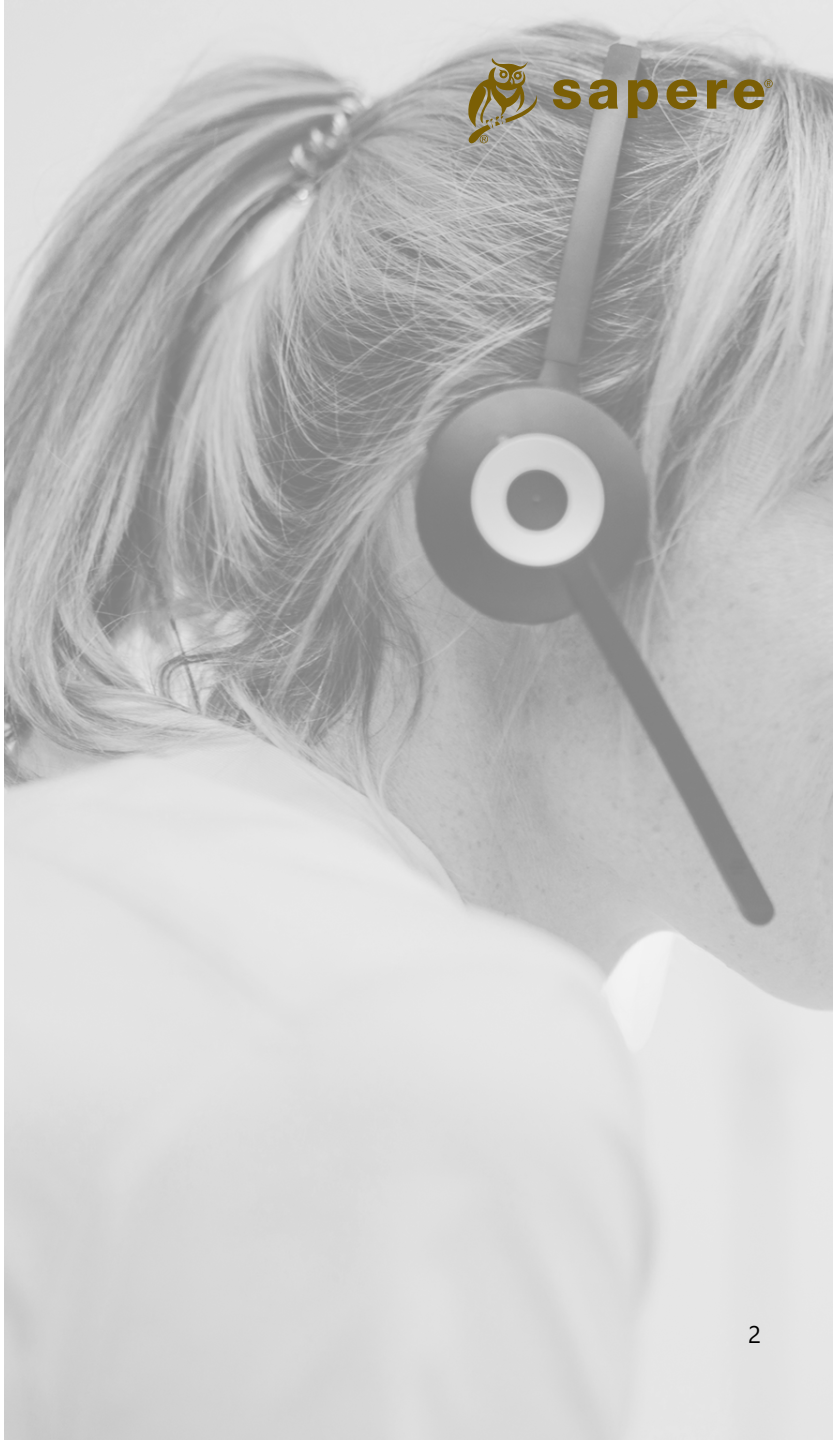
Estimating the value of Healthline

Reissue of 2023 Sapere report for *Whakarongorau Aotearoa – New Zealand Telehealth Services*

December 2025

Contents

Note: This is a reissue of a 2023 Sapere report, and figures will reflect values current at the time of publication.



Executive summary

Headline findings

- Strong return on investment:
  Estimated annual benefits between **$17.16m and $23.21m** against operational costs of **$12.89m**, delivering a **33% to 80% return on investment**.
- Value reflects Healthline's pivotal role in alleviating primary care pressure, supporting vulnerable populations, and optimising emergency care pathways.

Quantifying Healthline's annual economic contribution

The assessment uses a conservative approach combining 'cost to replace' and 'benefit received' methodologies. It recognises that while some contacts could theoretically be replaced, many represent care that would otherwise be forgone due to limited system capacity.

Estimated economic benefits

The valuation is deliberately conservative, assuming only 20 to 60% of contacts could be replaced by other services. Given primary care capacity constraints, the true value generated by avoiding unmet need is likely higher.

Value category	Estimated benefit
Calls linked to practice closing times	$6.44m–$8.43m
Calls linked to closed books	$1.70m–$2.23m
Calls linked to practice and ED wait times	$3.75m–$4.91m
Calls for 'vulnerable' people	$1.35m–$1.96m
Calls linked to ED attendances	$3.93m–$5.69m
Total estimated benefit	**$17.16m–$23.21m**
	Observed cost
Total operational cost	**$12.89m**

Executive summary

Strategic insights: Healthline's evolving system role

Healthline as an in-hours primary care safety net

- Call patterns have shifted markedly since COVID-19.
- Volumes now peak at 9am and remain elevated through the workday.
- This aligns with general practice pressures such as closed books, long waits, and reduced availability.

A critical enabler of health equity

- **Higher reliance** among Māori and Pacific peoples when local GP availability declines.
- **Improved adherence** to ED referral advice since 2018, with Māori showing an 11.6-point increase (49.1% to 60.8%).
- **Reduced inequities** for Pacific peoples: ED admissions rise from 19.2% (non-users) to 20.3% for Healthline users, narrowing the equity gap.

An effective 'wayfinder' for emergency care

- Healthline appropriately directs high-need patients to emergency departments.
- Users have nearly triple the annual rate of high-acuity presentations compared with a matched control group, though severity per visit is similar.
- Call data provides predictive insight into ED utilisation up to six months in advance, supporting national demand forecasting.

A high-value national asset

Healthline is a high-performing, indispensable component of Aotearoa's health infrastructure. It delivers substantial economic returns, alleviates pressure on primary care, improves access and equity for priority populations, and ensures appropriate use of urgent care.

A key outcome of this work is the creation of a unique, integrated national dataset. It is the only national dataset capturing primary care need and symptoms for unenrolled individuals, offering significant potential for research, innovation, and system planning, including advanced ED demand forecasting.

Background and context

Healthline is a free, nationwide, 24/7 health-advice service available to everyone in Aotearoa New Zealand. It is funded by Health New Zealand - Te Whatu Ora (Health NZ) and run by Whakarongorau Aotearoa – New Zealand Telehealth Services , providing confidential support over the phone and online. The service connects callers with registered nurses, paramedics and trained health advisors who can offer guidance for a wide range of symptoms and health concerns.

When someone contacts Healthline, they can receive advice on how to manage symptoms at home, whether they should see a general practitioner (GP) or visit an urgent care clinic, or if they need emergency medical attention. Advisors can also help people locate nearby health services such as general practices, pharmacies, after-hours clinics and hospitals. In recent years, Healthline has expanded its support by introducing additional services such as interpreter access and, in some situations, assistance with booking GP appointments.

Healthline plays an important role in New Zealand's healthcare system by giving people immediate access to clinical advice, especially outside normal clinic hours or for those who do not have a regular GP. The service helps reduce unnecessary pressure on emergency departments by guiding people to the right level of care. Since beginning in 2000, Healthline has grown into a key part of the country's telehealth network, supporting hundreds of thousands of New Zealanders every year.

About this report

In 2023, Whakarongorau Aotearoa commissioned us to analyse selected services in terms of their economic value, with a system-wide perspective to demonstrate their contribution in the Aotearoa New Zealand health system. The aim was to summarise our estimation of value, as much as possible, into a single quantitative table of results and to contextualise those results with the relevant qualitative aspects needed to help interpret the numbers.

This report is a reissue and sets out our valuation of **the Healthline service.** We set out:

- our findings
- our methodology
- reflections on understanding value in health services.

Further detail on our methodology can be found in the accompanying technical appendix.

1. Healthline results

In this section, we present our summary results and a contextual breakdown for each category of benefit.

Summary results

The estimated annual benefit of Healthline is between **$17.16m and $23.21m**, indicating an annual return on investment of **33% to 80%** across the identified benefit categories. This estimate draws on both 'cost to replace' and 'benefit received' methods (described in section 2), reflecting the assumption that, without Healthline, some people would still seek care from other primary care services and therefore continue to receive some level of health benefit. We discuss each estimate presented in the table in more detail in the following sections of the report.

- For the **vulnerable and emergency department (ED) attendance** groups, it is assumed that 20% of people would be able to access alternative services in the absence of Healthline, and their contacts are valued using the cost-to-replace method. The remaining 80% are valued using the benefit-received method, as these benefits would otherwise be forgone.
- For **practice closing times, closed books and wait times**, the assumed replacement rate is 60%, with the same valuation logic applied.

Table 1: Breakdown of Healthline value estimates (2022 dollars)

Value category	Estimated benefit
Calls linked to practice closing times	$6.44m–$8.43m
Calls linked to closed books	$1.70m–$2.23m
Calls linked to practice and ED wait times	$3.75m–$4.91m
Calls for 'vulnerable' people	$1.35m–$1.96m
Calls linked to ED attendances	$3.93m–$5.69m
Total estimated benefit	**$17.16m–$23.21m**
	Observed cost
Total operational cost	**$12.89m**

The first three categories relate to potentially unmet need arising from constraints in primary care, while the remaining categories capture contacts from potentially vulnerable people and those linked to an ED attendance.

Summary results

To generate the estimates in Table 1, a weighted sum is applied using the replacement assumptions and the valuation figures in Table 2.

For example, the lower-bound value for practice closing time calls ($6.44m) combines the avoided replacement care costs for the 60% who could replace their care with the delivered health benefits for the 40% who could not, calculated as $4.31m × 0.6 + $9.63m × 0.4 = $6.44m.

Table 2: Breakdown of cost to replace and benefits received valuations

Identified need	Cost to replace value	Benefit received value
Calls associated with practice closing times	$4.31m	$9.63m – $14.61m
Calls associated with closed books	$1.14m	$2.54m – $3.86m
Calls associated with practice and ED wait times	$2.51m	$5.60m – $8.50m
Calls associated with 'vulnerable' people	$905k	$1.46m – $2.22m
Calls associated with ED attendances	$2.63m	$4.25m – $6.45m
Total	**$11.50m**	**$23.48m – $35.64m**

Table 2 should not be read as suggesting that these Healthline contacts could be replaced with in-person services at a cost of $11.50m. Capacity constraints and the inelastic supply of primary care make this unrealistic.

Our cost estimates already assume up to 70% efficiency for a 24/7 nurse advice service, which is feasible only in major urban centres. Because round-the-clock in-person nursing would be impractical and prohibitively costly in rural and less-dense areas, these callers are treated as those who would be unable to access care without Healthline.

Benefits associated with practice closing times

Benefits associated with practice closing times

Healthline plays an important role in providing first-contact advice, particularly given inconsistent after-hours primary care across New Zealand. While this generates a substantial benefit ($4.31m on a cost-to-replace basis), the combined value of the other benefit categories is larger. Once the implausibility of full service replacement is accounted for, the value to patients facing unmet need due to practice closures is estimated at **$6.44m to $8.43m per annum**.

Summary methodology

Because general practices impact groups of individuals at once, it is difficult to accurately capture at the individual level whether a practice closing for the day in one part of a city may be impacting patients somewhere else in the city. To avoid this problem, we capture the number of calls associated with GPs closing for the day by aggregating our call datasets into demographic groups at the DHB level. This removes the high error associated with individual level datasets, while still allowing us to control for key demographic variables (i.e. age, ethnicity etc.) in the regression analysis. For the GP closing times analysis, we control for ethnicity, DHB, the time of day (in 30-minute increments), and time-varying characteristics (monthly) while allowing for heterogeneous effects by day of week and on public holidays. We also include our variable of interest, the number of practices closed for the day in each 30-minute interval, sourced from Healthpoint data for most practices in each DHB.

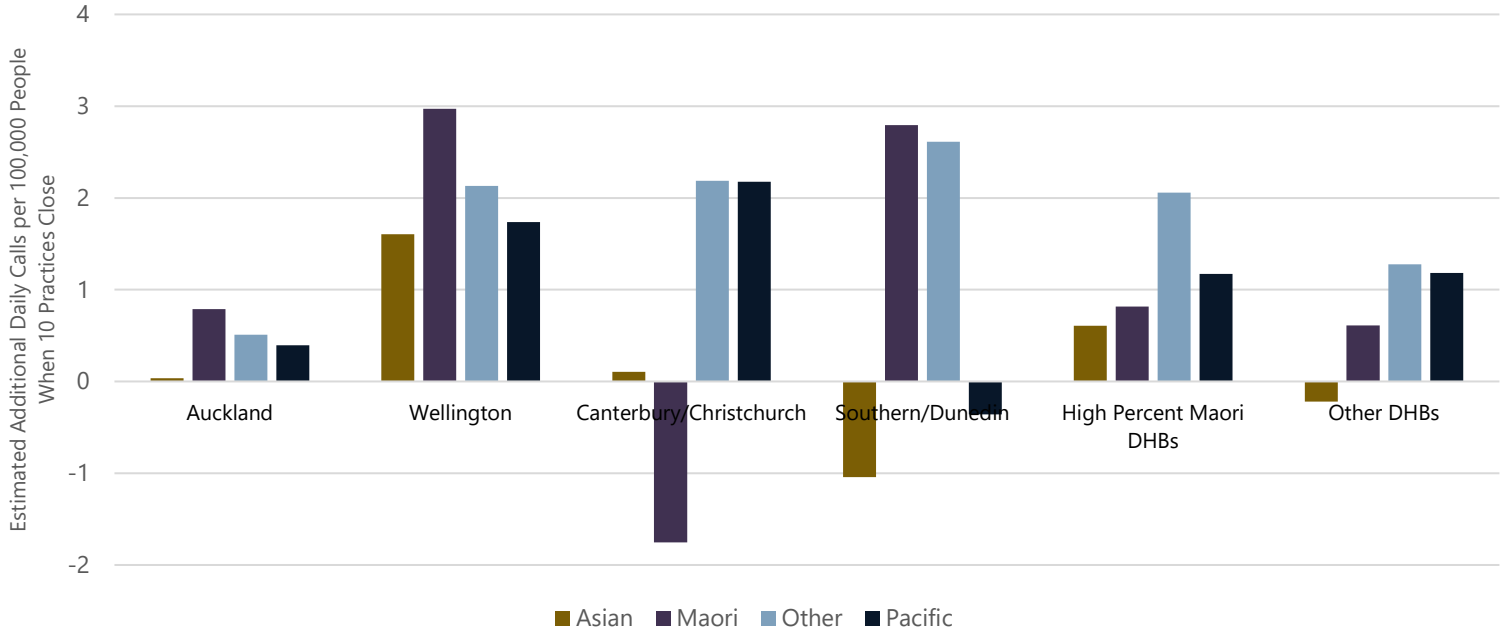
For valuation, we apply a cost-to-replace of $18.71 per call based on a bottom-up estimate of an in-person nurse advice service, and a health benefit value of $42 to $63 per call, drawn from the literature for a similar telehealth programme (Franzén et al., 2009) allowing for a deflation factor and quality-adjusted life year (QALY) values of $41,756 to $63,381. Further detail is provided in the technical appendix.

Benefits associated with practice closing times

Additional insights – district health board and ethnicity breakdown

Although Table 2 shows the total benefit across all district health boards (DHBs) and ethnicities, the underlying effects vary markedly. Māori in Auckland, Wellington, and Southern/Dunedin were the most likely (per capita) to call when a practice in their DHB closed. In Canterbury/Christchurch, however, Māori called less when GPs closed, while Pacific callers responded almost as frequently as the 'Other' group. Notably, in DHBs where Māori make up at least 40% of the population, Māori were less likely to call than both Pacific peoples and Other groups.

Figure 1: Additional calls per capita when practices close for the day in DHB



Overall, the results suggest that Māori in cities tend to turn to Healthline more often than their peers, although Christchurch appears to be distinctly different. We highlight this as a trend of interest, but more analysis is needed to interpret it fully.

Benefits from addressing general practice capacity constraints

Benefits from addressing general practice capacity constraints

General practice in New Zealand is operating beyond capacity, leading to practice closures, closed books, and long waits. Our analysis shows that many patients turn to Healthline when they cannot access primary care.

After accounting for the implausibility of full service replacement, Healthline delivers **$5.45m to $7.14m** in annual benefit for patients affected by wait times and closed books, alongside $6.44m to $8.43m in benefit linked to GP closing times.

Summary methodology

As with the GP closing-times analysis, we use a grouping approach to remove the error that arises when tracking how each patient is exposed to closed books and wait times across their city. Details are provided in the technical appendix, but our regressions generally account for variation by DHB, quarter, ethnicity and age. We then add variables representing GP and ED wait times and the number of practices with closed books, allowing us to identify calls associated with these factors after controlling for demographic, time-varying and DHB-level drivers of call volumes.

We use the percentage of people who "can get primary care when they need it" from the Health Quality & Safety Commission's Health System Indicators as a proxy for GP appointment wait times. For ED wait times, we use the percentage of "did not wait" attendances.* Both datasets allow us to capture within-DHB and ethnic-group variation. ED wait times are included to reflect patients who use ED to address primary-care needs, helping us measure the full extent of primary-care overcapacity when ED becomes the only timely option.

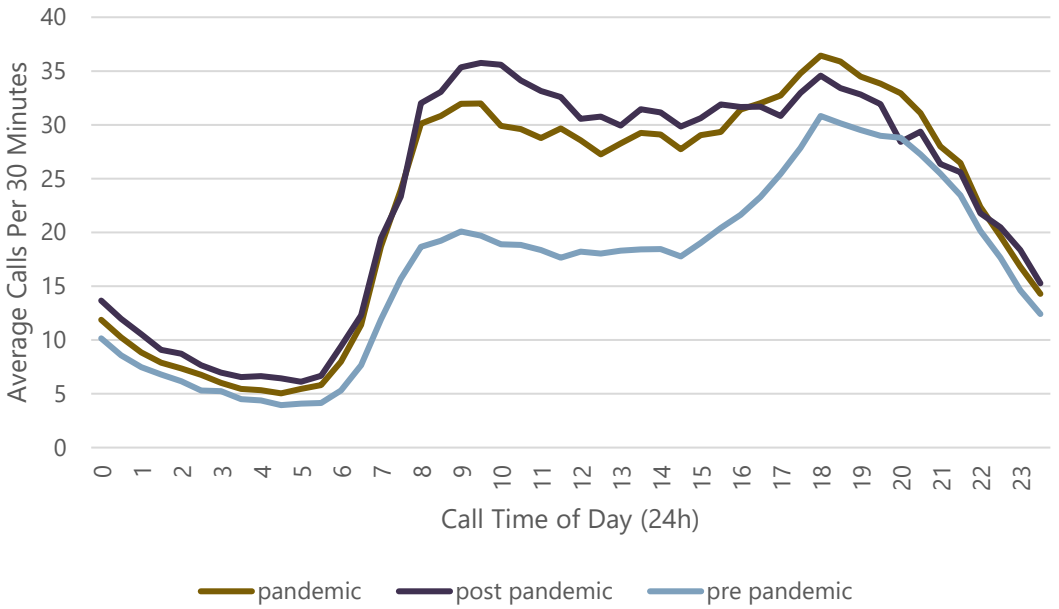
Valuation follows the same approach as in the GP closure analysis: a cost-to-replace of $18.71 per call and a health benefit estimate of $42 to $63 per call. Further detail is provided in the technical appendix.

*We use "did not wait" ED attendances rather than ED wait times because this measure better reflects the proportion of people effectively using ED as primary care. Average or median ED wait times (which include urgent cases) may not represent the experience of these patients. In contrast, the share of "did not wait" attendances more accurately indicates how many people came to ED with a non-time-critical issue and left due to frustration. In any case, this indicator is included mainly for completeness and contributes less than 10% of the overall value.

Benefits associated with practice capacity constraints

Additional insights – distributional change

Figure 2: Average number of Healthline calls per 30-minute interval



The shift towards calls at all hours on weekdays suggests that the need for Healthline is increasingly broader than an afterhours service. It appears that heightened capacity constraints mean many patients cannot access the care they need anymore, even during the day. This confirms the insights from our formal modelling, suggesting that Healthline is moving away from being predominantly an afterhours advice line, and towards being a catch-all for the increasing unmet need developing in the current highly constrained primary care environment.

Although capacity constraints have long existed in the sector, supplementary analysis indicates that most of the effect described in the closing times section stems from changes in how Healthline is used post-pandemic.

This is most evident in the weekday call distribution, which has shifted markedly.

- **Before the pandemic** (pre-28/02/2020),* call volumes were low from 8am to 3pm, then rose from mid-afternoon as people finished school and work and general practices closed.
- **Post-pandemic** (post-04/04/2022),** call volumes now peak at 9am and stay high until about 8pm.

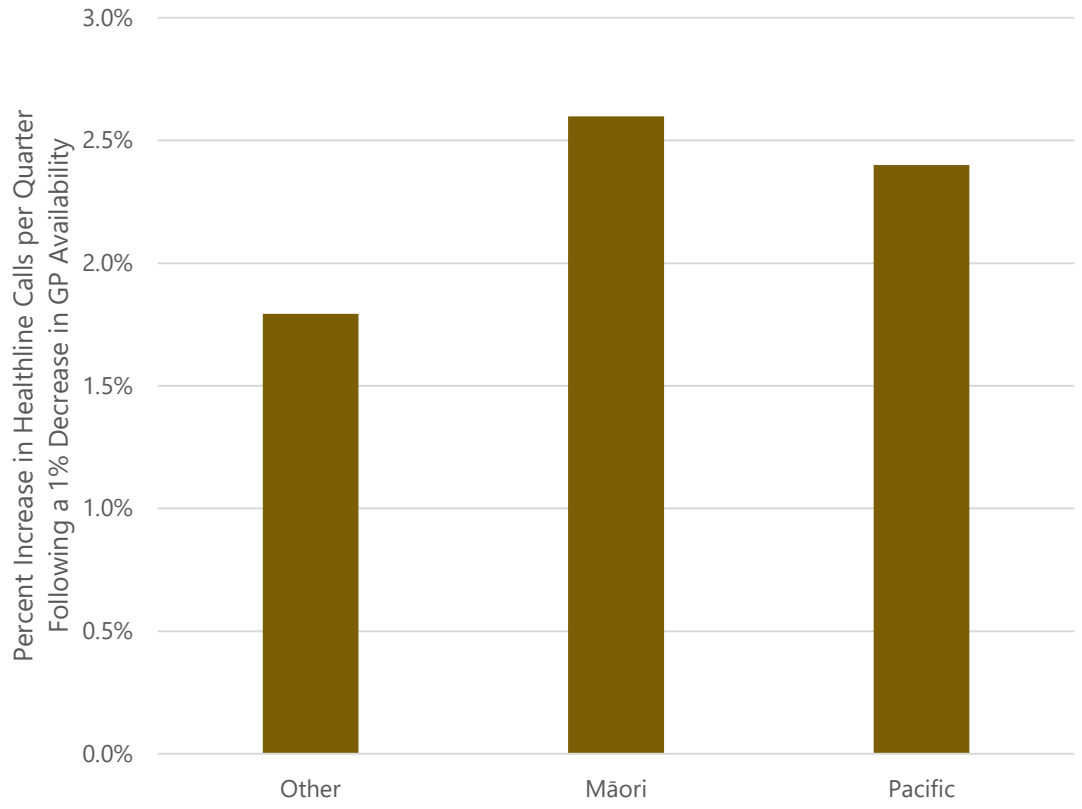
While some increase in contacts is expected due to greater awareness of Healthline, the dramatic shift in call patterns suggests a fundamental change in how the service is used.

* This is the date that the first Covid case was reported in New Zealand (New Zealand Government, 2022).
** This is the date that vaccine passes and most vaccine mandates were no longer required in New Zealand (New Zealand Government, 2022).

Benefits associated with practice capacity constraints

Additional insights – wait times impacts

Figure 3: Increase in Healthline calls following a 1% decrease in GP availability by ethnicity



Breaking down the wait-time analysis by ethnicity suggests that some groups may be more likely to contact Healthline when GP availability is poor, potentially reflecting socio-economic differences. Our proxy for wait times remains the Health Quality & Safety Commission's "can get primary care when they need it" indicator, where higher availability corresponds to shorter GP wait times.

The ethnicity-segmented results show that a 1% fall in GP availability within a DHB is associated with a 2.6% increase in Healthline calls from Māori and a 2.4% increase from Pacific patients. For Other ethnicities, the same reduction in availability is associated with only a 1.8% rise in calls. These differences are not statistically significant, likely due to the smaller sample used in this analysis.

The higher propensity for Māori and Pacific patients to turn to Healthline when GP availability declines may reflect higher need (i.e. forgoing care is less viable) or fewer alternative options, such as the ability to travel further for appointments. This pattern aligns with earlier research showing that Māori are more likely to report urgent need for GP care and to identify transport as a barrier (Jansen, Bacal & Buetow, 2011; Jeffreys et al., 2021).

Benefits associated with vulnerable patients and emergency department attendances

Benefits associated with vulnerable patients and ED attendances

Unlike the general-practice effects in the previous sections, vulnerability and ED attendances operate at the individual level and are captured directly through NES demographics (e.g. Community Services Card status, transience), PRIMHD (mental health comorbidities) and NNPAC (ED attendances). Allowing for partial, not full, replacement, we estimate **$5.28m to $7.65m** in benefits from calls linked to these factors.

Summary methodology

In our individual level model, we group calls per quarter for each patient and account for ethnicity, time-varying factors, age, gender, rurality, and deprivation as controls. To identify 'vulnerable' patients, we include variables for CSC status, changing address, changing practice, unenrolment, non-binary identifying patients, mental health referrals, and mental health consultations. For some variables we allow for lags across quarters. To identify calls associated with ED attendances we include a variable recording if an ED attendance occurred in the same quarter as the call or if an ED attendance is going to occur in the next quarter.

Calls associated with our indicators of vulnerability and ED attendances are costed at $32.31 on a cost-to-replace basis, and $52 to $79 on a benefits received basis. The $32.31 originates from a bottom-up costing of a mobile nurse advice service, similar to the mobile vaccine and testing centres that operated in vulnerable neighbourhoods during the pandemic. This reflects the fact that vulnerable patients are less able to access primary care, and thus reliably delivering care to these populations is more costly. For ED patients, this $32.31 cost reflects the fact that most calls are urgent, and a mobile neighbourhood service would be required to achieve the fast response times that Healthline is able to deliver. Benefit delivered values per call are deflated by less (from the study estimates) because vulnerable patients and ED patients benefit more from health care due to their higher need.

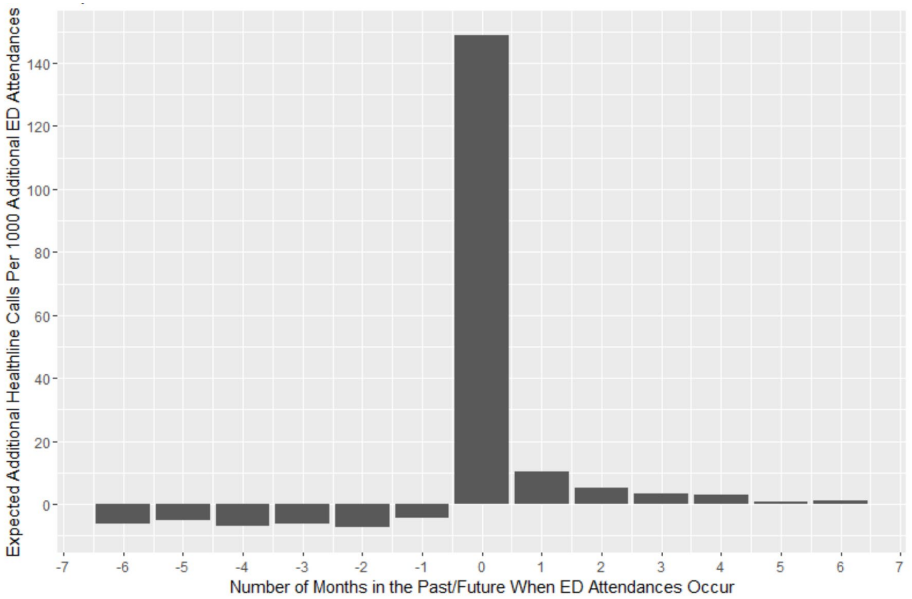
Benefits associated with vulnerable patients and ED attendances

Additional insights – Healthline use before and after ED attendance

Healthline's role as an emergency advice line immediately before an ED attendance is well established, and our results confirm that many calls occur in the same quarter as an ED visit.

However, we also find a smaller but consistent share of calls linked to ED attendances one or two quarters later. This suggests that as a patient's health gradually deteriorates—well before reaching the threshold for ED care—they are more likely to contact Healthline. In turn, Healthline data may have value for medium-term ED demand forecasting.

Figure 4: Expected additional Healthline calls associated with past and future ED attendances



Additional insights – distributional change

To examine this further, we developed a supplementary monthly model that tracks how past and future ED attendances relate to current Healthline calls, controlling for demographics and healthcare-need variables.

Our model shows that current Healthline calls are most strongly correlated with ED attendances in the same month. As Figure 4 illustrates, for every 1,000 ED attendances, we expect roughly 150 related Healthline calls in that month. We also observe a smaller but statistically significant predictive relationship: patients who will attend ED in several months' time are more likely to call Healthline now, with the effect detectable up to six months ahead.

By contrast, past ED attendances are associated with fewer current-month calls, suggesting patients do not rely on Healthline for post-ED care. This likely reflects that ED clinicians have already provided diagnosis and treatment, and that patients' remaining needs—such as prescriptions or ongoing GP care—are outside Healthline's scope.

Benefits associated with vulnerable patients and ED attendances

Additional insights – Healthline use and ED demands

Because Healthline calls are strong predictors of ED attendances, we have received considerable interest in the direction of causality and whether higher ED use among Healthline patients simply reflects higher clinical need.

Despite extensive effort, establishing causality has proven elusive and results are inconsistent. The core issue is that Healthline callers have unmet need that cannot be adequately controlled for in observational data.* No existing dataset can reliably adjust for underlying differences in symptoms or severity between Healthline callers and the general population. If firm evidence is required, a randomised controlled trial, supported by an instrumental-variables approach using intention-to-treat, would be necessary.

However, causality may matter less than often assumed. Even if Healthline did increase ED attendances, this could indicate strong performance (appropriately directing high-need patients to ED) or poor performance (sending low-need patients unnecessarily). For assessing value, the key question is whether Healthline patients who attend ED exhibit the level of need typically seen in ED populations. If they consistently present with lower-than-average need, this would suggest avoidable ED use; if they present with higher need, it would indicate Healthline is effectively directing patients to the right level of care.**

*Generally, causal econometric analysis requires comparing two similar groups or controlling for all relevant differences. In the case of Healthline, this is not feasible: there is no clearly comparable population, and the data cannot capture the full range of symptoms or conditions that shape a patient's need. While differences in ED need between Healthline and non-Healthline patients are useful signals, interpretation is not straightforward. We must also consider the counterfactual: even if Healthline patients appear to have lower need at ED, their outcomes might have been worse in the absence of Healthline.

**While this is a good indicator for further investigation, the true picture is more complex than this because we need to take into account what would have occurred in the absence of Healthline. So even if Healthline patients did have significantly lower need at ED, perhaps in the absence of Healthline this would be even worse.

Benefits associated with vulnerable patients and ED attendances

Additional insights – Healthline use and ED demands

Our analysis shows that Healthline patients who attend ED have substantially higher need than the general population, indicating strong performance in Healthline's 'wayfinder' role. Controlling for age, Healthline patients are admitted to hospital from ED at nearly three times the annual rate of our control group—around 7.6 additional ward admissions per 100 patient-years. Adjusting for rurality and ethnicity does not alter this finding.

Healthline patients are also far more likely to receive triage categories 1 or 2 over the course of a year. Notably, the *proportion* of ED visits ending in admission or triaged as 1 or 2 is similar between Healthline callers and controls. This suggests that higher need is reflected not in more severe *per-visit* presentations, but in more *frequent* high-need ED attendances.

Table 3: Ward admissions and triage 1/2 rates among Healthline and non-Healthline patients

	Healthline rate*	Non-Healthline rate**	Difference	Method
Ward admissions (from ED) per 100 person-years	12.02	4.41	7.61	Direct standardisation for age
Ward admissions (from ED) per 100 person-years	N/A	N/A	7.65	Linear model controlling for age, sex, ethnicity, and rurality
Triage 1 or 2 ED admissions per 100 person-years	7.37	2.67	4.70	Direct standardisation for age
Ward admission rate per ED attendance	21.58%	21.55%	0.04%	Direct standardisation for age
Triage 1 or 2 rate per ED attendance	13.42%	13.46%	-0.04%	Direct standardisation for age
ED admission rate per 100 person-years	51.51	18.64	32.87	Direct standardisation for age

*Healthline patients chosen for this analysis were any patients who called Healthline at least once over the period from 2019 to 2022 and were enrolled at a GP at least once during this period.

**These patients were sampled from the enrolment registers from 2019 to 2022. This means that these patients will not include individuals who were unenrolled across 2019 and 2022. Note that our Healthline sample has been adjusted to ensure this population remains a fair comparator.

Benefits associated with vulnerable patients and ED attendances

Additional insights – Healthline use and ED demands

Table 4: Direct age standardised ward admissions per 100 patient-years by ethnicity

	Healthline	Non-Healthline	Difference
Ward admissions per 100 patient-years – All Patients	12.02	4.41	7.61
Ward admissions per 100 patient-years – Māori Patients	17.69	7.45	10.24
Ward admissions per 100 patient-years – Pacific Patients	12.79	5.23	7.56
Ward admissions per 100 patient-years – Other Patients	11.09	4.25	6.84
Ward admissions per 100 patient-years – Asian Patients	7.03	2.33	4.70

Table 5: Direct age standardised ward admission rates per ED attendance by ethnicity

	Healthline	Non-Healthline	Difference
Ward admission rate per ED admission – All Patients	21.59%	21.55%	0.04%
Ward admission rate per ED admission – Māori Patients	22.67%	22.71%	-0.04%
Ward admission rate per ED admission – Pacific Patients	20.31%	19.21%	1.1%
Ward admission rate per ED admission – Other Patients	21.50%	22.11%	-0.61%
Ward admission rate per ED admission – Asian Patients	18.56%	17.32%	1.24%

Ethnicity results (Table 4) show that annual ward admission rates are highest among Māori Healthline patients, with relatively little difference between Pacific and Other patients. The large gap between Pacific peoples and Māori—despite broadly similar need profiles—is difficult to interpret and warrants further investigation.

Table 5 indicates that, on an age-standardised basis, Pacific patients in the control group are generally less likely to be admitted from ED: only 19.2% of attendances convert to a ward admission, compared with 22.7% for Māori and 22.1% for Other. Among Healthline users, however, this gap narrows by more than 1 percentage point, with Pacific at 20.3%, Māori at 22.7% and Other at 21.5%. In short, Pacific Healthline users experience lower inequities in admission rates per ED attendance than Pacific non-users.

Looking at yearly admission rates, Pacific Healthline patients have 7.6 more admissions per 100 person-years than Pacific non-users, compared with increases of 10.2 for Māori and 6.8 for Other. This reduces the gap in ward admissions per person-year between Pacific peoples and Other among Healthline users.

Benefits associated with vulnerable patients and ED attendances

Additional insights - Healthline adherence

Figure 5: Healthline ED adherence for current review and prior review

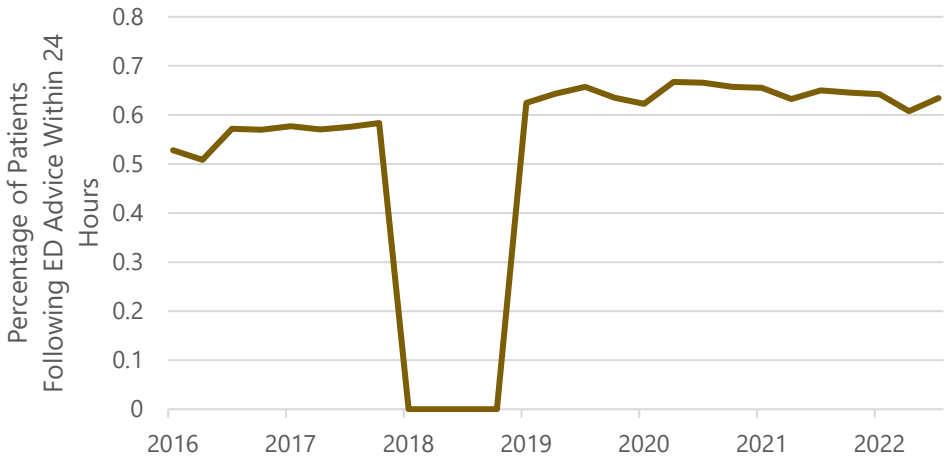
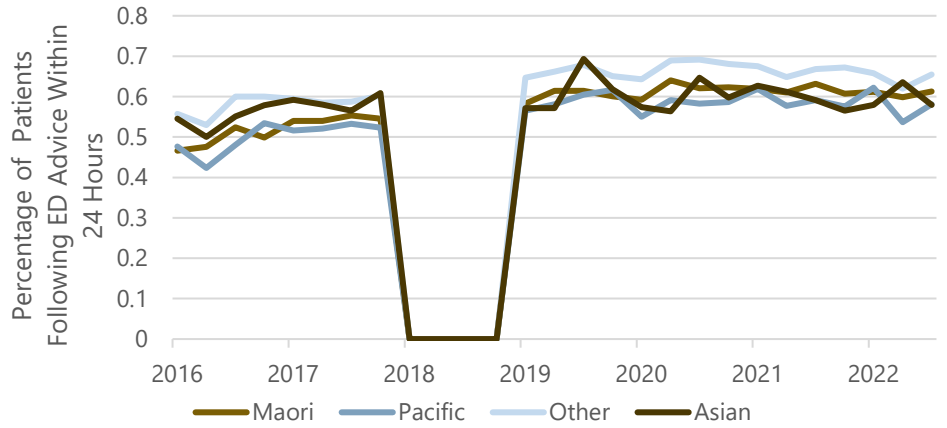


Figure 6: Healthline ED adherence for current review and prior review by ethnicity



Adherence to Healthline's ED advice has improved markedly since the 2018 review. From 2019 to 2022, 64% of patients followed ED recommendations, up from 57% in 2016 to 2017. This may reflect operational changes (e.g. higher thresholds for ED referrals) and/or increased trust in Healthline. Figure 5 shows quarterly adherence patterns across both periods.

Ethnicity results show uneven progress. Māori have seen the largest gains, rising from 49.1% adherence in 2016 to 60.8% in the final four quarters of the analysis—an 11.6-point improvement. The adherence gap between Māori and Other has narrowed from 8.0% to 4.3%.

Pacific peoples' adherence has also improved—up 10 points from 47.9% in 2016 to 57.9% in 2022—though the Pacific peoples-Other gap has only modestly reduced (from 9.3% to 7.2%). Other ethnicities improved by 7.9 points, broadly in line with the overall trend.

In contrast, Asian patients saw only a 4.6-point improvement (54.4% to 59.0%), and their adherence gap with Other widened from 2.8% to 6.1%—now larger than the Māori–Other gap.

Overall, while adherence has improved substantially—and Māori have benefited most—gains for Pacific peoples are moderate, and Asian patients appear at risk of falling behind. This suggests a need to strengthen trust in Healthline within Pacific communities and build greater confidence among Asian patients.

2. Methodology

In this section we set out our high-level methods for the analysis of Healthline.

Our general methods

A unique dataset

National Health Index (NHI) coverage in the Healthline dataset improves markedly, now enabling us to link over 80% of calls to wider national health collections datasets. This is a major achievement and, combined with the national datasets we assemble, likely creates one of the most valuable telehealth datasets globally. We use it to estimate the economic benefit of Healthline, but this likely only scratches the surface of its potential.

Dataset coverage summary

- Primary care (NES): We track enrolment status, practice changes, address changes (to meshblock level), patient location, and timing of GP consultations. Critically, Healthline provides the only national dataset capturing primary-care need and symptoms for *unenrolled* individuals.
- Emergency care (NNPAC): We track ED attendances, in-patient admissions, wait times, triage category and facility used.
- Mental health (PRIMHD): We follow referrals and service use, giving insight into mental health comorbidities.

Although not currently linked, it is straightforward to connect Healthline data to pharmaceutical dispensing information to infer conditions or construct need indices (e.g. the P3 index). Even wider opportunities exist through the IDI, linking Healthline records to tax, employment, and other administrative datasets.

Further description of the datasets we hold is given in the technical appendix.

Potential system uses

Beyond research, this integrated dataset presents major opportunities to lift efficiency and quality of care. Linked Healthline–NES data could provide GPs with a summary of recent call history before appointments, highlighting concerning symptoms. In EDs, our analysis shows high-risk Healthline calls closely predict imminent ED attendances; Healthline could therefore support algorithms forecasting short-term ED demand (e.g. within the next three hours), giving ED teams advance warning.

Our general methods

Regression analysis as a key method

Our methods include identifying potential drivers of telehealth use and using regression analyses to test whether this bears out in the data. Regression analysis allows us to control for confounding variables* and estimate the additional contacts associated with the factor we are investigating.

Take people who change address as an example—we observe in the data that the group of people who changed address in a three-month period called Healthline less than people who did not change address. However, much of this can be explained by the fact that young people are over-represented in the transient population and young people use Healthline less than other age groups. Once the regression analysis is performed and confounders are controlled for, our model suggests that changing address is associated with a significant increase in the number of Healthline contacts.

In a regression analysis, we can identify the portion of contacts that are associated with each factor included in the model, controlling for the other factors included in the model. In general, we use this method to identify how many calls are associated with indicators of (potentially unmet) need while controlling for other confounding variables. Calls identified using this method are called calls with 'identified value'.

The main limitation of the regression analyses is that there may be confounding factors that we have not identified and/or are unable to control for in our models. However, we are confident that our models control for the critical confounding factors in each situation and may only omit minor factors that are unlikely to substantially impact the results.

*A confounding variable is something that distorts the relationship between the factor we are interested in and the outcome.

Our general methods

Assigning a monetised value to calls associated with identified need

Having estimated the volume of contacts associated with indicators of need, we need to apply a monetary value to those contacts. We can do this in two main ways:

1. '**Benefit received**' by the service user—typically health benefits to the person are measured in quality adjusted life years (QALYs).

2. '**Cost to replace**' if care were provided by another primary care provider.

For our valuation we assume that in the absence of Healthline, some people would be able to seek and receive care from other (in-person) primary care services. Since the 'cost to replace' values are generally lower than the 'benefit received' value, we have been conservative and modelled scenarios where between 20% and 60% of the contact volume would be replaced by other providers, and value that portion accordingly. We consider this a conservative estimate because current primary care capacity constraints and inelastic supply curves mean the likelihood of substantial replacement is limited (McRae & Butler, 2014).

Further comment regarding estimates of monetised benefit is included, where necessary, with the relevant results.

Our approach to valuing QALYs

QALYs are conceptually simple but difficult to value, as doing so requires placing a monetary value on human life. Estimates vary widely, with credible figures reaching up to $210,000 per QALY.* In this section, we focus on the two values endorsed by the Treasury's CBAx tool and explain why we do not report results using a single estimate.

Treasury's Pharmac QALY estimate

The WHO-CHOICE approach values a QALY at one to three times nominal GDP per capita, implying a range of $70,000–$210,000 using June 2022 GDP per capita of around $70,000.

CBAx also provides a lower estimate of $41,756 per QALY, derived from Pharmac's average QALYs gained per million dollars spent. In 2019/20, Pharmac delivered 31 QALYs per $1m, implying a cost of $32,258 per QALY in 2019, or $41,756 in 2022 Q2 dollars after inflation adjustment. While informative, this figure has several limitations:

- Treasury notes it likely *overstates* Pharmac's true cost per QALY because it excludes offsetting cost savings.
- It is an *average* cost per QALY; the marginal cost—which drives true value—is unknown but understood to be higher, given the presence of many cheap, high-value generic drugs.
- Pharmac's average cost per QALY is constrained by its budget. If more money was available, it would support higher-cost medicines and the average cost per QALY would rise. However, Cabinet allocations may reflect political or fiscal pressures rather than societal preferences, meaning the current average cost may sit below the socially efficient level.

While the first point suggests the Pharmac-based estimate may be slightly high, the latter two imply it is likely well below the true societal value of a QALY. For this reason, we treat $41,756 as a lower-bound estimate rather than a standalone value.

*The WHO CHOICE estimate values QALYs at one to three times nominal GDP per capita, which would suggest a QALY value between $70,000 and $210,000 under June 2022 nominal GDP of around $70,000 per capita (Statistics New Zealand, 2022; WHO, 2002).

Our approach to valuing QALYs

Treasury's VoSL QALY estimate

The higher QALY estimate in the CBAx tool is $63,381 per QALY, derived from Waka Kotahi's value of a statistical life (VoSL): the $5.2m VoSL divided by average life expectancy.

Our choice as an upper bound

VoSL-based estimates have known limitations, but a key issue for our analysis is that Healthline users tend to have higher expected longevity than the general population. For example, 36% of Healthline calls are from people aged 19 and under, compared with only 25% of the enrolled population, and women—who live longer on average—represent 61% of callers. This younger, more female-skewed profile implies greater expected life years than in the population-wide VoSL calculation.

Whether this leads to a higher or lower appropriate VoSL is complex. Longer expected life increases both the value of life (the numerator) and the years over which that value is spread (the denominator). Evidence is also mixed: some empirical studies find that younger people have a lower VoSL, while theory suggests the opposite (Aldy & Viscusi, 2007). Given diminishing marginal returns to life years and empirical findings of lower VoSL for those under 35, one could argue—cautiously—that $63,381 per QALY may overstate the true societal value in this context.

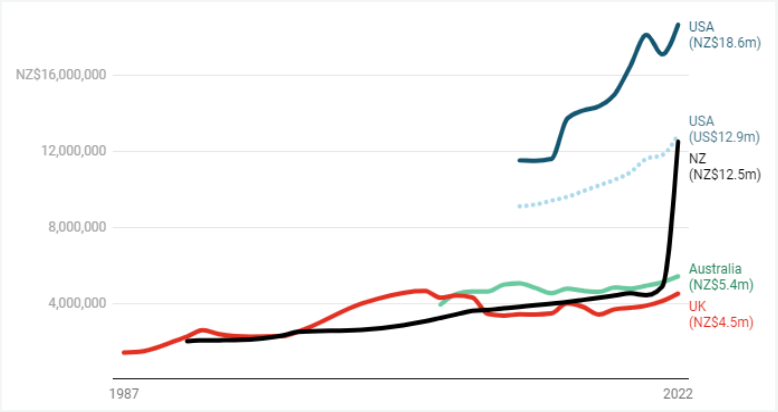
Accordingly, we adopt the $63,381 estimate as a conservative upper bound for the societal value of a QALY in this study.

Adjustments subsequent to our report

After the bulk of this report was finalised, Waka Kotahi released an April 2023 update to its Monetised Benefits and Costs Manual, increasing the value of a statistical life to $12.5m—a midpoint from a stated-preference study that produced a range of $8.1m to $16.9m. This revision is notable both for its major methodological change and for raising the value of life by nearly 150%.

While we have not formally analysed the effect of this new figure on our upper bound estimates or examined the study in detail, we note that this new figure breaks a long tradition of New Zealand's value of life estimates being broadly in line with Australia and the UK (Milne, 2023). Therefore, incorporating the new estimate into this study may require additional scrutiny and assessment to ensure it is appropriate for application in QALY valuation.

Figure 7: Historic value of statistical life estimates in New Zealand dollars



Source: Newsroom (Milne, 2023)

3. Understanding value in health services

In this section, we set out several issues in understanding and estimating value in health services.

Understanding value in health services: perspective

A major part of establishing value from a health service lies in clarifying the perspective from which value is measured. A range of legitimate perspectives can include:

- **Individual patients**: Value can lie in easing the burden of a disease and is classically measured using instruments such as QALYs or disability adjusted life years (DALYs), or other forms of patient value scale to identify the impact of an intervention. Measures based upon a person's estimate of the value of a given health state are formally considered cost utility analyses, and are widely used to provide a comparable measure of value across interventions that might have substantially different types of outcome (e.g. a medicine for migraine compared to a hip replacement operation).
- **Health services demand**: The impact of one kind of service upon another. This is typically measured as an impact on demand for a service, for example in avoiding need for acute care, or other forms of health service activity such as cancer treatment. This is an important element of value for a number of Whakarongorau services, particularly if there is a preventive effect. This applies to Healthline if it avoids inappropriate use of urgent care.
- **Health services effectiveness**: Health services have the greatest impact when they are accessed by those with the greatest need for the particular service. Navigating services in the complex New Zealand health system is a challenge for many people. Barriers in access to care can arise from poor information about what services are available, as well as from uncertainty about a person's symptoms and their severity and the best place to have these assessed. Whakarongorau plays an important role in helping people access care in the right place at the right time, potentially maximising the effectiveness of other services by ensuring that those with need are enabled to receive the care that is most appropriate for them, whether from a general practice, paramedic, emergency department or other service. Quantifying the value achieved from connecting patients to services is complex, but some aspects of this value can be estimated. For example, considering the loss of health that might have been sustained if a person had not accessed care, or by estimating the equivalent cost of care and advice had it been provided in a different setting.

Issues for assessing value

Equity and unmet need

Given the widely documented unmet need for primary health care that exists for priority populations in Aotearoa, facilitating access to services when they are needed has the potential to reduce health inequity. If a navigation service is effective at connecting people to care that they might not otherwise have been able to access, for a range of possible reasons, then it can be one element of a system response to improve equity.

Valuing equity is conceptually complex. While achieving equity in health access and outcome is clearly a significant policy goal for Aotearoa's health system, there is no single quantitative measure of how society, and government on behalf of society, values achieving such equity. At one level, willingness to pay is a common measure of value, and in this context that poses the question: how much is government willing to invest to reduce inequitable outcomes?

For Whakarongorau, a contribution to equity might run counter to fiscal measures of value. If increasing access to urgent care for populations that have unmet need results in increased access, then utilisation for urgent care and emergency departments may increase, representing the price for achieving more equitable care.

Substitution and addition

Characterising the value of Healthline is partly dependent upon assumptions about the nature of the service: to what extent is it a substitute for a service that would likely have been provided by some other service, and to what extent is it in addition to other services? Where the effect is a substitution, then value becomes a question of whether providing that service via Whakarongorau is a more efficient way of delivery than providing care through the alternative means.

This speaks to the technical efficiency of providing services via telehealth compared to face-to-face mechanisms. There are some aspects of Whakarongorau service that are likely to be substitutions – particularly a proportion of urgent care contacts. Where a person presents to the National Telehealth Service (NTS) rather than presenting to a face-to-face service, then the efficiency of NTS is a key element of the value that it provides. Value is measured directly in monetary terms as the difference in cost between the Whakarongorau service and the alternative.

Where a person presents to NTS or other Whakarongorau services in addition to using a face-to-face service, the question then becomes one of whether the Whakarongorau presentation added value over and above the cost of the face-to-face service. This is where the considerations of appropriateness of care, addressing unmet need and mitigating inequity become important, although not necessarily quantifiable in monetary terms.

Issues for assessing value

Capability, scale and responsiveness

A key element of value can lie in capability. A capability may not be deployed all the time, but there is value in having an element of infrastructure available when a response is needed. This approach to value drives investment in, for example, emergency services and civil defence infrastructure.

A similar consideration applies to telehealth services, given that the capability to scale services rapidly has at times been a key element of Aotearoa's COVID response, among other things. As with the value of equity, a capability is complex to value. A full valuation would likely require a detailed risk analysis of the costs under scenarios in which the capability was needed but didn't exist, and an assessment of how often such circumstances might arise. Such an analysis would be a significant project in its own right. While we do not undertake a risk analysis as part of this project, we do note the importance of capability, and the value that it can add to the health system.

Value for money and valuing investment in healthcare

Most healthcare interventions do not save money in direct terms. While some preventive services may have a net positive fiscal impact—such as cancer avoidance—nearly all health care services involve a net cost that is considered to be worthwhile in order to achieve some level of health gain. That health gain can be measured in a number of ways, but is frequently measured in terms of QALYs, since these are a metric that can make investments comparable across different interventions that do different things.

Using this approach to valuation then depends upon how much value society places upon improving the health of the population by one QALY. In New Zealand there are different approaches to this, but the level of benefit at which Pharmac typically chooses to invest is around $70,000 per QALY. This cost per QALY represents the level of investment that society is prepared to pay to improve health by one QALY. Services that offer a better return (a cost of less than $70,000 per QALY) are likely to be considered good value in the context of other investments in our health system.

Valuing Whakarongorau services is complex, because some aspects of value manifest themselves as direct fiscal benefits to the health system, whereas other aspects require valuation in terms of how much health improvement they add. There are risks of double counting some aspects of value across these different categories, although we have tried to be as clear as possible about avoiding such duplication. The specific reference is explained in the detailed methodology section, but we use a range of $41,756 to $63,381 per QALY to estimate some of the value components of Whakarongorau.

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For more information, please contact:

Name: David Moore

Phone: +64 21 518 002

Email: dmoore@thinksapere.com

Wellington	Auckland	Sydney	Melbourne	Canberra	Perth	Brisbane
Level 9 1 Willeston Street PO Box 587 Wellington 6140	Level 20 151 Queen Street PO Box 2475 Shortland Street Auckland 1140	Level 18 135 King Street Sydney NSW 2000	Level 11 80 Collins Street – North Tower Melbourne VIC 3000	GPO Box 252 Canberra City ACT 2601	PO Box 1210 Booragoon WA 6954	Level 18 324 Queen Street Brisbane QLD 4000
P +64 4 915 7590	P +64 9 909 5810	P +61 2 9234 0200	P +61 3 9005 1454	P +61 2 6100 6363	P+61 8 6186 1410	P +61 7 2113 4080

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