health care is inequitable. Addressing this issue is a key priority for the health system.

The scope of this analysis covers the traditional core general practice team, consisting of medical, nursing and administrative staff. This lies within the wider context of work programmes under way, including work on funding the wider primary health care team in an integrated and equitable fashion. This work therefore addresses one component of the wider funding picture, while funding itself is only one aspect of the work required to make primary health services modern and sustainable. Aspects such as workforce development are also key to the sustainable future of health services.

Our approach differs from previous capitation formula development in several important ways:

- Previous analysis of general practice funding has relied heavily upon counting the volume of consultations with a general practitioner. This tends to emphasise the role of the GP at the expense of the wider practice team, and to underestimate the time needed for high need patients at the complex end of the range. This analysis is based upon a dataset that estimates the amount of time that clinicians in general practice spend with a patient, avoiding the limitations of counting doctor consultations as the basis of a funding methodology.
- We conducted a bottom-up costing of the delivery of general practice care to a person who needs a given amount of clinical time, based upon the income of clinicians (using MECA rates) and the best available estimates of the overheads of running a general practice.
- The median predicted historical activity in general practice was used as the basis for costing the delivery of care for most of the population. This means that, for most people, the current median level of provision is what was used to estimate the needed level of general practice care. However, for Māori, Pacific people, and those with the highest level of socioeconomic deprivation, we have used a higher level of care to benchmark activity and cost, by excluding historic underservicing below a given level. We looked at several possible levels below which to exclude underservicing. This approach mitigates the risk of embedding historical inequities in access to care into a new capitation funding formula. Essentially, what is modelled is what resources would be needed to deliver higher than historic levels of care to priority populations, to represent a new normal.

We have assumed no change in co-payment revenue for the purpose of this calculation. But co-payment revenue is an important part of the overall funding for general practice in New Zealand, and this is an area where policy attention is needed.

For the purpose of this analysis we have not considered after hours general practice services, or rural services. Our patient level information did not have a substantial level of data for either after hours or rural populations. However these are central elements of general practice in New Zealand, and should urgently be subject to their own costing analysis. The cost structure of rural services is different from that which we see in urban areas, driven by differences in the kinds of activity needed in a different setting as well as by constraints of scale, and in many cases a somewhat different workforce mix. The general approach we have taken here to attempting a bottom costing of activity, and then considering issues of historic underservicing to address inequity is applicable to rural general practice services, but we would expect the specific results to be different, and potentially quite significantly different. Similar issues apply to after hours services.

Our key results are:

- We recommend an approach to funding general practice services based upon age, sex, ethnicity, deprivation and morbidity. This appears to give results that are adequately correlated to health need.
- We find that removing historic activity and cost data on underserved populations when predicting general practice activity has a strong targeting effect, and would lead to significant new funding for high need general practices, while also providing some level of investment in most practices in Aotearoa.
- We find that responding substantively to issues of inequity in access to care will require significant workforce development, with increased numbers of clinicians and general practice support staff.
- We find that total status quo general practice revenue lies below the likely true cost of delivering care at current levels. This is consistent with widespread anecdotal evidence of constraint in general practice services, with difficulty recruiting and retaining the workforce, and rising barriers for access to care (such as delays in being able to make appointments and practices declining to enrol new patients).
- For very high need practices, increasing the goal level of servicing to the higher levels we have modelled, sees an increase in capitation revenue of between 34% to 231%, depending upon the level of benchmarking chosen.
- For most practices, the median modelled increase is between 10% and 20% of current capitation revenue. This does not vary greatly with different levels of priority population targeting.

This analysis represents one component of the work needed to develop a new improved funding system to support effective, responsive primary health care services. It identifies patterns of activity and need, and sets out a possible approach for addressing some of the existing challenges arising from the way that New Zealand funds general practice services. But it exists within a much broader, complex, context of policy challenges that will have to be addressed in order to ensure the future of primary health care services. Key issues into which this analysis feeds include:

- Level of investment in unmet need. We have provided a number of scenarios for investment, premised upon the level of care that should be the goal for a new funding system to support for priority populations. This issue will have to be considered in light of the impact that is desired upon inequitable access to existing primary health care services. This will require specific analysis to understand the proportion of Māori, Pacific and socioeconomically deprived populations that currently do not access primary health care in proportion to their need. Some aspects of this unmet need are known and documented (for example in the New Zealand Health Survey), but setting the level of investment in unmet need will require specific analysis to inform decisions.
- Review of service viability. We have addressed some aspects of the viability of core general practice in our bottom up costing, but viability is about a wider range of factors, and funding is only one element of those. The viability of primary care services in the future depends critically upon the supply of the primary care workforce, and the distribution of services both geographically and demographically. Constraints of workforce may be partly addressed by funding, but also reflect wider issues of training investment, as well as changing professional roles. The service funding elements of primary care viability must be considered within a wider context.
- Changing workforce roles. We have modelled costs around a traditional model of general practice focussed upon a general practitioner and nurse clinical team, but the wider primary care workforce is evolving. The extent to which workforce change occurs within the level of investment indicated here for the traditional general practice team, and the extent to which additional investment is needed to develop those wider teams will require further analysis and debate.
- Implementation issues will be complex. Moving to a different distribution of funding will raise a number of complex issues in implementation, and these will require careful analysis and thorough debate. Where a redistribution at a given level of investment would imply that a small number of front line practices might see a reduction in their government revenue, will that be mitigated through a special funding mechanism, or by allowing co-payments to increase, or by some other approach? If a significant investment is made, it may take a number of years to get to the desired level, and there will be transitional issues and risks of unintended consequences that will have to be carefully considered. It will be important to have a regulatory environment in which there can be confidence that funding targeted for services to high need populations is used for the purposes for which it is intended.

These policy and implementation issues will require careful analysis and reasoned debate in order to develop the kind of approach presented in this analysis in a way that effectively improves health care services for the people of Aotearoa. We suggest that the next steps that will be needed in order to progress the analysis conducted here should include:

- Replicating the findings with other datasets. While best endeavours have been used to generate the estimates presented here, it would be prudent further to review the analysis to check for sources of bias, and to validate the findings based upon additional data. This should include specific data collection from practices with high need populations,

including practices that provide a Te Ao Māori informed model of care. It should also include further data collection on fixed costs and overheads – we have noted above that our data are derived from larger practices, and may underestimate these costs across the whole population of general practice;

- Considering the co-payment component of general practice revenue and the best options for future regulation of co-payments. Current co-payment regulation has not changed for nearly two decades. Policy settings are needed to determine the future goals of the health system for co-payment contribution for different populations, and what the future place of co-payments is within the overall general practice funding picture;
- Specific analysis should be conducted on costing and capitation for rural primary care services. This should acknowledge the unique constraints upon the provision of care in those settings. Rural practices are often smaller than urban practices, provide a different mix of care, and face particularly challenging workforce constraints. The capitation weightings in this analysis may not be effective in rural settings, and it is strongly recommended that specific analysis, based upon rural practice costs and populations, should be conducted in order to recognise the special character of these services;
- Analysis of after hours and extended access care., The scope of the care we have costed in this analysis does not include after hours care or services with extended hours of access. After hours and urgent care requires its own specific analysis of costs and service coverage in order to inform policy on the shape of these services across New Zealand. This is likely to be a significant piece of analysis in its own right;
- Consideration of investment in the extended primary health care team needed for a modern model of primary health care. Work has been progressing within Health New Zealand on the future development of wider primary health care teams, with a broader base of professional roles. This work is likely to be implemented as part of locality prototypes. Investment in general practice, as a key member of the overall primary care team, will have to be considered in light of these wider changes and developments in Aotearoa's primary health care services.

1. Background

1.1 How general practice is funded in Aotearoa

Funding for general practice care in New Zealand largely operated on a fee for service partial subsidy basis from the legislative introduction of a national funding scheme in 1938, to the implementation of the Primary Health Care Strategy in 2003. The value of that funding had eroded significantly over time, and since the health reforms of 1993 was no longer universal but targeted to holders of Community Services Cards (CSC). General practices could also claim a partial subsidy for the employment of a practice nurse. Other than ACC payments, remaining general practice revenue came from patient co-payments, which were unregulated.

The Primary Health Care Strategy of 2001, implemented from 2003, aimed for a primary care system that was much more focussed on meeting the needs of populations. The Strategy intended that "Primary Health Organisations will be funded according to a formula that reflects the relative need of their enrolled populations, taking account of factors such as age, sex, deprivation level and ethnicity." The Strategy set out an intention to reduce cost barriers to accessing primary care services, and explicitly envisaged that population-based funding would allow greater flexibility in models of care, and see reduced cost for patients.

In the event, the capitation formula for general practice that was developed under The Strategy was very limited in its effectiveness. The initial formula was based principally upon an aggregate number of fee for service subsidies expected for an enrolled individual given the average historical doctor consultation rate for someone of that age and sex. In effect this was simply an averaged historical fee for service subsidy. While some small additional funding streams included deprivation and ethnicity factors, the main formula for core first contact general practice services was based entirely upon demographic age and sex categories, with no adjustment for ethnicity or deprivation. This had the impact of embedding historic patterns of low access into the core funding for general practice, without recognising pre-existing differences in access patterns for Māori and others with high need, let alone newly addressing unmet need for health care.

Patient co-payment charges decreased as additional funding was channelled towards primary care in the first years following The Strategy. This additional funding required co-payment regulation, so that government could be confident that additional funding was being used to lower fees. Co-payment levels for an individual practice were frozen at the level they were at in 2003, less any additional subsidy that was added to the capitation formula over time. This base level has been allowed to increase annually on an inflation indexed basis, but may increase by more to compensate if base capitation funding increases annually by less than inflation. This has led to a system in which the absolute level of fee for a patient to attend a general practice is driven in part by the finances of that practice as they were in 2003, with a crude adjustment mechanism, and that has no cognisance of the changing real cost of a co-payment for an individual in a given regional economy or wage environment.

Where revenue has become demonstrably inadequate to operate a general practice, the practice can seek a fees review, and receive permission to increase co-payments at a greater rate than the national

inflation adjusted level. Fees reviews have been managed by individual DHBs, and anecdotally the approach to fees review varies across the country.

1.2 Why there is a problem with general practice funding

There are a number of problems with Aotearoa's funding for general practice care. Some of these issues were inherent in the original capitation formula approach, while others have emerged as the formula has been altered and revised incrementally over two decades.

The underlying approach to capitation as an averaged fee for service subsidy has resulted in only a moderate impact on new models of care. Many practices still operate an internal fee for service system to allocate income to medical practitioners. Fee for service revenue on a per consultation basis from patient co-payments is still a significant part of overall general practice income in most cases. These circumstances mean that assumptions about episodic service still underpins the funding approach for many general practices, and that the anticipated flexibility of capitation funding was not, generally, achieved.

Since the original capitation formula was implemented in 2003, several changes have been made, while retaining the original basic formula for first contact general practice services. This has resulted in many ad hoc additions to the formula, resulting in an opaque, complex set of funding arrangements. Additional funding lines include free under six funding, free under 14 funding, Very Low-Cost Access (VLCA) practice funding (where fees are regulated to a lower, uniform level, currently $19.50), and CSC supplementary funding. The Ministry of Health website lists 12 different components and options for general practice core capitation funding.

There are problems with the underlying sustainability of general practice capitation funding. As the population ages, the average complexity presented by a patient increases in a way that is not recognised in the current formula. This presents a general problem with the existing capitation rates. But beyond this, problems with the sustainability of the VLCA version of the formula have been recognised for some time. Since the VLCA formula is most frequently used in practices serving high need populations, this compounds existing issues of inequity in general practice funding.

The inequities in the current general practice funding approach have been at the heart of the Treaty of Waitangi Tribunal 2575 claim (notwithstanding that a wider range of services than core general practice are part of this claim). The current approach systematically underfunds services for Māori, by not recognising patterns of higher need and historical underutilisation by Māori. It embeds historical inequity. Approximately 15% of Māori are enrolled with Māori health care providers, with the remaining 85% enrolled with mainstream general practice services. Addressing the funding and responsiveness of general practice services to Māori health need will be an important (but far from the only) element of the Crown's response to the Tribunal's recommendations for WAI 2575.

Overall, funding for general practice care is problematic for a number of reasons, but the core issue is that funding does not align with patient need. This means that services that have a higher than average proportion of people with high health need are not funded adequately to deliver care to their patients. This is a serious deficiency in a core part of New Zealand's health system.

2. Methodology

2.1 Aims and scope

This project aims to identify the main characteristics of a capitation funding formula that could improve equity and sustainability in general practice. It focuses upon the core medical and nursing workforce for general practice, while acknowledging that there is a strong policy focus upon developing extended general practice teams and broader more integrated approaches, which are the subject of other workstreams and projects. The goal of this analysis is to address some of the core issues with general practice funding, providing a firm basis for a future primary care system that has an equitable distribution of resources.

2.2 Approach

The approach to this analysis departs from previous attempts to develop or modify general practice funding in Aotearoa. Key points of difference are:

- Analysis of time involved in delivering care, to estimate the workforce involved. Previous analysis of general practice funding has relied heavily upon counting the volume of consultations with a general practitioner. This tends to emphasise the role of the GP at the expense of the wider practice team, and to underestimate the time needed for high need patients at the complex end of the range. This analysis is based upon a dataset in which we have estimated the absolute amount of time that clinicians in general practice spend with a patient, avoiding the limitations of counting doctor consultations as the basis of a funding methodology. We use the time involved in delivering care as the basis for estimating FTE required, and therefore as the core of our bottom up costing approach.

- Estimating the costs of delivering care. Earlier changes to general practice funding have typically been based upon averaging previous subsidy levels, or substituting co-payment revenue. In this analysis we have conducted a bottom-up costing of the delivery of general practice care to a person who needs a given amount of clinical time, based upon the income of clinicians (using MECA rates) and the best available estimates of the overheads of running a general practice. We have used the best available information for this, and provide specific details in the results below.

- Modelling a higher level of care for people with higher need. In previous capitation funding exercises, the median predicted historical activity in general practice was used as the basis for funding the delivery of care for of the population. But well documented patterns of unmet need and barriers to accessing care mean that using historical averages without adjustment builds inequity into funding systems. In this analysis we have used the historical median level of care as the basis for estimating cost for most people. But for Māori, Pacific people, and those with the highest level of socioeconomic deprivation, we benchmark the new median to a higher level of care (and therefore cost). We have done

this for four scenarios of higher care delivery. This approach mitigates the risk of embedding historical inequities in access to care into a new capitation funding formula.

2.3 Main assumptions

Key assumptions that underpin this analysis include:

- *Time spent with patients is a better estimate of primary care resource than volume of contacts.* This assumption reflects a view that the time spent on individual patients is likely to be variable, and that not accounting for this is likely to undercount the resource need to care for people with high health needs.
- *The M3 morbidity index is a legitimate indicator of need for general practice services.* The index predicts mortality, but is likely to be strongly associated with health need more generally. In other contexts, morbidity based indices such as the Charlson Index have been shown to be associated with health expenditure.
- *The median level of general practice care delivered to the general population (not Māori, Pacific or in NZ Deprivation Index Quintile Five) is generally appropriate.* There is an assumption that, while general practice care may not be adequately funded, the level of care delivery is generally appropriate for the New Zealand population. This assumption lies within the context of policies to invest in developing and investing in wider primary health care teams across New Zealand.
- *A proportion of the Māori, Pacific and socioeconomically deprived population do not access general practice care at levels that reflect their need.* While there is room for further research on patterns of need, and how need is concentrated in different geographic and social spaces, it is generally accepted that there is unmet need for general practice care for these populations.
- *Health professionals in general practice should be remunerated at the same level as health professionals who work for government health agencies.* Pay equity outside government health agencies is not currently policy, although it is widely advocated for.
- *Capitation applies to an enrolled population.* This is a basic assumption that has underpinned primary care policy for two decades, although it should be noted that there is evidence of a significant unenrolled population with high need that should be considered as part of the overall population when planning services and addressing unmet needs.

Key assumptions underlying quantitative parameters are explained as they arise in our approach below.

2.4 Data sources

We used a variety of data sources for this analysis. The principal sources of information were:

Patient level activity data. We had access to a dataset of anonymised patient level activity data from general practices. The data had been provided for a research project, and permission was sought from the PHOs that supplied the data to use it for this project as well as the original intended purpose. The dataset was based on a population of 364,394 people, with 101 general practices that had a

median size of 4950 enrolled patients. The population contained 9.0% Māori, 7.9% Pacific people and 13.4% of people in the quintile of highest socioeconomic deprivation.

Population registers and capitation funding. The Ministry of Health supplied an anonymised register of the population enrolled with general practices. This dataset included the actual capitation funding that was paid to practices under the different capitation streams, meaning that we had a robust set of information on current capitation funding and how it is distributed across the population in practice.

Salary information. We drew upon publicly available MECA contracts to model the salary cost component of delivering care.

Practice survey. We conducted a rapid survey of practices to understand more about typical levels of overhead in general practice. This gave us information on rent, IT and other overheads, and how these vary across practices. We had 96 responses, meaning that nearly 10% of all general practices in New Zealand provided information. The median reported practice size was 6850 patients, somewhat larger than the New Zealand median, at around 3500. The larger practice size may mean that overhead and cost information from larger practices may underestimate the true costs, particularly if there are economies of scale in overheads and facilities.

2.5 Limitations

There are a number of limitations to the datasets we worked with. Important limitations to be aware of include:

- Our activity data are based upon a dataset from late 2018. This means that the primary care activity we are estimating predates COVID, and will not reflect any lasting changes that have emerged during the current pandemic.
- We drew upon an activity dataset that we could arrange access to in a timely manner. But while our activity dataset is quite large, it could be still larger, and it could be more representative. Since we consider the distribution for Māori, Pacific and people experiencing socioeconomic deprivation as a specific, separate component of the analysis, lack of proportionate representativeness in the activity estimates should not bias our results (if we did not analyse these groups separately the overall result would clearly be biased). However, extending this analysis to a wider dataset, if that could be made available, would be a prudent future step.
- There is little rural population in our data set. Our view is that rural primary care services should be the subject of a specific, bespoke analysis that reflects the particular issues of providing care in rural areas.
- Our activity data is reasonably robust for doctor activity in practices, but less so for nurse activity. We describe below how we have tried to validate activity data, and have adjusted our estimates to reflect known levels of undercounting of nurse activity in general practice.

There is a broader caveat about interpreting this analysis. We have modelled the cost of a traditional core general practice team, with medical, nursing administrative and management staff. We have chosen to model a specific workforce so that we can estimate a concrete level of funding needed to deliver a given level of care. However, it is not our intent to make this estimate a straitjacket. We

suggest that this is a basis for estimating the reasonable level of resource needed to provide care to a population, but we would not want to preclude the overall level of funding we model for a practice being used in different ways with a different workforce mix, where that is appropriate. The primary care workforce is changing, for example with the increasing emergence of nurse practitioners in general practice, and our approach to funding analysis is not intended to inhibit such changes in the workforce.

3. Data and results

3.1 Primary care activity

3.1.1 Method for calculating Full Time Equivalents

The output of the analysis is the cumulative GP Full Time Equivalent positions (FTE), Nurse Practitioner (NP) FTE, Nurse FTE, Other FTE and the number of NP and GP patient contacts. The method was developed, validated and used as part of a Health Research Council funded research project looking at evidence to guide investment in primary care models of care.[1]

Appointments during the 2018 calendar year are used to calculate FTE.

Appointment data (also referred to as provider templates) were used as the main data source. These templates allow staff to book patients in with a provider, set the duration of the appointment, and track key milestones such as when a patient arrives, when they're in consult and when they have been invoiced. This information is what is used to derive FTE.

Provider templates are classified by role type (GP, NP, Nurse or Other). The role is determined using the role code, medical council number or by search terms on the provider name e.g. Dr, Nurse, Acute nurse etc. This allows us to allocate FTE to the correct role type.

Templates are further classified into provider, generic or administrative templates. This allows us to account for at least some degree of non-contact time for clinicians, and identify activity that is for administrative purposes and should not be recorded as a patient contact. We adjust for non-contact time on a practice and role basis. This means that for each role at a practice, we derive a scaling factor that tells us the amount of non-contact FTE per contact FTE for that role. This scaling factor is then used to scale up patient FTE time, which effectively distributes the non-contact time proportionally to the amount of contact FTE time the patient used.

$$NonContactScalingFactor_{PracticeID,Role} = \frac{NonContactFTE_{PracticeID,Role}}{ContactFTE_{PracticeID,Role}}$$

$$PatientFTE_{i,PracticeID,Role} = ContactPatientFTE_{i,PracticeID,Role} \times \left(1 + NonContactScalingFactor_{PracticeID,Role}\right)$$

The FTE calculated using this method includes all patient facing activity and non-contact time. Analysing FTE in this way allows us to determine the total time each patient has utilised for each provider. We believe this is a better method for measuring activity than only counting consultations, since these can be of variable length. Exclusions and adjustments are made to account for double bookings, blank/unused templates, and dummy enrolled patients (e.g. 'Mickey Mouse').

[1] Outputs from this project are currently being prepared for publication

3.1.2 Comparison of calculated FTE to actual

We validated the method by comparing the calculated FTE to actual practice FTE collected via practice survey[2]. Comparisons were done for 94 practices from the two PHOs that we had data for.

In total, there was no difference between calculated and actual FTE for GPs. For nurses the calculated FTE undercounts actual by 39 per cent. Estimates of nurse practitioner FTE are variable given the very low numbers.

Table 1 Comparison of calculated FTE to actual FTE provided via practice survey

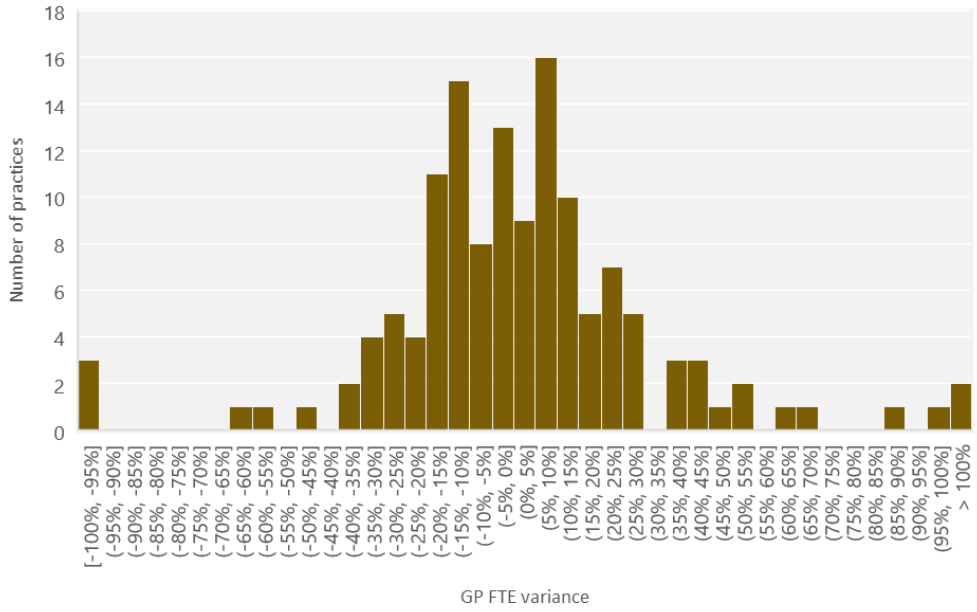
	Actual/Survey	Calculated	Variance (%)
GP FTE	265.6	265.8	0%
Nurse practitioner (NP) FTE	1.9	0.7	-61%
Nurse FTE	193.3	118.5	-39%

Source: Sapere analysis

3.1.2.1 Estimating General Practitioner activity

Variance by practice shows that we have calculated GP FTE within +/- 20% of actual FTE for 64 per cent of practices, with error well distributed around the median.

Figure 1 Histogram of percentage variance in GP FTE estimates

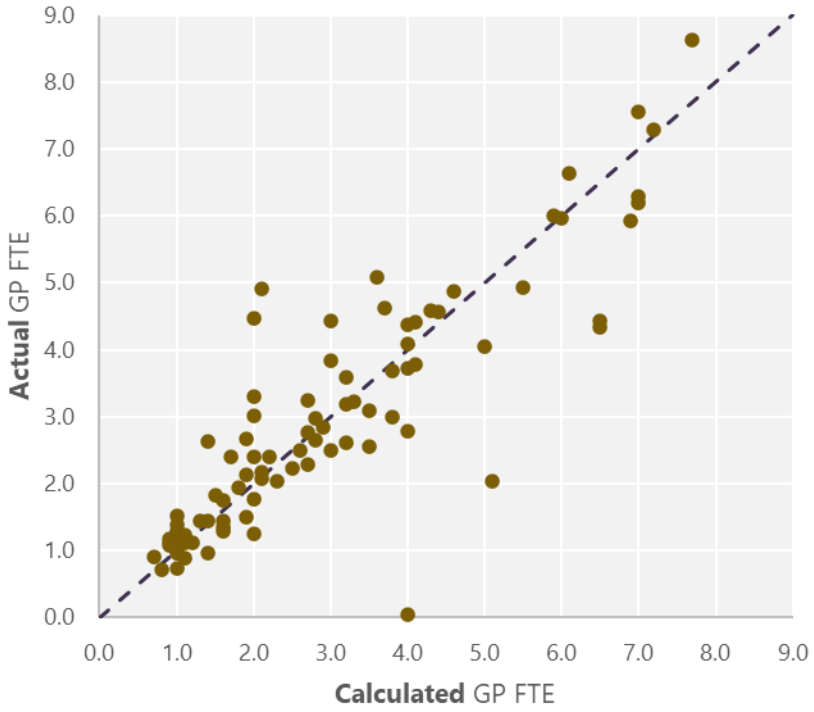


Source: Sapere analysis

[2] Survey data was collected for the Health Research Council research project on primary care models of care. Data were collected over the period from November 2019 to January 2020 and covered 957 practices.

A scatter plot of our activity based FTE estimate vs stated FTE shows a strong linear correlation with a slope of 1. This indicates that our FTE estimates are, on average, well matched to true FTE.

Figure 2 Scatter plot of GP FTE – actual vs calculated



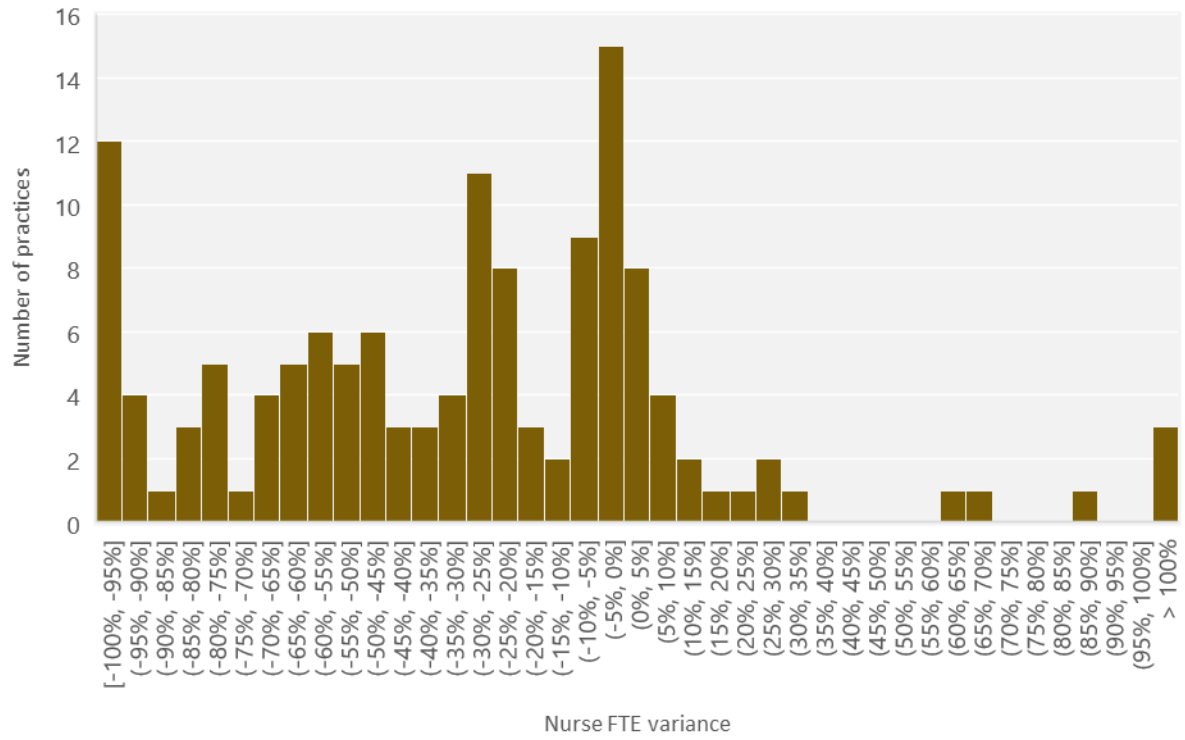
Source: Sapere analysis

Given that we do not think our GP FTE estimates are biased, we have confidence in the calculations. No corrections or adjustments have been made for GP activity in the ground up costing.

3.1.2.2 Estimating nurse activity

Nurse activity is not always reflected in general practice activity data. For many practices, generic provider templates are used as a way of managing daily activity within a practice e.g. "Acute Nurse", "LTC clinic". In large practices particularly, generic templates appear to be a pragmatic way for practices to simplify booking processes, manage nurse activity and allow for the seamless movement of nurses between different roles without the need to reshuffle patient bookings on individual provider template. As a result, it is difficult to accurately measure nurse activity and non-contact time. The histogram below shows a negative variance (under estimate) compared to actual for nurse FTE for 76 per cent of practices.

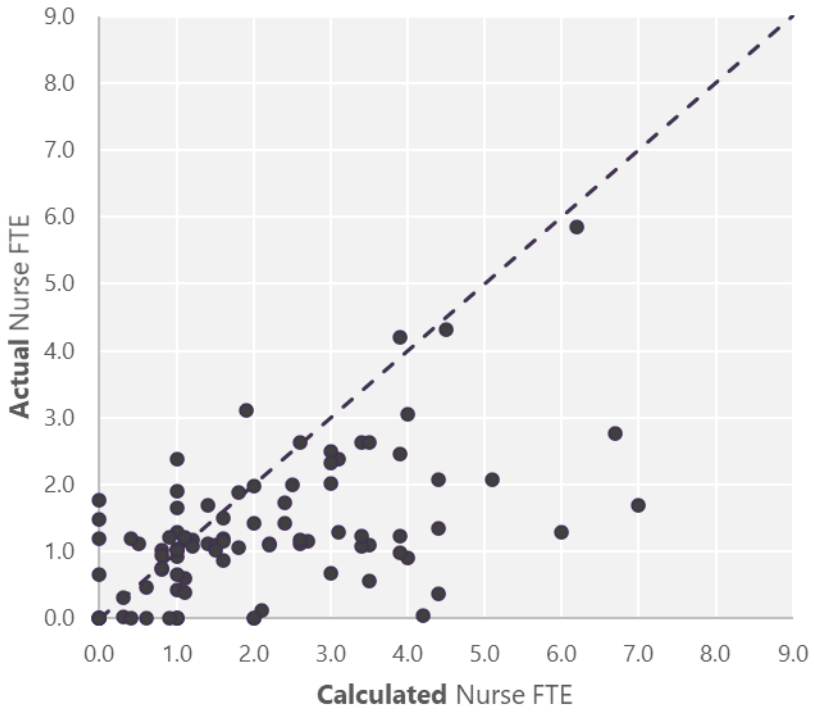
Figure 3 Histogram of percentage variance in Nurse FTE estimates



Source: Sapere analysis

The underestimates are larger the greater the FTE in a practice.

Figure 4 Scatter plot of Nurse FTE – actual vs calculated



Source: Sapere analysis

To adjust for the undercounting of calculated nurse FTE vs. the surveyed nurse FTE, we have scaled up all nurse FTE by the factors in Table 2 depending on the practice's size.

Furthermore, we suspect our practice survey may have undercounted nurse FTE as well. This is because the survey column in Table 1 suggests that there is a 1.4 to 1 GP-to-nurse ratio, however, previous work suggests that a GP-to-nurse ratio of 1 to 1 is common.[3] Therefore, we also include an adjustment to bring our overall GP-to-nurse ratio closer to 1 to 1. This is also given in Table 2.

Table 2 - Nurse adjustment factors by practice size

Practice Size	Calculated vs. Survey Nurse FTE Adjustment	Survey vs. Previous Studies Nurse FTE Adjustment
0 – 2,500	1.257	1.294
2,500 – 5,000	1.347	1.650
5,000 – 7,500	1.814	1.221
7,500 – 10,000	2.504	1.380
10,000+	1.724	1.407

3.2 Cost and capitation data

3.2.1 Annual salary rates

The annual salary rates used to determine practice costs are based DHB Multi-employee Collective Agreements where available. An FTE for doctors is equivalent to 1752 hours. This is calculated as 40 hours per week for 52 weeks a year, less public holidays and 6 weeks of annual leave. For all other roles, one FTE is assumed to be 1832 hours per year, which allows for the standard 4 weeks of leave per year and public holidays. All rates are inflation adjusted to the 3rd quarter of 2021 to align with the capitation funding provided by the Ministry of Health which is based on capitation rates and enrolled service users as at 1 August 2021.

[3] In research we conducted for General Practice New Zealand: https://gpnz.org.nz/wp-content/uploads/Workforce-Resources-FINAL-DISCUSSION-DOC.pdf

Table 3 - Annual salary rates by role

Role	Hourly rate[4]	Inflation adjusted[5]	Per FTE per annum[6]
GP	$139.59	$147.41	$258,255
Nurse practitioner	$59.95	$63.55	$116,419
Nurse	$45.41	$45.41	$83,186
Health care assistant	$26.89	$28.77	$52,702
Reception/ administration	$25.49	$27.27	$49,965
Practice manager	$65.50	$65.50	$120,000
Allied health	$53.72	$ 56.40	$103,328

In the model we also allow for a 0.15% employer ACC levy and 3% KiwiSaver employer contribution for all roles except general practitioner. For general practitioners, we assume a 0.15% ACC levy and a 6% KiwiSaver employer contribution (ASMS, 2020).

General practitioner

The annual rate for general practitioners is based on the full-time salary rate of $244,560 from the 2020 ASMS DHB MECA (ASMS, 2020). This rate allowed for 6 weeks of annual leave per year. An inflation adjustment of 5.6% was applied convert the rate from Q2 2020 to Q3 2021.

Nurse practitioner

Nurse practitioner rates are set using the DHB/NZNO Nursing and Midwifery Multi-Employer Collective Agreement - *Designated senior nurse* scale grade 6 step 3 rate of $110,146 (NZNO, n.d., p. 19) multiplied by 1.06 for inflation.

[4] This rate includes payment for annual leave and public holidays.

[5] Adjusted to 2021 Q3 using the Reserve bank Inflation Calculator: https://www.rbnz.govt.nz/monetary-policy/inflation-calculator/

[6] Does not include employer ACC levy or KiwiSaver.

Nurse

For nurses we use the 2020-2022 DHB/NZNO MECA (DHB & NZNO, p. 17). Our assumption is that practice nurses are working at a senior level so we have applied the top of scale *Registered Nurses and Registered Midwife* rate (step 7) of $83,186 per annum. This rate was being received on Q3 2021 so no inflation adjustment is needed.

Healthcare assistants, reception/administration, and practice manager

Healthcare assistants, reception/administration are set using the Primary Healthcare MECA (NZNO & NZMA, n.d., p. 10).

For healthcare assistants we use the top of scale rate (step 4) for *Medical receptionist/administration* of $23.68 per hour. This is multiplied by 1.07 for inflation and annualised assuming 2080 paid hours per year. Receptionists and administrative staff rates use the midpoint of the *Medical receptionist/administration* staff scale (steps 2 & 3) of $22.45. This is multiplied by 1.07 for inflation and annualised assuming 2080 paid hours per year.

We use an assumed senior manager rate of $120,000 per annum for practice managers.

Allied health

Other provider FTE is assumed to be allied health. We use the midpoint of the PSA Allied Health, Public Health and Technical MECA *Advanced Clinician / Advanced Practitioner / Designated Positions* band (step 11) of $98,408 per annum. We apply an inflation multiplier of 1.05.

3.2.2 Results of practice cost survey

Information that we could use on costs for many aspects of general practice is often invisible. To ensure we understood the range of these costs for general practices as we develop our advice, we undertook a survey of general practices to gather this information.

A survey was sent to members of Practice Managers and Administrators Association of New Zealand (PMAANZ) on 12 December and 3 follow up emails were sent. A follow up email and draft results was sent to PMAANZ and GPNZ members in February 2022.

The survey asked questions about practice operating costs and FTE. We also gathered information on population and practice characteristics to investigate if there are any differences based on these characteristics.

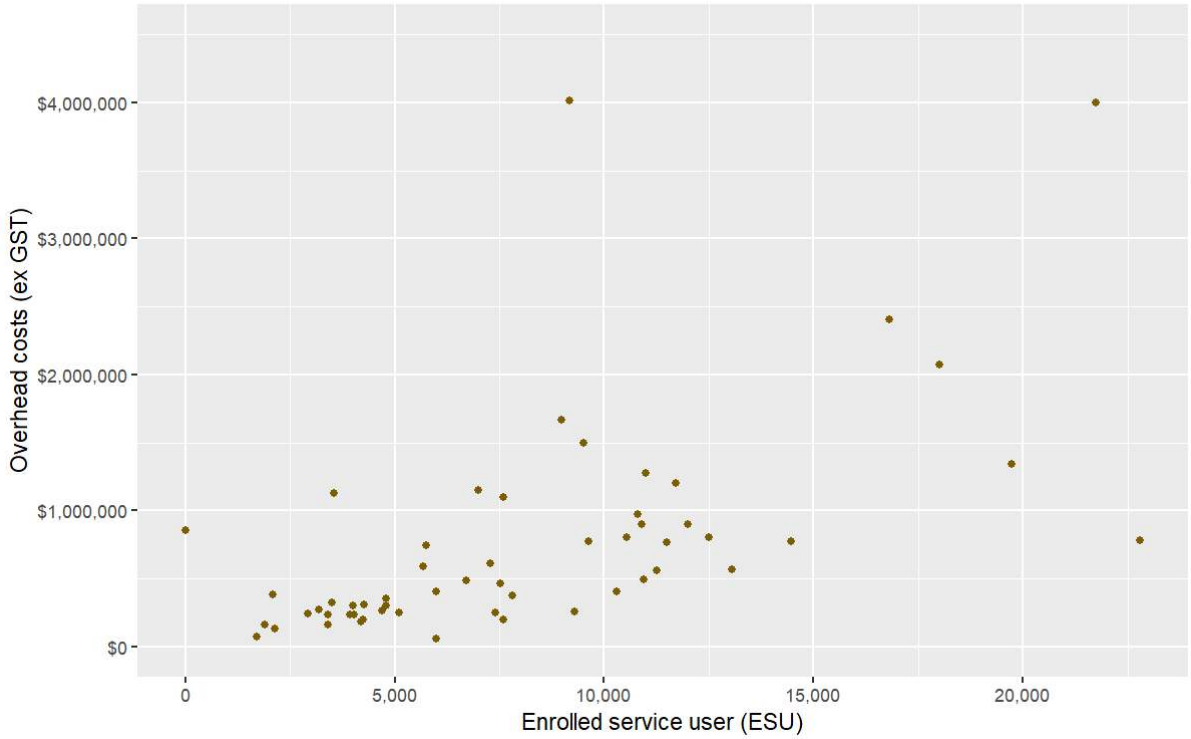
3.2.2.1 Results

We received 96 unique[7] responses to the survey, of which 59 were fully completed.

[7] There were 2 duplicate responses excluded, these were identified using IP address or practice name and address

The key insight we found from the results was the level of rent, and practice overheads. Rent and overheads increase proportionately to the practice population.

Figure 5 Scatterplot of total overheads by enrolled service users

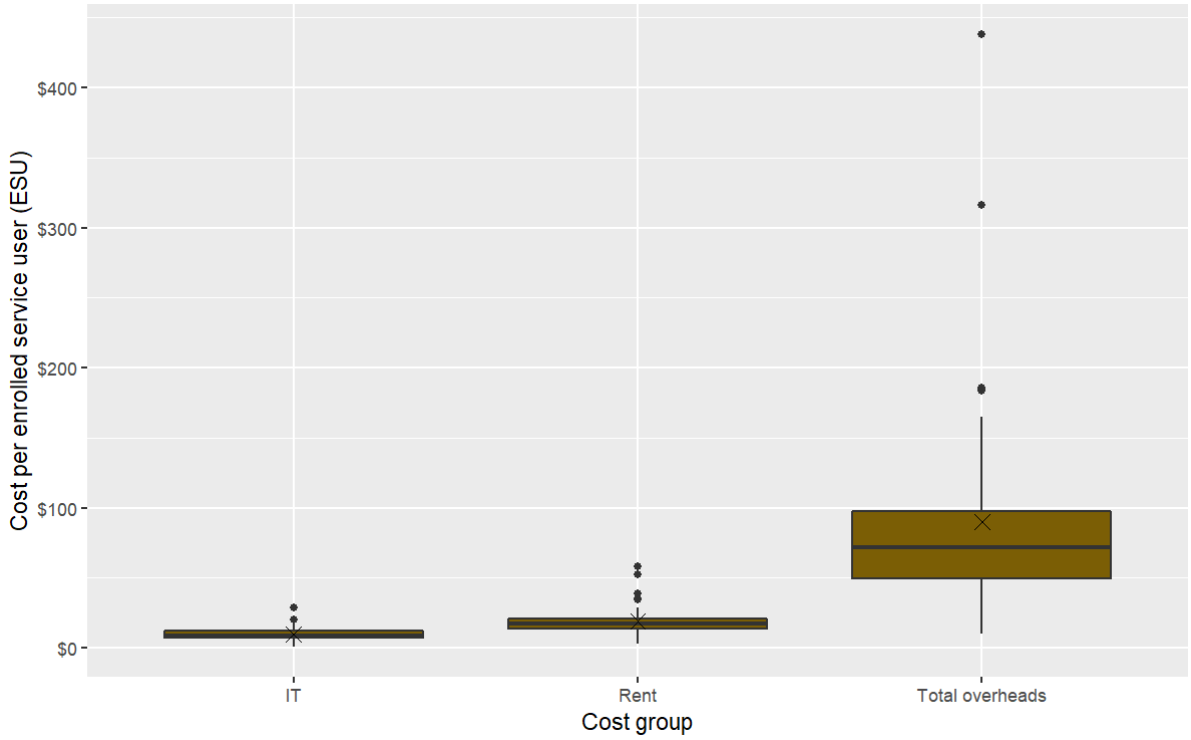


A regression of overhead costs using just ESU as the predictor gives R squared of 0.35. We have used Rent and Overhead costs per ESU in the ground up costings. The mean and median values and range of responses is shown in the table and box plots below.

Table 4 Rent, IT and Total Overhead costs per ESU

	Rent	IT	Total overheads
N	61	61	55
Mean	$19.13	$9.58	$89.77
Median	$16.88	$8.45	$72.01

Figure 6 Boxplot of Rent, IT and Overheads per ESU



3.2.3 Annual Capitation funding

Existing capitation funding was provided by the Ministry of Health for enrolled service users (4,810,950 people) as at 1 August 2021. The total capitation amount includes the following amounts:

Table 5 Capitation amount by component

Component	Annual total[8]
First contact	$774,146,165
Very low cost access (VLCA)	$115,208,853
Community services card (CSC)	$100,755,371
Under 14	$51,620,440
Under 6	$2,113
Services to improve access (SIA)	$59,974,453
Health promotions (HP)	$12,723,456

[8] The monthly capitiation amount provided by the MoH x 12

Total Capitation funding	**$1,114,430,851**

Source: Ministry of Health

Current per person capitation rates and total capitation funding by population demographics and practice type are provided in the table below.

Table 6 Annual Capitation funding per person and totals (GST exclusive)

	Capitation per person		Population		Capitation per person	Total capitation
	Non-VLCA	VLCA	Non-VLCA	VLCA		
Total	$217.94	$263.09	3,351,057	1,459,893	$231.64	$1,114,430,851
CSC card						
Not CSC	$180.63	$217.43	2,619,896	921,516	$190.21	$673,602,972
CSC	$351.64	$341.25	731,161	538,377	$347.23	$440,827,879
Sex						
F	$237.17	$286.51	1,733,212	744,527	$252.00	$624,386,504
M	$197.35	$238.72	1,617,845	715,366	$210.03	$490,044,347
5 Year Age Band						
00-04	$596.37	$656.25	197,226	98,987	$616.38	$182,578,764
05-09	$197.60	$216.36	216,903	104,984	$203.72	$65,573,442
10-14	$196.88	$215.90	220,155	105,102	$203.02	$66,034,663
15-19	$122.88	$164.23	188,349	100,253	$137.24	$39,608,789
20-24	$127.56	$165.00	176,161	109,544	$141.92	$40,545,888
25-29	$125.04	$166.86	208,518	110,159	$139.49	$44,453,709
30-34	$122.48	$164.18	231,460	112,544	$136.12	$46,826,823
35-39	$120.40	$162.64	219,645	97,866	$133.42	$42,362,486
40-44	$119.42	$163.23	206,454	87,012	$132.41	$38,858,015
45-49	$176.26	$250.13	217,931	86,403	$197.23	$60,024,138
50-54	$174.39	$250.60	225,609	88,589	$195.88	$61,543,956
55-59	$173.65	$248.99	223,307	85,764	$194.56	$60,131,334
60-64	$177.73	$250.97	209,697	78,266	$197.64	$56,912,748
65-69	$322.16	$428.03	181,397	66,204	$350.46	$86,775,328
70-74	$345.90	$441.72	161,825	53,785	$369.80	$79,732,780
75-79	$372.77	$458.34	113,896	35,039	$392.90	$58,516,904
80-84	$409.44	$480.94	80,147	22,583	$425.16	$43,676,379

	Capitation per person		Population		Capitation per person	Total capitation
	Non-VLCA	VLCA	Non-VLCA	VLCA		
85+	$440.71	$498.39	72,377	16,809	$451.58	$40,274,705
Prioritised Ethnicity						
Asian	$200.12	$223.11	426,996	279,788	$209.22	$147,874,840
Māori	$261.06	$292.43	336,337	397,530	$278.05	$204,053,707
Other	$213.91	$253.96	2,469,998	533,311	$221.02	$663,784,543
Pacific	$251.82	$281.35	101,304	244,947	$272.71	$94,427,380
Unknown	$196.94	$244.68	16,422	4,317	$206.88	$4,290,381
NZDep2018						
1	$195.05	$226.43	425,762	48,369	$198.25	$93,996,057
2	$199.31	$229.29	410,665	66,542	$203.49	$97,106,517
3	$204.39	$230.44	381,567	79,107	$208.87	$96,219,172
4	$208.18	$233.15	374,024	88,589	$212.96	$98,519,629
5	$213.21	$238.27	352,522	107,049	$219.05	$100,669,516
6	$218.18	$243.23	337,172	130,251	$225.16	$105,244,631
7	$227.20	$248.12	318,192	148,853	$233.87	$109,227,248
8	$239.15	$260.20	291,357	177,823	$247.13	$115,948,176
9	$254.47	$279.51	239,035	227,234	$266.67	$124,341,577
10	$279.40	$302.58	143,163	347,762	$295.82	$145,226,688
NA	$232.87	$257.39	77,598	38,314	$240.97	$27,931,642
Urban / Rural						
Urban	$219.99	$263.69			$233.28	$914,696,282
Rural	$205.54	$260.91			$221.99	$172,622,648
NA	$233.74	$257.53	75,312	36,922	$241.57	$27,111,922

Source: Ministry of Health, based on practice registers at 1 August 2021

3.3 Reconciling cost and activity

3.3.1 Current practice income and estimated expenditure shows net income of -$137 million

We estimate the total income for all practices to be $1,672 million after exclusions for ACC claims, health promotions and after hours. Expenditure is estimated at $1,809 million after adjustment to exclude ACC activity. Net income is, therefore, estimated to be -$137 million per annum (spread across all practices) at current levels of funding.

Table 7 Estimates practice income and expenses

Component	$ millions	Confidence in estimates	Notes
Income			
ACC claims	Unknown	n/a	Unknown but not required as we exclude ACC activity
Patient co-payments	$446	Moderate	Adjusted Statistics NZ household expenditure estimate.[9]
Capitation[10]	$1,114	High	
CarePlus	$82	High	
Immunisations	$48	High	
Primary Options for Acute Care (POAC)	$16	Low	Extrapolated based on estimated expenditure at one large PHO
Healthcare home	$7	Low	Variable funding arrangements by DHB/PHO
Exclusions			
After hours	-$28	Moderate	Assumed 2.5% of capitation funding though how after-hours is managed varies significantly by DHB
Health promotion	-$13	High	Mostly retained by PHOs for health promotions activity
Total income	**$1,672**		
Expenses			

[9] We include an assumption that 20% of patients with health insurance have GP coverage of 75%. We use Financial Services Council estimate that 30% of patients have health insurance of some kind (Financial Services Council, n.d.).

[10] Includes First contact, VLCA, CSC, U14 & U6, Services to improve access (SIA) and Health promotions (HP)

Salaries	$1,354	Moderate / High	Based on calculated FTE (adjusted to exclude ACC) x annual salary rates[11]
Overheads	$455	Moderate	Based on survey of practices
Unpaid admin time	$0	Low	Unknown but could easily be a further 10% of GP salary costs
Total expenses	**$1,809**		
Net income	**-$137**		
Surplus (%)	**-7.6%**		

Source: Sapere analysis

The results show net income of -$137 million after accounting for the cost of general practice services, a surplus of -7.6 per cent. This implies that general practice makes a 7.6% loss each year. We are not in a position to confirm whether or not this profit margin would be typical for general practice, though we suggest that given the sentiment that general practice is underfunded our result of an average 7.6% loss seems realistic. It is important to note here that general practice expenses are estimated from 2018 FTE use and under market rate salaries, whereas income is largely from 2021 capitation and inflation-adjusted 2019 co-payment expenditure. This suggests that many practices in the sector may have avoided explicit losses by decreasing the level of care from 2018 levels (i.e. shortening appointment times), paying below market rate salaries, or increasing co-payments faster than inflation. We also note that this aggregate result for the sector hides considerable variance, and the practice by practice picture (which we partially analyse in Section 4.3) shows that the situation is considerably worse for practices with a high need population.

3.3.1.1 Moderate to high level of confidence in the result

Most of a practice's income comes from general capitation funding and patient co-payments. We have a high degree of confidence in these estimates. Capitation funding was provided by the Ministry of Health based on practice population registers as at 1 August 2021. Aggregate co-payments were modelled using the Statistics NZ household expenditure estimates. Specifically, the 2019 Statistics NZ household expenditure estimates show that $405.695m was spent on general practice annually. This figure alone understates the amount paid by patients because healthcare insurance rebates are captured as negative expenditure, whereas the practice would receive the full payment (ILO, n.d.). Hence, assuming 30% of patients have health insurance (Financial Services Council, n.d.), and 20% of patients with health insurance have GP insurance at 75%, we can arrive at our figure below. 7.2% is our inflation adjustment to 2021 Q3.

$$[405.695 * (1 - 0.3 * 0.2) + 405.695 * (0.3 * 0.2) * (1/0.25)] \times (1/1.15) \times 1.072 = 446$$

[11] Assumed rates per FTE: GP ($231,111), nurse practitioner ($116,419), nurse ($76,420), health care assistant ($52,702), reception/ administration ($49,965), practice manager ($120,000)

Practice expenditure is calculated from two sources. First, FTE staff are estimated according to the method described above. FTE are converted to expenditure using assumed salary rates for each role. These rates are based on standard DHB MECA agreements. These may not apply to practices that rely heavily on locum GPs at higher rates.

The second component of expenditure is rent and overheads, based on our survey of practices There were 96 responses to calculate average rent and overhead costs questions. We have applied these results on a per capita basis.

3.4 Predicting activity

Capitation formulas decide how much funding should be given to a healthcare provider for serving a patient. As a result, it is desirable to provide funding which is as close as possible to the actual cost of serving that patient. If a capitation formula has too high variance, healthcare providers will see large shortfalls and surpluses between their costs and income each year. On the other hand, care is difficult to predict and a very accurate capitation formula may require complex variables which are difficult to compute or unavailable for some patients. This can place additional administrative costs on authorities and healthcare providers. Therefore, there is a trade-off between a capitation model's accuracy and the complexity of the variables used in the formula.

In this section we consider the effect of including additional variables in the capitation formula. For consistency all analysis is done with the Unmet Need Adjustment of 0.7 (described in Section 3.5). Each capitation formula/model is derived by regressing FTE of general practice staff use per person against a series of regressors that could predict that FTE use. We then turn FTE into dollars by applying our assumed hourly rates in Section 3.2.1.

We conduct the calculation by using three regressions for clinical FTE use: one for doctors, another for nurses, and a third one for nurse practitioners. For each patient, we use these regressions to predict their FTE use for each role. From that result we multiply the predicted FTE use by the respective salary for that role to arrive at the total cost of GP/Nurse/NP use for a patient. Roles such as receptionists and practice managers are costed using a ratio relative to GPs, which we obtained from a practice survey used in a prior project. We added fixed costs and distribute them according to healthcare use. Adding the total cost of GP/Nurse/NP use for each patient with admin/management and fixed costs generates the total capitation figure for each individual patient.

In this section we use the M3 comorbidity index in our funding formula. This comorbidity index is derived from hospital admission diagnoses. Each diagnosis was given a score/weight according to how important it was in predicting 1-year mortality. It is generally considered an indicator of healthcare need. M3 has been validated as a predictor of mortality for the New Zealand population, and has had some limited level of further validation, for example showing correlation with diabetes complications. The M3 index has not been specifically validated for Māori and Pacific populations. Such a validation would be a valuable contribution to monitoring patterns of health need in New Zealand.

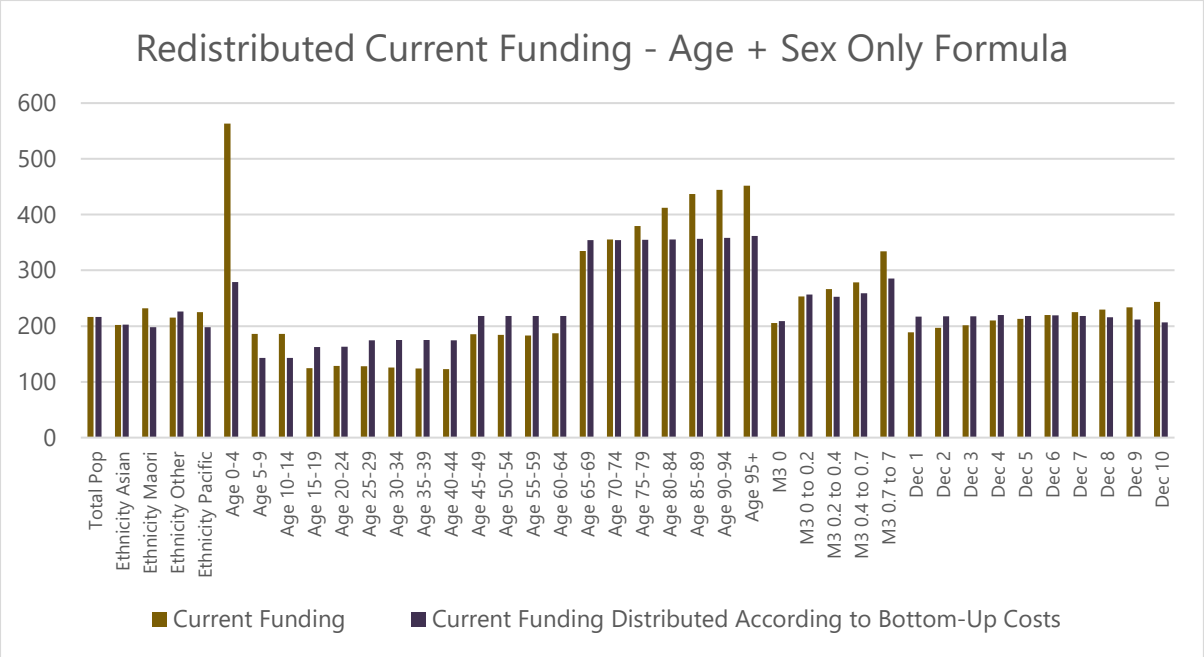
Our results suggest that the status quo is inadequate, and there is evidence that including a comorbidity index in the funding formula could be beneficial for high need patients.

3.4.1 Age + Sex Formula (First Contact Status Quo)

Using only age and sex as covariates in the capitation model limits our formula to the two variables used in the current First Contact funding stream. We have also limited our age brackets to the ones currently used in First Contact funding. This results in a capitation model with an R squared of 0.111, meaning that the model can only explain 11.1% of the variation it sees in the data.

The plot below shows a scenario where we hold the level of funding constant at the current level, but use the distribution implied by the Age + Sex model.[12] In this scenario, the capitation weights are largely inadequate. Māori and Pacific receive less funding than Other, because the model only considers age and Māori/Pacific are typically younger on average. Funding does not increase across deprivation, and only slightly across M3.

Figure 7 - Redistributed current funding according to age + sex only formula



Source: Sapere analysis

In Figure 8 below, we compare the Age + Sex capitation model's predicted healthcare use for a patient (red) to the actual incurred spending for that patient (blue)[13]. We divide patients according to a healthcare need index[14] so that we can see if high or low need patients are being "missed" by the capitation formula. Our goal is to account for nearly all variation along the healthcare need dimension that we can observe (i.e. the healthcare need index) with a reasonably simple combination of factors.

[12] Here government funding includes only core funding, that is: First Contact, U6&14, CSC, and VLCA.

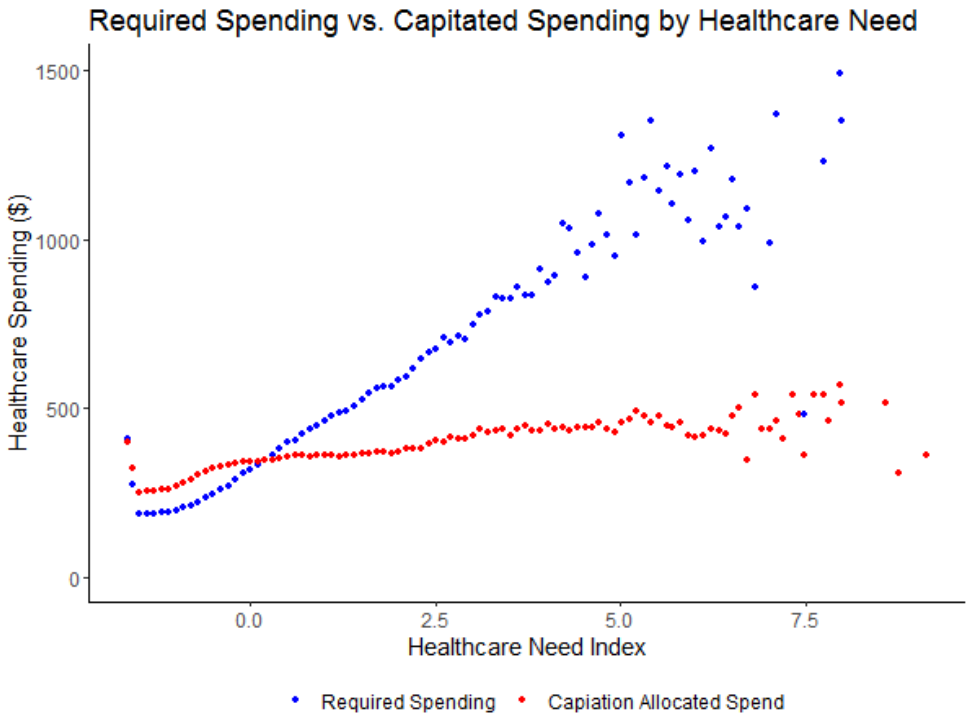
[13] We call actual incurred spending "Required spending" in Figure 8 because all these patients are from the "bias free" sample where their current healthcare use is reflective of need only and not bias (see Section 3.5 for how this "bias free" sample is constructed).

[14] Our Need Index is derived using PCA and MCA analyses on our databased upon ethnicity, P3 Index, M3 Index, and IMD Rank.

In terms of the graph, this means making the red points (capitation funding) match as closely as possible to the blue points (required spending at a given level of the healthcare need index).

The figure below shows that the Age + Sex model over predicts funding for low need patients (red points are above the blue) and under predicts funding for high need patients (blue points are above the red). This implies that even if the current Age + Sex based first contact funding were updated with more recent data, it would still fail adequately to match funding to need.

Figure 8: Expenditure and need – age + sex formula



Source: Sapere analysis

3.4.2 Age + Sex + Ethnicity + Deprivation Formula

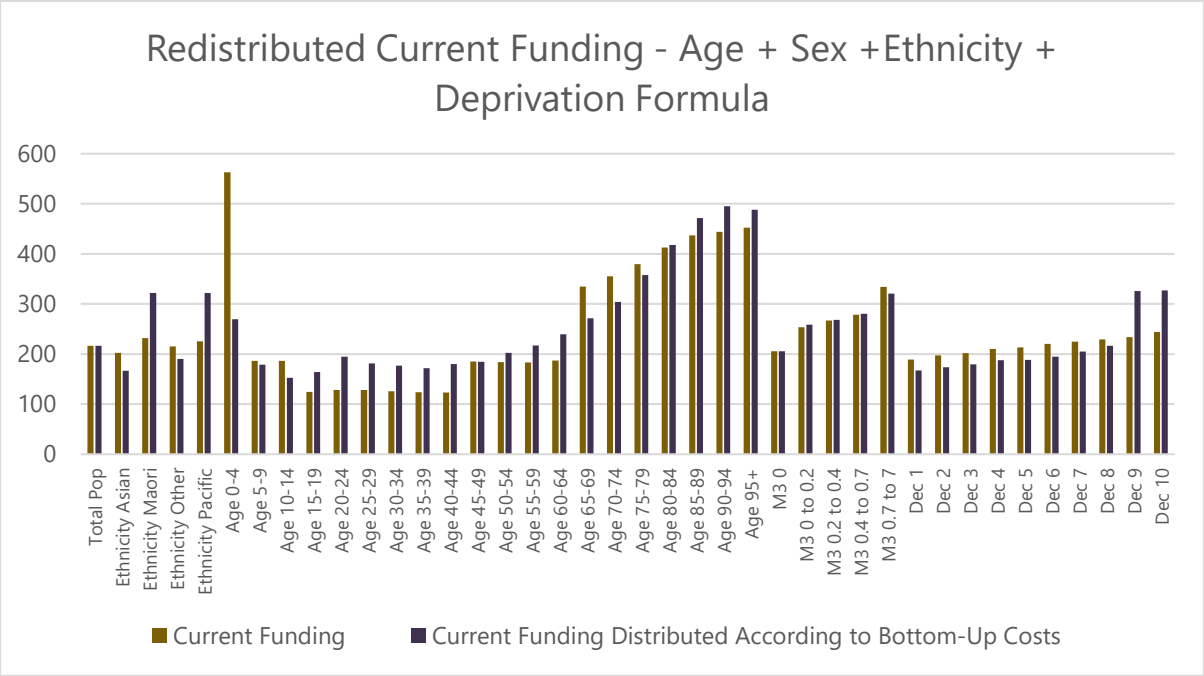
We analyse a potential capitation formula, which includes age, sex, ethnicity, and decile deprivation. We have also expanded the age bands from the limited First Contact age bands to 5-year age bands up to 95 years of age. This capitation model has an R squared value of 0.261. This means that the capitation model is able to explain 26.1% of the variation in healthcare expenditure.

The plot below shows what should happen if we redistributed the current level of funding according to the Age + Sex + Ethnicity + Deprivation formula. Māori and Pacific would see around $90 more funding per capita, whereas 'Other' ethnicities would see $25 less funding per capita. Age 0-4, Age 5-9, and Age 10-14 would see funding decreases, whereas the 15-44 age groups would see across the board funding increases between $40 and $65. Funding in the 65+ age group would be redistributed, with lower funding for those earlier in the age group and higher funding for patients with 80+ years of age. Funding across different levels of M3 would largely remain the same as the current system.

The decrease in funding for children under five is driven by the historic approach of introducing funding for this group on the basis of consultation volumes. A shorter than average consultation

volume for this group does not flow through when we base our resource estimate on total time, rather than volume of contacts.

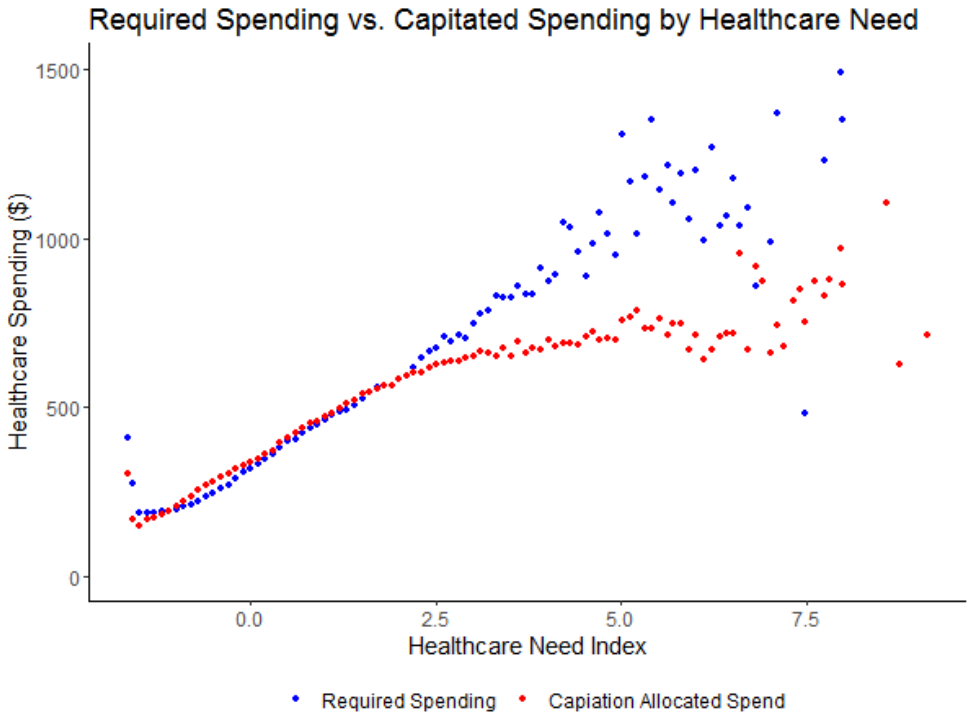
Figure 9 - Redistributed current funding according to age + sex + ethnicity + deprivation formula



Source: Sapere analysis

When we compare capitation predicted healthcare use (red) and actual health care use (blue) across different levels of need, we find that the model broadly works well for low and moderate need patients. But for high need patients, the model underpredicts the amount of funding these patients require. Our estimates suggest around 260,000 patients nationally fall into this underfunded high need category.

Figure 10: Expenditure and need adjusted formula with ethnicity + deprivation

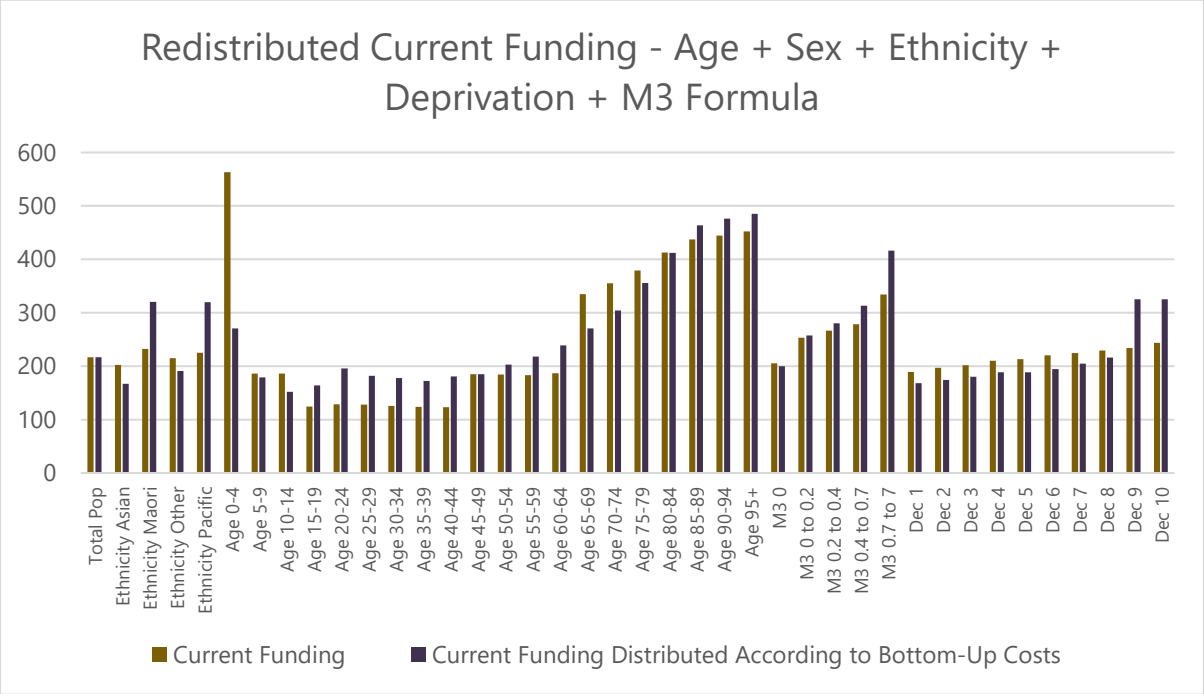


Source: Sapere analysis

3.4.3 Age + Sex + Ethnicity + Deprivation + M3 Formula

For this model, we take the previous Age + Sex + Ethnicity + Deprivation model and add the M3 index as a regressor. This allows the model to identify comorbidities in patients which are not correlated with general demographics. Including M3 raises the model's R squared to 0.279, meaning that the model can explain 27.9% of the variation in healthcare use.

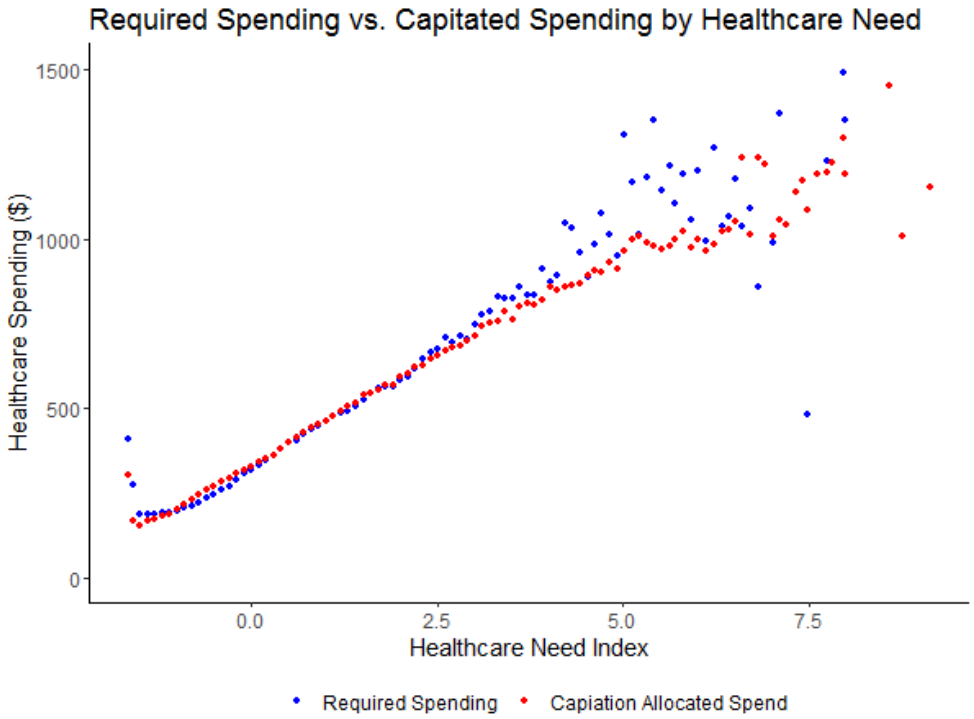
If we hold the level of current funding constant but redistribute it according to the Bottom-Up costs distribution, we get a distribution which broadly mirrors the Age + Sex + Ethnicity + Deprivation model's results. However, a significant difference is that the model would redistribute funding from patients with no M3 score to patients with positive M3 scores - with high M3 score patients receiving over $80 in additional funding.



Source: Sapere analysis

When we compare predicted healthcare costs from our capitation model to the actual healthcare costs incurred, we find that the funding gap which appeared for high need patients in the Age + Sex + Ethnicity + Deprivation model has largely disappeared as a result of including M3 in the funding formula.

Figure 11: Expenditure and need adjusted formula with ethnicity + deprivation + M3



Source: Sapere analysis

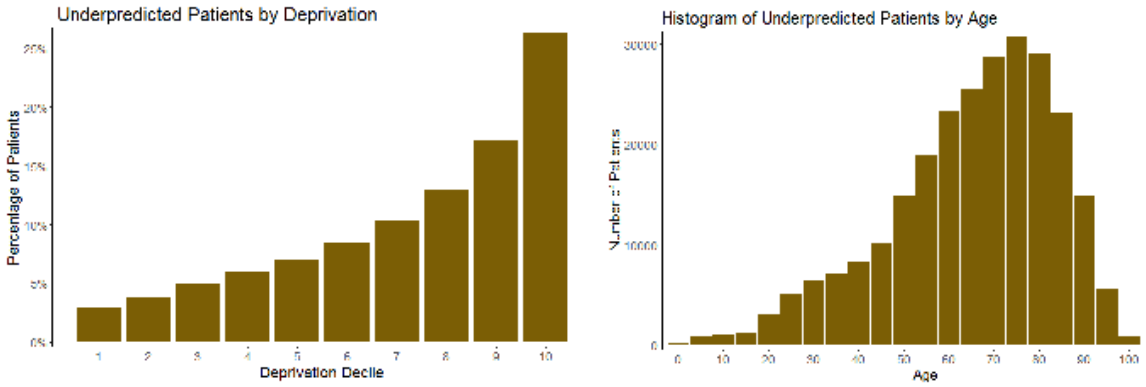
This means that the Age + Sex + Ethnicity + Deprivation + M3 model is the least complex model which accounts for nearly all the variation across our healthcare need index (i.e. observable need). In simple terms, the model with M3 is the least complex model that doesn't miss any observable high need patients.

3.4.4 Residual high need population

Under the model that includes comorbidity, there remains scatter in the high need end of the distribution. We conducted additional analysis in order to understand patients at the high need end of the distribution who may still be underfunded under this model. This analysis coveres 260,000 people, or approximately 5% of the New Zealand population.

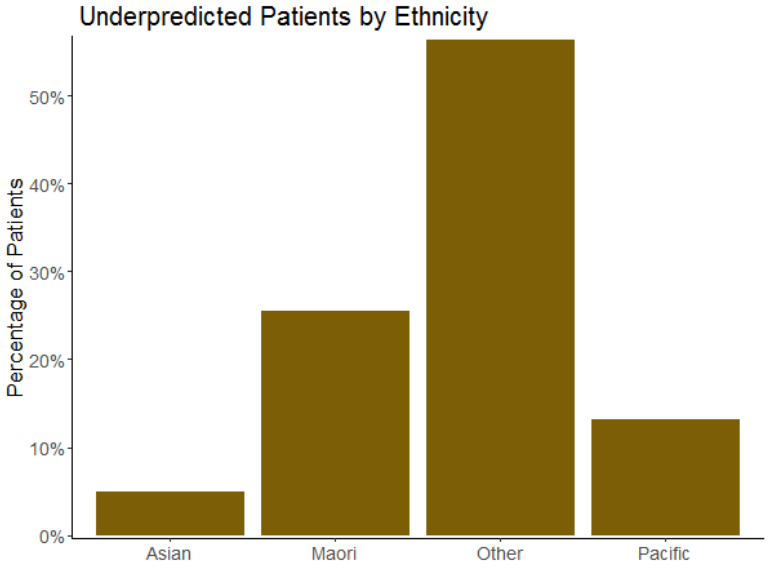
The left hand plot in the figure below shows that these patients skew considerably towards the highest deprivation deciles, with nearly 45% of these patients in Quintile 5 and less than 7% in Quintile 1. Meanwhile, the right hand plot shows that the population is considerably more elderly than the national average with the average patient having an age of 65. Overall, these two plots suggest that, while the model is a good predictor of age and ethnicity separately, there appear to be non-linear effects which compound for high need and high socioeconomic deprivation patients that are missed by a typical Age + Sex + Ethnicity + Deprivation model.

Figure 12 - Underpredicted Patients by Deprivation and Age



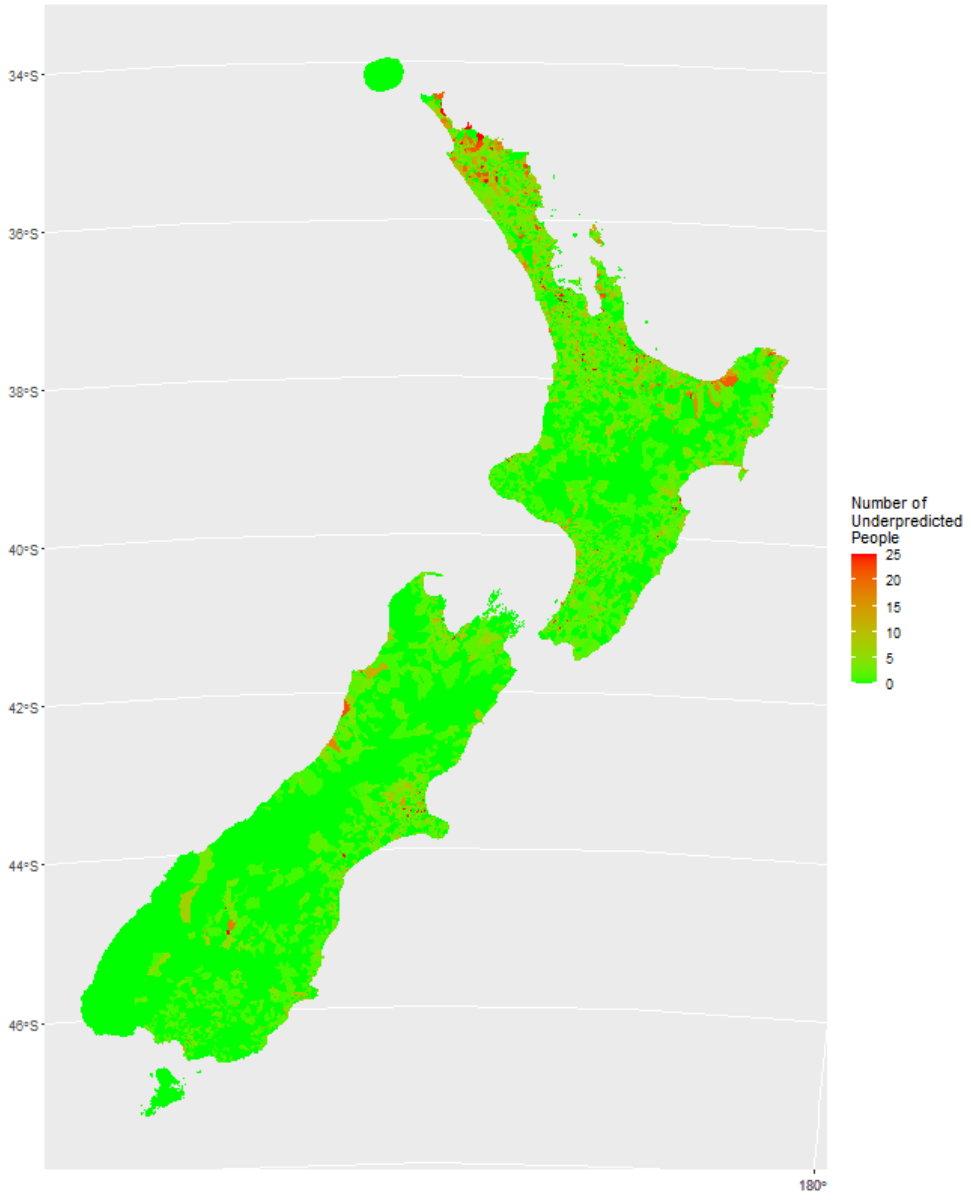
These underfunded patients also appear to lean considerably more towards Māori and Pacific ethnicities than the general population. The figure indicates that Māori and Pacific patients make up nearly 40% of the sample, relative to 22.5% nationally. The figure also shows that Asian populations are particularly lacking from this sample, only 5% relative to 15% nationally.

Figure 13 - Underpredicted Patients by Ethnicity



Geographically the figure below shows that the underpredicted patients appear to be situated predominantly in South Auckland, Northland and Eastern Bay of Plenty, with some pockets in other rural areas such as the West Coast. Underpredicted patients do not appear to be predominantly clustered in cities, rather they appear to lean slightly towards rural locations. Although, looking at the small bright red dots in some cities, those that are in cities appear to be clustered in tight areas. Comparing this to our rural/urban classifications in the data confirms a slight rural tilt, with our sample of underpredicted patients being approximately 2% more rural than the national average.

Figure 14 - Plot of Underpredicted Patient Meshblocks



What appears to be most characteristic of these patients is their Community Services Card status. 73.5% of these underpredicted patients have a Community Services Card, which is significantly higher than the national average of 26.4% and even the Quintile 5 average of 44.4%. This suggests that the current CSC system has some utility for targeting patients, and it suggests that any future system may be able to build off the current CSC framework to deliver additional capitation funding and access to care for these patients.

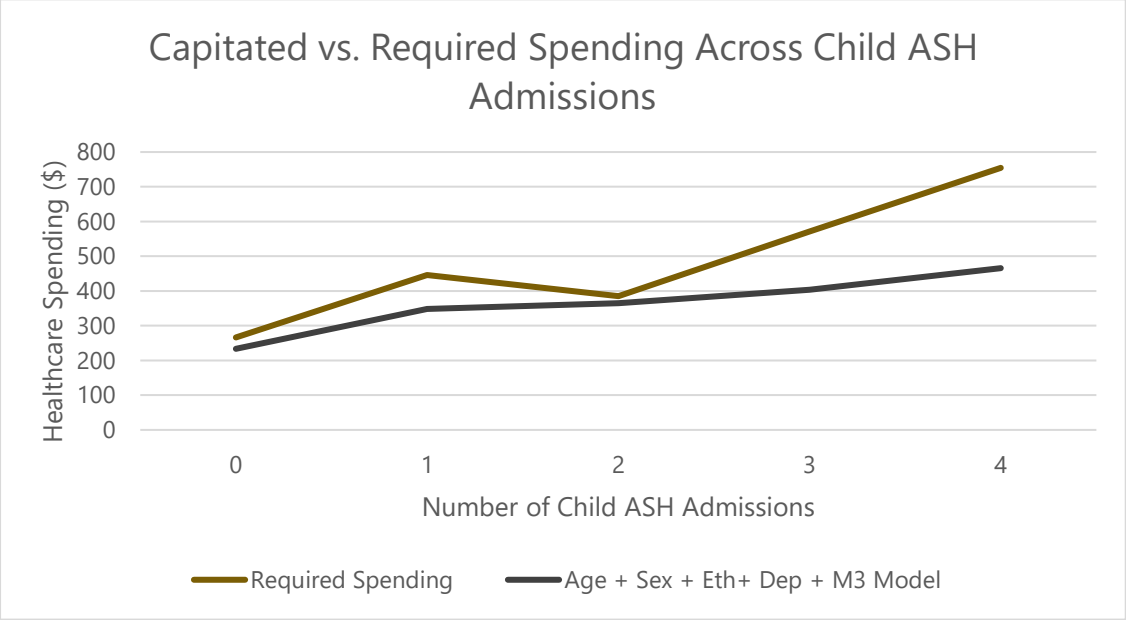
3.4.5 Face validity

As a simple check of face validity, we have examined whether the different capitation models have the expected correlation with some indicators of need that were not included in the index we used to test expenditure distributions. We used childhood and adult rates of Ambulatory Sensitive Hospitalisation

(ASH), and small area smoking rates, as indicators that have been widely used as proxies of health need. We don't necessarily expect our capitation allocation to match the precise distribution of any one of these measures, but we would expect to see a positive correlation in each case.

Our first test is for childhood ASH admissions. We looked at the predicted expenditure need from our preferred model, with age, sex, ethnicity, deprivation and M3 factors, and the number of ASH admissions in a 12 month period. The capitation model has a positive slope, indicating that there is a level of correlation with childhood ASH, although the slope is shallower.

Figure 15 - Expenditure vs. child ASH admissions by model

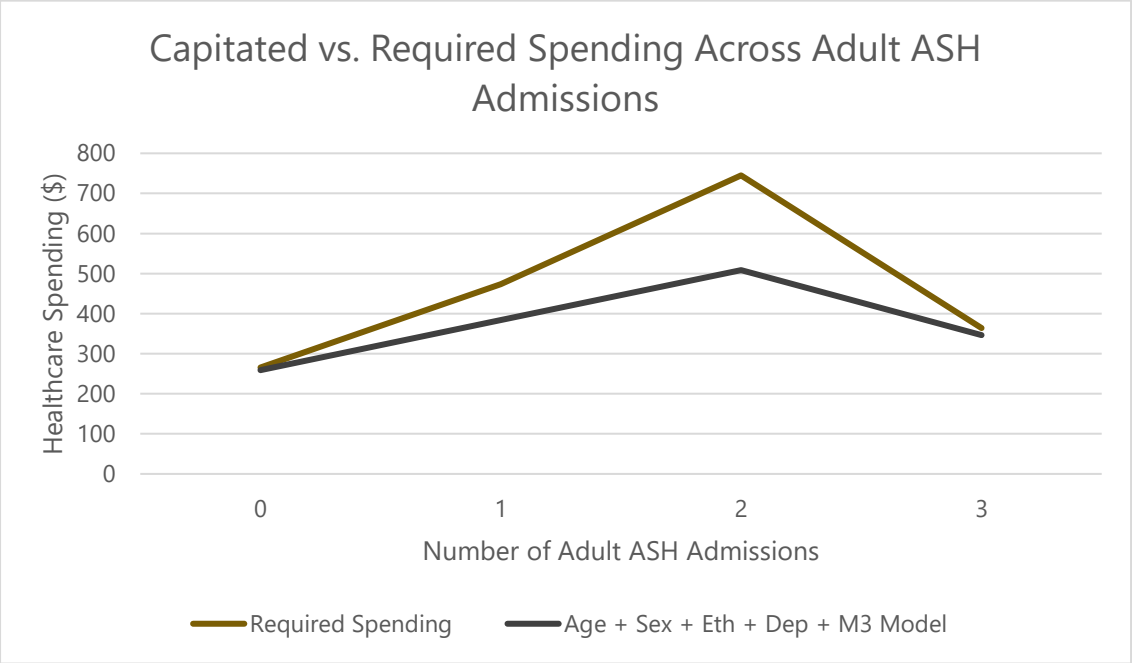


Source: Sapere analysis

Conducting the same comparison for ASH admissions metric for adults aged 45-65 years old gives the graph below. ASH admissions in this group tend to be driven by diabetes, heart disease and other

long term conditions. This measure has some sensitivity to ethnicity differences, given the earlier onset of many long term conditions in Māori and Pacific people populations.

Figure 16 - Expenditure vs. adult ASH admissions by model

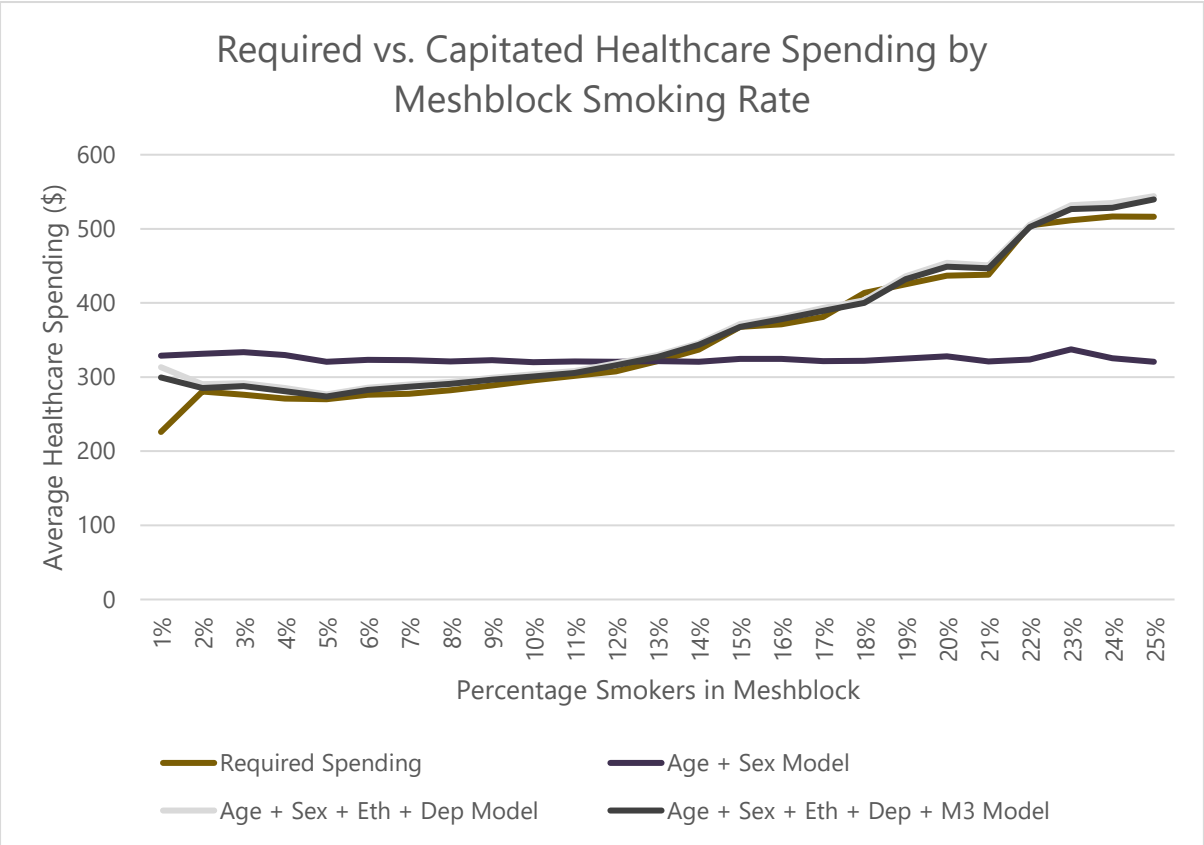


Source: Sapere analysis

In this case people both the predicted need and the capitation allocation funding have the same pattern, although the picture is more complex. Those with high numbers of ASH admissions appear to see a drop off in predicted primary care activity and expenditure. This is likely to be a highly complex pattern, and to be driven by a number o factors, including unmet need, as well as greater complexity, and a different balance between primary care and hospital care for those with multiple conditions.

Smoking status is highly correlated with health outcomes, and offers a third check on face validity. We present a plot of the required spending for a patient by the percentage of smokers in that patient's meshblock. In this case the fit between required spending and capitation allocation is very tight, largely driven by the collinear effects of socioeconomic deprivation.

Figure 17 - Expenditure vs. meshblock smoking rate by model



Source: Sapere analysis, 2018 Census

Overall, these results suggest that the model with M3 is at least broadly consistent with other measures of health need. It raises a number of complex questions about the pattern of health need and ASH rates, particularly for adults.

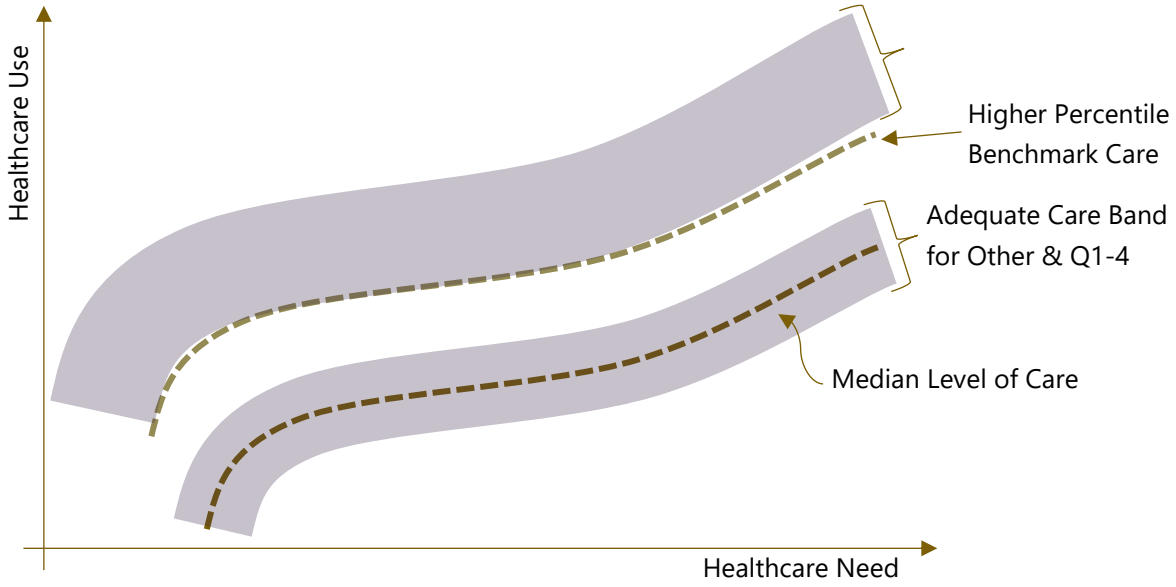
3.5 Adjusting predicted activity

3.5.1 How much would it cost to invest in a more equitable level of care?

The most significant challenge we face when calculating bottom-up practice costs is that the data on current healthcare use reflects both health need and existing biases in the system. For example, we know that 80-year-olds have significantly more appointments than 25-year-olds - this reflects a difference in healthcare need. We also know that Māori and Pacific patients have fewer appointments than Other (non-Māori/non-Pacific) patients and higher levels of unmet need - this reflects a bias in the system. Bottom-up sustainable practice costs should be calculated considering only need, but disentangling need from biases in the data is a difficult task.

Our approach is to model the aimed level of care for priority populations as higher than the historical median level of care. The general approach is that, for Other Ethnicities and Deprivation Q1-4, we assume the median patient receives adequate care and hence only patients near the historic median are included in our regression sample. For Māori/Pacific & Q5, the median is not representative of

adequate care as these groups are significantly underfunded in the current system, instead we include only patients above a certain percentile as those patients are more representative of adequate care for Māori/Pacific & Q5.



Which percentile of the distribution Māori/Pacific & Q5 should be benchmarked against is a matter for judgement. We present the results of several different percentile benchmarks for comparison and analysis (we refer to the percentile benchmark parameter for Māori/Pacific & Q5 as the "unmet need benchmark").

By design, the Unmet Need Adjustment will redistribute more funding to Māori, Pacific, and Quintile 5 patients as the Unmet Need Benchmark increases. However, it is not obvious how this funding will be allocated within these groups (i.e. does the model allocate more funding to elderly Māori or young Māori?). Therefore, we present the effect of redistributing the current level of government funding according to the distribution implied by the Bottom-Up Costs calculated at several different unmet need benchmarks. The graphs below show that benefits are not evenly distributed across age and decile.

Figure 18: Redistributed funding: Māori by age band

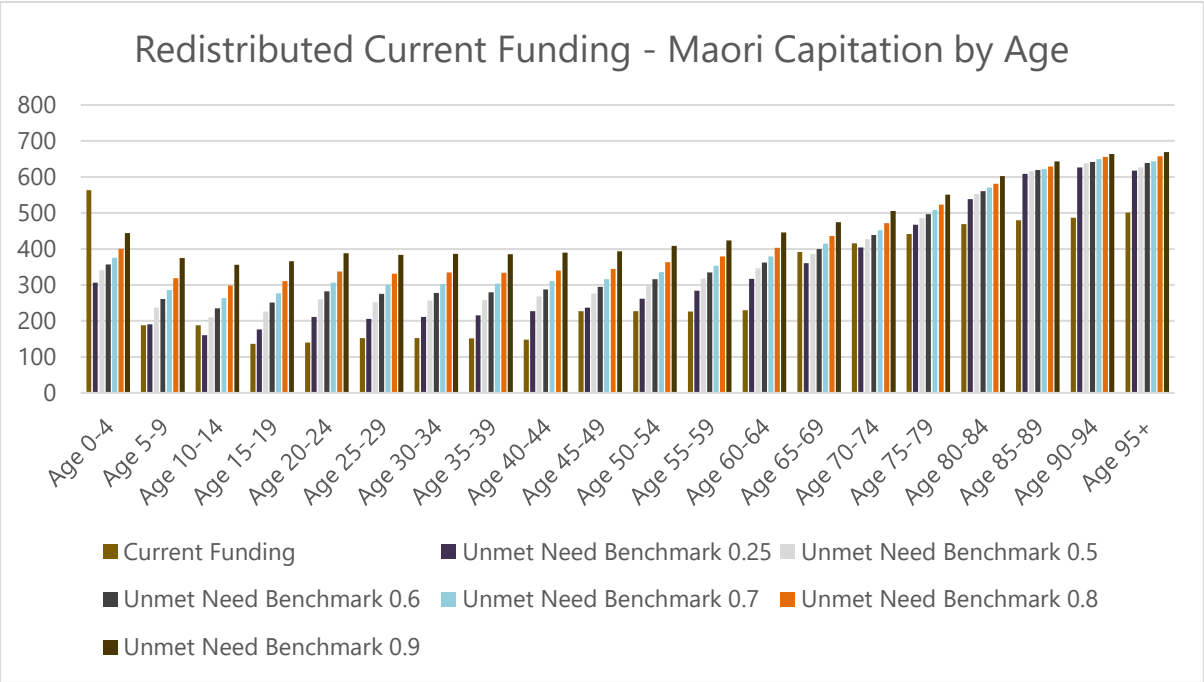


Figure 19: Redistributed funding: Pacific by age band

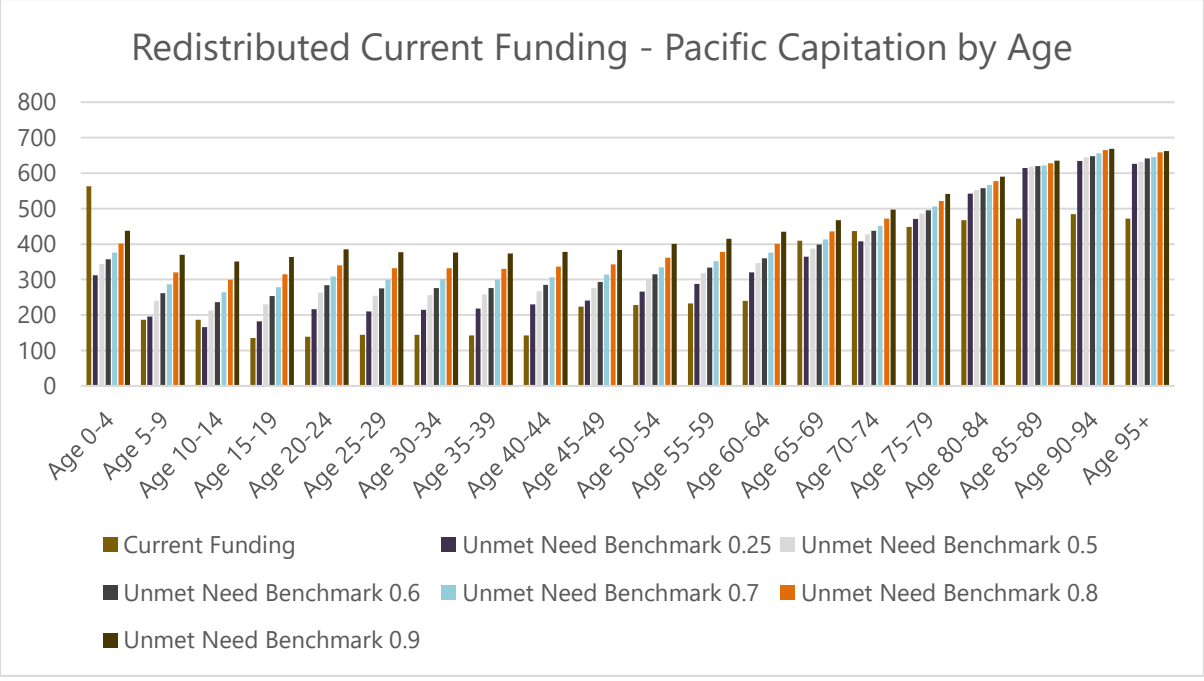


Figure 20: Redistributed funding – Māori by socioeconomic deprivation

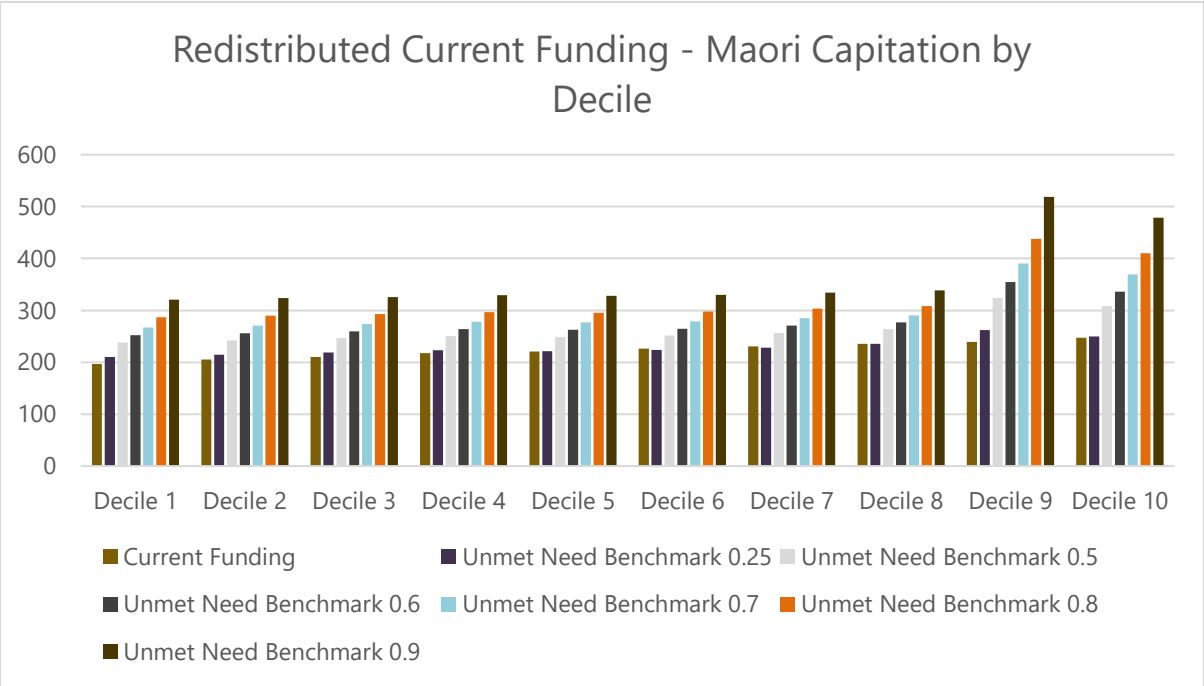
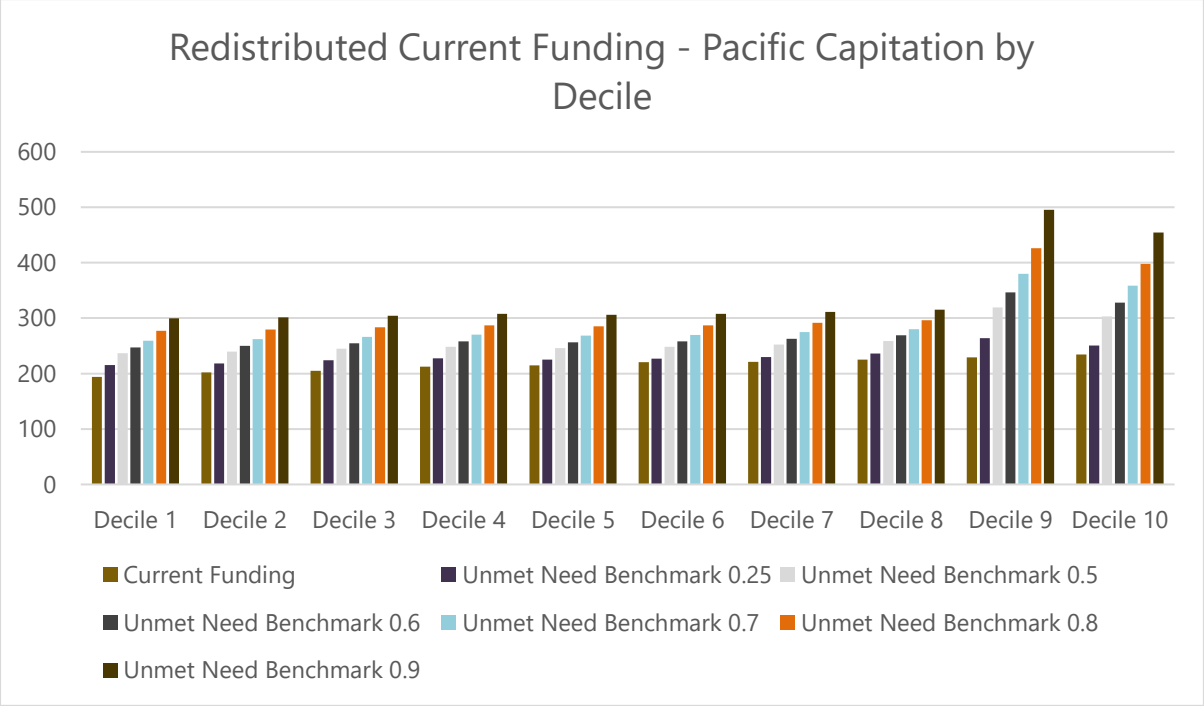


Figure 21: Redistributed funding: Pacific by socioeconomic deprivation



At all unmet need benchmarks, funding for Māori and Pacific would be significant higher for nearly all demographics. Age 0-4 would see decreased funding across the board under all unmet need benchmarks, this reflects our finding that the current capitation weight for Age 0-4 reflects a high volume of shorter than average consultations. Age 10-14 would see slight decreases in capitation but

only under the 25% Unmet Need Benchmark. Age 65-69 and Age 70-74 would only see a slight decrease in funding under the bottom-up costs distribution, reflecting that this population is at one end of a much wider age band in the current capitation formula. All other demographic cuts would see increases in funding.As the unmet need benchmark increases, Ages 5-64 see the largest increases in spending, whereas Age 65+ sees only moderate increases. In the Decile plots, deciles 9 and 10 see the largest increases as the unmet need benchmark rises.

We modelled the additional cost of funding equitable care nationally on the basis of 0.25, 0.5, 0.6, 0.7, 0.8 and 0.9 unmet need benchmarks. The results are shown in Table 8. The modelling assumes no change in co-payment policy. A change in co-payment policy would impact on service volumes and co-payment revenue, which would need to be modelled over and above our results.

Table 8: Investment needed for equity adjustments

Priority population benchmark	Total Govt Funding[15]	Increase Above Current Govt Funding
Current Funding	$1,226m	-
Break-Even Current System	$1,363m	$137m
Unmet Need Benchmark 25%+	$1,502m	$276m
Unmet Need Benchmark 50%+	$1,647m	$421m
Unmet Need Benchmark 60%+	$1,730m	$504m
Unmet Need Benchmark 70%+	$1,840m	$614m
Unmet Need Benchmark 80%+	$2,005m	$779m
Unmet Need Benchmark 90%+	$2,339m	$1,113m

In practice, much of the required investment in annual expenditure to achieve varying levels of response to unmet need is investment in workforce. The table below sets out the estimated FTE that lie underneath the investment estimate.

Table 9: FTE required for equity adjustments

	GPs	Nurses and NPs	Admin and management	Practice Managers	Other clinical
Current System/Breakeven	3037	2857	2831	1221	542
Unmet Need Benchmark 0.25	3381	2877	3152	1359	603
Unmet Need Benchmark 0.5	3687	3175	3437	1482	658
Unmet Need Benchmark 0.6	3845	3349	3585	1546	685
Unmet Need Benchmark 0.7	4037	3587	3763	1623	721
Unmet Need Benchmark 0.8	4311	3940	4018	1733	769
Unmet Need Benchmark 0.9	4812	4705	4485	1934	859

[15] This figure assumes that co-payment revenue remains fixed at the current level of $446m.

4. Impacts

4.1 How practice-level income is derived

In Table 7 we derived the costs and income for general practice at the national level. We now consider costs and income at the practice level. Practice costs are estimated by our capitation model on a per person basis, hence aggregating to the practice level is straight forward. But practice income is more complex. As mentioned in Section 2.4, we have the capitation funding received for each enrolled patient from the Ministry of Health, but this omits other funding streams such as POAC and immunisations which we only know at the national level. For co-payment revenue our figure in Table 7 was derived from the Statistics NZ household expenditure survey, thus there is no obvious way to disaggregate this to the practice level. Because of these issues, to estimate practice income we employ a series of scaling factors and a model to estimate the co-payment revenue for each appointment.

4.1.1 Co-payment revenue model

For each of the 94 practices we had FTE data for, we gathered consultation fees by age and CSC status from the Healthpoint website. The length of each consultation at these 94 practices was in our FTE data. We built two separate models to estimate the consultation fee and appointment time for each patient. These models trained on the data we collected for the 94 practices with FTE data, and then estimated a consultation fee and total yearly appointment time for each patient enrolled in the other 845 practices in New Zealand that we did not have FTE data for.

For the co-payment model we used a regression tree which estimated:

- no co-payment for anyone under 17
- anyone in a VLCA practice or with a CSC card pays $21 per consult regardless of age
- everyone else pays $42 per consult (if they are less than 28 years) or $52 per consult (if they are 28 and over).

For the appointment time model we used a simple OLS model.

The total cost of co-payments for a person was calculated as

$$TotalCopayments = CopaymentFeePerAppointment \times \frac{TotalAppointmentMinutes}{15}$$

In nearly all cases, the length of a standard appointment was not given on Healthpoint, thus we assumed a standard appointment was 15 minutes at all practices. As shown above, our methodology also assumed linearity of appointment costs.

4.1.2 Scaling factors

When we aggregated all our figures for the total co-payments paid by each person, we found that the national co-payment figure was $374m. This is around 20% short from our actual national co-payment figure of $446m. This was expected because our co-payment figure did not take into account the other fees practices charge (i.e. weekend surcharges, missed appointment fees, influenza vaccinations etc.). However, to get around this, we have assumed that the relative difference between practices in

our estimated co-payment figure is correct, and it is just the absolute level which is incorrect. This means that if we adjust the co-payment revenue at each practice by the shortfall at the national level, we can derive a co-payment figure which is reasonably accurate.

Similarly, our national government funding figure in the practice-level data was $1,040m, but after other adjustments in Table 7, the total figure for government revenue is $1,226. However, if we again assume that relative differences in our government funding figure are correct, we can simply scale up each practice's government revenue by the scaling factor implied at the national level.

4.2 Sustainability and distributive effects

The proposed bottom-up costs can be broken down into two components. The first component is a result of a bottom-Up costing of the current system - that is, the level of funding required to keep the current level of care operating. This component does not correct for the fact that some groups are underfunded in the current system. The second component is the change in the Bottom-Up costs required to achieve an equitable level of funding according to need. This component does correct for the fact that some groups are underfunded in the current system. This portion of funding varies with respect to the unmet need benchmark, as this controls how underfunded the model believes Māori/Pacific/Q5 populations are. The final equitable bottom-Up costs are the sum of the first and second components.

Table 10: Distribution of increased capitation funding

	All	Māori	Pacific	Asian	Other
Current Total Funding (govt + private)[16]	$347	$331	$319	$303	$365
Component 1: Level of funding required to keep current level of care	$376	$357	$374	$337	$390
Component 2: Increase in funding required to achieve equitable healthcare use according to need (Unmet Need Benchmark = 0.7)	$99	$350	$333	$29	$28
Final Bottom-Up Costs (Component 1 + Component 2)	$475	$707	$706	$366	$418

[16] This is an estimate which includes patient co-payments, first contact, VLCA, CSC, U14 & U6, Services to improve access (SIA), CarePlus, Immunisations, POAC, and HCH. Excludes health promotion and afterhours funding.

4.3 Practice level impacts

4.3.1 Component 1: Level of funding required to keep current level of care

The first component measures the level of funding that is required to sustainably deliver the current level of care. This is a level of care which, in general, underserves Māori, Pacific, and Quintile 5.

Reading off Table 10, we find that on average $347 per person in total funding is provided to general practice annually. To sustain the current level of care across all practices, we estimate that $376 per person in total funding must be provided to general practice. This means practices run a loss of $29 per person and suggests that the current environment is unsustainable. Most practices will need to raise co-payments or constrain access to care, for example by closing their books ot new patients.

The plot below shows the funding changes by practice required to sustain the current level of funding. Note that this does not include an allowance for a profit margin. We split practices by high need and VLCA for a low-level view. Most practices would see a moderate increase in funding.

Figure 22 - Change in Funding Required to Adequately Fund Current Level of Care

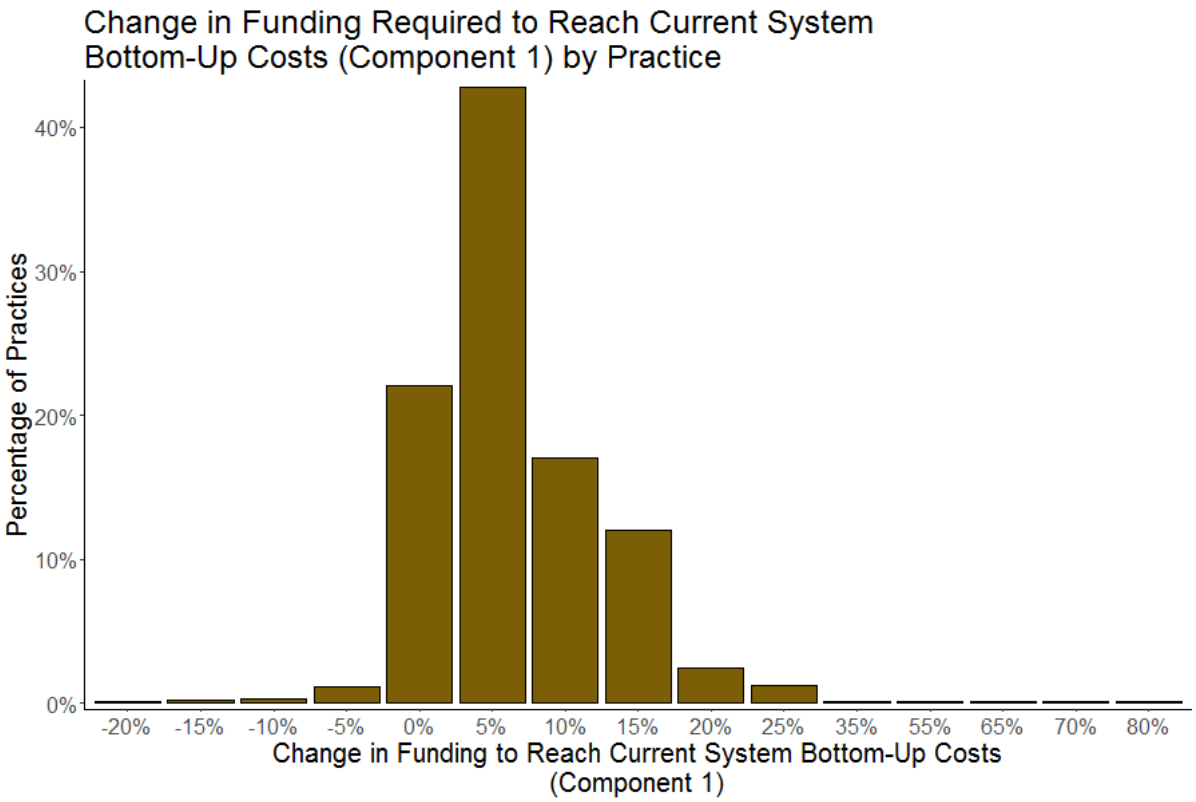
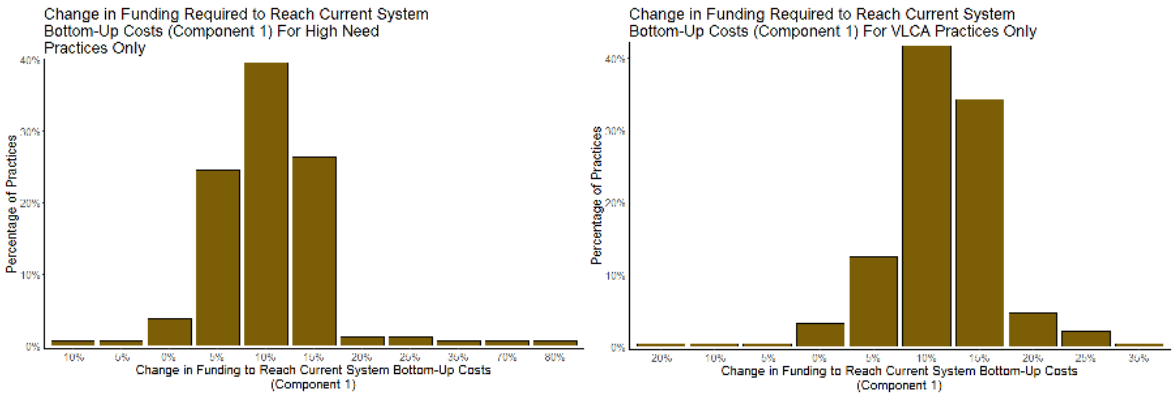


Figure 23 - Change in Funding to Adequately Fund Current Level of Care for VLCA and High Need Practices



If our bottom-up costs for Component 1 were implemented today, the model suggests that 98% of practices would see either no change or a moderate increase. The average practice would see a 9% increase in funding relative to current levels. In simple terms, this means that the average practice needs 9% more revenue to break even at the current level of care they provide today.[17]

It is important to note that these losses are unlikely to translate directly into literal accounting losses for all practices. Losses will be managed by approaches such as reducing incomes, by minimising staff, relying upon voluntary time, constraining access to care. The impacts of these constraints are likely to be seen in phenomena such as long delays in order to get appointments, or closed books to new enrolments. Therefore, even though many practices here may break even financially in 2021, we suggest that the losses listed here are real but they may have just been paid implicitly.

The model also tells us that the vast majority of high need and VLCA practices are underfunded because practices require an increase in funding to break even. To sustain the current level of care long-term, an additional profit margin should be included to recognise the ongoing need for investment in the practice as an organisation..

4.3.2 Component 2: Additional funding required to increase the level of care to recognise need

Component 1 tells us how much funding (derived from the bottom-up) is needed to provide today's level of care sustainably. Component 2 on the other hand, asks how much additional funding is needed (on top of what is already provided in Component 1) to fund everyone according to the level of care they need. This component addresses the fact that Māori, Pacific, and Quintile 5 have been historically underfunded in New Zealand's health system (and hence the current level of care is not an adequate benchmark of need).

Component 2 is a boost in funding on top of Component 1, so that practices can meet the level of care their patients actually need. However, this requires a judgement of what exactly the level of care that patients need is. There is a parameter in the model, called the unmet need benchmark, which

[17] In Table 7 we noted that the aggregate shortfall in the general practice sector was 7.6%. But the 9% average shortfall is an unweighted practice level average. This suggests that there are many small practices with significant losses beyond 7.6% (potentially paid implicitly as we note later).

controls the level of need that patients require (see Section 3.5 for more details). Higher unmet need benchmarks suggest that the level of unmet need is higher. The figures below show our capitation model's results at different unmet need benchmarks. The horizontal axis in these graphs is Component 2 as a percentage of a practice's current income. So for example in Figure 24 - for all practices, around 20% of practices will receive a 10%-19.99% increase to their current funding from Component 2.

Under all unmet need benchmarks greater than 25%, all practices would see an increase in funding from Component 2. Only under the 25% benchmark would a very small minority of practices see a minor decrease from Component 2. These practices that see a decrease from Component 2 funding are practices which the model suggests are already providing care at beyond the 25% Unmet Need Benchmark level.

Figure 24 - Component 2 at Unmet Need Adjustment Level 25% - All Practices

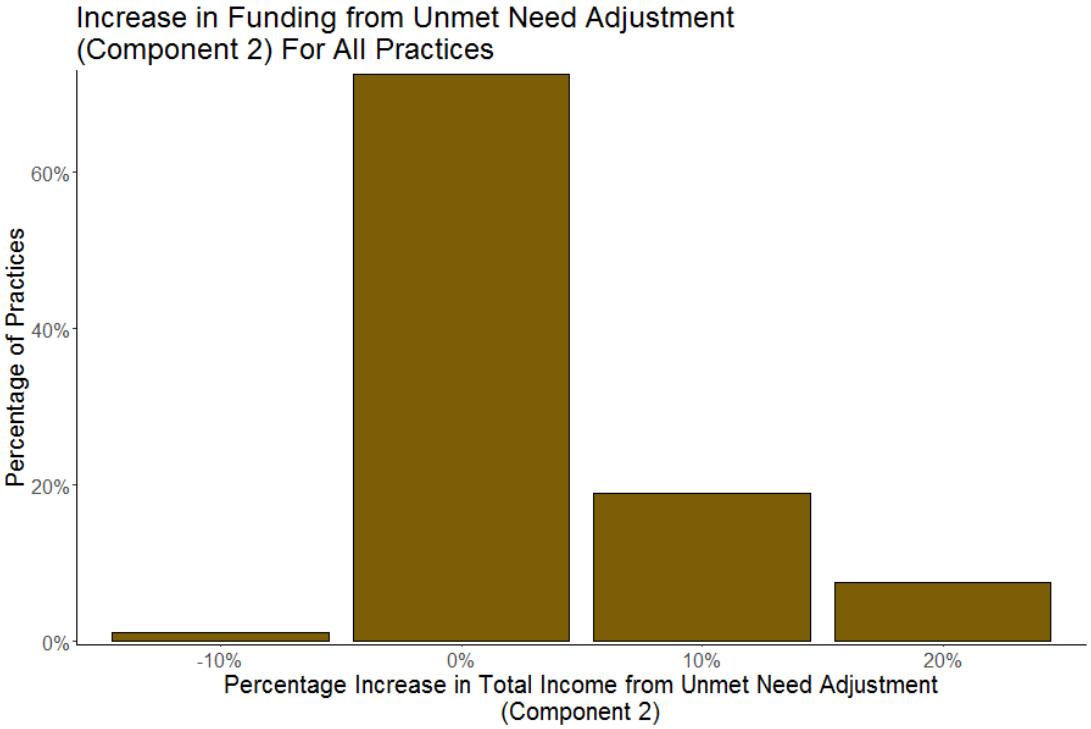


Figure 25 - Component 2 at Unmet Need Adjustment Level 25% - High Need & VLCA

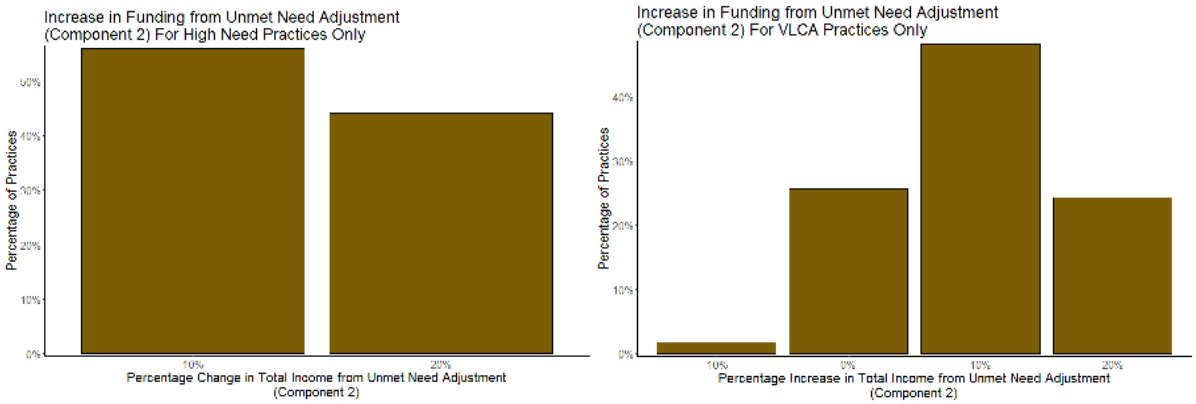


Figure 26 - Component 2 at Unmet Need Adjustment Level 50% - All Practices

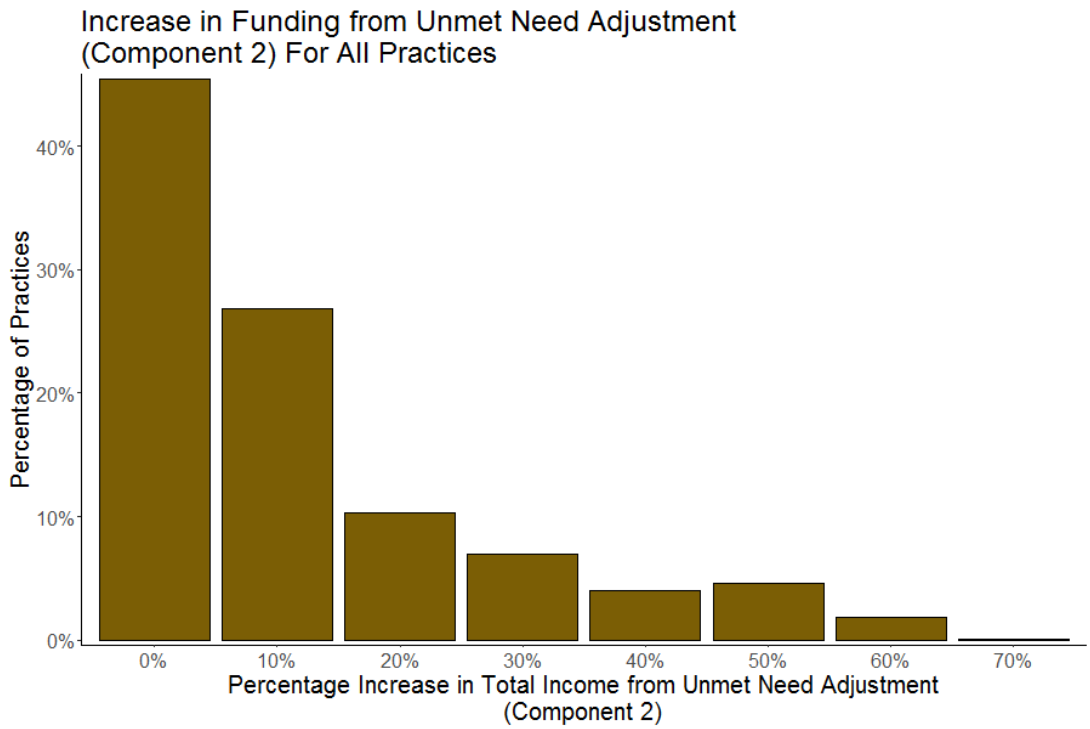


Figure 27 - Component 2 at Unmet Need Adjustment Level 50% - High Need & VLCA

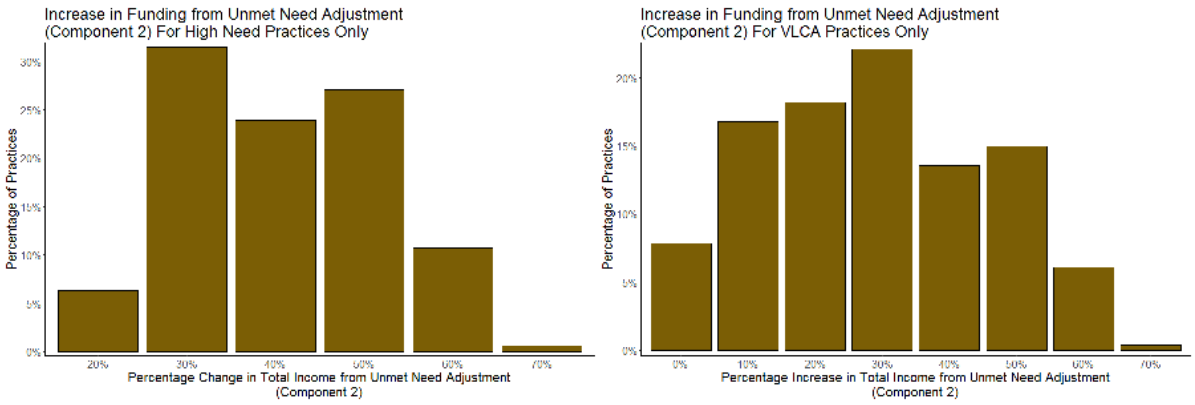


Figure 28 - Component 2 at Unmet Need Adjustment Level 60% - All Practices

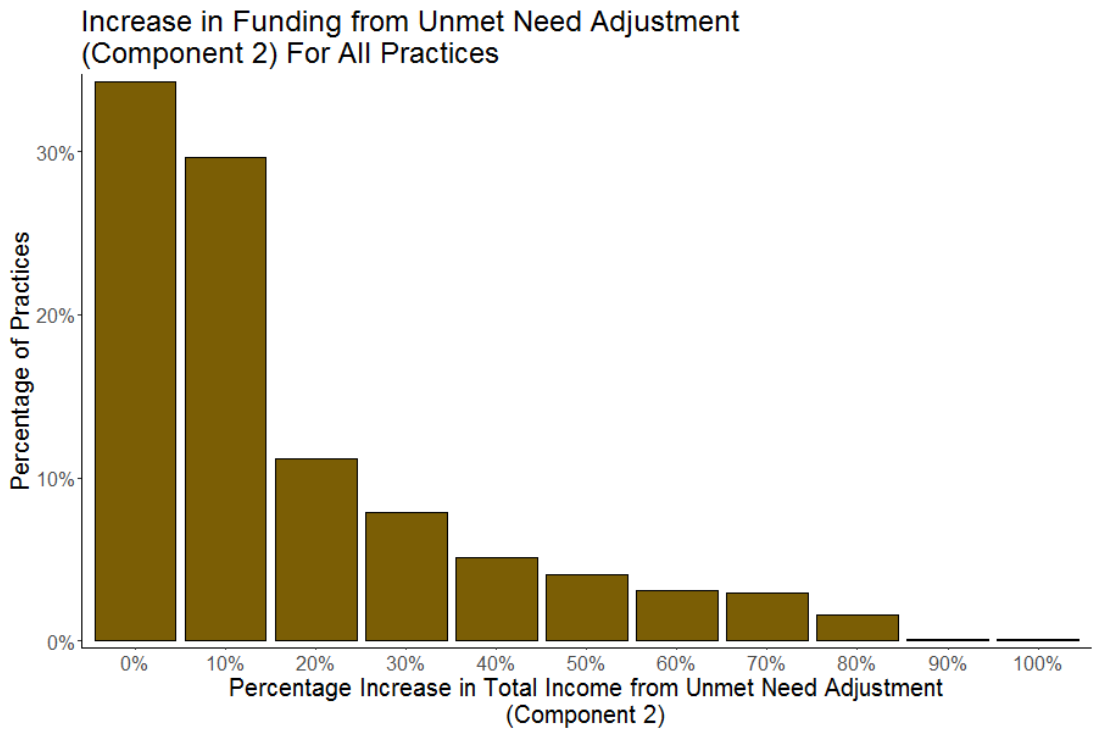


Figure 29 - Component 2 at Unmet Need Adjustment Level 60% - High Need & VLCA

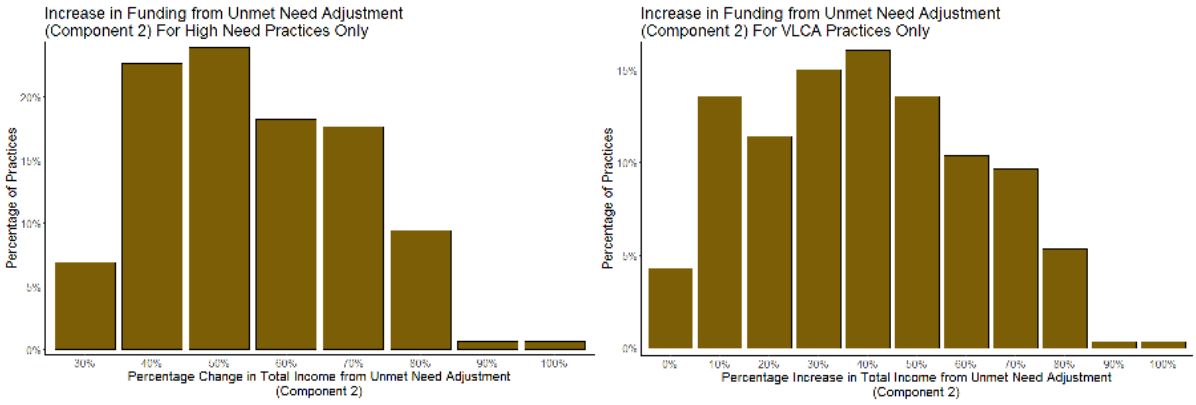


Figure 30 - Component 2 at Unmet Need Adjustment Level 70% - All Practices

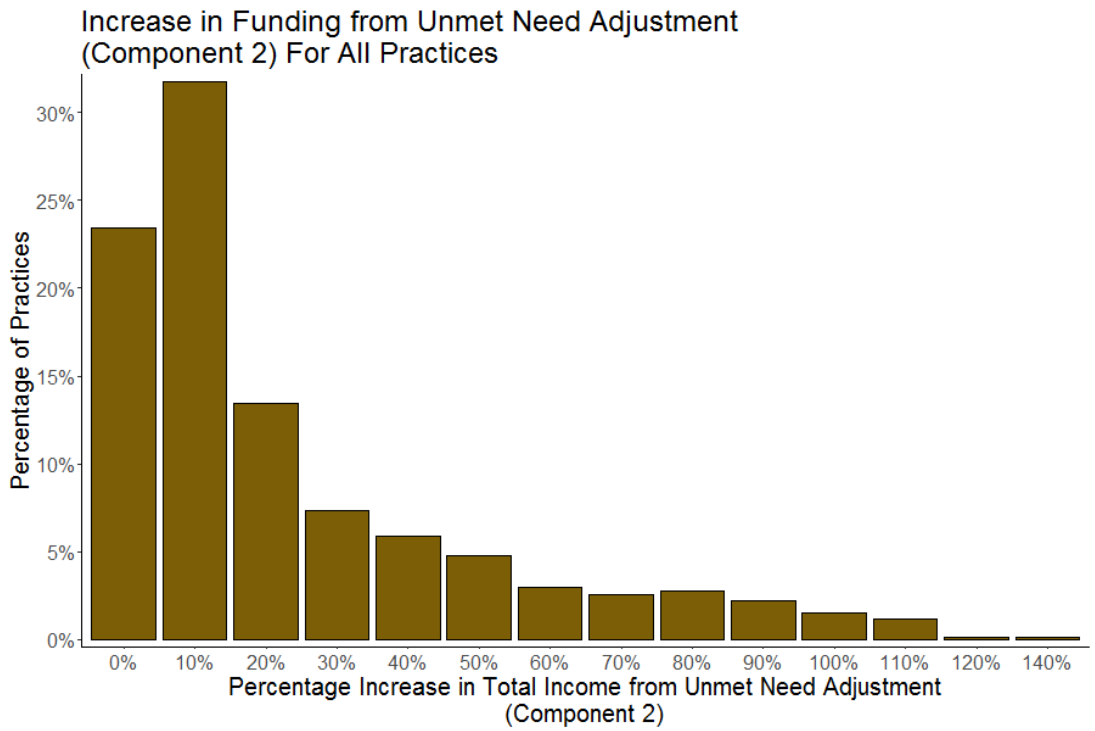


Figure 31 - Component 2 at Unmet Need Adjustment Level 70% - High Need & VLCA

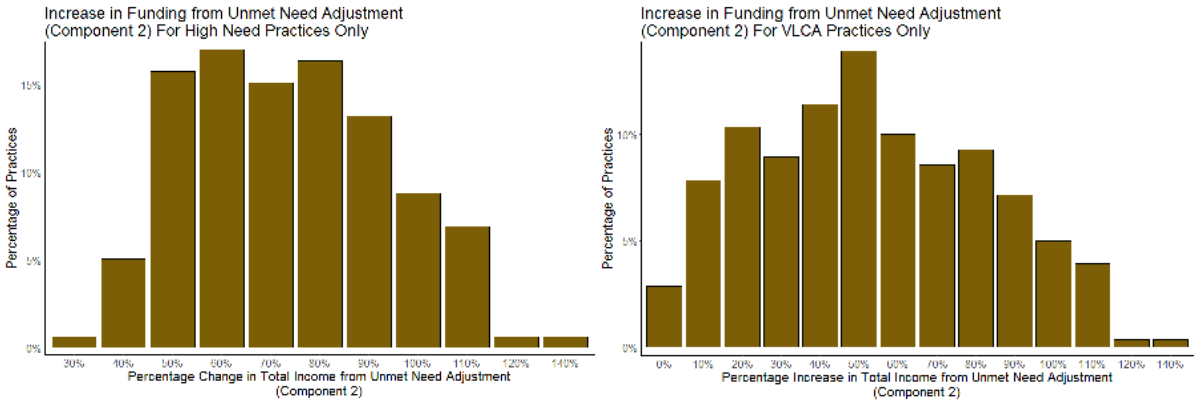


Figure 32 - Component 2 at Unmet Need Adjustment Level 80% - All Practices

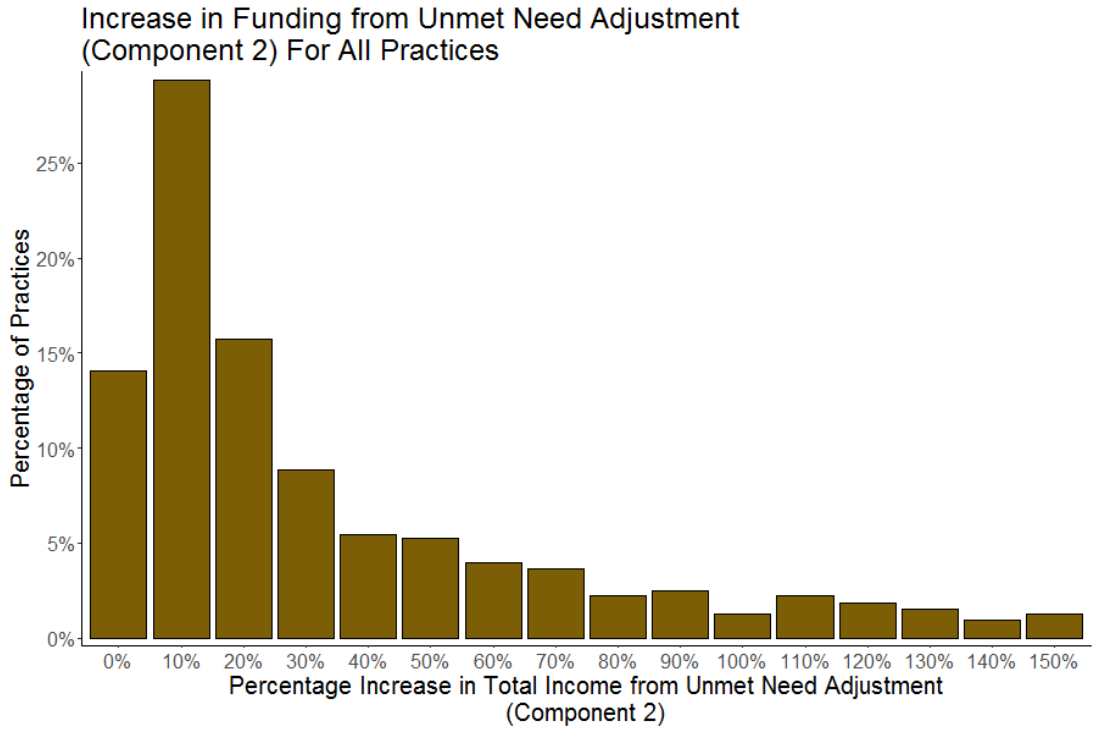


Figure 33 - Component 2 at Unmet Need Adjustment Level 80% - High Need & VLCA

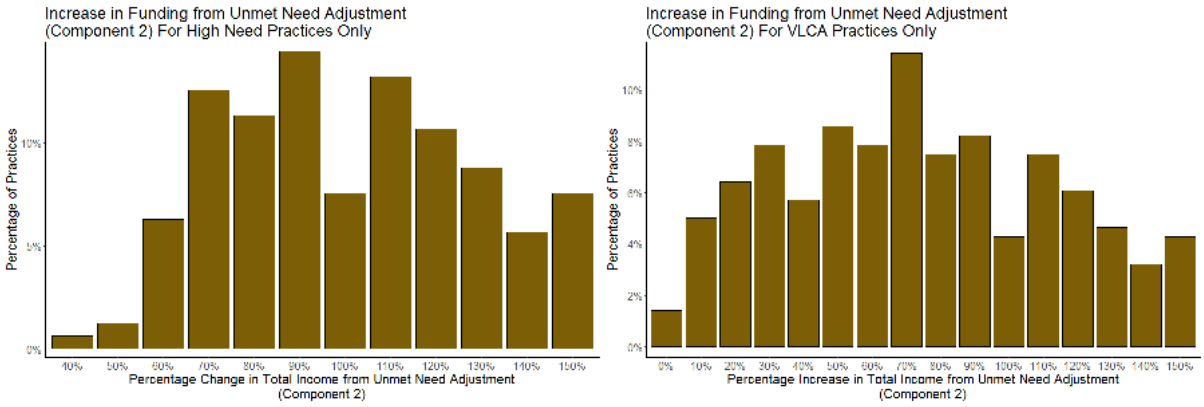


Figure 34 - Component 2 at Unmet Need Adjustment Level 90% - All Practices

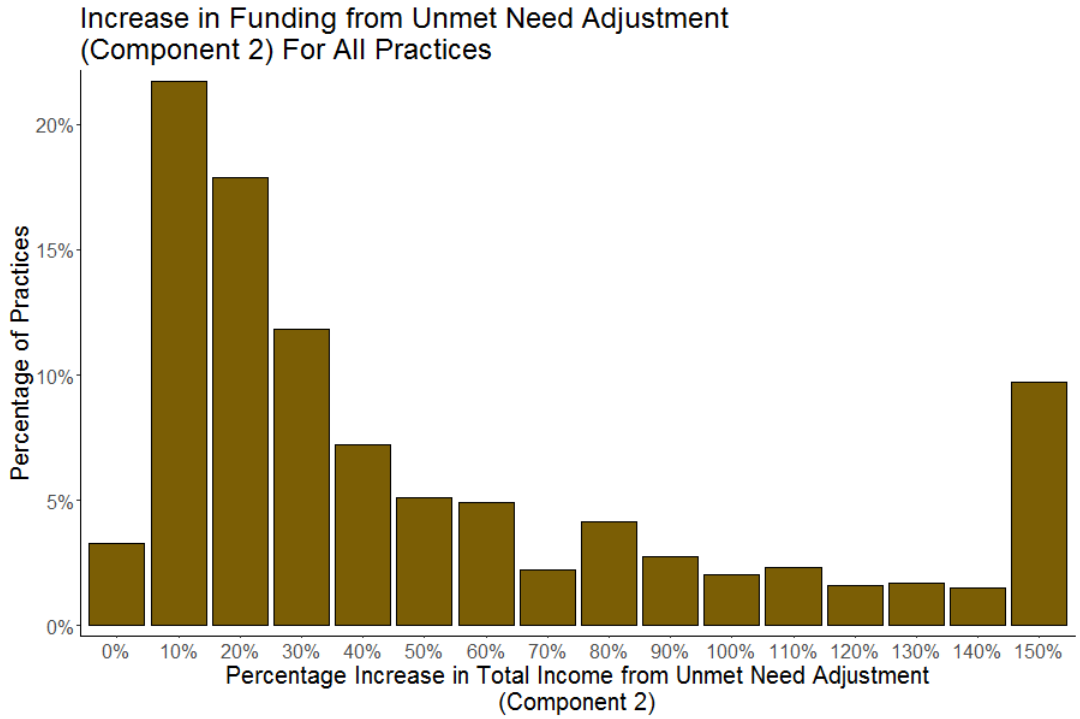
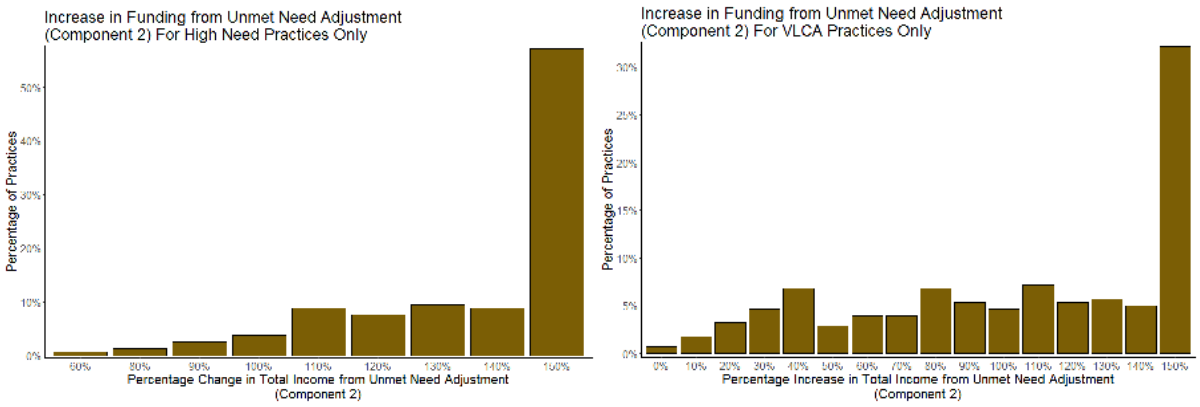


Figure 35 - Component 2 at Unmet Need Adjustment Level 90% - High Need & VLCA



The additional funding required for practices increases rapidly with the unmet need benchmark. For example, with a 25% unmet need benchmark, the average practice would see an 8.5% rise in their funding as a result of Component 2. However, at the 90% benchmark, the average practice would need a 59% increase relative to their current funding to provide a level of care which meets the need of their patients.

4.3.3 Bottom-up costs total funding (Component 1 + 2)

The total bottom-up costs includes both Component 1 and 2, giving the funding required to uphold the current level of care (Component 1) plus additional funding to improve the level of care to where it needs to be (Component 2). The total bottom-up costs is the level (and distribution) of funding that should be provided to general practice.

Below we present the total effect of our bottom-up costs by practice. The horizontal axis represents the change from current funding that practices would experience if the new funding formula was enacted today.

Figure 36 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 25% - All Practices

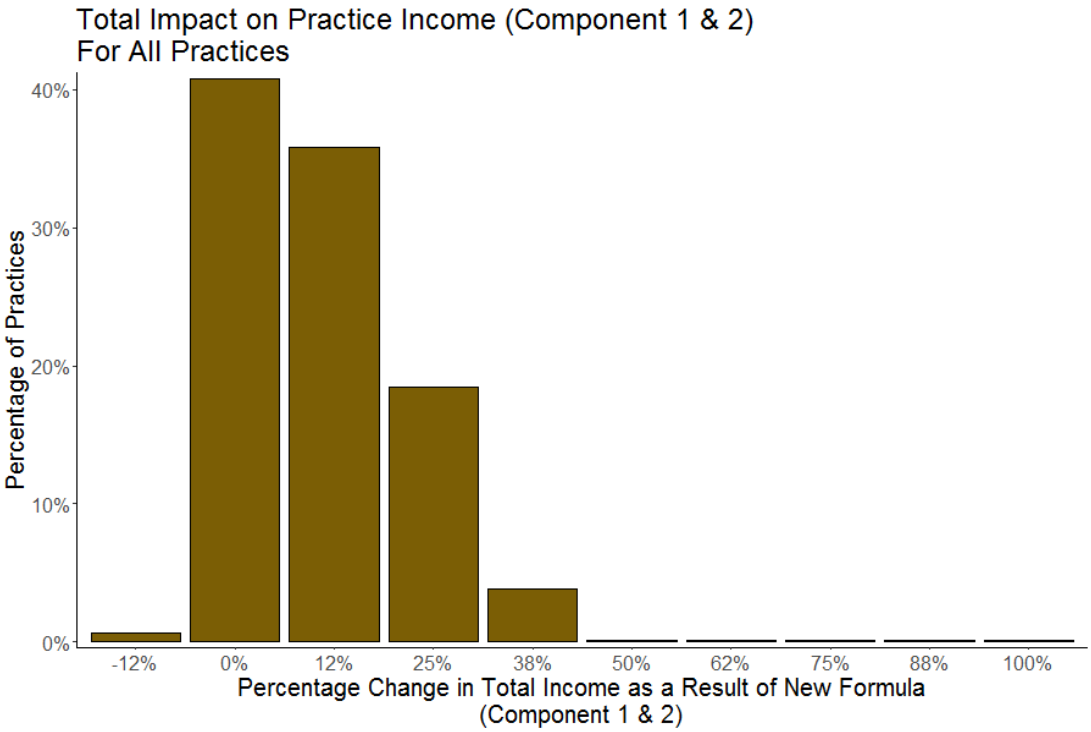


Figure 37 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 25% - High Need & VLCA

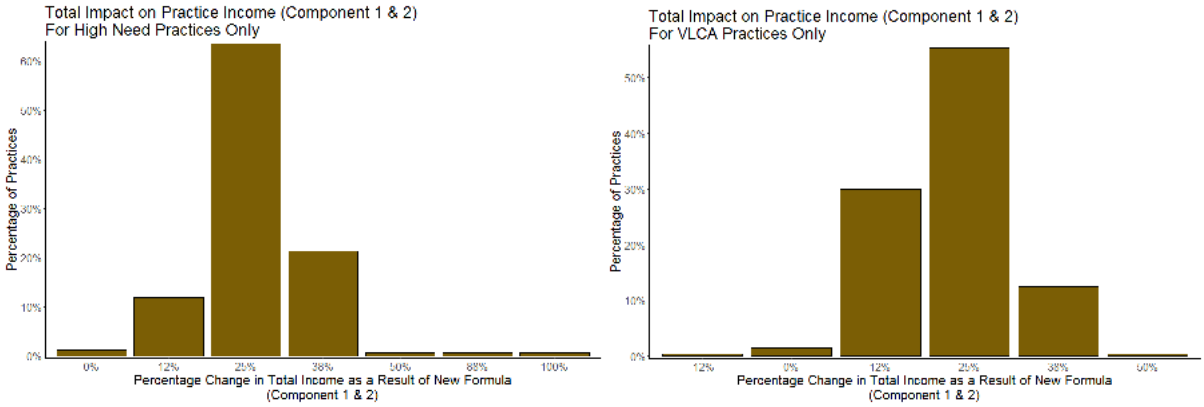


Figure 38 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 50% - All Practices

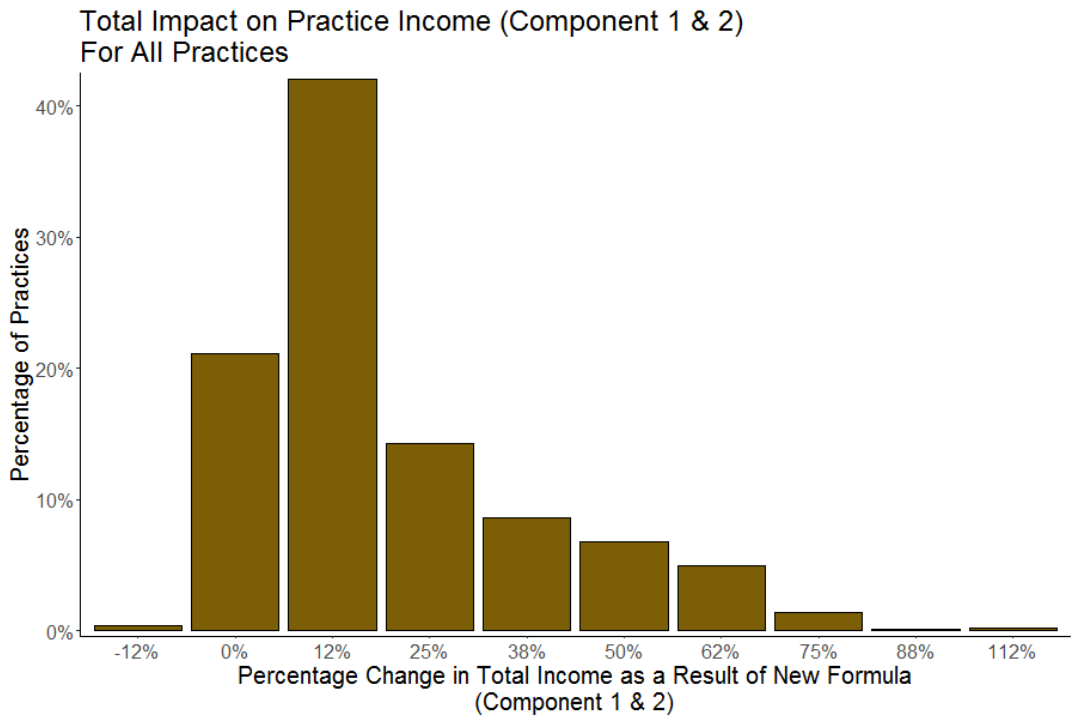


Figure 39 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 50% - High Need & VLCA

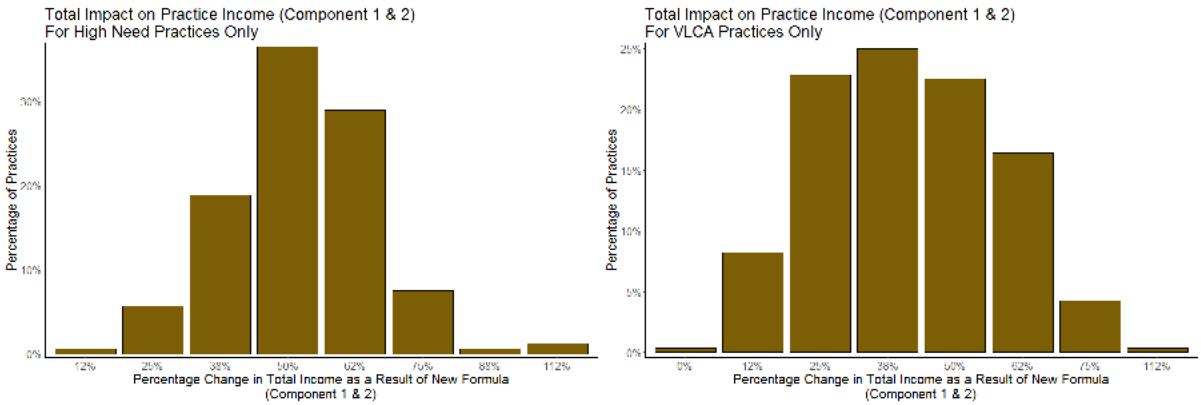


Figure 40 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 60% - All Practices

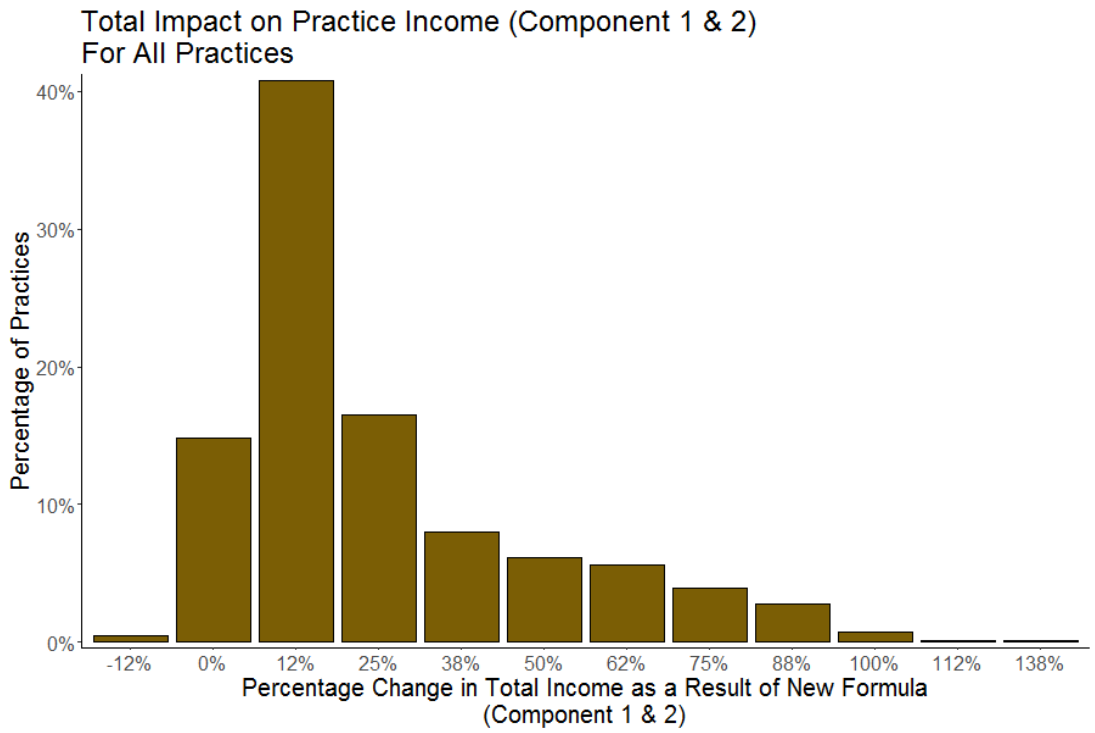


Figure 41 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 60% - High Need & VLCA

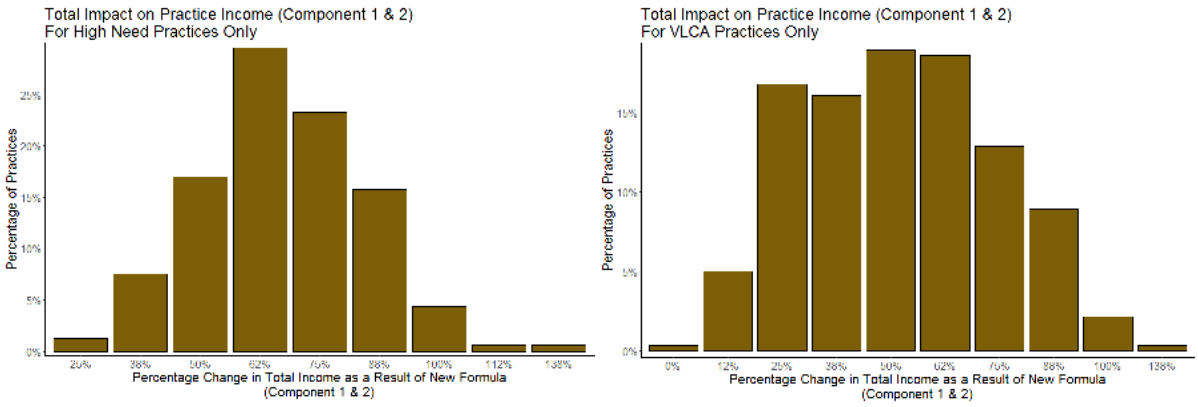


Figure 42 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 70% - All Practices

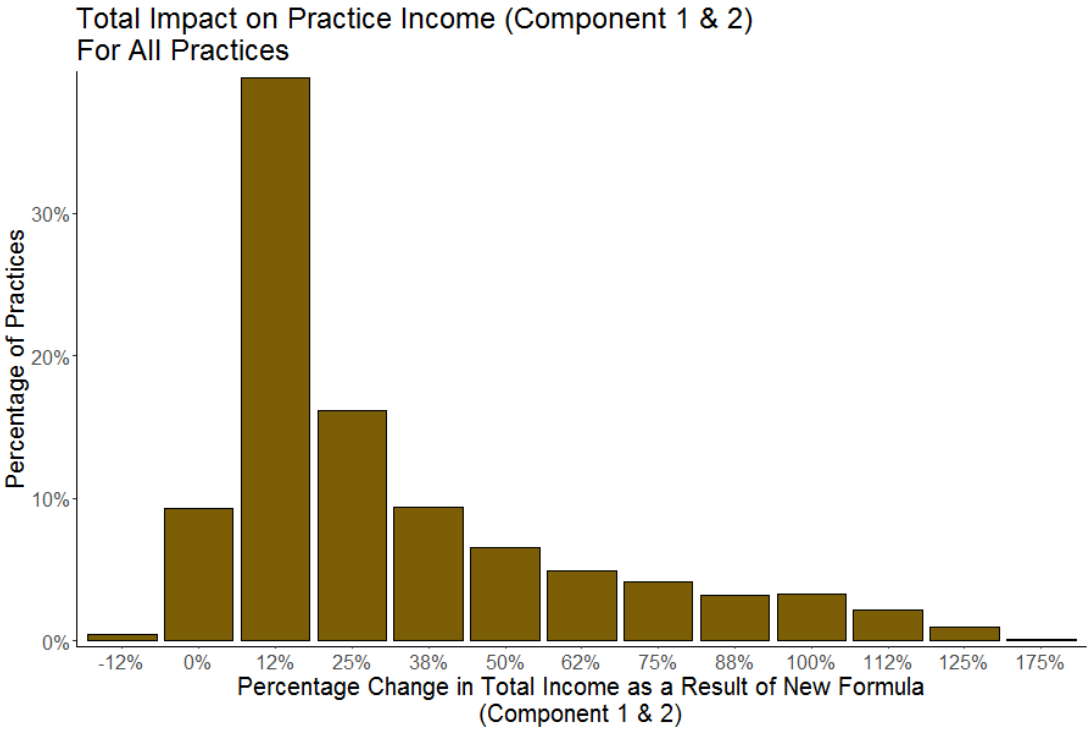
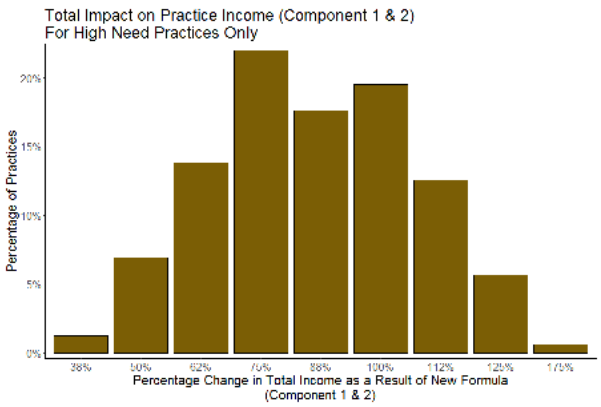


Figure 43 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 70% - High Need & VLCA



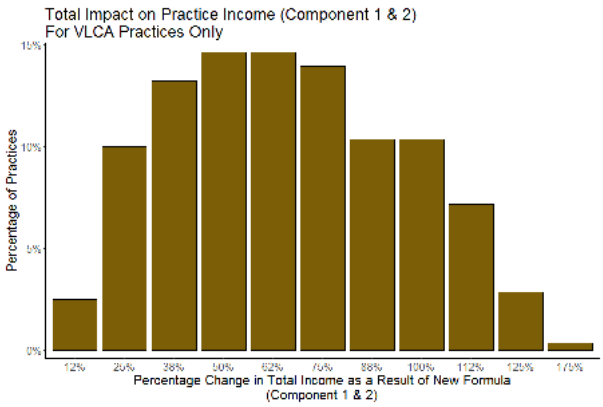


Figure 44 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 80% - All Practices

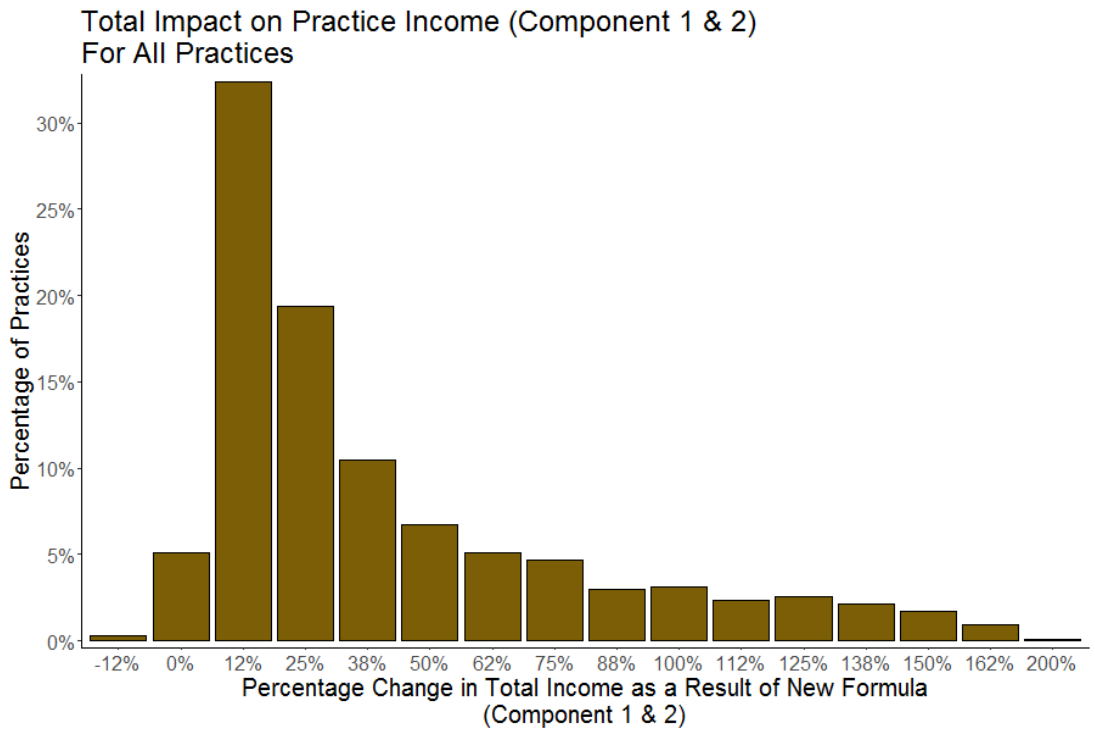


Figure 45 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 80% - High Need & VLCA

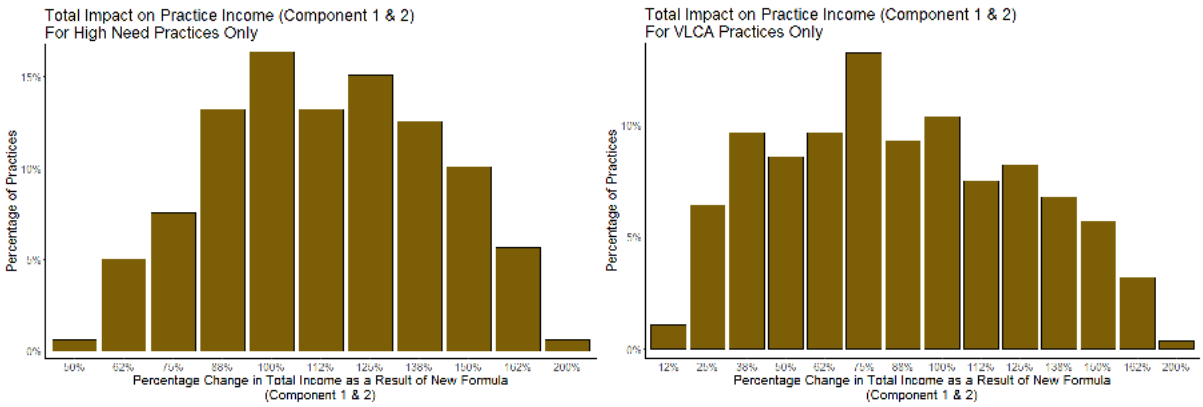


Figure 46 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 90% - All Practices

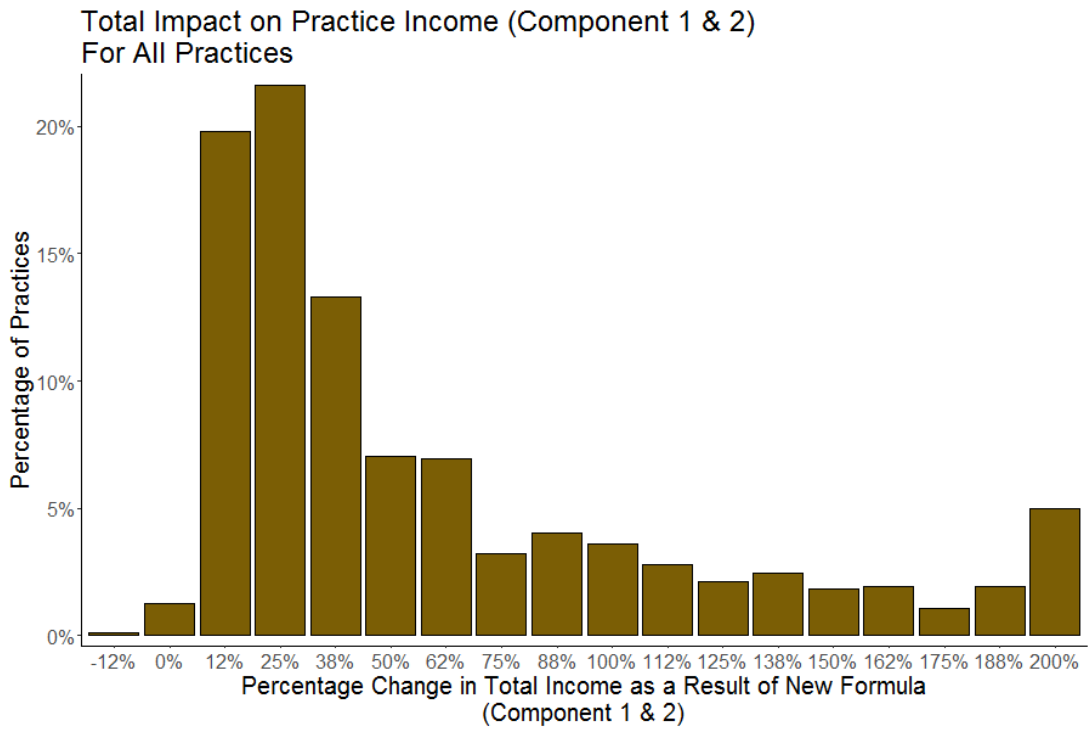
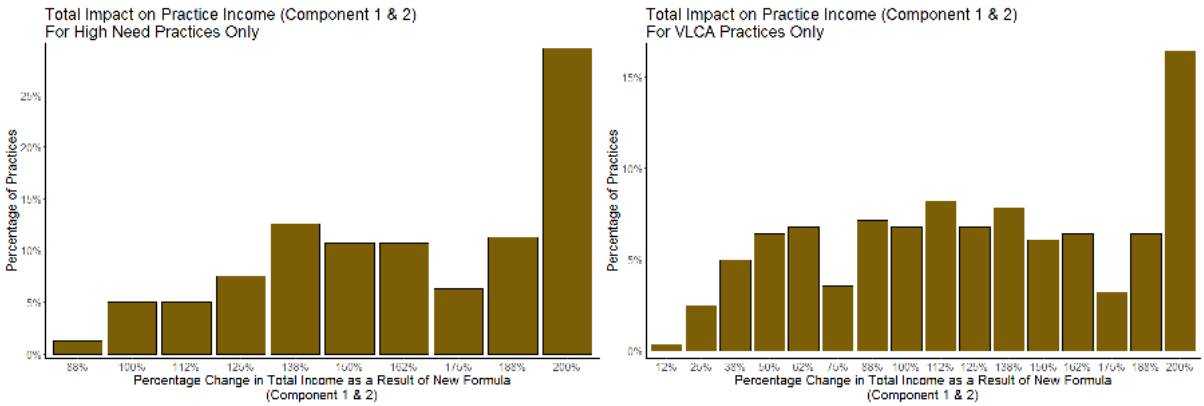


Figure 47 - Total Bottom-Up Costs Impact on Practice Income with Unmet Need Adjustment Level 90% - High Need & VLCA



Under all benchmarked scenarios, less than 1% of practices would see a decrease in funding at all. The percentage of practices that see a substantial increase (which we define as a 15% increase or more) ranges from 44% under the 25% Unmet Need Benchmark scenario to 97% under the 90% Unmet Need Benchmark scenario.

Figure 48 - Bottom-Up Costs Formula by Percentage of Practices

Scenario	Percentage of practices with any decrease under new formula	Percentage of practices with more than a 15% increase under new formula
Current System Bottom-Up Costs (Component 1 Only)	1.8%	16.3%
Unmet Need Benchmark 25%	0.64%	44.3%
Unmet Need Benchmark 50%	0.43%	65.0%
Unmet Need Benchmark 60%	0.43%	72.7%
Unmet Need Benchmark 70%	0.43%	81.3%
Unmet Need Benchmark 80%	0.32%	88.8%
Unmet Need Benchmark 90%	0.11%	96.8%

High need and VLCA practices would see the most benefit from the move to a new funding formula, with the average high need practice seeing a 32% increase in funding under the conservative 25% Unmet Need Benchmark scenario. Under the 90% Unmet Need Benchmark scenario, the average high need practice would see a 176% increase in funding.

4.4 Examples

To illustrate the impact of our bottom-up costs formula, we present data on two example practices with high need populations, Below are some basic summary statistics on each practice.

Table 11 - Summary Statistics for two high need general practices

	Practice One	Practice Two
Number of Enrolled Patients	6764	3675
Percent Māori	22.8%	74.3%
Percent Pacific	46.1%	13.6%
Percent Q5	74.9%	75.6%
Percent Māori/Pacific or Quintile 5	88.2%	95.1%

Using data supplied to us by the Ministry of Health and national trends, we can estimate the total public funding that went to each of these practices in October of 2021.[18] All funding figures are given on a yearly basis. These practices only receive between $21 - $41 more funding per person than the national average government funding of $255 per person, despite both of these practices serving a very high need population. We estimate that both of these practices on average receive around $45 annually in private co-payment funding for each enrolled patient. This figure is $48 less than the national average of $93 in co-payments per enrolled patient.

Table 12 - Funding Summary for two high need practices vs. average

	Practice One	Practice Two	Average Practice
Current Government Funding Per Person	$276	$296	$255
Total Private Copays Per Person	$45	$44	$93
Total Funding Per Person (Core Government + Private Copays)	$321	$340	$347
Total Funding Per Person Required to Maintain Current Level of Care	$359	$361	$376
Current Less Required Funding[19]	-$38	-$21	-$29

Overall, we estimate that Practice One and Two receive $321 and $340 respectively in core government and private co-payment funding per enrolled patient. The average practice in New Zealand receives $347 in core government and private co-payment funding per enrolled patient. Practices One and Two therefore receive between $7 - $26 less funding per enrolled patient than the average practice in New Zealand, despite the fact that they serve a significantly higher need population than an average New Zealand practice.

When we look at the level of funding required to maintain the current level of care (Component 1), we find that These practices need around $360 in funding to break even, whereas the average New Zealand practice needs $376 per person to break even. This indicates that patients at these practices are underserved. These practices are almost certainly underfunded relative to the need of their patients.

When we compare these practices' total funding to the funding required to maintain their current level of care, we find that Practice One has a $38 per person shortfall and Practice Two has a $21 per person shortfall. This indicates that both practices are not currently operating sustainably and will

[18] This includes first contact funding, under 6 & 14 funding, VLCA funding, and CSC funding along with estimates for smaller funding streams like POAC, SIA, Immunisations etc. We exclude HP and after hours funding.

[19] This is the difference between the total current funding (government + private), and our model's estimate of the bottom-up costs required to maintain the current level of care.

either need to compromise the care they provide or increase co-payments in the long run if there is no change in capitation policy. We noted in Section 4.3.1 that funding shortfalls of $21-$38 may not necessarily translate directly into explicit accounting losses, rather they may be paid implicitly via lower incomes for staff, or reliance upon voluntary activity.

In the table below, we look at the effect of not only funding these practices adequately for the current level of care they provide, but funding these practices adequately for the level of care their enrolled population needs. We present 6 different funding scenarios for these practices. Scenarios with higher Unmet Need Benchmarks imply that the level of unmet need is higher in that scenario.

Figure 49: Impact of adjusted capitation on two example practices

	Practice One	Practice Two
Total Average Funding Per Person (Government + Private Copays)	$321	$340
Total Funding Per Person Required to Sustainably Maintain Current Level of Care (Component 1)	$359	$361
Total Funding Per Person Required to Care for Each Patient According to Their Need (Component 1 + 2)		
Unmet Need Benchmark Scenario 25%	$429	$448
Unmet Need Benchmark Scenario 50%	$534	$573
Unmet Need Benchmark Scenario 60%	$592	$643
Unmet Need Benchmark Scenario 70%	$668	$732
Unmet Need Benchmark Scenario 80%	$780	$862
Unmet Need Benchmark Scenario 90%	$997	$1125

Across all scenarios, Practices One and Two should receive between $108 and $785 respectively more funding per enrolled patient than they currently do, in order for these practices to provide the level of care their patients need. This represents increases in the range of 34% to 231% from current funding levels depending on the assumptions regarding the Unmet Need Benchmark.

5. Next steps

We have demonstrated an approach to a bottom up costing of general practice care to inform a capitation formula, with a mechanism for addressing historical unmet need. We have explored a number of different scenarios for addressing levels of unmet need, and these will ultimately require policy debate across the health sector to make decisions about where investment should lie, given the patterns of need and funding distribution that we have identified in this analysis. It is also our view that, while this represents our best endeavours to estimate costs and patterns of need with the information available to us, validation and extension of this analysis will be needed.

Our approach has tried to avoid previous limitations of capitation exercises by using data on the time involved in delivering care by the general practice team as the basis for the approach, rather than counting general practitioner consultations. Our approach has also differed from previous exercises by explicitly making an allowance for unmet need in priority populations.

We have estimated the level of care and the associated funding needed if historic underservicing of populations is removed from our dataset. We have done this using a number of different thresholds below which we might consider the level of care to be underservicing. There remains a policy question about which of those thresholds should be chosen, if this approach were to be implemented.

Ultimately, setting a threshold will depend upon forming a view about the proportion of the targeted populations that currently underutilise general practice services. While there will be an element of judgement and policy pragmatism about which threshold is the basis for future funding, there are also approaches that could be used to inform that judgement, and this should be an explicit part of making recommendations on the future level of investment in general practice and other primary health care services. Approaches should include drawing upon some of the existing evidence base about under-servicing and need, such as the NZ Health Survey and NatMedCa study. It would also be feasible to undertake some qualitative work with practices and patient groups to inform a view on the level of threshold that effectively represents a desired level of servicing and access to care.

This analysis of patterns of need and activity, and the estimates we have made of the consequential level of investment needed to guarantee the sustainability and effectiveness of general practice for the whole New Zealand population are very much a starting point. There are a number of complex points of policy debate to be had about the future funding of general practice. This analysis provides supporting information for some key aspects of that debate. Important questions include:

- Review of service viability. We have addressed some aspects of the viability of core general practice in our bottom up costing, but viability is about a wider range of factors, and funding is one element of those. This is why we have not explicitly addressed rural general practice in this analysis, since the different constraints (eg. of scale, workforce etc) mean that, in our view the patterns of need, activity and impact on viability are likely to be fundamentally different from the majority of New Zealand practices. More generally, the viability of primary care services in the future depends critically upon the future supply of the primary care workforce, and the distribution of services both geographically and demographically. Constraints of workforce may be partly addressed by funding, but also reflect wider issues of training investment, as well as changing professional roles. The

service funding elements of primary care viability must be considered within a wider context.

- Changing workforce roles. We have modelled costs around a traditional model of general practice focussed upon a general practitioner and nurse clinical team. But the wider primary care workforce is changing rapidly, and general practice teams are evolving. The extent to which workforce change occurs within the level of investment indicated here for
- The traditional general practice team, and the extent to which additional investment is needed to develop those wider teams will require further analysis and debate, as new workforce configurations evolve.
- Implementation issues will be complex. Moving to a different distribution of funding will raise a number of complex issues in implementation, and these will require careful analysis and thorough debate. Where a redistribution at a given level of investment would imply that a small number of front line practices might see a reduction in their government revenue, will that be mitigated through a special funding mechanism, or by allowing co-payments to increase, or by some other approach? Similarly, the analysis here shows a decrease in the expected funding required for children under 5 but, realistically, policy options are more likely to be about how to make sure that funding for younger children is most effectively invested, rather than removing such funding. Timeframes for investment will also be an important policy parameter. If a significant investment is made, it may take a number of years to get to the desired level, and there will be transitional issues and risks of unintended consequences that will have to be carefully considered. The different starting points of VLCA and other general practices in the status quo funding system present further complications, and will require careful planning in order to avoid introducing inequities during a transition.

This analysis is a first step. Once reviewed and validated there remain a number of important steps to consider. These should include:

- Replicating the findings with other datasets. While best endeavours have been used to generate the estimates presented here, it would be prudent to review and replicate the analysis, to check for sources of bias, and to validate the findings based upon additional data. This should include specific data collection from practices with high need populations, including Māori practices that provide a Te Ao Māori informed model of care. It should also include further data collection on fixed costs and overheads – we have noted above that our data are derived from larger practices, and may underestimate these costs across the whole population of general practice;
- Considering the co-payment component of general practice revenue and the best options for future regulation of co-payments. Current co-payment regulation has not changed for nearly two decades. Policy settings are needed to determine the future goals of the health system for co-payment contribution for different populations, and what the future place of co-payments is within the overall general practice funding picture;
- Specific analysis should be conducted on costing and capitation for rural primary care services, acknowledging the unique constraints upon the provision of care in those settings. Rural practices are often smaller than urban practices, provide a different mix of care, and face particularly challenging workforce constraints. The capitation weightings in

this analysis may not be effective in rural settings, and it is strongly recommended that specific analysis, based upon rural practice costs and populations, should be conducted in order to recognise the special character of these services;

- Analysis of after hours and extended access care. The scope of the care we have costed in this analysis does not include after hours care or services with extended hours of access. After hours and urgent care requires its own specific analysis of costs and service coverage in order to inform policy on the shape of these services across New Zealand. This is likely to be a significant piece of analysis in its own right;
- Consideration of investment in the extended primary health care team needed for a modern model of primary health care. Work has been progressing within Health New Zealand on the future development of wider primary health care teams, with a broader base of professional roles. This work is likely to be implemented as part of locality prototypes. Investment in general practice, as a key member of the overall primary care team, will have to be considered in light of these wider changes and developments in Aotearoa's primary health care services.

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Appendix A Peer review comments

Much of the comment from reviewers focussed upon issues of policy, or implementation consequences arising from the results. While these lie outside the scope of the specific analysis commissioned in this project, further acknowledgment of those issues can be made in the concluding section of the report.

Specific issues from the peer reviewers are addressed and acknowledged as follows.

Issue	Response
Representativeness of the practice survey information.	Present additional information on the characteristics of the responding practices, and add a brief discussion on representativeness and any issues of bias that might arise.
Literature review.	Some literature was searched, and discussed in outline at an early meeting of the working group, focussing upon factors included in funding formula mechanisms. There may be some utility in a separate standalone report that summarises some of the relevant literature, we are hesitant to undertake a further literature review as part of this exercise. It is highly focussed upon the New Zealand context.
Justify using time rather than counts of contacts	Since we use a bottom up FTE pricing model, time assumptions would still have to enter at some level, even if we were using contacts.
Note that some capitation formulas (including the NHS) use geographically variable wage rates.	Noted, although New Zealand does not have geographic variation in remuneration in MECA agreements for most health professionals.
Clarify how staff time was combined in the regressions.	Add further explanation to clarify the details of the regression approach in the report.
Relation of comorbidity index to general practice need.	The M3 index demonstrates face validity in the analysis. The index has been shown to predict adverse outcomes in people with diabetes. The Charlson Index (a methodologically similar US index) shows relationships between the index and health system utilisation, although the proprietary ACG may be better (Huntley, Ann Fam Med 2012).
Lack of specific M3 validation for Māori and Pacific	The M3 has been validated on a NZ population, but not specifically for Māori and Pacific people. Agree that would be a good thing to do, but that would be a

	significant piece of work beyond the scope of this project. We're not aware of any other morbidity index that has been specifically validated for Māori or Pacific people. This can be made more explicit in the report. It could be noted that ASH rates, based on data that also constitute elements of the M3 index, show distinct patterns of higher morbidity for Māori and Pacific people, giving some degree of confidence that the M3 will respond to needs for priority populations.
Is the median level of care for the general population enough?	A good question – this is one of our assumptions. It has to be considered within the context of wider investment plans in primary care, including expanding practice teams.
Unclear which of the benchmarks to aim for.	Yes, this will need to be a specific piece of analysis, and also policy judgement and negotiation.
Consider what proportion of the targeted groups currently receive adequate care to find the benchmark	Yes, that is how it will need to be approached. Add a comment to this effect.
Can the authors examine what predicts whether members of typically under-served groups are currently receiving equitable care?	This would be valuable analysis to do, but a significant piece of work in its own right – aspects of this exist in various places in current research. This would be a very useful research project.
How to ensure additional funds used for the benefit of targeted populations? Will need a performance programme sitting alongside capitation.	This will be a very important policy and regulatory piece of work to do to support the implementation, but is not in the scope of this analysis.
Co-payment regulation will be important	Yes. This will need its own focussed work.
It was not clear to me why the median rather than the mean was used, but perhaps this is because the variable is skewed? Mean will give a higher result.	Yes, the variable is skewed. Median was used to be consistent with the approach of taking centiles of activity for the targeted populations. Suggest noting this point in the text, and some brief additional results showing how much difference using a mean would make to the average result.
Consider assessing workload for Māori and Pacific led practices.	This has been tried in a number of projects, and extracting data is very challenging. Note the issue and recommend future analysis and research.
How much extra time (as opposed to money) each benchmark level of care provides	There is a table showing FTE at the different benchmarks, as well as money.

There is still unexplained variation. Underfunding for those with the very highest needs could continue to be of concern if those with those highest needs are concentrated in a few practices. I think it would be essential to see what further adjustments/measures might work even better at that very-high-needs end	Note the issue and provide supplementary descriptive analysis for this high need end of the population, and note that further work might be required.

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