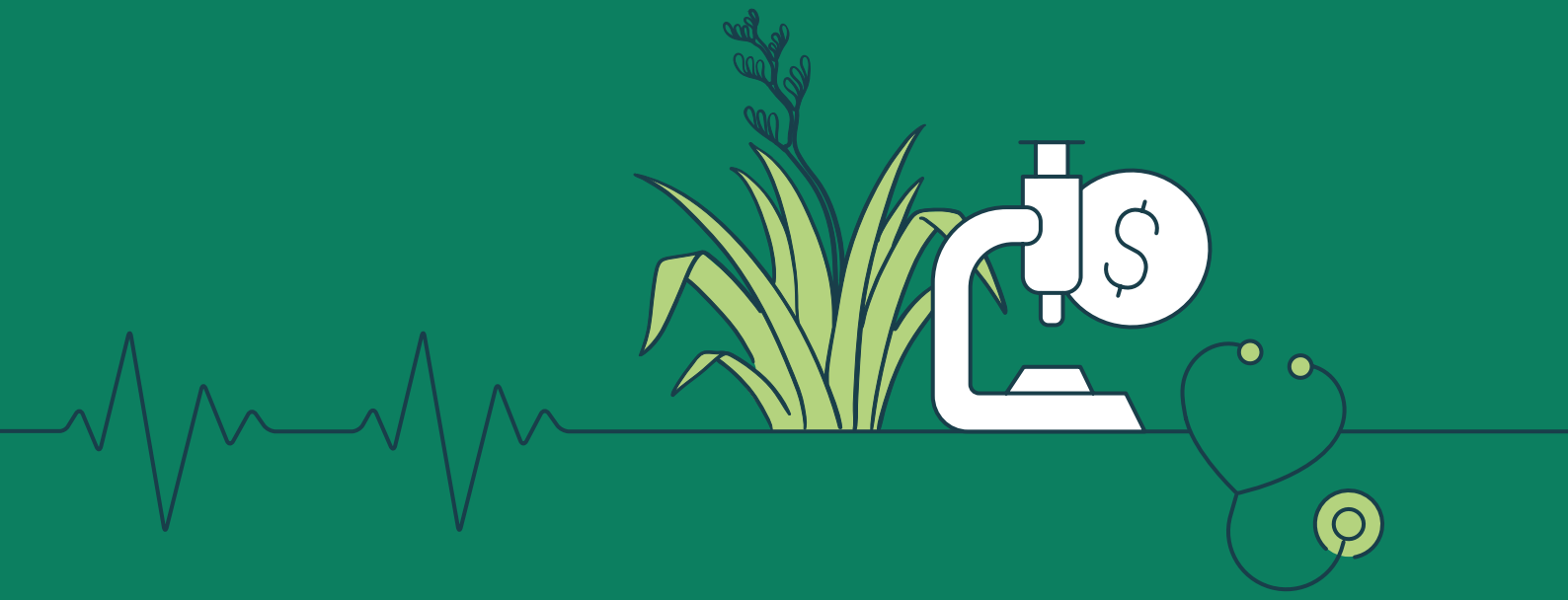
New Zealand's health financing and expenditure:

A comparative and historical review 2000–2023



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ASMS
TOI MATA HAUORA

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Foreword

Health is a fundamental human right and it's the job of governments to maintain strong health systems that enable current and future generations to enjoy the highest attainable standards of health without experiencing financial hardship.

In Aotearoa New Zealand, providing a strong public health system has been a fundamental role of government since 1938, and for many, it has delivered. However, avoidable inequities in access to care and in health outcomes have persisted based on ethnicity, socioeconomic status, location, and disability. Aotearoa's public health system has never met its obligations under Te Tiriti o Waitangi.

In 2021, Toi Mata Hauora released its vision for a strong, equitable health system *Creating Solutions Te Ara Whai Tika: A roadmap to health equity 2040*. In 2025, New Zealand seems even further away from achieving that vision. Inequities are growing, and it's getting harder for New Zealanders to access the care they need in the public system. As access to healthcare deteriorates, politicians continue to claim record investment in health. The disconnect between political messaging and what the health workforce and patients are experiencing continues to grow.

So how did we get here?

Toi Mata Hauora has previously called for an inquiry into health funding to help answer this question. Now we're launching our own inquiry with a series of papers that shed light on what's really stopping us from achieving health for all.

This paper, commissioned from academics at the University of Auckland, begins the series with an in-depth analysis of how Aotearoa's health funding tracks against 16 comparable countries over time. Their report provides some answers as to why funding claims by officials and politicians are at odds with what communities and health providers experience.

First, this research has uncovered major flaws in the OECD data that is used to compare New Zealand's health spending with other countries.

Since 2019, due to capability and capacity issues at the Ministry of Health, New Zealand has not provided data to the OECD on health spending. New Zealand is the only country in the OECD that has not been providing data. Consequently, the OECD has had to estimate data for New Zealand, leading to increasingly unreliable results and overestimates of New Zealand's health expenditure.

Despite this, the Ministry of Health uses the estimated OECD figures in briefings to the Minister of Health and on its website. The figures suggest New Zealand's health expenditure as a share of GDP is around 11%. This paints a highly misleading picture for decision makers and the public.

> **"We've got a health system model to be proud of. It's a system that delivers low-cost, high-quality care – for those who can access it. The mechanism for financing our health system doesn't need to change, but the amount governments invest must increase."**

Decisions to scrimp on health funding have come home to roost. Patients and health workers are bearing the costs of those poor decisions now.

The report also reveals that OECD data on publicly mandated New Zealand health expenditure (Core Crown Health Expenditure and ACC) includes GST. New Zealand differs from other OECD countries in that it applies GST to health-related goods and services, whereas most healthcare is not subject to consumption taxes in most other OECD countries.[i] This raises significant issues for the comparability of New Zealand's publicly mandated health expenditure with other countries and means New Zealand's publicly mandated health expenditure has been consistently overestimated in OECD comparative data.

The paper has also identified a sustained period from 2013 until the COVID-19 pandemic where the OECD data shows New Zealand's health expenditure as a per cent of GDP declined considerably in relation to 16 comparable countries. That's even with the overestimates from including GST on New Zealand's health expenditure data.

This long-term underinvestment explains the immense pressure Aotearoa's health workforce is under, with severe budget constraints leading to staffing shortages, hiring freezes, and stagnant wage growth. This underinvestment also means there is little resilience in the system to deal with shocks like the Covid-19 pandemic. The flow-on effects to patients are stark: it's getting harder to see a GP; the number of sick people showing up at emergency departments is growing, and waitlists for planned care have ballooned.

Decisions to scrimp on health funding have come home to roost. Patients and health workers are bearing the costs of those poor decisions now. Recent increases in health investment in part reflect Covid-19 related expenditure, and in part reflect delayed spending. The increases do not repair a decade of underfunding.

There is good news though. This paper has found the architecture of our tax-based system for financing health is strong. Compared to other financing mechanisms, tax-based financing enables a broader revenue base, has lower administrative costs, greater transparency, is more cost-effective, and tends to be more progressive. If we look at Aotearoa's per capita spending on health in $USD compared to that of other countries, our health system delivers care at a comparatively low cost.

We've got a health system model to be proud of. It's a system that delivers low-cost, high-quality care – for those who can access it. The mechanism for financing our health system doesn't need to change, but the amount governments invest must increase.

Polling indicates widespread support from New Zealanders across the political spectrum for increased government investment in public services such as health. Now it's time for political parties across the spectrum to commit to funding health properly. New Zealanders expect the government to do its job and support a public health system that can meet the needs of New Zealanders now, and into the future.

This is the first in a series of reports commissioned by Toi Mata Hauora looking at how government funding decisions impact the health of New Zealanders, and what governments must do to protect and strengthen our public health system for our children and grandchildren.

Sarah Dalton
Executive Director, Toi Mata Hauora Association of Salaried Medical Specialists

i While GST is paid alongside the appropriations for publicly funded healthcare, it is subsequently returned to the government as output tax. Nevertheless, GST forms part of the market or 'list' price for healthcare.

Contents

Executive summary

This report examines how Aotearoa New Zealand's health system is financed and how much is spent on health, particularly by government. It answers two questions:

- How is New Zealand's health system financed, and what are the advantages and disadvantages of this type of financing compared to others used internationally?
- How does New Zealand's level of health expenditure compare historically, and to comparable countries?

Headline findings

New Zealand has a predominantly tax financed system. There is no evidence that alternative financing systems perform better, and changing the way New Zealand finances health would result in high (and ongoing) administrative costs.

From our analysis of New Zealand's health expenditure, we conclude that the health system has been comparatively underfunded, and that this underfunding has been historical.

New Zealand's health financing:

- Since the 1990s, around **80% of health expenditure has been publicly funded**, with around 20% privately financed. These proportions have been very stable over time.
- Throughout the 21st century, tax-based financing has constituted approximately 70% of all health financing, while ACC, as a type of mandatory insurance constitutes around 10%.

Health financing alternatives:

- **Tax-based financing has well-known advantages and disadvantages**. These need to be considered in comparison to the known advantages and disadvantages of alternative types including mandatory insurance, private insurance and out-of-pocket payments.
- While tax-based systems are more prone to cycles of expansion and tightening of health expenditure, mandatory insurance-based systems are more vulnerable to economic fluctuations and long-term demographic changes.
- Mandatory insurance systems tend to spend more on health than tax-financed systems, but some of this difference is attributable to the higher costs of administering these systems and other drivers of higher costs.
- There is **no evidence to suggest that mandatory insurance systems perform better than tax-based systems** in terms of access, equity, and health outcomes.

Comparative analyses of health expenditure:

- New Zealand is compared to 16 other high-income countries for the period 2000-2023: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Portugal, Slovenia, Spain, Sweden and the United Kingdom.
- We have highlighted significant issues regarding the accuracy of OECD data on New Zealand health expenditure, and its comparability to other OECD countries.
- New Zealand's Good and Services Tax (GST), unlike most countries, does not exclude health expenditure. This impacts the way that health expenditure figures are reported to the OECD and may have resulted in significant overestimates of tax-based expenditure in reported OECD figures every year.
- The **Ministry of Health has not submitted data to the OECD on health expenditure since 2018. It is the only OECD country not to do so**. Because of this, the OECD has had to estimate and extrapolate New Zealand's expenditure levels based on the last data submitted in 2018.

New Zealand's health expenditure:

- From 2000 to 2018, New Zealand's per capita **total health expenditure ($USD PPP) was consistently between 76% and 86% of the average** of 16 OECD comparator countries.
- **Per capita publicly mandated health expenditure ($USD PPP) reduced** from 90% of the 16-country average in 2009 to 85% in 2018.
- Between 2000 and 2009, New Zealand's publicly mandated health expenditure as a % of GDP remained similar to, or was slightly above, the 16-country average.
- Between 2009 and 2018, New Zealand's total and publicly mandated **health expenditure, as a % of GDP declined considerably**, falling behind the 16-country averages.
- For the 2019-2023 period, we conclude that the **OECD estimates of New Zealand's health expenditure are misleading for comparative purposes**.
- The **impact and timing of COVID-19 varied considerably between countries** over the 2020-2023 period. The COVID-19 'bulge' in health expenditure occurred 1-2 years later in New Zealand than comparator countries. 2022 comparisons are particularly misleading.
- Adjusted estimates of health expenditure as a % of GDP, and in $USD PPP per capita, indicate that **New Zealand remained well below the average** from 2019-22.
- Our adjusted estimate of total health expenditure as a % of GDP in 2023 was between 10.2% and 10.4%, rather than the 11% reported in OECD figures. For context, an overestimate of 0.6% of GDP in 2023 equates to $NZ 2.48 billion.
- Our adjusted estimate of publicly mandated health expenditure as a % GDP in 2023 was between 8.0% and 8.3%, rather than the 8.8% estimated by the OECD.
- Both adjusted estimates for 2023 (total health expenditure and publicly mandated health expenditure) are close to the 16-country averages.
- The inclusion of GST in New Zealand's tax-based expenditure figures may mean that parity with the 16-country average % of GDP, and $USD PPP per capita, has not been reached.

Conclusions

Tax-based financing, with its more pronounced fluctuations provides a partial explanation for why New Zealand fell behind in the 2010s.

Many tax-financed countries in our comparator group experienced similar deterioration in the 2010s to New Zealand, but others including Australia, Canada and Sweden did not.

Changing the public component of the mix of health financing from taxation to mandatory health insurance, is unlikely to improve health system performance, and would create significant new health system vulnerabilities.

Data on New Zealand health expenditure has become increasingly unreliable for comparisons with other countries, as the Ministry of Health has not made submissions to the OECD since 2018 and made provisional returns from 2011 to 2018.

Recommendations

- Information on the Ministry of Health website that claims New Zealand spends more than 11% of GDP on health based on OECD data is misleading and we recommend that it be withdrawn.
- The Ministry of Health should be required and resourced to provide submissions of health expenditure data to the OECD in accordance with the OECD's 2011 System of Health Accounts.
- Further work needs to be done to understand whether OECD figures for tax-based health expenditure have been consistently overestimated due to the inclusion of GST, and if so, by how much.

Glossary

ACA	Patient Protection and Affordable Care Act 2010, also known as Obama Care
ACC	Accident Compensation Corporation – government-run, no-fault insurance scheme that provides compensation and support to individuals injured in accidents
Adverse selection	A type of market failure caused by asymmetric (unequal) information, for example where buyers of insurance have more information (like their risk behaviour) than sellers
Beveridge model	A model of universal healthcare system where the government provides and controls healthcare services, which are funded by taxes. Named after William Beveridge a social reformer whose ideas informed the creation of the NHS
Bismark model	A model of universal healthcare system with a requirement to have health insurance through mandatory contributions to a government-run sickness fund, often managed by non-government insurers. Named after Otto von Bismarck, the German statesman who introduced this model.
CCE	Core Crown Expenses – The day-to-day spending (e.g., public servants' salaries, welfare benefit payments, finance costs and maintaining national defence etc) that does not build physical assets for the Crown. Specifically in health, these are often referred to as Core Crown Health Expenses (CCHE).
Copayment	An amount of money a patient pays at the time of a medical service or prescription, copayments may exist in both tax financed and (private or public mandated) insurance systems
COICOP	Classification of Individual Consumption According to Purpose – reference classification used by United Nations Statistics Division
COVID-19	SARS-CoV-2 coronavirus
Deductible	The amount an individual pays out-of-pocket before their health insurance starts to pay, can either be a fixed amount of a percentage of the total cost
Elasticity	The responsiveness to change in income (or price) with the change in the demand for a certain good
EU	European Union
GAVI	Global Alliance for Vaccines and Immunization – a public–private global health partnership with the goal of increasing access to immunization in poor countries
GDP	Gross Domestic Product – the total value of goods produced, and services provided in a country during one year
GP	General practice, primary care facility that could be run by General practitioner or a nurse practitioner

GSC	General social contribution – mandatory payments to government to finance social security programs, a type of hypothecated tax
GST	Goods and services tax – Sales (consumption) Tax
Health expenditure	The amount of money spent on healthcare within a specific period
Health financing	An inclusive term that reflects not only methods of raising money for health care, but also the allocation of those funds
Health funding	Refers to the specific sources of money that are used to pay for healthcare services
Hypothecated taxation	Explicit earmarking of revenues from a particular tax, financing of healthcare using hypothecated taxes may be topped up using general tax revenues
ICP	International Comparison Program – World Bank organisation that produces comparable statistics, including PPPs
Luxury good	Good with a high income elasticity of demand, meaning that a percentage increase in income leads to a larger percentage increase in the quantity demanded. This elasticity is generally considered to be greater than 1, indicating that demand for luxury goods is very responsive to changes in income
Mandatory health insurance	A system where individuals are legally required to have health insurance coverage, this is either in the form of Social Health Insurance or National Health Insurance
Market failure	A situation where supply and demand fail to achieve equilibrium, leading to an inefficient distribution of goods and services in the free market
Monopoly	A market structure where a single firm dominates the supply of a particular good or service, giving it significant market power
Moral hazard	A form of market failure where an individual has an incentive to increase their exposure to risk as they don't bear the full cost
National health insurance	A form of financing and managing health care based on risk pooling, funded via mandatory contributions from employees, employers, and government, managed by a single statutory insurer. Where there are multiple insurers, it is referred to as Social Health Insurance
NHS	National Health Service (United Kingdom)
Necessity	Goods with an income elasticity of demand between 0 and 1. This means that as income increases, the demand for these goods increases, but by less than the increase in income
Normal good	A good or product which experiences an increase in demand when there is an increase in income, a normal good has a positive income elasticity
NZ	Aotearoa New Zealand
OECD	Organisation for Economic Co-operation and Development

OOP	Out of pocket, payments made for some (copayment) or the full cost of healthcare
PAYE	Paye as you earn, income tax and levies directly on wages and salaries
PMHE	Publicly Mandated Health Expenditure, includes taxation financed, social and national insurance funded healthcare (authors own definition)
PPP	Purchasing Power Parity – rates of currency conversion that try to equalise the purchasing power of different currencies
Private financing	A health financing typology which includes out-of-pocket payments and a broader category of voluntary health contributions (e.g. private insurance)
Progressive tax	A tax in which the tax rate increases as the taxable amount increases, with income this means those on higher income pay a higher tax rate
Public mandated financing	A health financing typology where taxpayers and/or employers and employees are legally required to contribute to common pools of revenue to pay for health services; this may be via taxation and/or mandated health insurance (including social health insurance and national health insurance).
Regressive tax	A tax structure where the effective tax rate decreases as income increases, sales taxes – which are often flat rates – are regressive.
SHA	System of Health Accounts, OCED approach to estimating health expenditure
Social health insurance	A form of financing and managing health care based on risk pooling, funded via mandatory contributions from employees, employers, and government, into multiple sickness funds which are quasi-autonomous/non-governmental bodies, memberships and contribution rates can be based on occupational group. Where there is a single statutory insurer, it is referred to as National Health Insurance
THE	Total Health Expenditure – health spending from all sources, government/public, insurance and out-of-pocket
Taxation funding	Revenue raised through taxation, could be income (PAYE), sales tax (GST) or customs duties, or corporation taxes. Taxation funding of health competes with other publicly provided services like education and welfare
WHO	World Health Organization
UHC	Universal health coverage – ensuring that everyone, especially the most vulnerable, has access to the quality health care they need without suffering financial hardship
UK	United Kingdom
US	United States of America
USD	US Dollars
VAT	Value added tax – Sales (consumption) Tax

1 Introduction

Throughout the 2020s there has been increasing concern about the health of New Zealand's publicly funded health system. Many pressing health system issues, such as workforce shortages, service gaps, and inequities of access to services have been highlighted in the aftermath of the COVID-19 pandemic and health system restructuring, although these largely existed prior to this period.[1]

During the 2020s, two questions have risen in prominence on the health policy agenda. One is about the adequacy of health expenditure, particularly the public component of that health expenditure, and whether it is at a sufficient level to meet citizen and patient expectations of a twenty-first century health system. Some have expressed fears that the stresses on our publicly funded health system will lead to deterioration in access and quality of health services.[2]

A second question concerns the way our health system is financed. All health systems are financed by a combination of public and private sources. Some commentators have questioned whether our tax-based financing remains fit for purpose.[3]

The two issues are inter-related because our predominantly tax-based system is a potential cause of underfunding of the health system given the demands on our tax revenue. In this report we explore the alternatives for raising sufficient and sustainable revenues in an efficient and equitable manner. We reflect on how Aotearoa New Zealand currently finances healthcare and then explore how much New Zealand has spent on healthcare relative to other countries since 2000.

In Section 2 of this report, we describe the major types of health financing and outline their advantages and disadvantages. We then describe New Zealand's mix of health financing and examine its strengths and weaknesses in the light of the broader discussion of health financing types.

In Section 3 we look at New Zealand's levels of health expenditure in historical and comparative terms. Our aim is to inform debates about whether New Zealand's health system has been underfunded.

This analysis in Part II is necessarily retrospective. To compare internationally, we use data from the Organisation for Economic Co-operation and Development (OECD). Our analysis dates back to 2000. At the time of writing, the latest OECD figures are from 2023.[ii]

We note at the outset that the comparative and historical data was readily available only until 2018. It is more difficult to accurately comparatively assess New Zealand's health expenditure since 2018 because the government has not provided the relevant data to the OECD, and because the COVID-19 pandemic has made comparison challenging for the 2020 to 2023 period.

In this report we provide our best estimate of how New Zealand's levels of health expenditure compare since 2018 drawing on other sources of data.

We do not explore whether current and projected budget allocations are sufficient, important as that debate is. Our aim is to put some historical and comparative context around that debate.

In the final part of our report, we bring together our analysis in Sections 2 and 3 to inform debate about whether a change to our mix of health system financing is warranted, and how much funding should be budgeted for health.

ii The OECD published data for 2024 on 7 July 2025, but this was too late to be included in this analysis.

2 Review of health financing systems and types

2.1 Introducing health system financing

Health financing is one of the core functions of a health system. Globally the goal of health financing is to deliver universal health coverage whereby financing mechanisms ensure different groups of individuals – particularly those who are vulnerable and high-risk – can access healthcare and be protected from catastrophic expenses and poverty.[4] Health financing is the process of revenue collection, risk pooling and the purchasing of care.[5] Revenue collection is how health systems raise money from households, businesses, and external sources. Pooling deals with the accumulation of revenues so that members of the pool share collective health risks, thereby protecting individual pool members from large, unpredictable health expenditures. Purchasing refers to the mechanisms used to purchase services from public and private providers. See Appendix 1 for a depiction of these interactions between different actors/agencies.

This report largely focuses on the revenue collection aspect of health financing.

Investing in health, evidenced by the amount we spend on health, has the aim of improving health outcomes and thereby increasing productivity and wellbeing. Individuals, governments and society not only need to invest in health, but a range of other, often competing areas, like education and housing. Greater investment delivers greater outcomes, although arguably at a point there are diminishing marginal returns – whereby more investment does not yield improvements in population health.[6] To understand where New Zealand is on the health expenditure spectrum, and how the increase in demand due to an ageing population, technological advancements and greater expectations will need to be managed, we need to understand health expenditure over time, relative to other comparable countries, and also the share of health expenditure that is funded publicly by the government and privately by individuals, employers and through insurers.

2.2 Overview of major types of health financing

Health systems and services can be financed through a variety of mechanisms, each tailored to their specific economic, social, and political contexts. The existence of one method or another in a country is often historical, with cultural links. Combinations of financing and provision generally follow one of four models: the Beveridge model, the Bismarck model, the national health insurance model, and the out-of-pocket (OOP) model.[7] Of interest here is the health financing component, the revenue collection mechanisms from households, businesses and external sources. In this analysis, we largely ignore the provision of care, and whether it is public, private or mixed provision of health care, thus focus on just one side of the 'health system'.

Described in detail below are four common sources of revenue collection for health funding: taxation, insurance (both public/mandatory and private), and OOP payments.

For a fuller discussion of different financing options in the New Zealand context, we recommend the report provided to the Director General of Health in 2002 on Future Funding Options for Health and Disability Services in New Zealand. [8]Although this report is over twenty years old, the key findings regarding advantages and disadvantages of various types of financing remain highly pertinent.

2.2.1 General taxation

This type of financing of health services is based on general taxation revenue, which can include income tax, consumption tax, corporate tax, and other sources of government revenue. In tax-based financing, income tax is usually a large component of general revenue. In most countries that finance health this way, the income tax is 'progressive', meaning that those on lower incomes pay a lower proportion of income as tax than those on higher incomes. Other forms of taxes that may be part of the tax revenue that finances health care includes sales tax and corporation tax. The former is regressive, as it is the same rate irrespective of one's income, while the progressivity/regressivity of corporate tax remains open for debate.

When health is financed through general taxation revenue, decisions about how much financing goes to health are made through the government budget process. This means that proposals to increase health funding must be considered alongside all other government budget priorities – there is no ring-fencing of health financing.[iii]

In some jurisdictions, some taxes are collected by multiple levels of government (e.g. federal and state/provincial governments in Australia and Canada; or municipal, local and central government in Denmark and Sweden. In New Zealand, while local government collects taxes (rates), this is not a significant source of health funding.

Advantages of general taxation financing

One major advantage of general taxation financing is that it does not require a separate system of revenue collection characteristic of all varieties of insurance-based financing – this lowers the administrative costs of the health system.

General taxation is also the most straightforward way to achieve universal health care coverage (UHC) – all citizens are automatically covered with no need, for example, for those accessing services to demonstrate that they hold insurance.

Tax-based financing is generally (though not in every case) more progressive than insurance-based schemes particularly if income tax is raised by central government.[9,10]

Having a more comprehensive revenue base, compared to insurance-based financing, provides a firmer foundation for dealing with increasing health costs as it is possible to reallocate public expenditure across the whole range of government vote appropriations.

Conversely because of centralised budget processes (particularly where revenue is predominantly collected by central government), there is a greater capacity to contain costs as there is enhanced accountability and transparency of spending.

Tax-based financing gives governments greater capacity (in theory) to prioritise population health, prevention, and to facilitate links between health and non-health sectors. This is never easy, but such objectives are more likely to feature on the policy agenda, especially where governments are responsible for social policy spending and have the potential to link health and social services.[11]

Disadvantages of general taxation financing

Tax-based systems may aspire to universal coverage, but because a basic package of services is less likely to be defined, the range of services covered can fluctuate over time.[12]

The downside of centralised budget processes is that health funding levels are subject to volatile political cycles, as some governments prioritise increased spending while others prioritise cost-containment. This aspect of the United Kingdom's (UK) health system has been apparent over the past 40 years.[13]

While tax-based systems may be better at cost-containment, this does not necessarily lead to greater allocative or technical efficiency, as cost-control mechanisms can be short-term and short-sighted. Tax-funded systems can also be more prone to resource constraint in capital spending and workforce costs.[14]

iii Local government in New Zealand does fund some public health functions, such as providing clean water, removing wastewater, licensing alcohol outlets etc, as well as providing transport services, and providing for leisure activities which contribute to health and wellbeing.

2.2.2 Hypothecated tax

Hypothecated taxes involve explicit earmarking of revenues from a particular tax so that they are only used for specifically designated purposes. For example, Australia's Medicare Levy is only used to fund health services.[15]

We can distinguish between 'hard' and 'soft' hypothecation.[16] In hard hypothecation, the amount of money available for public spending on health care (or whatever purpose is designated) would be limited to the revenues raised by that tax. With soft hypothecation, the specified tax would fund only part of total public expenditure on health care, with the remainder coming from the rest of the tax take.

Our international research revealed that hypothecating tax revenues for health care or social care is not common — while some countries have considered it - even fewer have used it. In France since 1998, employee payroll contributions to mandatory health insurance (MHI) have been slowly replaced by a hypothecated tax called the "general social contribution" (GSC). The GSC is based on total income (including income from property) rather than on only earned income and was adopted as part of attempts to broaden the social health insurance system's revenue base.

Australia's Medicare Levy (of 2%) is an example of soft hypothecation, as it does not cover the full extent of government expenditure on health.[15] Italy's publicly funded health care is partly financed through a number of hypothecated taxes: an earmarked corporate tax on the value added of companies and public sector salaries; a regional surcharge of up to 0.5% on the national income tax; and a fixed proportion of national VAT revenue used to supplement funding in poorer regions.[16] A novel approach to hypothecating a small part of income tax is also in operation in Italy where individuals can choose to allocate 0.5% of their income tax payments to any of a list of non-profit organisations, including (but not limited to) those delivering or supporting health and social care. However, the sums these payments add are a tiny proportion of total public spending on care.

Hypothecation for health care can also take the form of so-called 'sin taxes'. These tax consumer expenditure on health-damaging products such as tobacco, alcohol, sugar, and gambling. 'Sin taxes' can appear attractive as a source of funds for health care as they simultaneously raise revenues and discourage unhealthy behaviours. In our research, we found that while many countries, including the UK, levy taxes on tobacco and alcohol, the revenues raised are typically not earmarked for spending only on health care.[iv]

Advantages of hypothecation

Advocates of hypothecation have argued that it is a mechanism for increasing transparency and accountability for health spending, and therefore builds public trust.[17,18]

If health financing is separated from general revenue collection, proponents claim that it could increase public support for more health expenditure because the electorate may consider increases in health taxes more favourably than increases in general taxation.

A separate financing system for health could help insulate funding levels from volatile political cycles when contending political parties or blocs of parties have different priorities regarding levels of public expenditure.[13,19]

Disadvantages of hypothecation

While hypothecation may insulate health funding from political cycles, it would be more exposed to economic cycles which could create significant year-to-year fluctuations in revenue. While smoothing of these fluctuations is possible, it would require significant analytical and operational capacity to design and run.[13,17,19]

Finance ministries generally oppose hypothecation on the grounds that it reduces transparency and accountability for health spending – health is exempt from government-wide budgetary and accountability processes.

If hypothecation is soft rather than hard, critics argue that it is a 'fudge' or 'window-dressing' because significant portions of tax-based financing are still tied to general revenue. If hard hypothecation makes

iv The Problem Gambling Levy, a levy on the profits of gambling operators in New Zealand, reimburses the Ministry of Health who have the responsibility to fund and coordinate problem gambling services.

Our international research revealed that hypothecating tax revenues for health care or social care is not common – while some countries have considered it – fewer have used it.

it easier for governments to increase revenue levels for health, the other side of the coin is that other, less politically popular areas of expenditure are more exposed to political fluctuations due to a smaller pool of general taxation revenue available to them.

'Sin-tax' hypothecation can create perverse incentives for governments who may be reliant on revenue and therefore not support policies aimed at lowering consumption of tobacco, alcohol, sugar, or gambling.[20]

2.2.3 Insurance-based financing

Insurance-based financing of health is based on pooled funding from contributors. Insurance as a way of financing health care has a long history. In early modern European and Japanese societies, occupational guilds pooled funds from their members to support members and their families affected by illness, injuries or death. In the late nineteenth and early twentieth centuries, many 'mutual funds' or 'mutual societies' were established based on voluntary membership, and pooled contributions from members.[21] These were often the basis of both social and private health insurance financing systems that evolved throughout the twentieth century in high income countries.

The key distinctions between social, national and private insurance are principally determined by the ownership and purpose of insurance organisations. Below we make a distinction between social health insurance and national health insurance, both can be described as mandatory health insurance (MHI), and are often used interchangeably.[22] The distinctions are important in the New Zealand context because of our Accident Compensation Corporation (ACC).

2.2.3.1. Social health insurance

Social insurance is a statutory insurance system that provides protection against a range of economic risks. Such risks include unemployment, illness, disability and retirement. Social health insurance (SHI) is where working people and their employers, as well as the self-employed, make mandatory contributions that cover a package of services available to the employee and their dependents.[23] As well as employment contributions, governments pay subsidies into these systems in order to ensure or improve their financial sustainability, and to cover those who are not in employment. Social insurance contributions are usually collected by quasi-autonomous/non-governmental bodies which are regulated rather than controlled by the government. There can be a single contribution fund, or multiple funds that compete for membership.

Contributions to funds are arguably progressive, so those that earn more pay a higher proportion of their income as contributions, although they can have contribution ceilings which can make them regressive. Contributions do not vary with health status, and in this way the financial risks of paying for healthcare are shared across the healthy and the sick, or across the life course. Coverage is linked to contributions, not in terms of how much one contributes, but rather that non-contributors may have different (lesser) entitlements than contributors. Similarly, individuals contributing to different schemes may have different entitlements. The design of SHI can be such that high income earners are able to opt-out and instead are mandated to take up private health insurance, as is the case in Germany.[24]

There may sometimes be variations in the how SHI-based systems provide cover for those individuals not employed in the formal sector.[25] Some countries, like China and Mexico, have voluntary contribution schemes, while the Philippines and Vietnam use tax revenues to enrol those with insufficient means. In terms of delivery, Latin American countries have separate provision for contributors and non-contributors, whereas other countries impose higher co-payments for those outside of SHI schemes.[25]

Advantages of social insurance

Those who advocate for SHI argue that tax revenues alone are insufficient to finance enough healthcare that meets public expectations, given competing public sector needs. Proponents argue that there may be greater acceptability from the public for SHI premium increases than for tax increases, thereby making it easier to raise revenues. In this respect SHI provides some insulation from political involvement in health financing, and countries with social insurance models have less government involvement in health care provision and health policy. Others argue that SHI can be unpredictable, rising and falling with economic cycles, and is vulnerable to negotiation within the government with respect to the level of coverage, eligibility and premiums, which creates uncertainty for insurers and beneficiaries.[26]

SHI systems tend to have more provider competition, which may improve provider performance and therefore efficiency. In many SHI systems there is a mix of for-profit private sector, not-for-profit organisations and local government provision, not necessarily central government owned providers.[26]

Disadvantages of social insurance

As noted above, if SHI covers a sizable share of the population and there are contribution ceilings, then SHI can be regressive, thereby raising issues of equitability in financing.[9]

The size of the contribution base, i.e. those in employment, needs to be large, otherwise SHI ends up covering a relatively small share of health spending.[10] It is common for people to evade paying their contributions in low and middle income countries, which means SHI revenues are then lower than expected. There is also evidence that countries with SHI have larger informal labour markets, and small employers can more easily evade paying employer premiums.[25] Evasions and a small contribution base can mean some health sector expenditure can't be funded or taxes are used to provide additional finances for healthcare.

Although there can be less variation due to more stable SHI revenues,[27] SHI contributions and funds are not immune to financial crises, particularly those that affect employment (such as recessions and rising unemployment). Falling SHI revenues due to rising unemployment in the 2000s in part caused Germany's healthcare crisis (as contributions paid by Germany's workers also pay for cover for the unemployed).[25] An ageing population will have a similar impact on the SHI contributions base. For this reason, most countries with SHI supplement contributions using tax revenue, avoiding adding additional costs to businesses, and offsetting the changing ratio between working age and retired population.

SHI systems tend to have higher administrative and transaction costs compared to tax-based systems.[25] This is particularly true for those systems with multiple SHI funds, and where there are complex contracting arrangements with competition and choice. There is even more added complexity (and costs) when SHI co-exists with public and private-sub sectors covering different sections of the population.

2.2.3.2 National health insurance

This sub-type of financing applies when health care is financed from insurance contributions from employees and/or employers, but, unlike social insurance, there is a single insurer which is a public, statutory organisation. In terms of OECD data (see section 3.3.2 below), this sub-type fits under 'compulsory contributory health insurance' within government expenditure. In New Zealand, this category covers the Accident Compensation Corporation (ACC) (see section 2.4).

In common with taxation and social insurance, in national health insurance (NHI) systems, there is no link between the level of contributions and entitlements.

NHI is rarely the dominant mode of financing health expenditure but is sometimes a component in the broader health financing mix. It is used in Singapore, France, the United States (US), as well as New Zealand.

Taiwan is a jurisdiction in which NHI is the dominant financing source, where it was introduced in the mid-1990s.

In some countries where SHI financing predominates, there are government-run insurance schemes that cover citizens outside the labour market. Unlike other examples of NHI, these do not cover the whole population but are designed for those not covered by employment-based insurance systems.

Advantages of national health insurance

This type of health funding shares some advantages (and disadvantages) with hypothecated taxation, and some advantages and disadvantages of SHI.

NHI insulates health expenditure decisions from political cycles to some extent (like SHI above, the government can still set coverage and premiums or levies). As the financing of health is separated from taxation, NHI may facilitate greater public support for increases in health expenditure. As a type of insurance-based financing, there is more transparency around entitlements, compared to tax-based systems.

Disadvantages of national health insurance

NHI shares with all insurance-based health financing the disadvantage of being more closely tied to employment and therefore more affected by economic and demographic change. As populations (including New Zealand's) age, the proportion of those in the labour market (the primary source of revenue) decreases in relation to those outside the labour market, particularly those aged over 65. This reduces the financial stability of insurance schemes over the long term.

Compared to general taxation, NHI is likely to be less progressive (i.e., where those on lower incomes pay lower contribution rates), although this will depend on the design.

The contribution rates for health insurance for both employers and employees can become a highly visible political and electoral issue (as it has in Taiwan).[28] As an insurance-based financing mechanism that relies partly on employer contributions, NHI financing increases the cost of employing staff and raising contribution rates has macro-economic consequences.

NHI requires a separate administrative apparatus to general taxation, therefore leading to extra administrative costs of the health system, when compared to pure tax-based financing. Finally, as with SHI, it may be possible to evade paying premiums.

2.2.3.3 Private health insurance

In many countries, individuals and/or groups purchase private health insurance to cover their healthcare costs. Employers sometimes purchase private health insurance on behalf of their employees. Both are common in the US, where private insurance plays a much larger role in the health system than in other high-income countries. Globally, private health insurance makes a small contribution to total health spending, but it has a large effect on health system performance because it causes market failure (through adverse selection – where high-risk individuals seek insurance and information asymmetries mean this is not known to the insurer

National health insurance requires a separate administrative apparatus to general taxation, therefore leading to extra administrative costs of the health system, when compared to pure tax-based financing.

and thus risks the financial sustainability of insurance as low-risk individuals are priced out of the market – and moral hazard – where insured individuals overconsume as the price they face is not the true cost) and thereby requires public policy intervention (to address inequalities, inefficiencies, risk segmentation).[29]

In many health systems majorly funded by taxation or SHI, a role can exist for voluntary private health insurance to offer supplementary coverage for those services not in a public benefit package (e.g. new innovative medicines); complementary coverage for out-of-pocket payments in a public system; or may duplicate coverage, allowing those covered to gain faster access or have increased choice.

Compulsory private insurance can be the primary mechanism through which an entire population gains basic healthcare coverage to a benefits package (as is mandated in Switzerland and the Netherlands). In some countries (Germany and Chile) individuals can opt out of SHI but are mandated to obtain private health insurance.

There is considerable heterogeneity in the scope of private health insurance across countries. This is particularly true for coverage for pre-existing conditions. In those countries where private health insurance is supplementary, these pre-existing conditions are often excluded or attract large premiums, whereas in the US since the Affordable Care Act, health insurance companies cannot refuse to cover individuals or limit benefits for pre-existing conditions.[30]

Incentives and penalties can exist to promote voluntary private health insurance, as is the case in Australia where in 1997 a subsidy was introduced for low-income earners to purchase insurance and a tax surcharge introduced (1% of taxable income) for high-income individuals without private insurance. Effectively this meant that public funds were directed to support the private health insurance industry and, by extension, the private health care sector.[31]

Advantages of private insurance

Those who support private insurance argue that it enhances efficiency and consumer choice, or as a second-best option, that it is preferable to OOP payments. These arguments are based on private health insurance filling gaps in publicly financed health coverage, even though economic theory and evidence show that gaps may be filled for some people, but not for others, thus exacerbating inequities.[32]

Disadvantages of private insurance

Market failures in health insurance have been well documented since the seminal article of Kenneth Arrow.[33] Health insurance will only result in an optimally efficient allocation of health care resources under certain conditions: (a) there is chance of becoming ill that is not known (e.g. there are no pre-existing conditions); (b) illness of one individual is independent of others (no endemic communicable diseases) and the illness is known and costs are estimable (insurers are able to calculate future claims and adjust premiums for risk); (c) there are no major problems with adverse selection, risk selection, moral hazard and monopoly (all elements of market failure that occur with asymmetric and imperfect information that changes the behaviour of those insured).[34] Moral hazard (overconsumption) and monopolies (single producers with exclusive control over supply) can exist irrespective of the funding mechanism, but problems acknowledging probabilities, risk and adverse selection (effectively hidden risks that distort markets) are more evident for private insurance because of the selection issue (that is the non-mandatory element).

Community rating – where individuals with the same insurance product pay the same premium regardless of the difference in expected claims costs – is one approach to addressing the affordability issue with private insurance, which is a driver of adverse selection. Notably in New Zealand, community rating is not mandated, as such many older individuals opt out of the private insurance market as it becomes unaffordable (premiums increase with age, rather than spreading the cost over all insured individuals).

Similarly, insurers in New Zealand can also use genetic information to set premiums and coverage plans during the underwriting phase. Such genetic discrimination is outlawed in most major jurisdictions; in New Zealand there is concern that this means individuals who could benefit from genetic testing do not have it for fear of insurance exclusions.[35]

2.2.4 Out-of-pocket payment (OOP)

In all health systems, there are some services where patients pay directly for services at the point of care as an out-of-pocket (OOP) payment. This payment is often a form of cost sharing, not necessarily paying for the total cost of care. OOP payments may be a fixed amount for each service (a copayment), the first X amount (a deductible) or a percentage (so called coinsurance) of the cost. If this fee is higher for those on higher incomes, then it can be described as progressive, although OOP payments can lead to high financial burdens for individuals. OOP payment is still a prevalent method in many low- and middle-income countries for medical care, but also common for services such as dental and optometry care in high-income countries.

Copayments exist to ensure that healthcare consumers do not face zero cost and thereby overconsume (described as moral hazard). However, copayments can also be a significant barrier to access for those seeking care thereby exacerbating health inequities.[36]

2.2.5 Other (philanthropic) financing options

Globally, philanthropic funders play a significant role in financing a range of public health initiatives. Aside from the substantial research funding these organisations donate, philanthropic organisations also fund the provision of healthcare in many low- and middle- income countries. The Gates Foundation is an example of a non-governmental philanthropic funder at a macro level. The Gates Foundation has funded sanitation programmes and is a significant donor to the GAVI Alliance which led on procuring and delivering COVID-19 vaccines to low- and middle-income countries.[37] Even in high income countries like New Zealand, philanthropists fund health system infrastructure.[38]

At the micro-level (that is the patient level), there has been an increasing role for crowdfunding. Crowdfunding websites include Givealittle and GoFundMe. Recent analysis of GoFundMe in the US for the period 2016-2020, found that medical crowdfunding is misaligned with key indicators of health financing needs, and it is best positioned to help in populations that need it the least, thus exacerbating inequities.[39]

2.3 Comparing types of health system financing

2.3.1 Typologies of health system financing

Most comparative typologies of health systems incorporate financing as one feature, alongside other features such as service provision and governance.[40,41,42] As we are only focused on financing, the most straightforward approach is to categorise countries in terms of the type of financing that takes up the largest share of health care expenditure.

Terminology to describe types of health systems vary in the international literature. So it is important to specify how we name and define different types.[43,44] As our analysis that follows is based on comparative OECD data, we adopt an approach that closely reflects the OECD categorisations (see section 3.3.2). Even though there is considerable variety in the design of SHI systems, for our purposes it is sufficient to treat SHI as a single category.

Our typology for comparative analysis is outlined in Table 1. It starts from the key distinction between **publicly mandated** and **private financing**. In **publicly mandated financing**, taxpayers and/or employers and employees are legally required to contribute to common pools of revenue to pay for health services. Within publicly mandated health financing, we primarily distinguish between taxation and mandated insurance. As described above mandated insurance includes SHI and NHI. **Private financing** covers OOP, and a broader category of 'voluntary health contributions'. Following the OECD, we use the term voluntary health contributions to cover private health insurance and philanthropic and community sources.

In our analysis that follows we show how our terminology maps onto OECD categories used in our comparative analysis. Although philanthropic and community financing are important categories, they are usually very small in terms of their shares of health expenditure in high-income countries.

Table 1: Three level typology of health financing

Level 1	Level 2	Level 3
Publicly mandated	Taxation (tax-based)	• General taxation • Hypothecated taxation
	Mandatory insurance	• Social health insurance • National health insurance
Private	Voluntary health contributions	• Private health Insurance • Philanthropic and community sources
	Out-of-pocket payments	

2.3.2 Which high income countries fit which types?

No high-income country has OOP payments as its predominant type. This means a basic three category typology based on the remaining Level 2 categories.

Table 2: Predominant financing source – high-income country examples

Predominant source of financing	Level 3 typology	Countries
Taxation	General Taxation	Australia, Canada, Denmark, Finland, Italy, United Kingdom, Sweden, Norway, Spain, Portugal,
Mandatory insurance	Social Health Insurance	Germany, Netherlands, Switzerland, France, Japan, South Korea, Belgium, Austria
	National Health Insurance	Taiwan, Slovenia
Private insurance		United States

In high income countries, the two most prevalent types of financing are general taxation and SHI. No country uses hypothecated health tax as the predominant source of financing, and NHI is relatively rare, but is emerging as a common type financing in middle-income countries.

The US is a prominent example of a high-income country with a high reliance on private financing. In 2023, 68.6% of the population had either a group or a direct-purchase private health insurance policy. As such, the US is often characterised in comparative studies as a private insurance-based system, even though the proportion of publicly mandated expenditure has exceeded private insurance for some time. This is because Medicare is a publicly mandated tax-based scheme that covers all citizens over the age of 65, constituting a considerable proportion of health expenditure, along with Medicaid, Veterans Affairs and child health programmes. However, compared to all other high-income countries, private insurance is the dominant source for those aged under 65.

The introduction of the Patient Protection and Affordable Care Act (ACA) in 2010 has seen a significant fall in the number of uninsured: in 2010 16% were uninsured, this proportion has since halved.[45] However, most insurance plans remain with private, for-profit organisations. The ACA was important regulatory reform but must be understood in the context of the historical and continuing dominance of a private insurance-based model.

2.3.3 Financing and health system performance

Most international research and comparative analysis of health system performance caution that there are few strong links between health system financing and how well countries' health systems perform.

In our typology, publicly mandated financing, whether it be based on taxation, social insurance or national insurance, aims to deliver universal health care (UHC). Each country achieves UHC to varying degrees across the three dimensions of population (how many are covered), services (which services are covered) and costs (what proportion of costs), to which this is achieved in any specific system.[46]

The other side of this coin is that health systems with higher proportions of private financing are usually further away from UHC. Comparative analyses undertaken by the US-based Commonwealth Fund have consistently ranked the US health system as having far worse performance in terms of health outcomes, access, equity and efficiency when compared to other high-income countries.

The USA is the only high-income country in which private insurance plays such a prominent role. Some of the reasons for its comparatively high health expenditure are due to very US-specific factors, but there is much evidence to link a greater role for private financing with higher health expenditure, without concomitant higher performance or value for money. The two most significant contributors are the relatively high prices paid for goods and services by private funders, and the comparatively high administrative costs for running private insurance. These drivers of higher spending do not contribute to better health system performance.

Compared to these differences in performance between countries reliant on private financing and those with higher public components, the differences in performance between social insurance and tax-funded countries are minimal.

One of the most comprehensive reviews comparing tax-based and SHI financed systems was conducted by Adam Wagstaff in 2009.[47] His analysis of 29 countries between 1960 and 2006 concluded that social insurance-based systems spent slightly more (3-4% total health expenditure per capita) on health than tax-based systems, but that this slightly higher spending did not translate into better health outcomes, and may be associated with worse outcomes for conditions where population-based screening is feasible (because this is harder to organise in SHI systems). Given that SHI systems spend slightly more, but health outcomes such as amenable mortality are similar, tax financing systems were found to be more efficient.

In an analysis of lower- and middle-income countries' efforts to achieve UHC, a review[48] concluded that "general revenues are more likely than labour taxes (i.e., employment-related insurance levies) to provide financially sustainable, efficient and equitable health systems" (p.896).

Analysis of 124 countries over the 2000-17 period by Gabani et al concluded that low- and middle-income countries that transitioned to tax-based financing achieved larger improvements in health outcomes compared to those that transitioned to social insurance.[12]

2.4 The New Zealand context

2.4.1 The establishment of state financed health provision

European settlement of Aotearoa resulted in a mix of government, voluntary and private provision of health.[2] The first State hospitals were commissioned in 1846; by the 1880s the government funded about three quarters of hospital care. The late 19th century saw local hospital boards tasked with raising half of the finances they needed via patient charges, contributions from local authorities levied from rate payers, and voluntary contributions) and the government (via tax revenue) contributing the remainder. Other funding sources included community financing, through voluntary mutual societies and other non-profit entities. Group-based insurance became increasingly common in the early decades of the 20th century.[49] Thus, prior to 1938, private financing comprised more than half of New Zealand's health expenditure.

The New Zealand health system became predominantly funded by taxation following the passage of the Social Security Act in 1938, with New Zealand among the first high-income countries to move comprehensively to UHC.

The New Zealand health system became predominantly funded by taxation following the passage of the Social Security Act in 1938, with New Zealand among the first high-income countries to move comprehensively to universal health coverage.

The Social Security Act meant that public hospital services (including mental health and maternity hospital services), as well as medicines, were fully funded by government. However, unlike the UK's National Health Service that began ten years later, the New Zealand government did not fully fund primary care visits, due to a compromise with the New Zealand branch of the British Medical Association. While initially small, primary care co-payments gradually increased as a proportion of health care expenditure as government reimbursement rates remained static and hence lagged behind increases in the cost of primary care services.[49] In 2019, the private funding share of general practice primary care services was 23%.[50]

2.4.2 Public-private financing mix

In 2019, the Health and Disability Review's Interim Report provided a snapshot of the mix between public and private financing of community-based health services. This shows that adult dental care, optometry and hearing services and radiology services in the community are predominantly privately financed, but services including maternity, community mental health, and ambulances are almost exclusively funded publicly.[39] Some social welfare payments are also available to support those unable to afford services, at times as loans that must be paid back.

Since 1940, the publicly mandated proportion of health spending has sat at around 80%, rising to around 85% in the 1970s and 1980s, before settling at or around 80% ever since.[49]

The private insurance industry dates back the early 1960s, with the creation of Southern Cross as a funding source for newly established private hospitals. The proportion of New Zealand residents covered by private insurance has remained stable, sitting between 30% and 37% in the 1990s, and between 33% and 37% since 2010.[51] Higher income, European and mid-aged New Zealanders are more likely to purchase such insurance than lower income, Māori, Pacific or older New Zealanders.[51]

Over the 2004-18 period,[v] tax-based financing ranged between 69.1 and 73.1% of total health expenditure, and mandatory health insurance (ACC) between 7.5 and 10%. For private health expenditure, voluntary contributions (predominantly private insurance) varied between 5.9 and 7.9%, and out of pocket expenditure between 11.5 and 14.1%.[52]

2.4.3 ACC – a type of national health insurance

There has been a limited compensation scheme for injuries in the workplace since the Workers' Compensation for Accidents Act 1900. A Royal Commission recommended that this be extended to cover all injuries on a no-fault basis, and the Accident Compensation Act was passed in 1972, and the Accident Compensation Commission (later renamed the Accident Compensation Corporation, ACC) was established in 1974.[53,54]

v OECD data only began separating ACC (mandatory government schemes) from taxation in 2004. As we outline in Section 3, data on New Zealand health expenditure distinguishing between tax-based and ACC sources, and between out-of-pocket and voluntary contributions, has not been reported since 2018.

As the sole and compulsory provider of accident insurance it is a form of National Health Insurance. It is funded through levies on employers and the self-employed, employees through PAYE, general taxation, levies on petrol and motor vehicle licences fees. These cover injuries that are work-related, non-work-related by income-earners, non-work-related by non-income-earners, and related to motor vehicles, respectively.

These levies are reviewed every three years. The ACC Actuarial Team proposes levy rates based on claims received, health care costs and investment returns.[55] These proposed levies are then reviewed by MBIE and the Minister for ACC. Unlike other NHI systems, health expenditure decisions are not necessarily insulated from political cycles. In addition to the Minister approving the levies, previous governments have sort to deregulate and introduce competition from private insurers for work-injury contracts (under National Government) and then restored the monopoly (under Labour Government).

ACC funds a range of private providers to deliver medical treatment and vocational and social rehabilitation for those injured by accident (including through medical treatment), for work-related illnesses (e.g. hearing loss), and for mental injury caused by crimes of a sexual nature. It also provides income-related compensation (normally 80% of prior income). All injury is no fault – there is no recourse to sue – except for exemplary damages in some cases.

2.4.4 Iwi financing of health care

A notable recent addition to the health financing landscape in Aotearoa New Zealand is that at least two Iwi are offering private health insurance. Since 2018, Ngāti Whātua Ōrākei via nib provides private insurance cover for all its Iwi members across New Zealand. Ngāti Whātua Ōrākei pay for the insurance premium and the payable excess, effectively providing full coverage to Iwi for a base level of hospital and surgical cover and primary care (GP, dentist, physiotherapy) visits. Waikato-Tainui also have an insurance plan. It is with Southern Cross and provides annual cover for GP visits, dental care, optometry, physiotherapy and chiropractic care up to a $1,250 cap specifically for kaumātua (aged 60+). Prior to the insurance offering Waikato-Tainui offered medical grants. Medical grants are common across Iwi and Māori Trust Boards and are used to support the cost of treatment that is not covered by the government, e.g. glasses, dental treatment, hearing aids. It is our understanding that these health financing arrangements are funded by Iwi from their commercial interests as a result of Treaty settlements.

2.5 Health financing systems summary

There are many types of health system financing, and all health systems are comprised of a mix of types. The most important distinction is between publicly mandated sources and private sources.

Publicly mandated financing schemes are means of achieving universal health care as they are designed to protect citizens from the costs of ill-health. Within the category of publicly mandated sources, the two main sub-types are tax-based financing and mandatory insurance financing. Both are underpinned by legal obligations of taxpayers and/or employers and employees to contribute to common pools of revenue to pay for health services. Tax revenue can be hypothecated (i.e. earmarked specifically for health), however internationally, most tax financing of health systems is linked to general revenue.

Mandatory insurance financing is primarily based on employee and employer contributions. Within this category, NHI involves a single insurer which is a government entity, and SHI is based on multiple insurers that are non-government organisations but are subject to government regulation to ensure consistency of coverage across the population. Most mandatory insurance systems are of the SHI variety.

Private sources of health financing include two broad sub-types – OOP payments, and voluntary contributions which include private health insurance, philanthropic financing, and donations. In most high-income countries, private health insurance is the largest source of voluntary contributions.

All types of health system financing have advantages and disadvantages which are summarised in Table 3.

In New Zealand, taxation is the dominant source financing health care, constituting around 70% of all health care spending. ACC accounts for just under 10% of health expenditure, bringing the total from public

sources to around 80%. Private expenditure (OOP payments and voluntary contributions including private health insurance) is, correspondingly, around 20% of total health spending.

New Zealand has experienced the benefits of tax-based funding since 1938. The progressive nature of the tax system (though attenuated) has meant few cost-based barriers of access to hospital and specialist services historically. Taxation is a stable revenue source, albeit subject to economic fluctuations. The costs of administering our health system are comparatively low. Policies promoting the planning and funding of health services in terms of population needs, and integration with social services have proven challenging to design and implement, Nevertheless, New Zealand is comparatively advanced in these respects.

Many of the disadvantages of tax financing have also been manifest in New Zealand, particularly since 2000. While governments have a greater capacity to exercise budgetary control, this often manifests in delayed capital investment, and salaries not keeping pace with inflation. As in the UK, these strains have led some commentators in the late 2010s to consider the merits of changing to a different type of financing.[56,57,58]

Hypothecated tax financing of health may provide some insulation from the volatility of political cycles. However, both hard and soft forms of hypothecation would create new and different problems for governments. Hard hypothecation leads to greater fluctuations in revenue, soft hypothecation blurs the boundaries between earmarked and general revenue, and sin-tax hypothecation creates perverse incentives for governments.

Regarding mandatory insurance, there are few cases of NHI to compare systematically. Comprehensive international comparisons have shown that SHI systems deliver broadly similar types of benefits to tax-based systems, but are more expensive to administer, and more vulnerable to economic cycles and demographic change.

The only high-income countries to have ever switched from tax-funded to mandatory insurance in the last sixty years were all former Eastern European countries under Communist rule in the post-war era.[47,59] Many more high-income countries switched from mandatory insurance to taxation between the 1960s and 1980s.

Table 3: Summary of advantages and disadvantages of financing sources

Level 2 Typology	Level 3 Typology	Advantages	Disadvantages
Taxation (tax-based)	General Taxation	• Doesn't require separate system of revenue collection lowers the administrative costs of the health system. • Progressive in design, assuming majority of tax revenue is progressive. • More capacity to contain costs. • Greater capacity to prioritise population health, prevention. • Greater capacity to integrate health and social services. • Greater financial stability.	• More subject to volatile political cycles. • Cost-control can be short sighted. • More prone to resource constraint in capital spending and workforce costs.
	Hypothecated taxation	• Mechanism for increasing transparency and accountability for health spending, builds public trust. • Eectorate may consider increases in health taxes more favourably than increases in general taxation. • May help insulate funding levels from volatile political cycles.	• More exposed to economic cycles create significant year-to-year fluctuations in revenue. • Reduces transparency and accountability for health spending. • Soft hypothecation a 'fudge' or 'window-dressing' as still reliant on general taxation. • 'Sin-tax' hypothecation can create perverse incentives for governments.
Mandatory insurance	Social Health Insurance	• Insulates health expenditure decisions from political cycles. • May facilitate greater public support, and therefore increases in health expenditure. • More transparency around entitlements, compared to general taxation.	• More closely tied to employment and therefore more affected by demographic change. • Upward pressures on contribution rates. • Reduced financial stability of insurance schemes over the long term.
	National Health Insurance	• May provide more finance than tax revenues alone. • Easier to raise financing, as greater acceptability of premium increases than for tax increases – leads to higher health expenditure. • Provides some insulation from political involvement in health financing. • More provider competition, which may improve provider performance and therefore efficiency.	• Can be regressive if there are contribution ceilings. • Ability to evade paying contributions. • Small contribution base (because of large informal sector) means other funding sources are necessary. • Funding can be unpredictable, rising and falling with economic cycles. • Vulnerable to negotiation within the government, creates uncertainty for insurers and beneficiaries. • Tend to have higher administrative and transaction costs, particularly true for those systems with multiple SHI funds.
Private insurance	Private health Insurance	• Enhances efficiency and consumer choice. • As a second-best option, it is preferable to OOP payments.	• Only optimally efficient under certain conditions. • Considerable market failure. • Equity implications, unless community rating is mandated and genetic discrimination banned. • Less public scrutiny.
	Philanthropic and Community sources	• Able to fund large initiatives like public health interventions or hospital builds.	• Inequitable.
Out-of-pocket		• Avoids moral hazard, no over-consumption.	• Inequitable.

3 Comparative data on health spending – has NZ spent enough on health?

3.1 Introduction

In this section of the report, we focus on the question of how New Zealand's health expenditure, and its publicly mandated component in particular, compares with similar countries. This involves taking a broader historical view of health expenditure trends based on OECD data. By necessity, this is a retrospective analysis, as comparative data cannot be used to assess current and future levels of health expenditure. Within New Zealand, other analyses have been undertaken to evaluate the current and future adequacy of publicly mandated health expenditure.[60,61] Our analysis tells the story of how we compared with other countries between 2000 and 2023, the year for which the most recent OECD figures are available.

We note that this question has become more challenging to answer because the availability and quality of New Zealand's health expenditure data (both public and private) has deteriorated markedly since the early 2010s. The Ministry of Health used to provide regular, detailed reports on health expenditure.[62,63] The last of these reports in 2012 provided a comprehensive picture, with detailed categorisations of expenditure, and good alignment with the OECD System of Health Accounts. This document also provided sophisticated analysis and discussion on how New Zealand's health expenditure compared internationally.

From 2011 to 2018, the data that the Ministry of Health provided to the OECD was provisional data. Since 2018 no relevant data on types of health financing has been provided. This is highly unsatisfactory, as public debate on matters of health financing requires timely and trustworthy information.

3.2 How much health spending is enough?

As with all matters of public policy, this is not a wholly technical question, as it is linked to questions about the purposes of health spending, its impact on health outcomes, its contributions to economic growth and productivity, and many other things that are valued in society. Higher spending on health always has trade-offs: finite resources and budget constraints mean the opportunity cost of greater health investment comes at the expense of investing in education, housing, transportation, etc; this is true at both the micro individual and macro government level.

Since the mid-twentieth century, health spending as a proportion of GDP has risen steadily in all high-income countries.[64] This is partly due to an ageing population, an accompanying increase in chronic conditions, but also to medical advancements which typically come at a higher cost. The growth in health expenditure in high income countries has not been matched with a concomitant improvement in health outcomes. This is cited as evidence of the law of diminishing returns, where, at some point additional investment in healthcare results in a smaller and smaller marginal health benefit. Much research has sought to understand that 'bliss' point, asking how much spending is enough, or what is the optimal level of health spending?

The primary focus for this paper is the level of funding that is **publicly mandated** (i.e. financed via taxation, and/or mandatory insurance). However, we also need to consider the overall health

From 2011 to 2018, the data that the Ministry of Health provided to the OECD was provisional data. Since 2018 no relevant data on types of health financing has been provided. This is highly unsatisfactory, as public debate on matters of health financing requires timely and trustworthy information.

financing ecosystem, in which private financing (OOP, private insurance, and philanthropic contributions) is also a key element.

No high-income country totally funds its health system via publicly mandated sources. The proportion ranges between around 70% and 85% for most countries, and has been gradually increasing as all countries seek to achieve UHC, where everyone has access to quality essential health services without financial hardship.[65]

Of note is that the US is somewhat of an exception amongst high-income countries in how it funds healthcare (predominantly via private insurance), but it also provides an example of what spending too much on health might look like. It spends a much greater percentage of GDP on health (around 17%), and some of this is very low value spending, particularly when health outcomes, access to services, and efficiency are considerably worse than its high-income country counterparts.[66] It is often considered an example of diminishing marginal returns or flat-of-the-curve medicine.[64]

Even considering the US as an outlier, we can gain insights from comparing NZ with other high-income countries as the variability across countries can offer a useful counterfactual for what other types of systems spend on healthcare.

3.3 Comparing New Zealand's health spending with other countries

International comparisons of health expenditure provide many useful insights, particularly when conducted over longer time periods. At the outset it is important to acknowledge potential limitations. Many argue that it is misleading to compare health expenditure across countries because of differences in input prices and productivity. There are always definitional and technical challenges in standardising data collection and reporting across health systems. The quality of health expenditure data can vary between countries and over time. However, the attempt is worthwhile, and it is possible to undertake comparisons while acknowledging limitations.

3.3.1 Review of the literature

Comparative analyses of the health expenditure across countries are common in health systems literature. Researchers have sought to understand the drivers of expenditure, and the relationship between expenditure and health outcomes. The Organization for Economic Co-operation and Development (OECD) and World Health Organization (WHO) facilitate such analyses with their databases of health expenditure/ health statistics.[52,67]

The first study of the determinants of healthcare expenditure in 1977 used 13 OECD countries with data from 1970.[68] Newhouse's seminal paper estimated the income elasticity of healthcare spending, finding that as national income increased, health expenditure as a proportion of national income increased, and the relationship was reflective of healthcare being a 'luxury good' (where a luxury good is defined as increases

in income causing a greater percentage increase in demand). Subsequent analyses exploring income elasticity and the determinants of healthcare expenditure have also used OECD data, exploring the issues with longitudinal/panel data, and adding additional covariates.[69,70,71] It is worth acknowledging that the recent analyses with more sophisticated econometrics often find that health is a normal good; as income increases spending on health increases, but not at a disproportionately higher rate compared to other goods.

A recent systematic review of factors determining health expenditure found that 75% of all papers were on developed countries, particularly OECD countries. This is likely due to the high level of comparability across OECD countries, described by Gerdtham and Jönsson[69] as homogeneous industrialized market economies, and the similarity of the data collation and management process. Some analyses with a specific interest in say primary care diverge from using OECD data and use data from the WHO Global Health Expenditure Database as the interest is in the determinants of primary care expenditure,[72] and only the WHO data provides this information. The WHO analysis, however, still focused on OECD countries. One study that does look at a large number of countries (N=173) used the WHO National Health Accounts but also had to source information from the World Bank and other global agencies.[73] Another analysis that used WHO and UN (World Development Indicators) data focused on SEAR (South-East Asian Regional) countries.[74] This study compared public, private and total healthcare expenditure and the relationship with GDP per capita; they found that public expenditure was inelastic, so a necessity, whereas private expenditure in these countries was elastic (as income increases there is a larger increase in the quantity demanded), implying private purchasing of 'luxury' healthcare.

A corollary of the research on the drivers of health expenditure and the relationship to health outcomes is the notion that there is an optimal amount of health expenditure that a country should target. Spending targets were first put forward in the Abuja Declaration of 2001.[14] This recommended that governments allocate 15% of their budgets to the health sector, although the evidence to support this is unknown.[75]

A key indicator increasingly promoted to achieve UHC is the amount a country spends in terms as a percentage of GDP. This indicator has a fiscal context, in terms of how large government is relative to the economy. The World Health Report 2010 argues that it is difficult to get close to UHC where government health spending is less than 4-5% of GDP.[76] This was further asserted in a suggestion that to ensure financial protection (limiting out-pocket-payments to 20% of total health expenditure), and that governments of lower-income countries should commit to government health expenditure of at least 5% of GDP.[77] These are minimum thresholds and largely relate to achieving UHC for low- and middle-income countries.

Wang[78], focusing solely on OECD countries for the period 1990 to 2009, used econometric analyses to estimate the optimal level of (total) health expenditure, where a value less than this threshold means increases in health spending lead to better economic performance, and values greater than this suggest inefficiencies in health spending. Wang estimated that the optimal level of health spending was 7.55% of GDP. The mean level of health expenditure in OECD countries 1990-2009 was 5.48% of GDP.

Within-country analyses have also explored the adequacy of spending on health. The US[79] and UK[80] offer two examples. The US has one of the highest levels of expenditure globally, nearly double that of other high-income countries. Expenditure has increased steadily over time, and the growing number of ageing American's has been identified as a concern for publicly mandated health expenditure. In 2022 17% of the US population were age 65 and over, this is predicted to reach 21% by 2032.[79] At the age of 65 individuals are eligible for Medicare which is expected to significantly increase the cost of Medicare and government expenditure on health in the US.[79] Government health spending in the UK has for a long time been of interest, in part driven by comparisons not with the OECD but with other European (Union) countries. In 2000, the Labour Government led by Tony Blair committed to raising the spending on healthcare (specifically for the NHS) to match the EU average (an extra £12billion was pledged to raise healthcare expenditure as a proportion of GDP, from 6.7% to 8%). A recent comprehensive review[80] of health and social care spending in the UK concluded that without annual 4% increases in public spending in real terms (and publicly mandated health expenditure of 9.9% of GDP by 2033–34), there is a risk that the NHS will be degraded, there will be a reduction in benefits coverage, increased inequalities and an increasing reliance on private finance.

3.3.2 Understanding OECD data on health expenditure

In 2000, the OECD developed A System of Health Accounts (subsequently revised in 2011[81]). These are a set of core principles for national health accounts that are comprehensive, consistent and flexible, using a common framework that allows for international comparisons. The system has been adopted by the OECD, Eurostat and WHO, to support the reporting of expenditure on health. The system offers insight on (a) where does the money come from? (financing schemes), (b) where does the money go? (providers of health care), and (c) what kind of services are performed and goods purchased? (functions of health care). A new International Classification of Health Accounts (ICHA) was proposed, defining each of the questions above.

Our interest is in the ICHA source of funding / health funding (ICHA-HF), which considers the following types of financing arrangements

- Government schemes
- Compulsory contributory health insurance
- Voluntary health insurance
- Other financing arrangements in which participation is voluntary
- Out-of-pocket expenditure by households.

In the 16 countries selected for this comparative analysis, the fourth of these categories is not separated out in the OECD's high-level reporting. The third and fourth categories are merged into an overarching 'Voluntary Health Contributions' category.

Table 4 below shows the OECD terminology and compares it to the terminology we introduced in Section 2. The following analysis uses data from OECD level 2 but with our slightly different terminology.

Compulsory private insurance as a type of financing is a category that applies to a small number of countries, including the Netherlands and the US (since the Affordable Care Act of 2010). There is legitimate debate about which side of the public/private line compulsory private insurance schemes should be. However, our comparative analysis of OECD data only uses Levels 1 and 2 categories in Table 4.

Table 4: Health system financing terms and OECD terminology

Our terms			OECD categories		
Level 1	**Level 2**	**Level 3**	**Level 1**	**Level 2**	**Level 3**
Publicly mandated	Taxation (tax-based)	General taxation Hypothecated taxation	**Government-compulsory schemes**	Government schemes	
		Hypothecated taxation			
	Mandatory insurance	National health insurance		Compulsory contributory health insurance schemes	Social health insurance schemes
		Social health insurance			Compulsory private insurance schemes[vi]
Private	Voluntary health contributions	Private health Insurance	**Voluntary schemes/ household out-of-pocket payments**	Voluntary health care payment schemes	
		Philanthropic and community sources			Voluntary health insurance
					Other financing arrangements in which participation is voluntary
	Out-of-pocket			Household out-of-pocket payments	

OECD calculations for health expenditure take raw data reported by each country's health ministry/department and aim for some level of international consistency using the System of Health Accounts. This means that for New Zealand, Vote Health does not constitute the whole of the tax-funded figure. Some expenditure from other government agencies, such as the Department of Corrections (health services for prisoners) and Ministry of Social Development (emergency dental care grants) should also be included. Some spending on disability services is also included in OECD health expenditure. The updated System of Health Accounts also tracks capital expenditure (on hospitals and health facilities) but this is not included in the estimate of total health expenditure, which focuses solely on current expenditure, or the final consumption of healthcare goods and services.

In light of the COVID-19 pandemic, the WHO developed a technical note to help countries track and classify COVID-19 spending within the System of Health Accounts framework.[82] The goal was to enable countries to integrate pandemic response financing in an internationally comparable fashion. This was particularly crucial given countries responded differently to the pandemic in terms of health and economic responses. For example, in New Zealand financial support to businesses (e.g. COVID-19 Support Payment) and quarantine

vi This is a case in the Netherlands and US. For example, in the Netherlands there is one universal social health insurance program underpinned by private insurance and mandatory coverage

hotel costs were not included in current health expenditure. However, any accompanying health costs of surveillance (medical check-up, testing, tracing, etc.) were classified as health expenditure.

Historically, the OECD has built the most fit for purpose database for comparisons of health expenditure, and is the one used by most researchers. OECD data is most useful because it is reported in terms that allow for more meaningful international comparisons. There are other datasets that are sometimes used to compare health expenditure. The WHO and the World Bank use the same raw data as reported to the OECD (for OECD countries) but make different decisions about which comparative indicators to report. The WHO's reporting system on the same data is much more limited for the purposes of comparing levels of health expenditure. The most significant limitation is that the WHO dataset does not enable comparisons in terms of per capita expenditure on health. The WHO also uses a different GDP denominator. The GDP estimates the WHO use come from the World Bank, which appears to not adjust for inflation.

3.3.3 Comparative indicators

The key OECD indicators that we use to compare levels of health financing are:

- Publicly mandated expenditure on health as a % of total health expenditure
- Health spending as a % of GDP
    - Total health expenditure as a % of GDP
    - Publicly mandated expenditure as a % of GDP
- $USD purchasing power parity (PPP) per capita
    - Total health expenditure
    - Publicly mandated health expenditure

Publicly mandated health expenditure as a % of total health expenditure is a commonly used indicator in much comparative health research and a suitable indicator of Universal Health Coverage (UHC). One disadvantage of this indicator is that some financing arrangements in some countries are difficult to categorise. For example, both the Netherlands and the US have a form of mandatory private insurance. Singapore's Medical Savings Accounts are another example of a source of financing that would not fit easily on one side or other of the public/private line. However, this difficulty is not pertinent to most countries in our analysis.

The two other types of indicators (health spending as % of GDP and $USD PPP per capita) each provide important information and using them together provides some mitigation of the disadvantages of each.

As an indicator, total health spending as a % of GDP does not consider the level of income: countries with lower GDP per capita may have similar levels of health expenditure as a % of GDP but spend less because their GDP per capita is lower.

This downside of the % of GDP as an indicator is mitigated by also using $USD PPP which more directly compares the amounts spent on health. $USD PPP per capita is an indicator that picks up differences in purchasing power of health systems. Having a per capita figure is essential to make historical and international comparisons that adjust for differences in population sizes, and population growth. Most international comparisons of health expenditure per capita use $USD PPP in preference to raw $USD figures. PPP takes expenditure measured in national currencies, converts these figures to $USD, adjusting for differences in domestic costs between countries. Thus, it gives a better comparable indication of how far spending will go. Throughout this report we advise some caution with the interpretation of $USD PPP figures, as it is not clear how the OECD has calculated New Zealand's $USD PPP figures from the $NZD health expenditure data provided to them.

In theory, PPP controls for differences in price levels and standards of living in different countries. However, this can only be an accurate estimate at one point in time. PPP is calculated infrequently, so between survey dates it is necessary to impute PPP rates. For example, in May 2024 new PPP rates related to International

Comparison Program (ICP) 2021 cycle were released; the previous data cycle was 2017.[83] This means that PPP may not accurately reflect inflationary periods. Note that countries experienced inflationary surges/recessions at different times post-pandemic and to varying degrees and for varying periods of time.

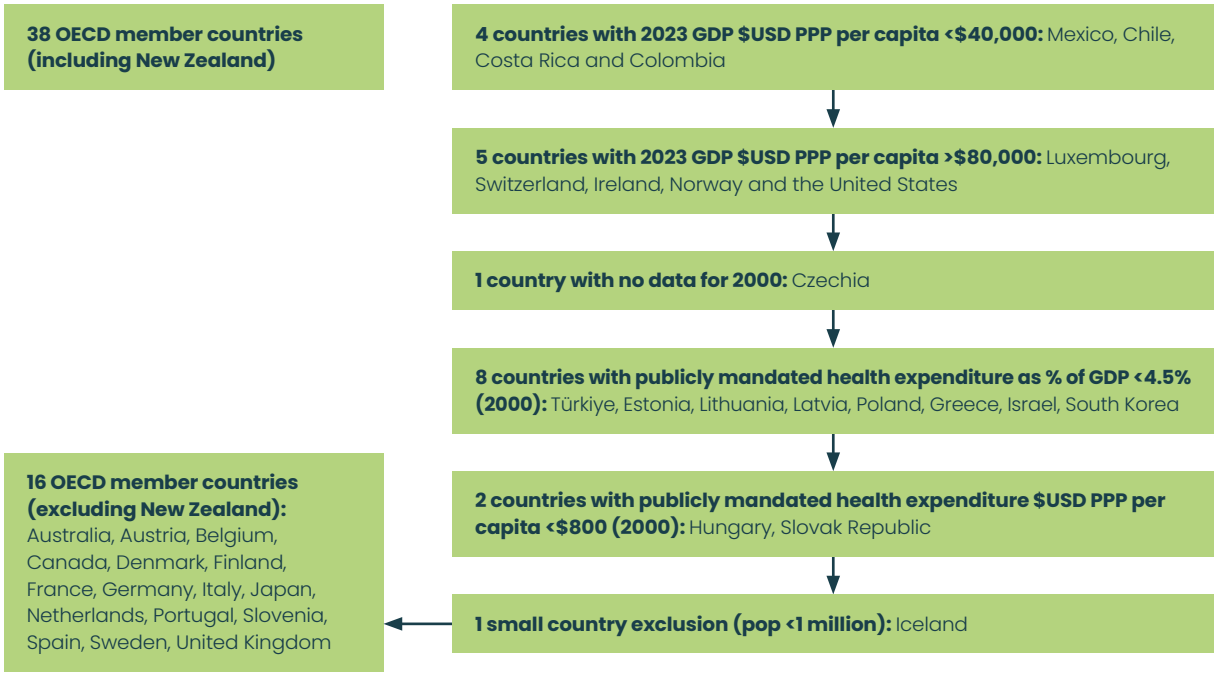
The central indicator we use in our analysis is publicly mandated health expenditure as a % of GDP. This anchors our selection of comparator countries, and our analysis of comparative historical trends. However, all five indicators outlined above contribute to our analysis.

3.3.4 Selection of comparator countries

Our aim in this analysis is to track how New Zealand's levels of total and publicly mandated health expenditure compare with similar countries. As outlined earlier, the most robust data for comparative purposes comes from the OECD. Some countries that may have been useful comparators are not part of the OECD.

There is no optimal way to pick comparator countries, given the variation in economic and social circumstances, and history of health system development. We have selected a subset of 16 of 38 OECD member countries to compare health expenditure data over the 2000-2023 period. The process of selection is detailed in Figure 1.

Figure 1: Selection of comparator countries



Although predominantly comprised of higher-income countries, the OECD is a diverse group with GDP per capita (USD PPP) ranging from just over $20,000 (Colombia) to just under $140,000 (Luxembourg). New Zealand's 2023 figure is $53,481.

Although predominantly comprised of higher-income countries, the OECD is a diverse group with GDP per capita (USD PPP) ranging from just over $20,000 (Colombia) to just under $140,000 (Luxembourg). New Zealand's 2023 figure is $53,481. Our first selection criteria for comparison was to select countries with GDP per capita (USD PPP) between $40,000 and $80,000.

Our second consideration was to select a group of comparator countries with a similar average level of publicly mandated health spending as a % of GDP in 2000, the beginning of our comparative timeframe. New Zealand's figure for 2000 was 5.83%. We removed eight countries with publicly mandated spending as a % of GDP less than 4.5% in 2000, and two countries above that threshold but with much lower publicly mandated health expenditure USD PPP per capita than the OECD average. We also removed one country (Iceland) because of its small population.

This left a group of 16 countries for comparison with an average level of publicly mandated health expenditure as a % of GDP of 5.99% - close to the New Zealand figure.

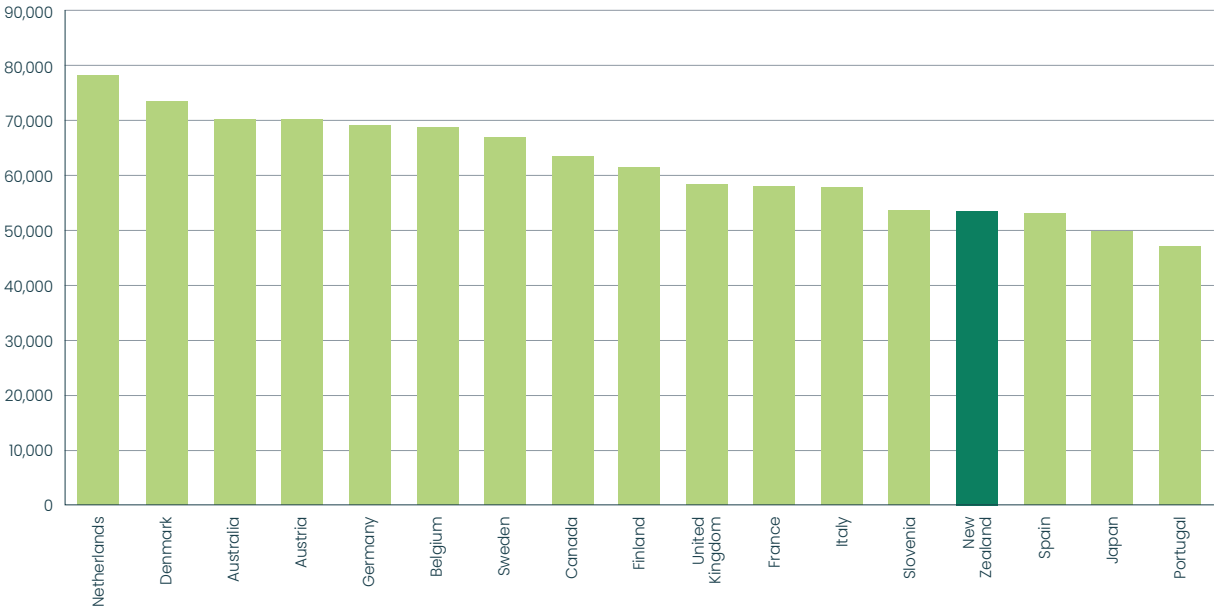
The comparator group contains nine tax-financed health systems (Australia, Canada, Denmark, Finland, Italy, Portugal, Spain, Sweden, UK) and seven mandatory insurance systems, of which six are SHI systems (Austria, Belgium, France, Germany, Japan, Netherlands). Slovenia is the only example of an NHI system.[84]

This provides a suitable basis to compare health expenditure trends of tax and mandatory health insurance systems. Many of these countries (e.g. UK, Australia, Canada) draw from the same international health workforce labour pool, so differences in levels of expenditure that translate into difference in remuneration are likely to affect recruitment in some professional roles in a time of global health workforce shortages.

While we include some data from the US to show an example of a predominantly privately financed health system, we have not included it in our multi-country average for comparing New Zealand, because it is such an outlier in terms of total health expenditure.

It is worth acknowledging the absence of Singapore, a country that frequently features as comparator nation for New Zealand because of its population size and its reliance on trade. Singapore could not be included because it is not an OECD member. Singapore's GDP per capita is twice that of New Zealand, so even if it was an OECD member it would have been excluded from our comparison on these grounds. Although private insurance is common among Singapore's wealthy and expats, the main form of health financing is a type of mandatory health insurance in the form of medical savings accounts. Medisave was introduced to encourage individuals, particularly young people, to accumulate personal savings for future healthcare expenses. In this respect it is similar to KiwiSaver.

Figure 2: GDP per capita – New Zealand and 16-country comparators 2023



Source: https://databank.worldbank.org/source/world-development-indicators#

3.3.5 OECD health expenditure data and consumption taxes

In preparing this report, we became aware of an issue that may affect the comparability of New Zealand's reported health expenditure to other countries. Consumption / sales taxes such as goods and services taxes (GST) or value-added taxes (VAT) are common tools for raising taxation revenue. In most countries, most of healthcare is not subject to consumption taxes (for example in the UK NHS prescriptions are VAT free, while private prescriptions have VAT added in the final price). New Zealand is highly unusual, however, because it has a GST regime in which health-related goods and services are not exempt. This means that private health expenditure, and ACC purchasing of health services attracts GST. However, there is no GST effectively applied to publicly funded health services provided by public sector organisations (i.e. public hospitals). For public and private health expenditure to be comparable when health services are not exempt from consumption tax, it is appropriate to add the GST rate of 15% to the taxation financed figures. This is also a reasonable approach when overall GDP figures are calculated in terms of market prices, as they are in New Zealand. Our communication with the Ministry of Health confirms that figures for tax-based expenditure submitted to the OECD have included GST.

In Table 5 below, we show the comparison between Treasury figures for Core Crown Expenses (CCE) for health and OECD reported figures which shows the addition of a nominal GST component in the OECD figures.

In Table 5 a small component of tax-based health expenditure that is transferred to ACC has been subtracted from the CCE figure to avoid counting this expenditure twice in the same set of accounts. Once this adjustment is made, there is a very close alignment between figures for CCE plus GST, and the OECD figures for tax-based expenditure (as reflected in the last row which presents the difference between these as a percentage).

Table 5: Comparison between OECD tax-funded health expenditure and Core Crown Expenses for health

Year, (NZD millions)	2011	2012	2013	2014	2015	2016	2017	2018
CCE Health	13,753	14,160	14,498	14,898	15,058	15,626	16,223	17,159
Payments to ACC	849	744	715	694	587	694	697	682
CCE Health minus ACC	12,904	13,416	13,783	14,204	14,471	14,932	15,526	16,477
Addition of GST	14,840	15,428	15,850	16,335	16,642	17,172	17,855	18,949
OECD Tax-based	14,802	15,297	15,731	16,247	16,591	17,438	18,044	19,307
(CCE Health minus ACC transfer) + GST as % of OECD tax-based health expenditure	100.3%	100.9%	100.8%	100.5%	100.3%	98.5%	99.0%	98.1%

Source: OECD Health Data, NZ Treasury
Note: Data in Table 5 is from years in which health expenditure data were submitted to the OECD.

This raises significant issues for the comparability of New Zealand's tax-based expenditure with other countries. A possible implication is that New Zealand's publicly mandated health expenditure has been consistently overestimated in OECD comparative data.

In 2023, Treasury's figure for CCE for health (ie tax-based expenditure) was $28.49 billion. The OECD estimate for tax-based expenditure was $32.05 billion New Zealand dollars.[vii] The difference – $ 3.54 billion – is 0.86% of GDP.

As none of the 16 countries in our comparison have a tax system in which GST is applied to most or all health spending, these countries are unlikely to have made adjustments to their tax-based health expenditure because all or most health services are exempt from GST.[85] There is no specific guidance about how to treat GST issues in the OECD System of Health Accounts, although there is general guidance around GST reporting for other OECD datasets. We have not found comparative health systems literature that identifies an issue with the comparability between countries that apply consumption taxes to health expenditure, and those where health is largely exempt.

This uncertainty regarding the international comparability of New Zealand's public expenditure on health, and the extent of any possible overestimation, requires further investigation.

3.3.6 New Zealand reporting to OECD (data post 2018)

In preparing this report, we learnt that the OECD has not received submissions on NZ health expenditure from the Ministry of Health since 2018. A recent OECD report noted that "with the exception of New Zealand, all OECD countries currently submit some data on health spending and financing based on the SHA 2011 core classifications."[86]

Between 2010 and 2018, the figures provided to the OECD by the Ministry of Health were treated as provisional, due to the loss of staff with the requisite expertise to compile the figures meeting the new 2011 OECD System of Health Accounts requirements.

With no data provided since 2018, the OECD made estimates for New Zealand based on available Treasury data on public expenditure on health and information from other OECD datasets for private

vii This figure is calculated by taking the overall estimate for publicly mandated health expenditure for 2023 ($36.4b) and dividing it into proportions for tax-based expenditure and ACC that are the same as the 2018 percentages. In 2018, tax-based expenditure comprised 88.05% of all publicly mandated health expenditure.

viii We outline how these estimates were calculated in sections 3.6.7 and 3.6.8 below.

health expenditure.[viii] These estimates did not separate public expenditure between taxation and mandatory insurance (ACC) and did not separate private expenditure between OOP and voluntary health contributions.

3.3.7 Taking COVID-19 into account

The other key issue in comparing New Zealand's recent pattern of health expenditure is the impact of the COVID-19 pandemic, particularly the timing of COVID-19-related health expenditure.

In analysing comparative data, we considered both including and removing COVID-19 expenditure. Within the OECD data, it was not possible to separate out COVID-19 expenditure, and in WHO data, figures that separated out COVID-19 health expenditure were available in only 10 of the 16 countries reported here.[82] The timing of the COVID-19 bulge is a critical factor to consider in any international comparison of health expenditure in the 2020s.

3.4 Comparing changes across time periods

Any comprehensive analysis of New Zealand's levels of health expenditure must take a historical approach, rather than a snapshot of any particular year. Often, there is year-to-year volatility in health expenditure data, so taking longer periods allows us to build a better historical overview rather than focusing on short-term ups and downs. Our comparative analysis begins in 2000, and we have divided this into three time periods: 2000-2009; 2009-2018 and 2018-2023.

During the 2000-2009 period, there was relatively high economic growth globally, and it was common for governments to expand health spending. The 2009-2018 marks the onset of the Global Financial Crisis of 2008 and its aftermath. The third period marks the impact of COVID-19. 2018 is a more appropriate baseline than 2019 because some COVID-19 spending was reported in 2019 figures for some countries.

In New Zealand, these time periods approximate major changes of government (although this is not the rationale for choosing these periods). They also reflect changes in how New Zealand health expenditure data has been reported (or not reported) to the OECD.

3.5 New Zealand's health expenditure in comparison

We start with a snapshot of the 2022 and 2023 OECD estimates of New Zealand's health expenditure, prior to outlining our reasons for arguing why these figures are overestimated in Sections 3.6.7. Using the average of all 38 OECD countries as the basis of comparison, the 2022 figures have been cited by the Ministry of Health as evidence that New Zealand's public funding of health is relatively high within the OECD. These claims were made in response to claims that the health system has been underfunded.[87]

In 2023, Treasury's figure for CCE for health (ie tax-based expenditure) was $28.49 billion. The OECD estimate for tax-based expenditure was $32.05 billion New Zealand dollars. The difference - $3.54 billion – is 0.86% of GDP.

Table 6: Comparison of OECD estimates for New Zealand with 16-country average

	Total health expenditure as % of GDP		Publicly mandated health expenditure as % of GDP		Total health expenditure $USD PPP per capita		Publicly mandated health expenditure $USD PPP per capita	
	2022	2023	2022	2023	2022	2023	2022	2023
New Zealand	11.3	11.0	9.1	8.8	$6,293	$6,368	$5,083	$5,111
16-country average	10.5	10.4	8.3	8.0	$6,276	$6,513	$4,966	$5,076
All OECD average	9.1	9.2	6.7	6.7	$5,300	$5,477	$4,100	$4,217

Source: OECD Health Data

We have argued above that the 16 countries are a more appropriate basis for comparison than the whole OECD. The figures in Table 6 suggest that New Zealand's total and publicly mandated health expenditure were above the 16-country average for % of GDP and were very close to the 16-country average for $USD PPP in 2022 and 2023. On face value, this data could also be interpreted to conclude that New Zealand's total health expenditure and publicly mandated health expenditure are on par with comparable countries.

The analysis that follows casts doubt on this interpretation. In addition to the issue raised in Section 3.3.5 regarding the treatment GST in New Zealand's figures, there are two other crucial questions that need to be addressed.

First, to what extent is this comparative picture shaped by the timing of COVID-19-related health expenditure? Second, given that New Zealand has not provided data to the OECD since 2018, and has only provided provisional data since 2011, how accurate are the OECD's estimates? What follows is a systematic approach to answering these questions that will show that the snapshot in Table 6 gives a highly misleading picture of how New Zealand's health expenditure compares with similar countries.

3.6 Comparative trends in historical context

3.6.1 Publicly mandated health spending as a % of total health spending

We start by tracking changes in public/private mix of health expenditure since 2000. New Zealand's overall balance between publicly mandated and private health expenditure fluctuated within a small range (between 77% and 83%) over the 2000-18 period. In 2000, it was 78%, rising to 81.1% in 2009 and dropping to 79.2% by 2018. Table 7 (below) shows that New Zealand sat consistently above the 16-country averages throughout the period. The general trend across our 16 comparator countries is a modest increase since 2000, with much of the increase occurring before 2009. Increases from 2018 to 2022 include COVID-19 related expenditure, most of which came from publicly mandated sources, so may not reflect a long-term trend.

Table 7: Publicly mandated health spending as % of total health spending

	2000	2009	2018	2022
Australia	68.4	69.3	69.6	72.6
Canada	70.0	70.3	69.7	71.2
Denmark	83.1	84.5	83.8	84.6
Finland	74.1	77.5	77.0	79.6
Italy	72.6	78.3	73.9	74.4
Portugal	69.8	63.9	61.2	62.5
Spain	71.4	75.1	70.2	74.0
Sweden	85.5	82.5	84.8	86.0
United Kingdom	75.4	82.4	79.2	82.4
Austria	75.5	75.1	74.7	77.6
Belgium	74.6	76.2	76.5	75.1
France	78.9	76.5	83.1	84.7
Germany	78.1	83.3	84.2	86.7
Japan	80.4	81.3	83.8	
Netherlands	69.0	83.2	82.1	84.2
Slovenia	72.9	73.1	72.8	74.0
United States	44.4	48.3	82.9	83.6
New Zealand	78.0	81.1	79.2	80.8
Average (non-US, NZ)	**75.1**	**77.3**	**76.9**	**78.3**
Tax based system average	**74.5**	**76.0**	**74.4**	**76.4**
Mandatory insurance system average	**76.6**	**81.1**	**83.3**	**85.2**

Source: OECD Health Data

3.6.2 Health expenditure as % of GDP

As indicated above, the treatment of GST in New Zealand's reported OECD data for health expenditure may mean that our tax-based health expenditure, which is historically, around 70% of total health expenditure, may be systematically overestimated for comparative purposes. The analysis that follows is based on the reported OECD data.

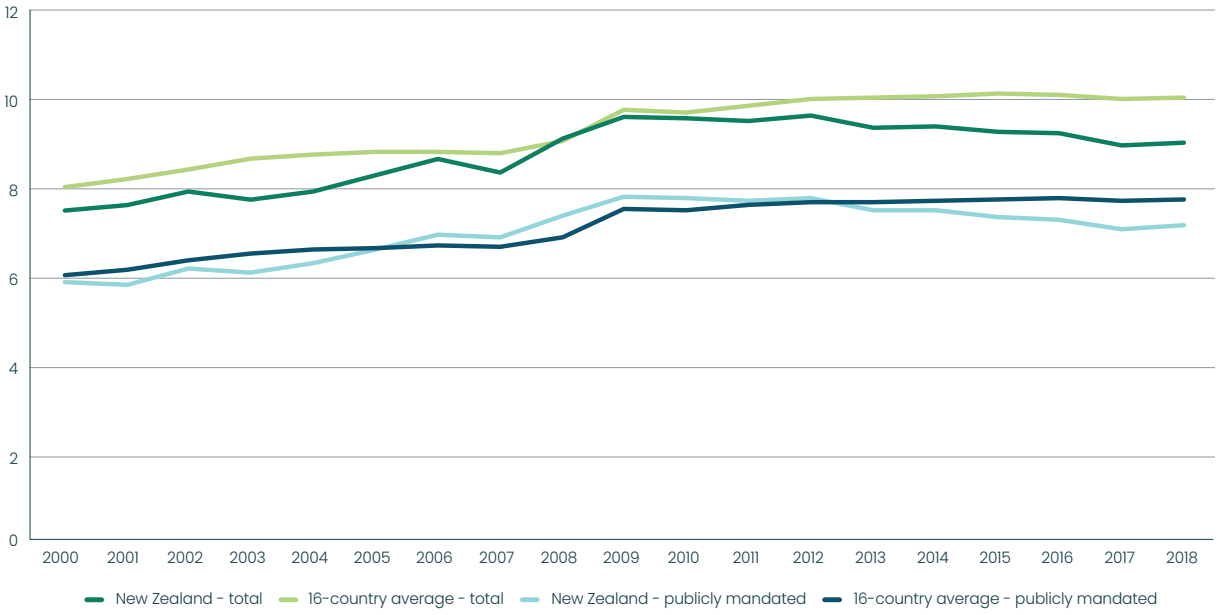
To build a historical picture, we focus initially on 2000-2018 when the Ministry of Health provided returns to the OECD. We explore the period after 2018 in Section 3.6.7.

3.6.2.1 Total health expenditure

Figure 3 shows the overall trends in total and publicly mandated health expenditures for New Zealand and the average of the 16 countries. In 2000, NZ health spending as a % of GDP (7.47%) was slightly below the average of the 16 comparator countries, which was 7.98%. We note that this figure is very close to Wang's estimate of the 'optimal' figure for health expenditure of 7.55% of GDP for the 1990-2009 period.[ix]

Between 2000 and 2009, the % of GDP spent on health in New Zealand increased at similar rates to other 16 countries. In 2009, NZ's figure (9.62%), was similar to the 16-country average of 9.78%.

Figure 3: Health spending as % of GDP (total and publicly mandated), 2000-2018



Source: OECD Health data

Figure 3 shows the growth pattern over this period, with gradual increases throughout the 2000s, with sharper increases in 2008-9 due to the impact of the Global Financial Crisis on national GDP figures.

The next period (2009-2018) captured the aftermath of the Global Financial Crisis of 2008. Over this period, the 16-country average % of GDP in 2018 was very close to the figure for 2009. However, by 2018 New Zealand's total health spend was 9.04% of GDP, considerably lower than the 16-country average of 10.05%.

ix 2000 was the midpoint of Wang's analysis.

Figure 4a: Total health expenditure as % of GDP, tax-based countries, 2009-2018

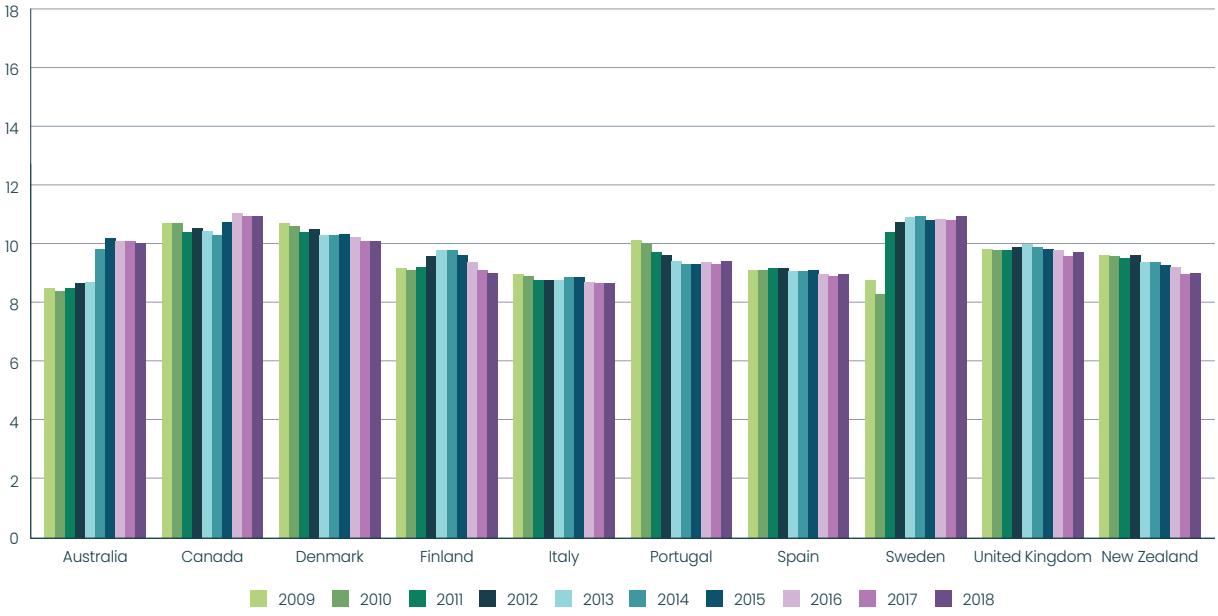
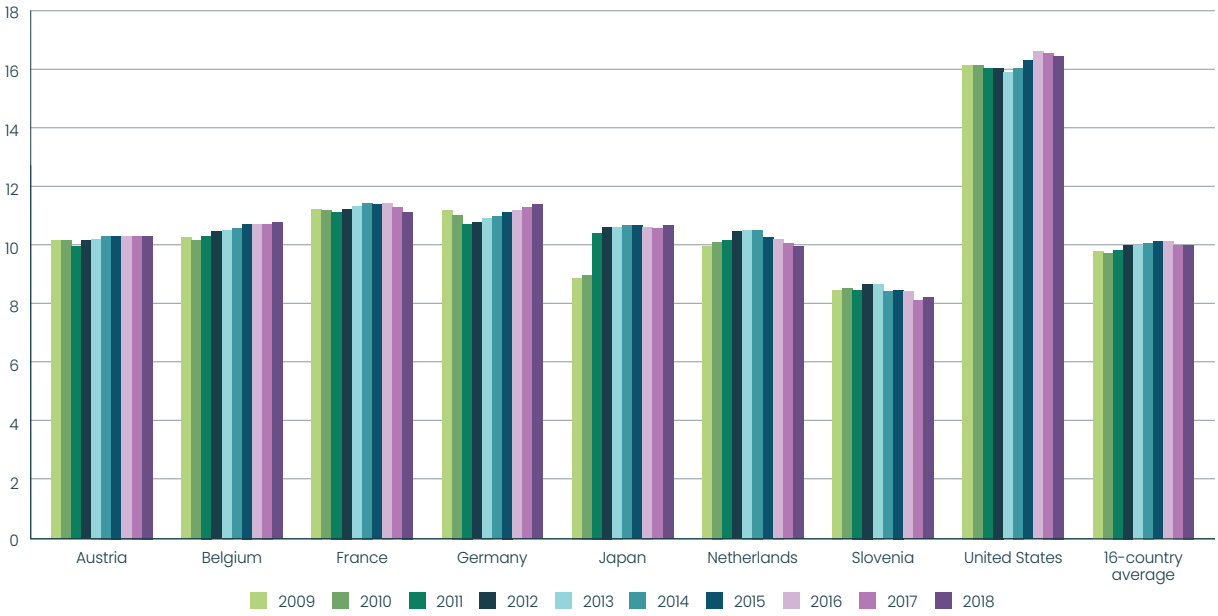


Figure 4b: Total health expenditure as % of GDP, insurance-based countries and 16 country average, 2009-2018



Source: OECD Health data

Figure 4 shows that of the tax-financed health systems, Denmark and Portugal experienced similar decreases to New Zealand between 2009-18.[x] Notably, Australia spent 8.54% of GDP on health in 2009, stayed around that level until 2013, after which it increased substantially to reach 10.05% in 2018. Total health spending as a % of GDP remained static or slightly increased in the other tax-financed systems, and in insurance-based systems.

x Reductions in % of GDP in the first few years after the GFC may be partly attributable to GDP 'rebounding' while health expenditure stayed constant.

New Zealand's drop in publicly mandated health expenditure as a % of GDP was also pronounced from 2009 and 2018. Across the 16 comparators, average publicly mandated health expenditure varied only slightly over that time and rose to 7.74% in 2018. However, by 2018 the NZ figure had dropped to 7.16% of GDP.

3.6.2.2 Publicly mandated health expenditure

As publicly mandated health expenditure is around 80% of all health expenditure in NZ, and between 70% and 85% in most comparator countries, the trends mentioned above will be dominated by trends in publicly mandated expenditure.

In 2000, New Zealand spent 5.83% of GDP on publicly mandated health expenditure, compared to the 16-country average of 5.99%. By 2009, these figures had risen to 7.8% for NZ, above the 16-country average of 7.54%.

New Zealand's drop in publicly mandated health expenditure as a % of GDP was also pronounced between 2009 and 2018. Across the 16 comparators, average publicly mandated health expenditure varied only slightly over that time and rose to 7.74% in 2018. However, by 2018 the NZ figure had dropped to 7.16% of GDP. (see Figure 3). The lowest figure during this period was 7.04% in 2017. Because of the comparability issue regarding GST, it is possible that New Zealand's figures for publicly mandated health expenditure as a % of GDP have been overestimated throughout the period of analysis.

Figure 5a: Publicly mandated health expenditure as % of GDP, tax-based countries, 2009-2018

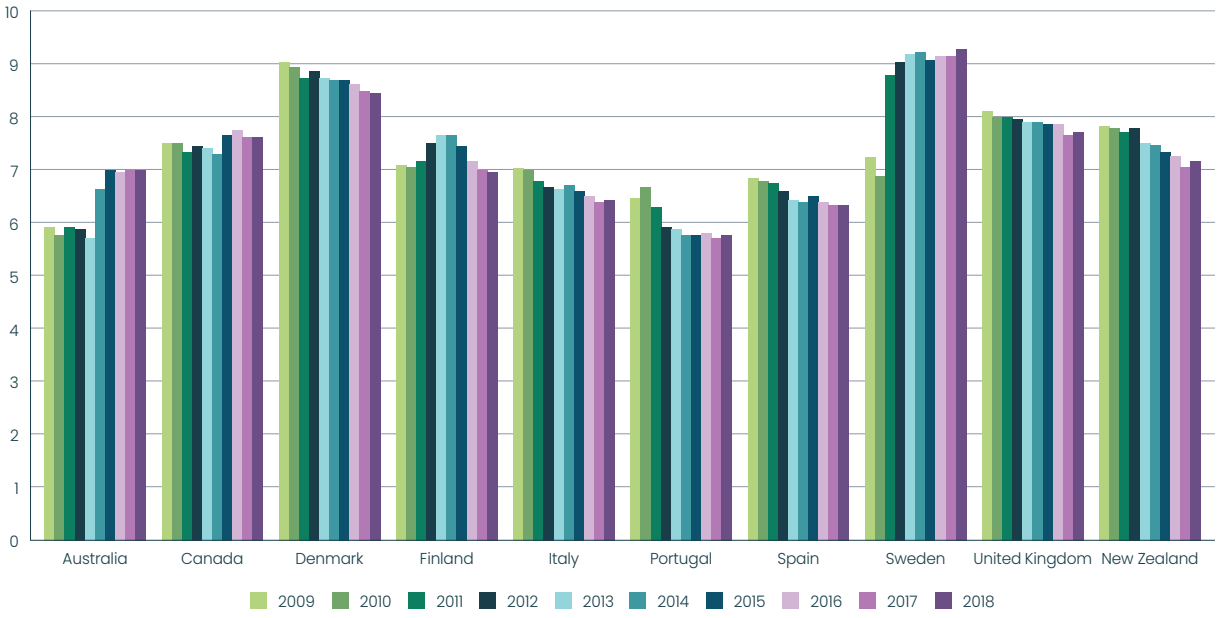
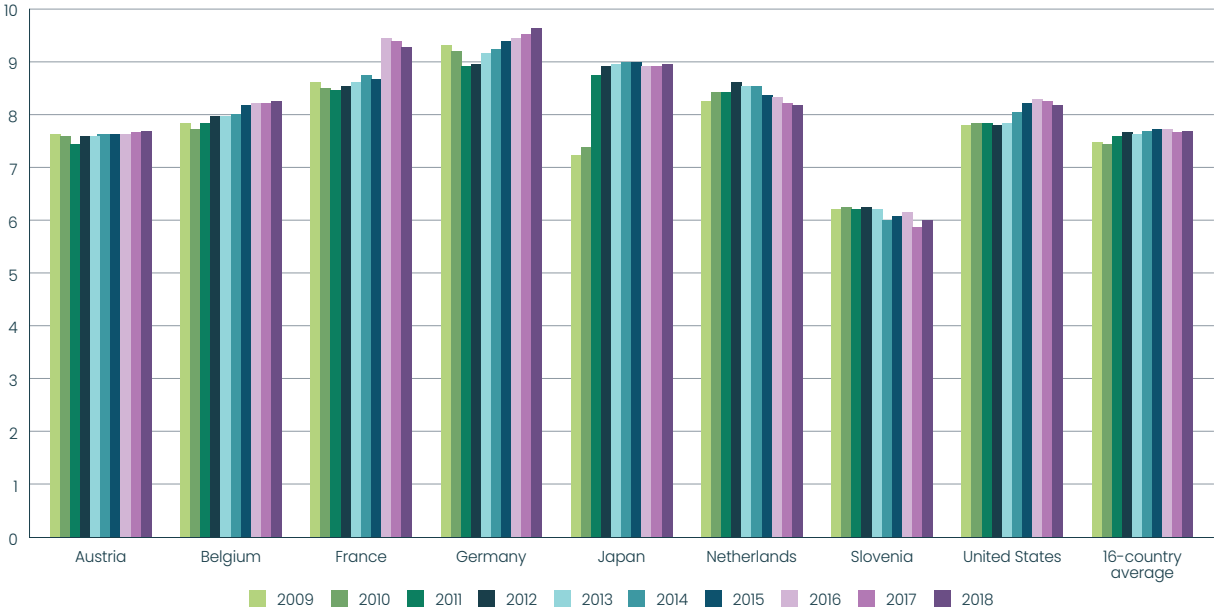


Figure 5b: Publicly mandated health expenditure as % of GDP, insurance-based countries and 16-country average, 2009-2018



Source: OECD Health data

There is significant variety between the shapes of 2009-2018 in tax-funded countries. Figure 5a shows that publicly mandated health expenditure as a % of GDP also decreased in Denmark, Italy, Portugal, Spain and the UK, but rose in Australia, Canada and Sweden.

3.6.2.3 Private health expenditure

Over the 2000 to 2018 period, private expenditure on health as a % of GDP in New Zealand increased slightly (from 1.64% to 1.88% of GDP), and at around the same pace as the 16-country average which increased from 1.99 to 2.32%. Figure 6 shows the variation between countries on private health expenditure as a % of GDP. The US figure is over 8% (this is not part of the 16-country average). None of the other 16 countries have levels anywhere near this figure.

Figure 6a: Private health expenditure as % of GDP, tax-based countries, 2009-2018

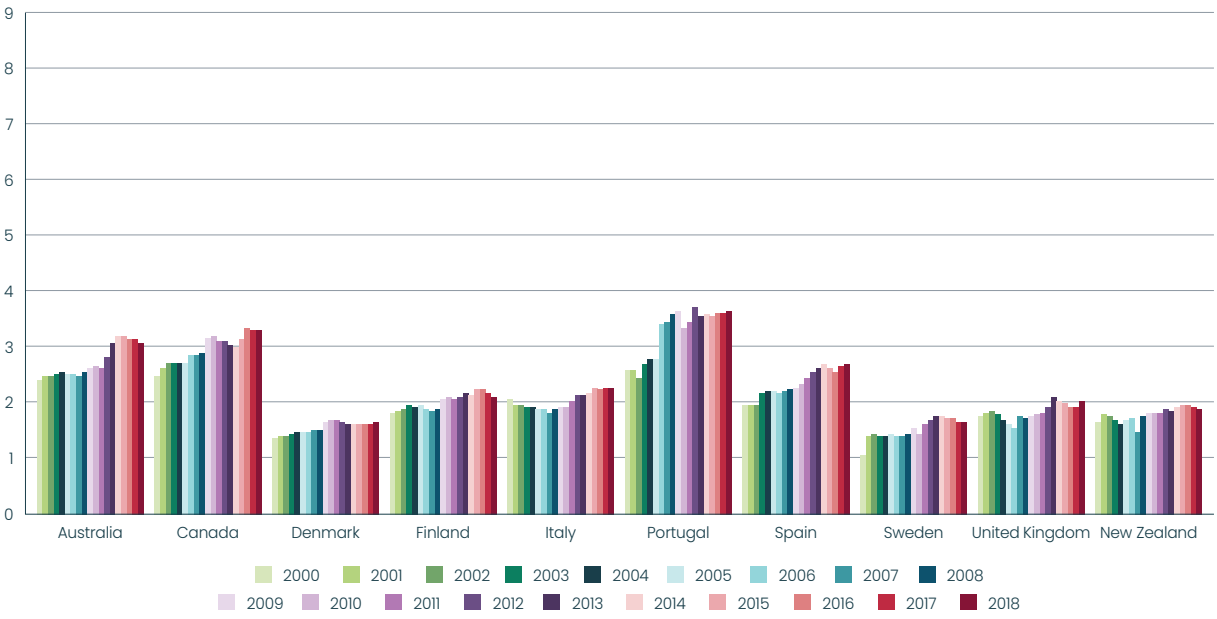
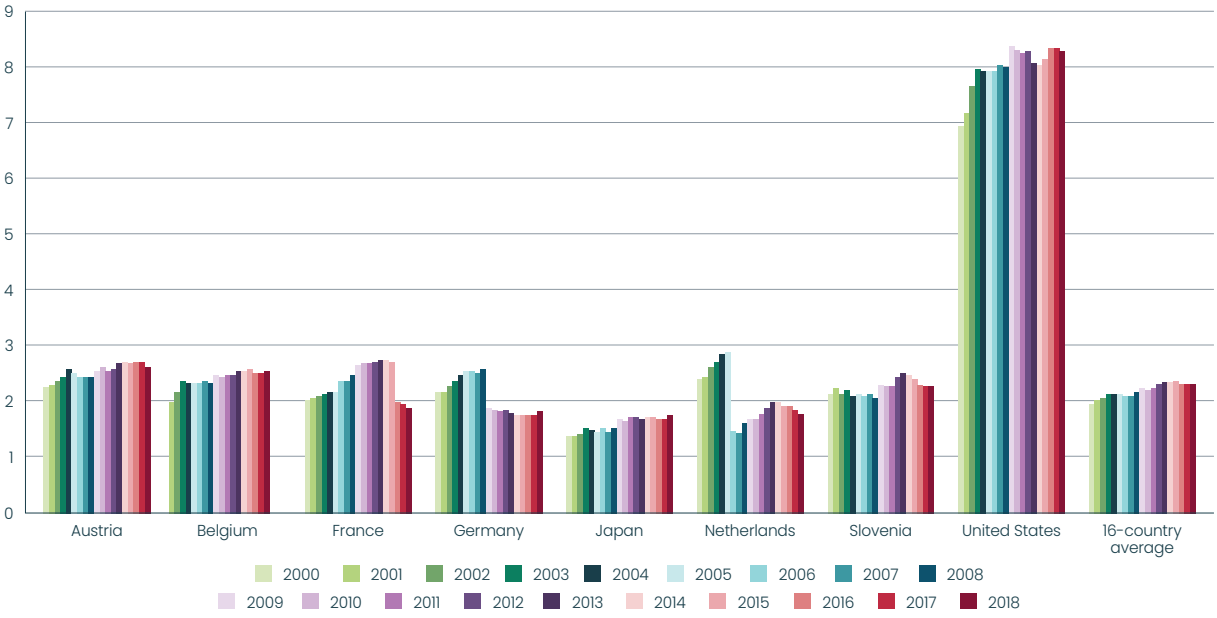


Figure 6b: Private health expenditure as % of GDP, insurance-based countries and 16-country average, 2009-2018



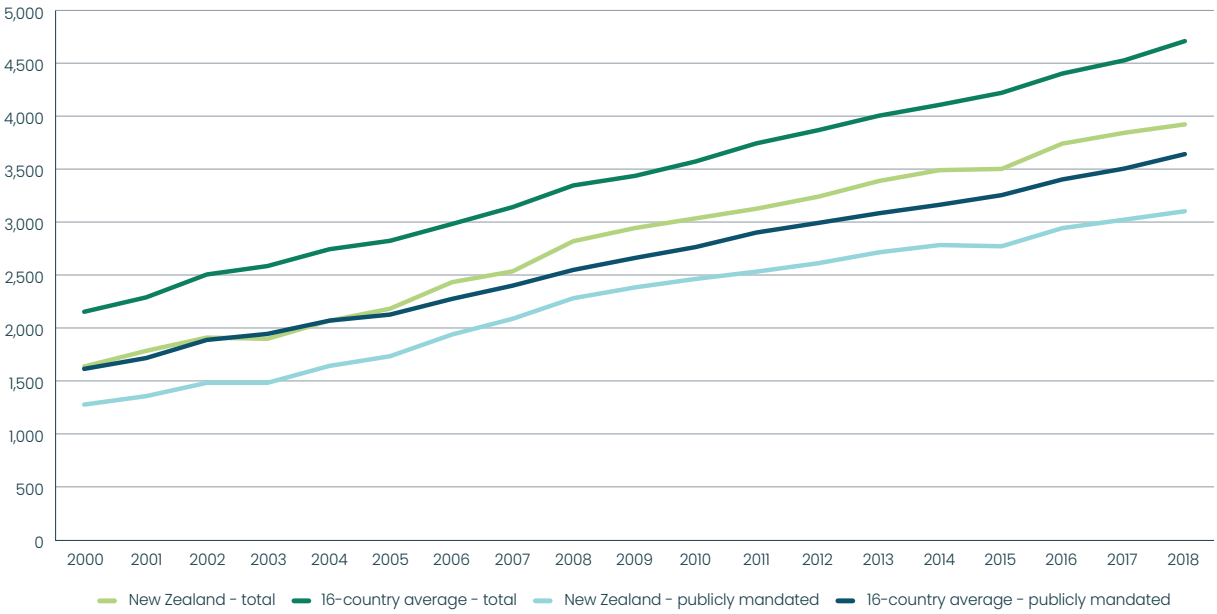
Source: OECD Health data

Of the tax-financed health systems, Australia, Canada, Portugal and Spain all have higher proportions of private health spending as a % of GDP compared to New Zealand. The mandatory insurance systems have similar or slightly higher levels of private health expenditure to New Zealand, whereas the US is a significant outlier amongst high-income countries with private health expenditure over 8% of GDP compared to an average of just over 2% for the 16 comparator countries.

3.6.3 Health expenditure $US PPP per capita

In terms of $US PPP per capita, New Zealand consistently spent less than comparator countries on health throughout the 2000-18 period. NZ started the century with health spending per capita at 76.4% of the 16-country average. By 2009, this had risen to 85.7%, but by 2018 had decreased to 83.2%.

Figure 7: Total and publicly mandated health expenditure: $USD PPP per capita, 2000-2018



Source: OECD Health data

In Table 8 we compare New Zealand's $US PPP per capita across between 2000 and 2018 to the 16-country average.

Table 8: Increases in $USD PPP per capita 2000-18 – total and publicly mandated

	2000	2009	2000-09 increase	2018	2009-18 increase	2000-18 increase
Total health expenditure						
16-country average	$2,172	$3,440	58.3%	$4,701	36.6%	116.4%
New Zealand	$1,659	$2,947	77.6%	$3,913	32.8%	135.8%
NZ as % of 16-country average	**76.4%**	**85.7%**		**83.2%**		
Publicly mandated health expenditure						
16-country average	$1,634	$2,665	63.1%	$3,640	36.6%	122.8%
New Zealand	$1,295	$2,389	84.6%	$3,100	29.7%	139.4%
NZ as % of 16-country average	**79.2%**	**89.7%**		**85.2%**		

Source: OECD Health Data

New Zealand's $US PPP increased by 77.6% between 2000 and 2009, compared to the 16-country average of 58.3%. Over the 2009-18 period, total health expenditure increased by 32.8% in NZ, less than the 16-country average of 36.6%. Over the whole 18 year period, New Zealand's total health expenditure in $US PPP increased by 135.8% compared to the 16-country average of 116.4%.

3.6.3.1 Publicly mandated health expenditure

The same pattern is evident in figures on % of GDP on publicly mandated health expenditure, with NZ's $US PPP figure at 79.2% of the 16-country average in 2000, rising to 89.7% in 2009 and falling to 85.2% ($USD 3100) of the 16-country average ($USD3640) in 2018. New Zealand's publicly mandated health expenditure grew by 29.7% compared to the 16-country average of 36.6% between 2009 and 2018.

Across the 2000-2018 period, New Zealand's growth in $US PPP per capita health expenditure (both total and publicly mandated) was higher than the 16-country average but started from a lower base.

3.6.3.2 Private health expenditure

For $US PPP per capita figures for private health expenditure increases in New Zealand were also higher than the 16-country average (Table 9). Private health expenditure increased by 53% from 2000 to 2009, and 45.7% from 2009 to 2018, compared to 16-country averages of 43.4% and 36.9%.

These figures also start from a lower base. In $US PPP terms, in 2000 New Zealand's amount of private health expenditure was 66.5% of the 16-country average and rose to 75.5% of the 16-country average by 2018 (71.9% in 2009).

Table 9: $USD PPP per capita – private health expenditure

	2000	2009	2000–09 increase	2018	2009–18 increase	2000–18 increase
Private health expenditure						
New Zealand	$365	$558	53.0%	$813	45.7%	122.8%
16-country average	$548	$786	43.4%	$1076	36.9%	96.3%
NZ as % of 16-country average	**66.5%**	**71.0%**		**75.5%**		

Source: OECD Health Data

3.6.4 Summary of the period 2000-2018

Throughout the first two decades of the 21st century, New Zealand spent less per person on health, primarily due to having lower levels of GDP per capita throughout. The gap narrowed somewhat in the 2000s, before widening again in the 2010s. As a proportion of GDP, both total and publicly mandated health spending in New Zealand was on par or slightly more than comparable countries throughout the 2000s but fell behind on this indicator by 2018. Thus the 2009-2018 period shows a comparative deterioration in publicly mandated expenditure on health. Private health expenditure in New Zealand increased to a similar extent to publicly mandated expenditure.

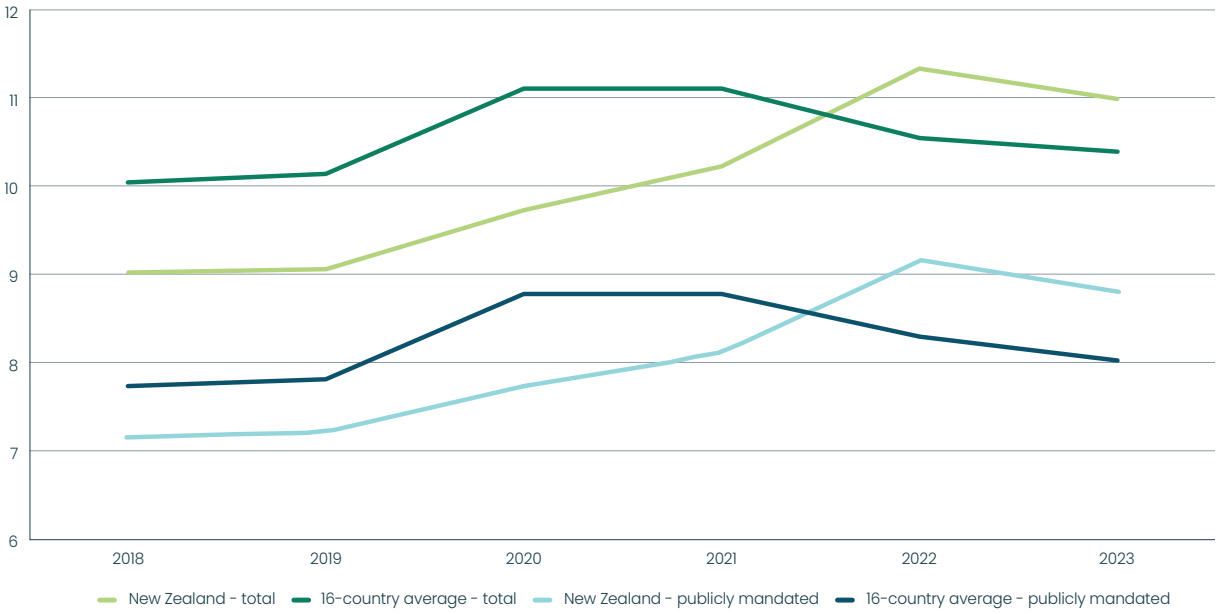
If the inclusion of GST in New Zealand's tax-funded health expenditure has consistently overestimated this component, the gaps between New Zealand and the 16-country average will have been even larger for both publicly mandated health expenditure $US PPP, and total health expenditure $USD PPP.

3.6.5 OECD estimates for 2018-2023

We now explore the comparison between OECD's estimates for New Zealand since 2018 when the last NZ figures were reported to the OECD, and how they compare to 16-country averages in this period.

Figure 8, based on the OECD's estimates for New Zealand suggests that NZ moved from being well below the 16-country average in 2018 to being well above it in 2023. The lines cross between 2021 and 2022.

Figure 8: Total and publicly mandated health expenditure as % of GDP, 2018-2023

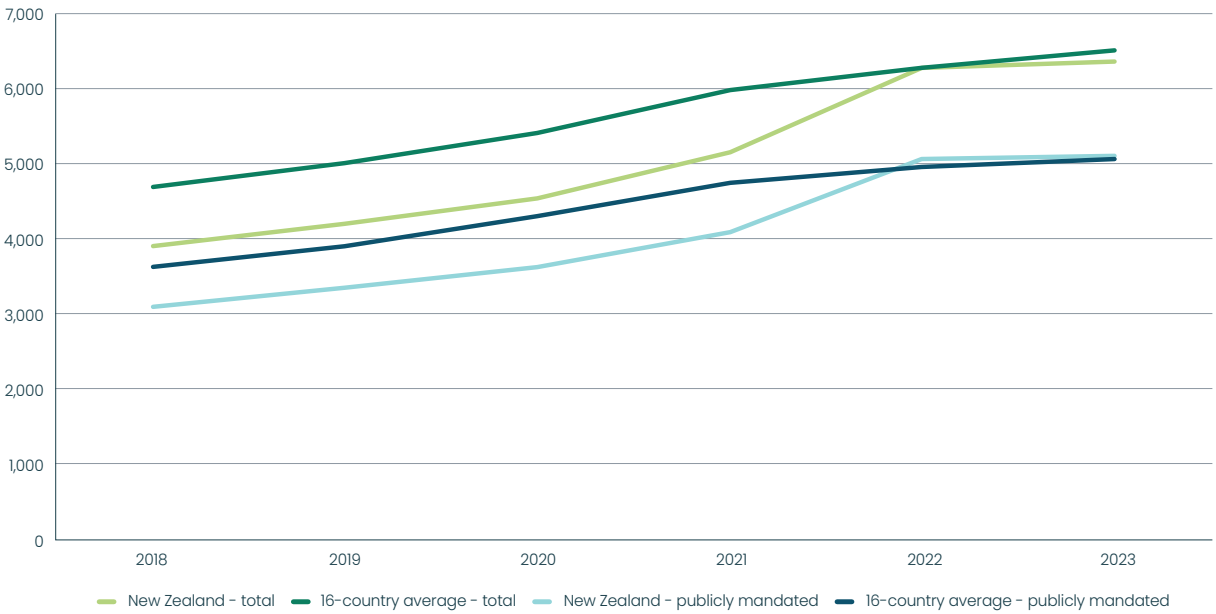


Source: OECD Health data

As reported earlier, the OECD estimate of 2023 total health expenditure as a % of GDP for New Zealand was 10.99%, well above the 16-country average of 10.39%, having risen from 9.0% in 2018. In historical and comparative terms, this is a large increase. The 2023 estimate for publicly mandated health spending as a % GDP was 8.80%, up from 7.16% in 2018, and well above the 16-country average of 8.04% for 2023.

The $USD PPP per capita figures (Figure 9) show that New Zealand's figures for total health expenditure and publicly mandated health expenditure moved from being well below the 16-country average to parity by 2022.

Figure 9: Total and publicly mandated health expenditure: $USD PPP per capita, 2018-2023



Source: OECD Health data

However, our analysis below shows why these OECD estimates for 2019-2023 are highly misleading for the purposes of historical and international comparisons.

3.6.6 The timing of the COVID-19 bulge

We first look at how these estimated figures are affected by the timing of COVID-19 related spending. The OECD figures do not separate out COVID-19-related health spending in their reporting, but there is data from the World Health Organisation for ten of the comparator countries that shows the pattern of expenditure over the early 2020s.

Table 10: Expenditure on COVID as % of current health expenditure

	2019	2020	2021	2022
Australia*	2.81	5.96	10.04	
Canada		11.08	11.44	2.68
Denmark		1.95	6.95	2.52
Finland		1.40	3.92	
Spain		7.0	6.0	
Austria		4.0	10.0	6.0
Belgium		5.0	4.0	2.0
France		3.56	4.66	2.19
Germany		4.22	6.55	7.38
Netherlands		9.37	9.78	3.48

Source: WHO data
*Figures from Australia are from 2019/20.

Table 10 shows that most comparator countries experienced a COVID-19 bulge in 2020 and 2021. To find the shape of the COVID-19 bulge in New Zealand, we looked for estimates of COVID-19-related health expenditure as a proportion of total tax-based health expenditure over the 2020-23 period.

Table 11: COVID-19 health expenditure as a % of tax-based expenditure (New Zealand)

	2020	2021	2022	2023
COVID as % of CCE health expenditure		5.53%	17.87%	7.41%
COVID as % of Vote Health (excluding disability support services)	5.16%	11.95%	24.24%	11.75%

Source: Core Crown Expense data, email from Treasury

Table 11 shows that the COVID bulge manifested in New Zealand data 1-2 years later than comparator countries. Because New Zealand was successful in preventing high rates of COVID-19 infections through a range of policies including lockdowns and strict quarantine in 2020 and 2021, the biggest effects of COVID-19 on health expenditure did not appear until 2022.[88]

There are two sets of NZ Treasury figures that estimate COVID-19 related health expenditure, and each set was collected for different purposes. The first row of the table is taken from Treasury's Core Crown Expenses (CCE) data, which provides an overview of the government's budget. The second set were provided by Treasury in response to an email request to provide a breakdown of Vote Health expenditure separating out COVID-19-related health expenditure. These figures include expenditure on treatment and hospitalisation of patients with COVID-19. Neither set of figures are directly comparable to the WHO figures reported above.[xi] Both sets of Treasury figures show that COVID-19 spending as a proportion of tax-based health expenditure peaked in 2022 and was still significant in 2023 compared to peaks in 2020 and 2021 for comparator countries.

Therefore, it would be very misleading to take 2022 and 2023 as indicative of how New Zealand compares to the 16-country average because the timing of the COVID-19 bulge significantly affects the comparison. In Section 3.6.7 below we will estimate the effect.

3.6.7 Accuracy of OECD estimates for publicly mandated expenditure 2019-2023

To address the reliability of the OECD estimates, we need to look separately at the OECD types of health expenditure and compare the estimates with other available data sources for New Zealand. Although domestic data sources do not follow OECD definitions, analysing their rate of increase over time provides a reference point to compare the OECD estimates. For publicly mandated expenditure, there is better data available than for private expenditure.

The first step is to attempt to reconcile health expenditure data from New Zealand government sources with OECD figures. For publicly mandated health expenditure, the OECD based their estimates on Treasury's Core Crown Expenses (CCE). They took the year-on-year increases in CCE health spending from 2018 onwards and imputed these increases to all publicly mandated health expenditure. This means that the 2019 OECD estimate ($20.55b) was 6.46% higher than the provisional figures for 2018 that the Ministry of Health provided ($19.307b) because CCE health spending increased by 6.46% from 2018 to 2019. The same estimation technique was used each subsequent year (see Table 12).

xi They are for tax-funded expenditure only and will not have used the same methodology as the WHO

Table 12: Publicly mandated health expenditure estimates New Zealand 2018-23

(NZD millions)	2018	2019	2020	2021	2022	2023	2018-2023 increase
Core Crown Expenses (Treasury)	17,159	18,268 (6.46%)	19,891 (8.88%)	22,784 (14.54%)	27,781 (21.93%)	28,489 (2.55%)	66.0%
OECD tax-based estimates	19,307	*20,554 (6.46%)*	*22,380 (8.88%)*	*25,635 (14.54%)*	*31,258 (21.93%)*	*32,054 (2.55%)*	*66.0%*
OECD ACC estimate	2,621	*2,790 (6.46%)*	*3,038 (8.88%)*	*3,480 (14.54%)*	*4,243 (21.93%)*	*4,351 (2.55%)*	*66.0%*

Figures in italics are estimates, figures in brackets indicate increase from previous year.

Table 12 shows different sources of information regarding tax-funded and ACC health expenditure over the 2018-23 period. We have already drawn attention to the inclusion of GST in OECD figures for tax-based health expenditure in all years covered in this analysis. This also is reflected in Table 12. This would mean that the OECD figures for tax-based expenditure for 2019 onwards may also be significant overestimates for comparative purposes. However, we are unable to estimate the extent of any possible overestimate.

We have, however, attempted to calculate the extent to which COVID-19 expenditure and figures for mandatory insurance (ACC) have been overestimated.

We sought figures from Treasury to estimate the degree of COVID-19 health expenditure over the 2020-2023 period. Figures from Core Crown Expenses indicate COVID-19 spending that was appropriated in the annual budget cycle. Treasury also provided internal calculations of the costs of providing COVID-19 related health services between 2022 and 2023.

Table 13: Treasury data on COVID-19 expenditure

(NZD millions)	2020		2021		2022		2023	
	$NZD (m)	%GDP	$NZD (m)	%GDP	$NZD (m)	%GDP	$NZD (m)	%GDP
GDP	329,682	100.00%	359,444	100.00%	388,941	100.00%	412,355	100.00%
Taxation								
OECD estimate for NZ	22,380	6.79%	25,635	7.13%	31,258	8.04%	32,054	7.77%
COVID-19 spending - Core Crown Expenses	-	0.00%	1,261	0.35%	4,965	1.28%	2,112	0.51%
COVID-19 related health services spending - Treasury calculations	914	0.28%	2,421	0.67%	6,365	1.64%	3,047	0.74%

These two figures for COVID-19 expenditure enable us to identify the impact of COVID-19 on health spending as a % of GDP. COVID-19 spending accounted for between 1.28% and 1.64% of GDP in 2022. For 2023, that component had reduced to between 0.51% and 0.74%.

Because the OECD provided a single estimate for publicly mandated health expenditure, their estimates for ACC expenditure assume the same pattern of increase as for tax-based funding. However, as government health spending on COVID-19 was channelled through Vote Health, we would not expect COVID-19 to affect ACC expenditure to the same degree as it affects tax-sourced health spending.

We sought data on ACC health expenditure that was comparable over time, so that we could track the increase over the 2018-23 period and compare it to the OECD Estimates. This data was available in tables published in ACC Annual Reports dating back to 2011[xii].[89] From these tables we included expenditure on medical treatment, social rehabilitation, public health acute services (i.e. public hospitals and specialists) and elective surgery (private hospital and specialists), but excluded income support.

Table 14: Comparison between OECD estimates for mandatory insurance (ACC) and ACC annual report data

(NZD millions)	2018	2019	2020	2021	2022	2023	2018–2023 increase
OECD data estimates from 2019 onwards, (increase from previous year)	2,621	*2,790 (6.46%)*	*3,038 (8.88%)*	*3,480 (14.54%)*	*4,243 (21.93%)*	*4,351 (2.55%)*	66.0%
ACC annual reports	2,507	2,615 (4.31%)	2,953 (12.93%)	3,005 (1.76%)	3,473 (15.57%)	3,990 (14.89%)	59.2%
ACC annual reports as % of OECD figures	95.7%	93.7%	97.2%	86.4%	81.9%	91.7%	
Lower imputed figure (95%)	**2,639**	**2,753 (4.31%)**	**3,108 (12.93%)**	**3,163 (1.76%)**	**3,656 (15.57%)**	**4,200 (14.89%)**	**59.2%**
Higher imputed figure (97.3%)	**2,577**	**2,688 (4.31%)**	**3,035 (12.93%)**	**3,088 (1.76%)**	**3,569 (15.57%)**	**4,101 (14.89%)**	**59.2%**
Lower overestimate (Row 1 minus Row 4)	37	-71	317	587	151		
Overestimate as % of GDP	0.01%	-0.02%	0.09%	0.15%	0.04%		
Higher overestimate (Row 1 – Row 5)	**102**	**3**	**391**	**673**	**250**		
Overestimate as % of GDP	**0.03%**	**0.00%**	**0.11%**	**0.17%**	**0.06%**		

Source: OECD data, ACC Annual Reports
Figures in italics are estimates, figures in brackets indicate increase from previous year

xii In the 2024 Annual Report, this data is reported in Table 14 on p88. This table can be found in Annual Reports dating back to 2011. The table number varies across these reports.

OECD estimates suggest an increase of 66% in ACC expenditure between 2018 and 2023. Data from ACC Annual Reports indicated a 59% increase over that period (see Table 14).

However, based on our analysis, the OECD figures overestimate ACC expenditure from 2020 onwards. When we compared historical ACC Annual report figures with reported OECD figures, the ACC Annual Report figure was between 95% and 102% of the OECD figure from 2011-18. The OECD estimates for 2019 and 2020 were within this range. However, in the COVID-19 years, ACC Annual report figures were 86.3% of the OECD estimates in 2021, 81.9% in 2022 and 90.7% in 2023 – considerably lower than the historical ratios. This is most likely because the OECD's estimates based on Core Crown Expense budget data includes COVID-19 expenditure. Because ACC covers accident-related expenditure, and COVID-19 expenditure is medical, there is no convincing reason to expect equivalent increases in ACC figures.

We calculated the degree of overestimate using two figures. Our first, more conservative calculation divided the ACC Annual Report figure by 95% (reflecting the lower end of the 2011-2018 range of ratios). Our second calculation divided the Report figures by 97.3% (the average of the ratio between 2011 and 2018). This gave us a range of the likely overestimate.

From this we calculate that that the OECD 2021-23 figures for ACC expenditure were overestimated by between $317m and $391m in 2021, between $587m and $673m in 2022, and between $150m and $250m in 2023 (see Table 14).

So how does the COVID-19 bulge and the ACC overestimate affect the OECD estimates of New Zealand health expenditure? In Table 15, we combine information about the COVID-19 bulge, and the possible ACC overestimates to calculate underlying figures for health spending as a % of GDP for 2020-2023.

However, based on our analysis, the OECD figures overestimate ACC expenditure from 2020 onwards... This is most likely because the OECD's estimates based on Core Crown Expense budget data includes COVID-19 expenditure.

Table 15: Effects of COVID-19 expenditure and ACC overestimates on health spending as % of GDP (total and publicly mandated)

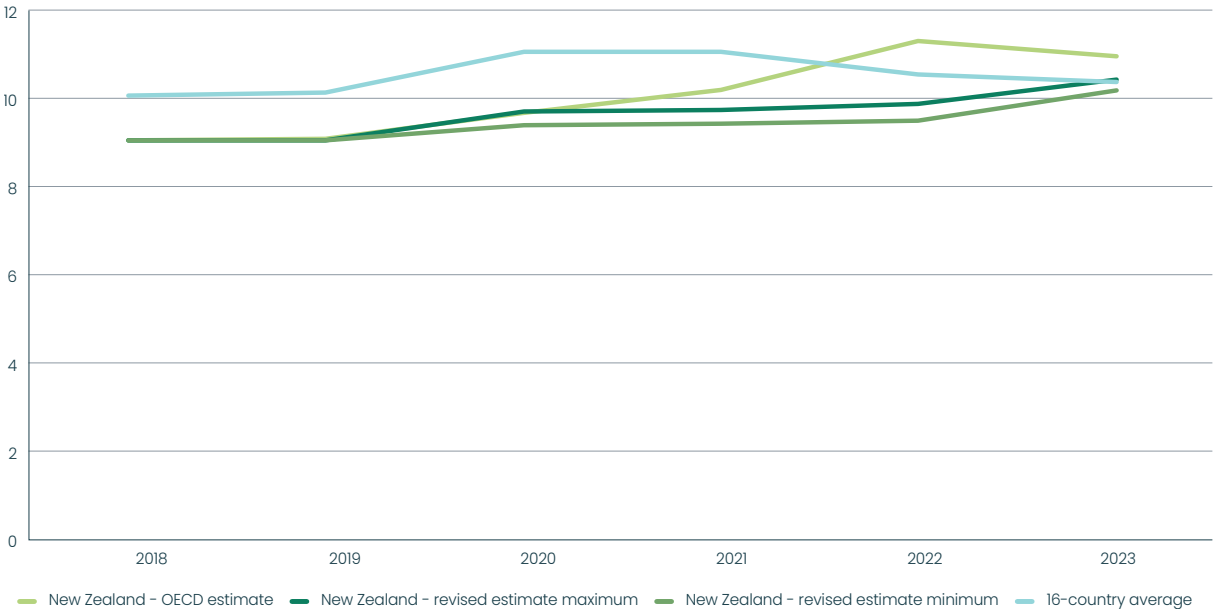
(NZD millions)	2020		2021		2022		2023	
	$NZD (m)	%GDP	$NZD (m)	%GDP	$NZD (m)	%GDP	$NZD (m)	%GDP
GDP	329,682	100%	359,444	100%	388,941	100%	412,355	100%
Taxation								
OECD estimate for NZ	*22,380*	6.79%	*25,635*	7.13%	*31,258*	8.04%	*32,054*	7.77%
Covid-19 spending - core crown expenses	-	0.00%	1,261	0.35%	4,965	1.28%	2,112	0.51%
Covid-19 related health services spending - Treasury calculations	914	0.28%	2,421	0.67%	6,365	1.64%	3,047	0.74%
ACC								
OECD estimate for NZ	*3,038*	0.92%	*3,480*	0.97%	*4,243*	1.09%	*4,351*	1.06%
Lower overestimate	-71	-0.02%	317	0.09%	587	0.15%	151	0.04%
Higher overestimate	3	0.00%	391	0.11%	673	0.17%	250	0.06%
Total publicly mandated spending (taxation + ACC)								
OECD estimate for NZ	*25,418*	7.71%	*29,115*	8.10%	*35,501*	9.15%	*36,405*	8.83%
Maximum adjustment	24,501	7.43%	26,303	7.32%	28,462	7.32%	33,108	8.03%
Minimum adjustment	25,489	7.73%	27,538	7.66%	29,949	7.70%	34,142	8.28%
OECD 16-country average		8.77%		8.77%		8.29%		8.04%
Total health spending								
OECD estimates for NZ	31,920	9.68%	36,663	10.20%	43,950	11.32%	45,359	10.99%
Maximum adjustment	31,003	9.40%	33,851	9.42%	36,912	9.51%	42,062	10.19%
Minimum adjustment	31,990	9.70%	32,273	9.76%	31,360	9.89%	43,096	10.44%
OECD 16-country average		11.09%		11.09%		10.54%		10.39%

Source: OECD data, ACC Annual Reports
Figures in italics are estimates. Minimum adjustment subtracts the lower COVID-19 and lower ACC overestimate figures from the OECD estimate. Maximum adjustment subtracts the higher COVID-19 and higher ACC overestimate figures from the OECD estimate.

From Table 15, the revised estimates are that total health expenditure was between 9.51% and 9.89% of GDP in 2022, compared to the OECD estimate of 11.32%. For 2023, total health expenditure is estimated to be between 10.19% and 10.44%, rather than 10.99%.

Figure 10 shows how the comparison with the 16-country average for total health expenditure as a % of GDP differs from the OECD estimates once adjusted for the COVID-19 bulge and ACC overestimates. The comparative picture looks very different, particularly for 2022.

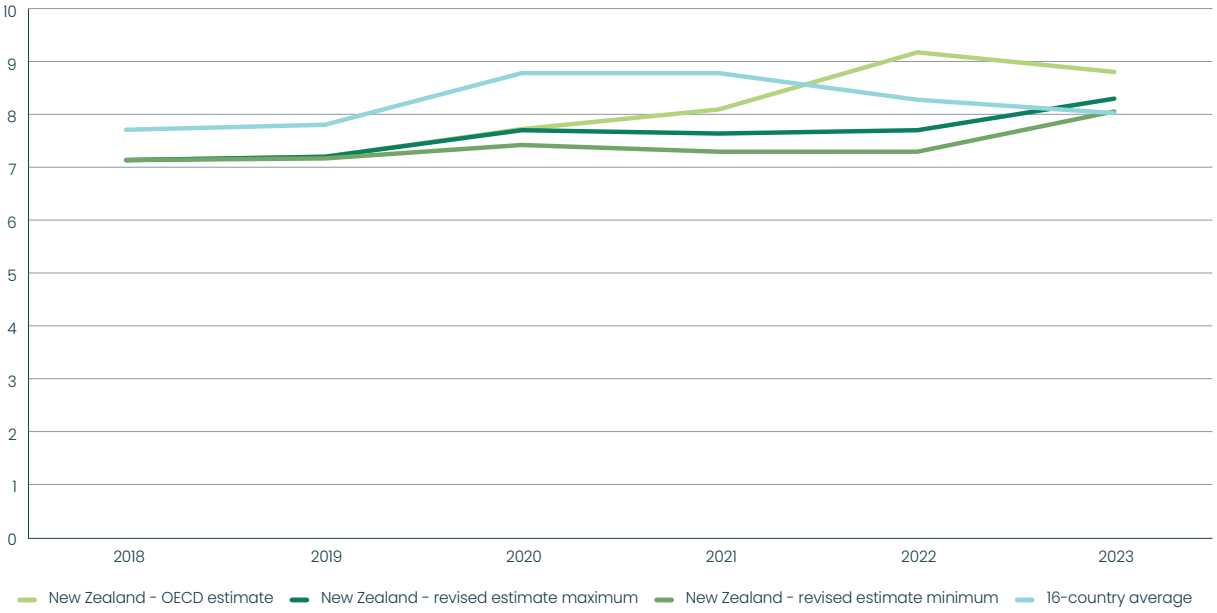
Figure 10: Total health expenditure as % of GDP, 2018-2023 - revised comparison



Note: The 16-country average figures for 2022 and 2023 will include the tail-end of COVID-19 pandemic expenditure.

Taking into account both the COVID-19 bulge in the taxation figures and the likely OECD overestimate of ACC expenditure, total health spending as a % of GDP would be between 9.51% and 9.89% for 2022, and between 10.19% and 10.44% for 2023. This adjusted estimate of New Zealand's total health expenditure as % of GDP was similar to the 16-country average in 2023 (10.39%).

Figure 11: Publicly mandated health expenditure as % of GDP, 2018-2023 - revised comparison



Note: The 16-country average figures for 2022 and 2023 will include the tail-end of COVID-19 pandemic expenditure.

Figure 11 shows a similar picture for publicly mandated health expenditure. For publicly mandated health expenditure in 2022, our revised estimate places this figure between 7.32% and 7.7% for 2022, compared to the OECD estimate of 9.15%. For 2023, the range is 8.03% to 8.28% (OECD estimate 8.83%). This is equivalent to or slightly above the 16-country average of 8.04% (which is likely to still contain an element of residual COVID expenditure).

In Table 16 below, we have updated Table 6 using the re-estimated figures for % of GDP and for $USD PPP per capita.

Table 16: Comparison of re-estimates for New Zealand with 16-country average

	Total health expenditure as % of GDP		Publicly mandated health expenditure as % of GDP		Total health expenditure $USD PPP per capita		Publicly mandated health expenditure $USD PPP per capita	
	2022	2023	2022	2023	2022	2023	2022	2023
New Zealand OECD	11.3	11.0	9.1	8.8	$6,293	$6,368	$5,083	$5,111
New Zealand re-estimate*	9.7	10.3	7.5	8.2	$5,391	$5,977	$4,173	$4,736
16-country average	10.5	10.4	8.3	8.0	$6,276	$6,513	$4,966	$5,076
All OECD average	9.1	9.2	6.7	6.7	$5,300	$5,477	$4,100	$4,217

Note: Mid-point of maximum and minimum adjustments reported in Table 15.

While it is beyond our brief to go into detail about how tax-financed health expenditure is allocated, we note that government Budgets in the early 2020s contained increased levels of new investment in the health system over and above cost pressures. We also note that a significant component of the increases in tax-based health expenditure in early 2020s includes funding to address historical pay disparities, and remediation of historical underpayment due to incorrect interpretation of the Holidays Act. These components contribute to the uptick in tax-based expenditure in 2023, after COVID-19 is excluded.

The adjustments to OECD figures for New Zealand do not take into account the possible effect of including GST in New Zealand's tax-based expenditure figures for comparative purposes.

3.6.8 Trends in private health expenditure

We are unable to explore the trends for private health expenditure in as much detail, given the difficulties of finding appropriate data against which to compare the OECD estimates for New Zealand.

Table 16 shows OECD estimates of increases in private expenditure from the 2018 to 2023 period. For these figures, the OECD based its estimates on Stats NZ data on household expenditure data provided to the OECD (COICOP).[90] It took the year-to-year increases in this figure from 2018.

Table 17: Private health expenditure – OECD estimates and NZ data

(NZD millions)	2018	2019	2020	2021	2022	2023	2018-2022 increase	2019-2023 increase	2018-2023 increase
COICOP year-on-year increases		3.73%	8.99%	16.10%	11.94%	5.97%			
OECD total private expenditure*	5,750	*5,965*	*6,501*	*7,548*	*8,450*	*8,954*	*46.94%*		*55.7%*
OECD out-of-pocket	3,574	*3,707*	*4,040*	*4,691*	*5,251*	*5,565*	*46.94%*		*55.7%*
NZ Health Expenditure Survey		3841				5058		31.68%	
OECD voluntary health contributions	2,177	*2,258*	*2,461*	*2,857*	*3,199*	*3,390*	*46.94%*		*55.7%*

Figures in italics are estimates, figures in brackets indicate increase from previous year.

As with publicly mandated spending, the OECD only provides a single estimate for private expenditure for New Zealand, not distinguishing between OOP and voluntary health contributions. We separated out these figures by taking the baseline OECD figures from 2018 and applying the year-on-year increases.

The OECD estimated that private health expenditure in New Zealand increased by 55.7% over the 2018 to 2023 period, with 2023 estimates much higher than 2022, when private health spending was estimated as 46.9% higher than 2018.

3.6.8.1 Out of pocket payments

OOP payments are the larger contributor to private expenditure. We looked at NZ Household Expenditure Survey (HES) figures to provide a comparator dataset on OOP health expenditure. These surveys were conducted in 2019 and 2023, so we are comparing this four-year increase to the 2018-22 estimated increase in OECD figures. HES figures indicate an estimated increase of 31.6% (from $3.84 to $5.06 billion) over that period – a lower rate of increase than the OECD estimate of 46.9%.

3.6.8.2 Voluntary health contributions

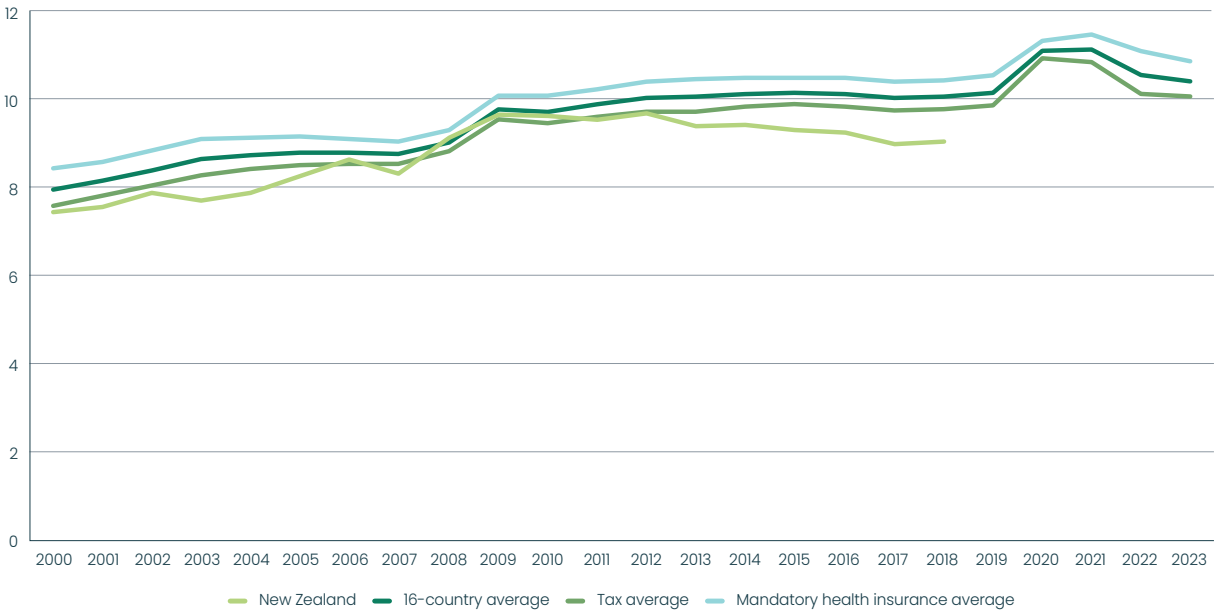
We do not have easily comparable data for increases in private insurance and other (philanthropic) expenditure. The OECD estimates suggest that this expenditure was around $3.2b in 2022, and $3.39b in 2023, up from $2.18b in 2018. The Financial Services Council (representative body for private health insurers) have indicated that private insurers spent $2.5b on health services in 2023 (personal communication). The FSC represents all but one health insurer, and does not cover philanthropic health expenditure, which has generally been around 1% of health spending (0.1% of GDP).

To compare with the other 16 countries, we used 2022 figures because 2023 figures for private health expenditure were not available for most countries. Increases in private health expenditure in the comparison 16 countries were within a range of 8% and 26% between 2018 to 2022. Of this group, Australia had the highest increase (26%). New Zealand's estimated figure of nearly 47% is considerably higher than all other countries. However, we are unable to confidently evaluate whether New Zealand's figures for private health expenditure are overestimated. If so, this would not constitute more than 0.2% of GDP (most likely less). Because of the paucity of data and the minimal effects of an overestimate, we have not provided adjusted estimates for private health expenditure.

3.6.9 Are health expenditure trends different for different financing types?

Figure 12 shows that the average total health expenditure as a % of GDP was consistently higher for mandatory insurance countries by at least 0.5%. Within our selection of 16 countries, mandatory insurance countries averaged 10.84% of GDP spent on health in 2023, compared to tax-financed countries which averaged 10.04%. On this indicator, New Zealand increasingly fell behind the 16-country average, and the average for tax-financed countries, during the 2010s.

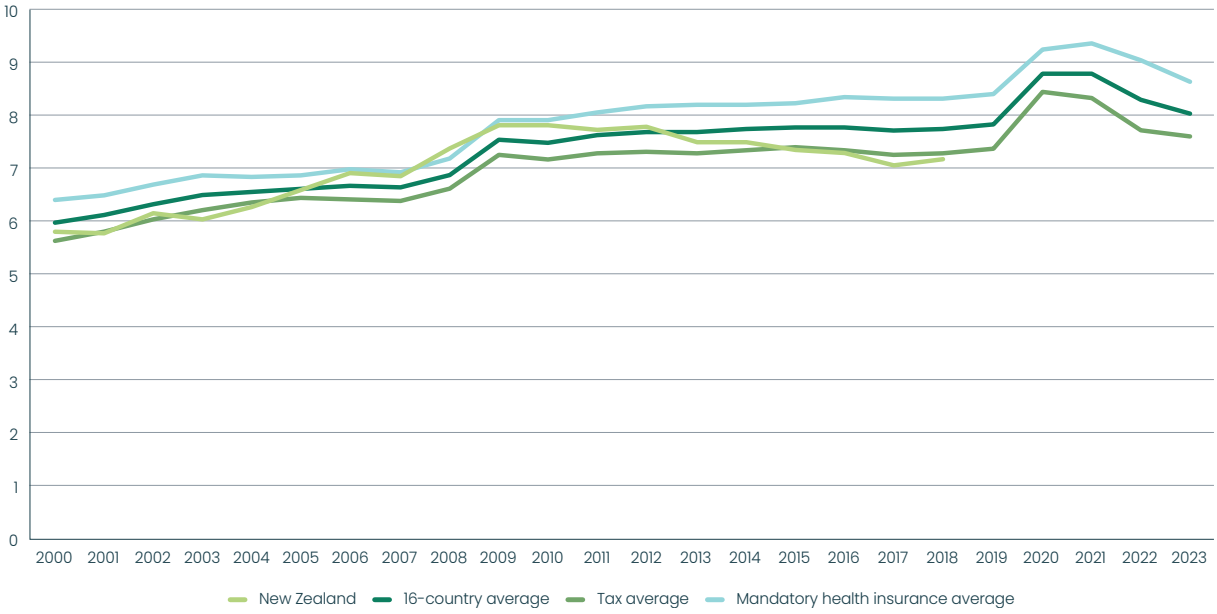
Figure 12: Total health expenditure as % of GDP by financing type, 2000-2023



Source: OECD data
Note: OECD estimates for New Zealand after 2018 not included

However, if we restrict our focus to publicly mandated health spending, Figure 13 shows that the gap between mandatory insurance and tax-funded country averages diverged further during the 2010s. New Zealand's publicly mandated health expenditure as a % of GDP rose above the average for tax-financed countries in the late 2000s, but its rate was similar to this average in 2018.

Figure 13: Publicly mandated health expenditure as % of GDP by financing type 2000-2023



Source: OECD data
Note: OECD estimates for New Zealand after 2018 not included

Figure 13 shows that tax-based and mandatory insurance systems in our 16-country comparison have gradually diverged further in the 2020s in the aftermath of COVID-19.

3.7 Comparative health expenditure summary

In compiling our historical and international comparison of New Zealand's health expenditure we encountered a range of issues in making sense of the available data.

- New Zealand may be the only country in our comparator group in which OECD figures for publicly mandated health expenditure includes a nominal GST component.
- The Ministry of Health has not provided returns to the OECD since 2018, and the OECD has had to estimate New Zealand's health expenditure based on limited information.
- Figures for tax-based health expenditure for 2022 and 2023 include significant COVID-related health expenditure, which occurred later in New Zealand than comparable countries.

In New Zealand, publicly mandated health spending has been around 80% of total health expenditure since the 1990s. This is slightly higher than the average of the other 16 countries.

New Zealand's publicly mandated health spending as a % of GDP declined to below comparator 16 countries between 2012 and 2018, and this continued into the early 2020s. This indicates cumulative underfunding over a decade.

New Zealand's publicly mandated health spending as a % of GDP declined to below comparator 16 countries between 2012 and 2018, and this continued into the early 2020s. This indicates cumulative underfunding over a decade.

The OECD estimates that have been used to claim that New Zealand spent a higher proportion (over 11%) of GDP on health in 2022 and 2023 than comparable countries paint a misleading picture.

Based on the above analysis, it is likely that the underlying % of GDP figure for 2023, without COVID-19 expenditure and OECD overestimate of ACC spending, was between 10.2% and 10.4%, for 2023, rather than 11.0%.

After taking into account the impact of COVID-19 and likely OECD overestimates, New Zealand's publicly mandated health expenditure as a % of GDP was close to the 16-country average at around 8.0% for 2023 for the first time since 2010.

This estimate does not take into account any possible effect of including GST in New Zealand's figures for tax-based expenditure.

In terms of $USD PPP per capita, New Zealand's publicly mandated health spending was consistently between 79% and 90% of the 16-country average from 2000 to 2022. While OECD estimates indicate New Zealand reached parity with the 16-country average in 2023, these figures included a significant component of COVID-19 pandemic expenditure.

It is possible that we have underestimated the gap in $USD PPP between New Zealand and comparator countries because we don't know to what extent the inclusion of GST in New Zealand's tax-based health expenditure affects the comparison.

This long-term gap in $USD PPP per capita is likely to have affected New Zealand's capacity to attract and pay health professionals in an international labour market.

The true picture of how New Zealand compares internationally will not be clear until:

- the Ministry submits returns according to the OECD System of Health Accounts,
- comparative data for 2025 is available once COVID-19 expenditure has washed through
- the possible effect of adding GST to New Zealand's tax-based health expenditure on comparative health expenditure data is determined.

4 Synthesis and conclusion

4.1 Is New Zealand's health system underfunded?

The purpose of our analysis was to address questions of the adequacy of health system funding in a comparative and historical context. While this is only part of the picture, and this analysis does not address the effectiveness of health expenditure, our analysis aims to inform the debate about health system underfunding.

In terms of $US PPP per capita, New Zealand has spent 10-20% less on health than the 16-country average, and this can be partly attributed to our lower GDP per capita. But even taking into account our smaller economy, New Zealand also fell behind comparable countries in terms of health expenditure as a % of GDP for 10 years (2013-2022).

Although OECD estimates in the past 2-3 years have suggested that New Zealand's spending is now comparatively high in historical and international terms, this interpretation is not credible, primarily because of the timing of COVID-related health expenditure.

It is also possible that these findings based on reported OECD data underestimate the extent to which New Zealand has spent less than comparable countries on health throughout the 21st century because of the treatment of GST in New Zealand's health expenditure data.

The consequences of New Zealand falling behind comparable countries in terms of % of GDP (both publicly mandated, and total) for an extended period help to explain current pronounced health workforce shortages, significant delays in upgrading capital and IT infrastructure, and increasing co-payments for primary health care, all of which put considerable pressure on publicly provided health services. Much of the boost in public expenditure on health in 2023 should be regarded as delayed spending.

4.2 Should New Zealand change its type of public financing of health?

Tax-based financing is part of the reason for New Zealand's decline in total and publicly mandated health expenditure as a percentage of GDP in the 2010s. However, in some comparable tax-funded systems such as Australia, Canada and Sweden, publicly mandated health expenditure as a % of GDP did not fluctuate as much as in New Zealand and other countries such as the UK. This is most likely due to the more significant role for sub-national levels of government in financing health care in these countries.

The argument that tax-based funding is more subject to political cycles is a secondary consideration, and one which must be balanced by the greater vulnerability of social insurance systems to economic cycles and demographic change.

Mandatory insurance systems in our comparator group spent a higher proportion of GDP on health than tax-based systems. Although our analysis is based on a smaller number of countries, our analysis is consistent with comparative literature reported in Section 2. There would be considerable risks, and little if any benefit, in shifting from taxation to mandatory insurance as the dominant mode of public financing. A greater reliance on raising revenue from employers and employees in health financing would mean that demographic pressures are stronger than in the broader revenue base of tax-based systems.

Introducing hypothecation of tax-based health financing is an alternative means of smoothing out political cycles without some of the drawbacks of mandatory insurance, but this approach would have considerable design complexity and disadvantages.

We also note that few high-income countries, and none in our comparator group, has made changes to its overall dominant type of health financing this century. This is because of the high degree of path dependency in health financing. Changing a system of health financing is a much larger systemic change than the organisational restructures that have been common in New Zealand and some other tax-financed health systems.

Our conclusions are consistent with a recent review published in The Lancet on United Kingdom health system financing concluded that the case for switching from taxation to mandatory insurance is weak, noting:

> *"little compelling evidence to suggest that switching to a social health insurance model would justify the upheaval and costs of doing so, funding for the NHS (National Health Service) should continue to be raised from general taxation"*[59]

4.3 Should there be a greater role for private financing?

While private financing has continually increased in volume in New Zealand, the overall proportion of private financing has thus far remained constant this century at around 20% of total health expenditure. While there has been much commentary suggesting significant growth in private expenditure on health, there is no solid evidence yet that the mix between public and private funding is changing significantly. That said, there is currently no publicly available, reliable data on levels of private financing. An increase in the proportion of private financing would be counter to broad international and historical trends in high-income countries. Our review in Section 2 also suggests that higher proportions of private financing would have significant implications for access, equity, and efficiency of health services.

4.4 Could we use our limited funding better?

Two countries could spend the same proportion of GDP on health but have different health systems outcomes. Access, efficiency, and quality are also a consequence of how health systems are designed and function.

It is likely that there is some publicly mandated health expenditure in New Zealand that is wasteful or inefficient, and it is important that governments aim to get the best value for money from inherently limited spending on health. That said, in the real world of comparable countries, it is difficult to find any examples health systems that have systematically been able to minimise wasteful expenditure and inefficiency while preserving high-value spending. It is highly unlikely that New Zealand's publicly mandated health expenditure is more inefficient or wasteful than comparator countries, primarily because tax-based health financing costs less to administer than insurance-based alternatives.

The consequences of New Zealand falling behind comparable countries in terms of % of GDP (both publicly mandated, and total) for an extended period help to explain current pronounced health workforce shortages, significant delays in upgrading capital and IT infrastructure, and increasing co-payments for primary health care, all of which put considerable pressure on publicly provided health services. Much of the boost in public expenditure on health in 2023 should be regarded as delayed spending.

4.5 Recommendations for improving data availability and quality

We conclude this report with an urgent call for improvements in the collation, analysis and publication of relevant, comprehensive and timely data on New Zealand health expenditure.

Currently there is no publicly available health expenditure data that can be readily used for comparative purposes, and a dearth of information about levels of private health expenditure.

Steps to remedy this situation should include submission of data to the OECD from the Ministry of Health that is consistent with the 2011 System of Health Accounts. If the Ministry of Health is sufficiently resourced to rectify this, such data should be provided from 2011 onwards.

We also recommend that the Ministry of Health resume publication of New Zealand Health Expenditure Trends at regular intervals (e.g. every three years), to enable more detailed analysis of health expenditure patterns that can be traced over time.

There needs to be further investigation into how the inclusion of GST in the OECD's estimates of New Zealand's tax-based health expenditure affects comparisons of health expenditure with other OECD countries. If the use of OECD comparative data is based on the assumption that we are comparing apples with apples, when this is not the case, we need to understand whether this results in overestimation of tax-based health expenditure, and if so, to what degree.

4.6 Looking to the future

New Zealand's situation is broadly comparable to that of the United Kingdom[80], and this is not surprising, given that the UK's historical health expenditure pattern is very similar to ours. Charlesworth et al indicated that annual increases in health spending per capita needed to be between 3.3% and 4% in real terms simply to keep up with demand pressures. To do so, they projected that publicly mandated health expenditure as a % of GDP would need to reach 9.9% of GDP by 2033-34.[80] We have estimated New Zealand's 2023 figure to be between 8.0 and 8.3% (although there are a number of caveats to this, as discussed above).

This could provide a useful benchmark of publicly mandated health expenditure as a % of GDP for New Zealand, keeping in mind necessary caveats about the quality and efficiency of spending. Using a benchmark in terms of % of GDP takes into account New Zealand's lower GDP per capita.

We recommend that government agencies undertake or commission analyses that utilise and build on the methods and data used recently by United Kingdom health systems researchers to explore more fully questions regarding the adequacy of publicly mandated health financing.[59,80]

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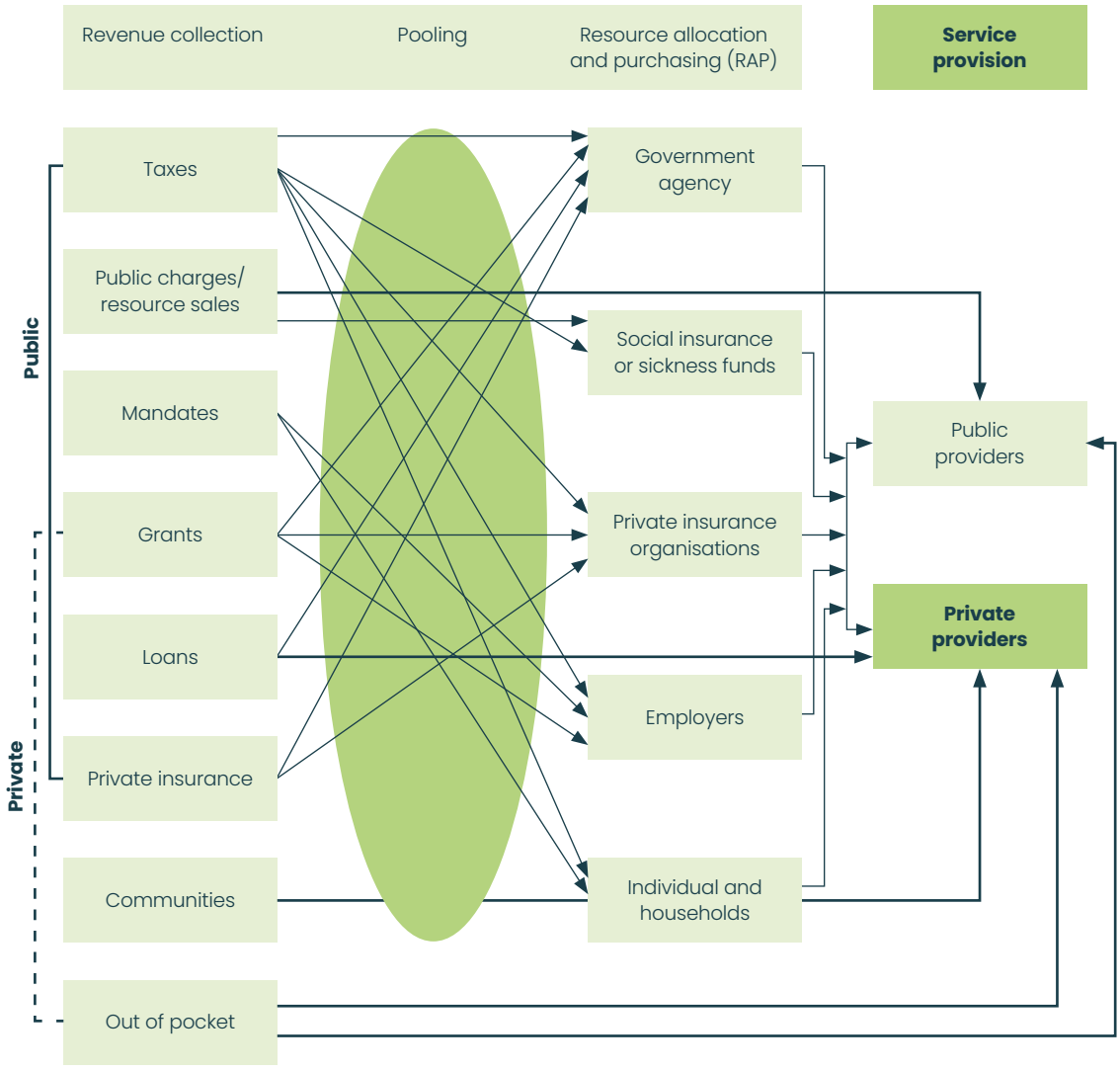
Appendix 1

Figure A1: Interactions among Revenue Raising, Risk Pooling, Resource Allocation, and Service Provision



Source: Schieber et al (2006)[5]

ASMS

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