



A critical missing ingredient

The case for increased dietetic input in tier 1 health services

NZIER report to Dietitians New Zealand

21 April 2021

About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice.

We undertake and make freely available economic research aimed at promoting a better understanding of New Zealand's important economic challenges.

Our long-established Quarterly Survey of Business Opinion (QSBO) and Quarterly Predictions are available to members of NZIER.

We pride ourselves on our reputation for independence and delivering quality analysis in the right form and at the right time. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review.

NZIER was established in 1958.

Authorship

This paper was prepared at NZIER by Sarah Hogan and Kevin Tuaño.

It was quality approved by Todd Kriebel.

The assistance of Sarah Spring is gratefully acknowledged.

Registered office: Level 13, Public Trust Tower, 22–28 Willeston St | PO Box 3479, Wellington 6140
Auckland office: Ground Floor, 70 Shortland St, Auckland
Tel 0800 220 090 or +64 4 472 1880 | econ@nzier.org.nz | www.nzier.org.nz

© NZ Institute of Economic Research (Inc). Cover image © Dreamstime.com
NZIER's standard terms of engagement for contract research can be found at www.nzier.org.nz.

While NZIER will use all reasonable endeavours in undertaking contract research and producing reports to ensure the information is as accurate as practicable, the Institute, its contributors, employees, and Board shall not be liable (whether in contract, tort (including negligence), equity or on any other basis) for any loss or damage sustained by any person relying on such work whatever the cause of such loss or damage.



Te Tiriti Statement

Dietitians New Zealand is committed to the spirit of Te Tiriti o Waitangi and are working towards a Te Tiriti Relationship Governance Model.

Key points

According to the 2019 Global Burden of Disease Study of 195 countries (IHME 2019), diet is the single leading risk factor for death.

New Zealand registered dietitians are highly qualified practitioners regulated under the Health Practitioners Competence Assurance (HPCA) Act (2003). Dietitians work with both healthy and sick people to prevent illness and complications, reduce the impact of long-term conditions on quality of life, and optimise health and well-being. They treat complex clinical conditions such as diabetes, food allergy and intolerance, IBS syndrome, eating disorders, chronic fatigue, malnutrition, kidney failure and bowel disorders. In a society full of dietary and nutrition advice, registered dietitians provide the evidence-based care that helps people navigate the complexities of their conditions, their treatment, and their nutritional intake in a safe, practical and sustainable way to achieve optimal health outcomes.

Cancer, diabetes and mental illness are high prevalence conditions within the New Zealand population for which outcomes are optimised through best practice care including dietetic support. Evidence suggests that for every dollar spent on dietetic support delivered by dietitians in tier 1 settings, the health system receives a cost saving benefit of \$5 to \$6.40 from reduced hospitalisation and reduced medical treatment. But are people with these conditions getting the care they need?

Is the supply sufficient to meet the demand?

This report focuses on the dietetic workforce and considers whether the current and projected workforce is sufficient to meet the demand for dietetic services for specific populations in specific contexts, by asking the following questions for three leading conditions:

- Is the public-hospital-based dietetic workforce sufficient to provide best practice care for people undergoing cancer treatment or still being followed-up under the care of cancer specialists? If the oncology dietetic workforce is insufficient in hospital settings, it will be no better placed to meet this demand as it shifts increasingly towards tier 1 settings.
- Is the publicly-funded primary and community dietetic workforce sufficient to provide best practice care for people with a diagnosis of diabetes? The increasing prevalence of diabetes and the significant equity implications of poor management of diabetes demand a strong publicly-funded secondary prevention with dietetic support a critical component.



- Is the publicly-funded primary and community dietetic workforce sufficient to provide nutrition assessment and support for people with mild to moderate mental illness? The role of nutrition and the high rates of obesity and comorbid conditions in this population demand a multi-disciplinary approach that has not traditionally been offered.
- Is the current dietetic workforce sufficient to support the roll-out of a proactive *primary* prevention-focused model of care to high deprivation communities, based on the best practice diabetes ratio, to address the high prevalence of risk factors as well as multi-morbidity in these communities?

Supply and demand misalignment indicates significant unmet need

Our analysis, based on FTE dietitian to patient ratios from the published literature, indicates that New Zealand has a significant shortage of dietitians in the relevant settings (see table below).

Table 1 Summary of results for cancer, diabetes and mental health

| Condition | Current setting of care | Ratio of dietitian FTE to patients | Regional Range of FTE in relevant setting of care | National Workforce shortage (FTE) |
|---------------|-------------------------|------------------------------------|---|-----------------------------------|
| Cancer | Hospitals | 1:120 ¹ | 1:263 – 1:143 | 110 |
| Diabetes | Tier 1 | 1:300 ¹ | 1:2190 – 1:4000 | 805 |
| Mental Health | Tier 1 | 1:500 ² | 1:1645 – 1:2605 | 236 |

¹Best practice ratios indicated in published literature

²Ratio tested in the absence of evidence of a best practice ratio

In addition to condition-specific ratios, we tested the capacity of the current primary and community-based dietetic workforce to deliver:

- A pro-active primary prevention approach to highly deprived communities.
- A secondary prevention approach to all people with multi-morbidity in highly deprived communities.

Results for these broader community-based approaches indicate that a severe shortage of dietitian FTEs prevents a pro-active primary prevention approach and that a secondary prevention approach for people with multimorbidity would only be possible in the most deprived decile.

Unmet need has previously been recognised and is expected to persist

These results are consistent with published reports that indicate New Zealand's dietetic workforce is lower in proportion to population than Australia's or the UK's, particularly in primary care, where other health professionals have indicated a need for more dietetic services to support patients with or at risk of long-term conditions.

Furthermore, based on population projections, prevalence rates, and Ministry of Health workforce modelling, none of the calculated ratios are expected to improve significantly by 2030, indicating that existing unmet need and inequitable access to dietetic support will continue without specific measures to address this.



The Health and Disability System Transformation provides an opportunity to address gaps

The health and disability system is facing a once in a generation redesign which will focus heavily on more effective and efficient services with improved equity of access and outcomes. The health workforce is a critical building block of a high quality, safe, equitable and efficient health system. It needs to be able to support a shift to more pro-active, person-centred, multi-disciplinary approaches, including better primary prevention and more effective secondary prevention, as well as improved access to publicly-funded services to close the equity gaps in both access and outcomes.

We recommend:

- Investing to achieve best practice dietetic input through recruitment and training, especially of Māori and Pacific dietitians, to increase the supply of dietitians in New Zealand.
- Developing and funding models of care with specific, recognised dietetic roles.
- Reviewing the prescribing endorsement of dietitians to include more medications, especially those commonly used in the management of long term conditions.
- Establishing national competency frameworks for Registered Nutritionists that support the work of Registered Dietitians.

Contents

| | | |
|-----|--|----|
| 1 | Background | 1 |
| 1.1 | The registered dietetic workforce | 1 |
| 2 | Our approach | 4 |
| 2.1 | The principles..... | 4 |
| 2.2 | Data..... | 5 |
| 2.3 | Disease group scenarios | 5 |
| 2.4 | Dietitian to patient ratios | 6 |
| 2.5 | Population scenarios..... | 7 |
| 3 | The opportunity and the challenge..... | 8 |
| 3.1 | The opportunity: Dietitians are key to addressing current demand drivers | 8 |
| 3.2 | The challenge: Dietitians are a scarce resource | 11 |
| 4 | Cancer | 16 |
| 4.1 | Demand for dietitians in cancer care..... | 16 |
| 4.2 | Dietitians' potential contribution | 20 |
| 4.3 | Potential unmet need for dietitians in cancer care 2020-2030..... | 23 |
| 5 | Diabetes | 26 |
| 5.1 | Demand for dietitians in diabetes care | 26 |
| 5.2 | Dietitians' potential contribution to the solution..... | 32 |
| 5.3 | Potential unmet need for dietitians in tier 1 diabetes care | 34 |
| 6 | Mental health..... | 40 |
| 6.1 | Demand for dietitians in mental health care..... | 41 |
| 6.2 | Dietitians' potential contribution to the solution..... | 42 |
| 6.3 | Potential unmet need for dietitians in primary mental health services..... | 44 |
| 7 | Needs-based prevention in high deprivation communities..... | 46 |
| 8 | Dietitians in future tier 1 services | 49 |
| 8.1 | Publicly-funded tier 1 roles for dietitians | 49 |
| | Collaborative care including dietitians in tier 1 services would maximise the impact | 50 |
| 8.2 | Current system barriers to address | 51 |
| 8.3 | Unleashing the current potential of dietitians with updated regulation | 52 |
| 9 | Recommendations | 54 |
| 10 | References..... | 55 |

Figures

| | | |
|----------|---|----|
| Figure 1 | Percentage of health loss attributable to leading risk factors in New Zealand | 2 |
| Figure 2 | The triple aim | 4 |
| Figure 3 | Leading causes of health loss in the New Zealand population | 9 |
| Figure 4 | Dietitian to population ratio, projected 2020-2030 by region..... | 12 |
| Figure 5 | FTE dietitian to population ratio, projected 2020-2030 by region | 13 |
| Figure 6 | Registered dietitians' main workplace | 15 |
| Figure 7 | DHB-employed registered dietitians' main workplace | 15 |
| Figure 8 | New cancer registrations by region – 2018..... | 17 |

| | |
|--|----|
| Figure 9 Projected new cancer registrations by region..... | 17 |
| Figure 10 Unique patients having cancer-related outpatient follow-up appointments by region – 2019/2020 | 18 |
| Figure 11 Projected patients having cancer-related outpatient follow-up appointments by region | 19 |
| Figure 12 Unique patients receiving inpatient (including day case) cancer treatment by region – 2019/2020 | 19 |
| Figure 13 Projected patients receiving inpatient (including day case) cancer treatment by region | 20 |
| Figure 14 Models of cancer survivorship care | 22 |
| Figure 15 Current ratio of individuals receiving inpatient and outpatient cancer treatment to FTE DHB clinical tier 2 dietitians..... | 24 |
| Figure 16 Projected ratio of individuals receiving inpatient and outpatient cancer treatment to FTE dietitians working in a DHB clinical setting..... | 25 |
| Figure 17 Unique individuals diagnosed with diabetes by region – 2020..... | 27 |
| Figure 18 Projected individuals diagnosed with diabetes by region..... | 27 |
| Figure 19 Unique patients attending diabetes-related outpatient services or dialysis services by region – 2019/2020 | 28 |
| Figure 20 Projected patients attending diabetes-related outpatient services or dialysis services by region..... | 28 |
| Figure 21 Unique patients with acute/arranged inpatient admission and primary diagnosis of diabetes by region – 2019/2020 | 29 |
| Figure 22 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes by region..... | 29 |
| Figure 23 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Northern Region DHBs | 30 |
| Figure 24 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Midland Region DHBs..... | 30 |
| Figure 25 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Central Region DHBs..... | 31 |
| Figure 26 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Southern Region DHBs | 31 |
| Figure 27 National attribution of patients accessing outpatient and inpatient diabetes services as a proportion of the VDR population | 32 |
| Figure 28 Percentage regional ethnic distribution of individuals diagnosed with diabetes | 34 |
| Figure 29 Current ratio of individuals diagnosed with diabetes to FTE publicly-funded tier 1 dietitians..... | 36 |
| Figure 30 Projected ratio of individuals diagnosed with diabetes to FTE tier 1 dietitians..... | 37 |
| Figure 31 Current ratio of individuals attending diabetes-related outpatient services or dialysis services to FTE publicly-funded tier 1 dietitians | 38 |
| Figure 32 Projected ratio of individuals attending diabetes-related outpatient services or dialysis services to FTE tier 1 dietitians | 39 |
| Figure 33 Mood and anxiety disorders by age group, 2011-2019 | 40 |
| Figure 34 Unique people accessing primary mental health services by region – 2017/2018 | 42 |
| Figure 35 Projected people accessing primary mental health services by region | 42 |
| Figure 36 Shared biological pathways influencing depression and obesity..... | 43 |
| Figure 37 Current ratio of people accessing primary mental health services to FTE publicly- funded tier 1 dietitians | 45 |

| | |
|---|----|
| Figure 38 Projected ratio of people accessing primary mental health services to FTE publicly-funded tier 1 dietitians | 46 |
| Figure 39 Medication of people with diabetes in New Zealand, by age group | 53 |

Tables

| | |
|---|----|
| Table 1 Summary of results for cancer, diabetes and mental health | v |
| Table 2 Patient groupings for scenario analysis | 6 |
| Table 3 Distribution of dietetic workforce by setting of work and region | 13 |
| Table 4 Distribution of FTE dietetic workforce by setting of work and region | 13 |
| Table 5 Ratio of FTE DHB clinical tier 2 dietitians to patients receiving inpatient and outpatient cancer treatment..... | 24 |
| Table 6 Primary care workforce model for best practice diabetes care | 35 |
| Table 7 Ratio of FTE publicly-funded tier 1 dietitians to individuals diagnosed with diabetes .. | 36 |
| Table 8 Ratio of FTE publicly-funded tier 1 dietitians to individuals attending diabetes-related outpatient services or dialysis services | 37 |
| Table 9 Mental health workforce per 100,000 population | 41 |
| Table 10 Ratio of FTE publicly-funded tier 1 dietitians to patients accessing primary mental health services..... | 45 |
| Table 11 Dietitian FTE requirements for a primary prevention approach to multimorbidity in highly deprived communities | 47 |
| Table 12 Dietitian FTE requirements for a secondary prevention approach to multimorbidity in highly deprived communities | 48 |

1 Background

Dietitians New Zealand commissioned NZIER to analyse the available data to estimate the supply of and need for dietetic input in publicly-funded health services for people with cancer, diabetes and mental illness, and to identify, in light of any identified unmet need, what the optimal role would be for dietitians in the future health and disability system.

1.1 The registered dietetic workforce

1.1.1 Supporting optimal health and well-being

Dietitians are registered health practitioners who translate evidence about nutritional intake into practical strategies for people to achieve and maintain health and wellness. Dietitians in New Zealand work in partnership with individuals, whānau, communities and populations, in various states of health and illness and across settings of care. In the health and disability sector, dietitians' workplaces include publicly funded health providers, health centres, hospitals, rest/care homes, and private practices.

Dietitians' work can include promoting and protecting public health, directing and delivering medical nutrition therapy services, and managing food and health systems.

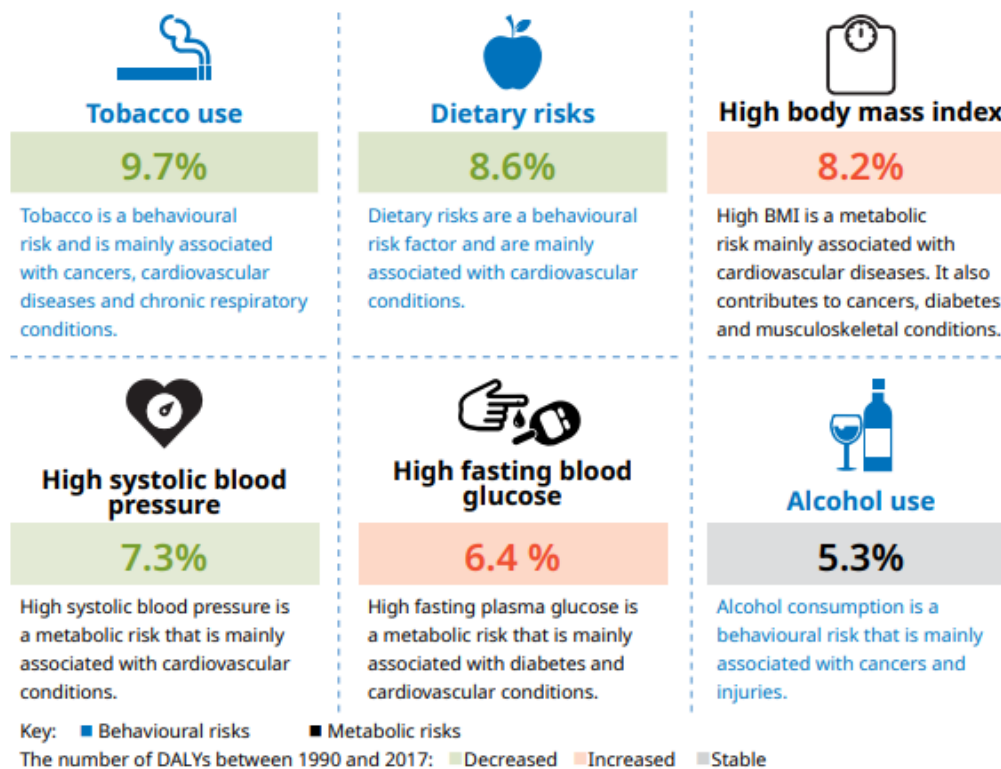
There is a wealth of evidence in the published literature to support the benefits of dietetic services for a range of patient groups. Good health and wellbeing through dietetic support is not an expensive luxury: Evidence suggests that for every dollar spent on dietetic support in tier 1 settings, the health system receives a cost saving benefit of \$5 to \$6.40 from reduced hospitalisation and reduced medical treatment (Howatson, Wall, and Turner-Benny 2015).

In terms of the conditions and health needs managed by dietitians, across all employment settings, the dominant conditions and health needs are older people and aged care, diabetes, oncology, obesity, and mental health.

Amongst six leading risk factors identified by the Global Burden of Disease Study (IHME 2019), dietitians are uniquely trained to directly address three – dietary risks, high body mass index, and high fasting blood glucose – and to contribute to addressing the others (see figure below).

Figure 1 Percentage of health loss attributable to leading risk factors in New Zealand

In 2017, and 1990-2017



Source: Ministry of Health (2020a)

1.1.2 A highly educated and trained workforce

Dietitians are highly educated professionals, with 77 percent of New Zealand's dietetic workforce holding a postgraduate diploma, master's degree or PhD (the remainder with state exam or undergraduate qualifications) (Dietitians Board of New Zealand 2020).

Approximately 84 percent of dietitians in New Zealand also meet the requirements to become non-medical prescribers (Dietitians Board statistics provided by Dietitians New Zealand). These practitioners have either graduated from an accredited New Zealand Dietetic Education Programme since 2014 or passed the 'Dietitian Prescriber' Training Course. Dietitian Prescribers must have an approved prescribing supervisor, and, on an annual basis, complete self-audits and peer reviews of their prescribing, and undertake continuing professional development in prescribing. Prescribing is monitored through quarterly reports on prescription transactions received from the Ministry of Health by the Registrar, a dietitian auditor and the Board, to ensure that Special Foods and approved nutrition related medicines are being prescribed appropriately and safe practice is being undertaken (Dietitians Board of New Zealand 2020).

Dietitians' high quality training leads to a higher level of effectiveness. For example, a meta-analysis showed that dietitians achieve better weight loss than non-dietitians (Sun et al. 2017).

1.1.3 A regulated workforce assuring quality for all patients

Individuals wishing to practise dietetics in New Zealand (or be known as a dietitian) must, by law be registered with the Dietitians Board of New Zealand (the Dietitians Board) and hold a current Annual Practising Certificate (APC). This means dietitians are approved as having the appropriate qualification and considered fit for registration and competent to practise (as required under section 15 of the Act). Practising certificates must be renewed annually and practitioners need to assure the Dietitians Board they have maintained their competence (and fitness to practise by meeting recertification requirements and making a declaration (Dietitians Board of New Zealand 2020).

Dietitians are regulated practitioners under the Health Practitioners Competence Assurance Act 2003 (HPCAA) which requires the Dietitians Board to *'set standards of clinical competence, cultural competence (including competencies that will enable effective and respectful interaction with Māori), and ethical conduct to be observed by health practitioners of the profession'*. These are generally referred to by Regulatory Authorities as professional standards and competencies.¹

These standards were reviewed and updated in 2016 and 2017 culminating in the revised Professional Standards & Competencies for Dietitians.

1.1.4 Critically different from nutritionists

As described above, dietitians are a well-defined group of highly trained and highly accountable professionals. Although they may sometimes work in many of the same settings as nutritionists, it is important to note that nutritionists may not present the same opportunities for the health system. This is because the term 'nutritionist' can be used freely by anyone because there isn't a specific qualification or a legal registration process for nutritionists. A nutritionist may be highly qualified in a specialty area of nutrition but may equally be someone providing nutrition counselling services with no formal training at all. This is the reason registered dietitians are often found working in multidisciplinary secondary care teams while nutritionists typically are not.

In practice, these features mean that:

- Dietitians are equipped and accountable to deliver evidence-based care for more complex patients.
- The dietitians' standards and training provide a high level of assurance that they can function well working with medical professionals in a collaborative team-based care environment.
- Dietitians face severe consequences for malpractice, meaning high safety and effectiveness standards are key strengths of dietitians that cannot be assured to the same degree by nutritionists.
- Dietitians could be considered for extended scopes of practice with appropriate safeguards in place.

Because of dietitians' education and registration, the quality of their services is assured in secondary care, working with demanding and/or complex environments and patients with multiple challenges related to scientific, social, economic, cultural, and personal factors.

¹ <https://www.dietitiansboard.org.nz/practitioners/>

2 Our approach

The objective of this report is to identify the value of dietetic input in publicly-funded health services, the demand for dietitians in New Zealand across tier 1 and tier 2 services, and the magnitude of unmet need. The focus is on dietetic services for people with cancer, diabetes and mental illness.

We present a range of evidence indicating that a greater role for registered dietitians in tier 1 services would be aligned with the triple aim framework of equity, quality and value and support greater sustainability of the system as a whole.

2.1 The principles

The principles we applied to assessing the evidence are the three components of the Triple Aim: Quality, equity² and efficiency. And, because system change requires more than a framework designed for relatively minor health service quality improvement, we were also guided by consideration of a fourth dimension: sustainability, for which provider experience (workplace stress or enjoyment, workloads and professional relationships) and the acknowledgement that the health budget may be able to grow over time, but should not grow further relative to other important areas of government spending are important considerations.

Figure 2 The triple aim



Source: Health Quality and Safety Commission

² The HQSC definition of equity “means people receive the care they require – as distinct from health equality (where everyone receives the same).” This means working towards eliminating “avoidable and unfair differences in health outcomes”. (HQSC. 2017. Health Equity. <https://www.hqsc.govt.nz/our-programmes/other-topics/new-projects/health-equity/>) in ways that are consistent with the Ministry of Health’s Te Tiriti o Waitangi (Te Tiriti) Framework (Ministry of Health. 2020. Te Tiriti o Waitangi Framework. <https://www.health.govt.nz/system/files/documents/pages/whakamaua-tiriti-o-waitangi-framework-a3-aug20.pdf>)

2.2 Data

Our analysis of need is based on New Zealand data, including:

- The NMDS (national database of inpatient events, including day patients)
- The NNPAC (national database of outpatient events, including emergency department)
- PRIMHD (primary mental health data)
- The VDR (Virtual Diabetes Register)
- The registered dietetic workforce data and projections contained in Health Workforce New Zealand's dietetic workforce model
- Population projections used for the Population-Based Funding Formula at the DHB-level with age and ethnicity detail.

Because this is a data-based analysis and the VDR does not distinguish between different types of diabetes, we simply refer to diabetes in this report. People with type 1 diabetes and people with type 2 diabetes would benefit from dietetic services.

2.3 Disease group scenarios

To establish the need for dietetic input in tier 1 services, we defined patient groups that are likely to benefit from dietetic support in tier 2 or tier 1 settings (see Table 2 below) and which could be identified and quantified using the available data. We then considered what evidence existed by which dietitian to patient ratios could be calculated and benchmarked.

For each selected scenario, we identified the number of people per year who could benefit from dietetic input, calculated the number of dietitian full-time equivalents (FTEs) that would be required to provide best practice care, and identified the gap relative to the maximum possible dietetic input that the relevant population could receive.



Table 2 Patient groupings for scenario analysis

| Service intensity | | | |
|-------------------|---|--|--|
| Least intense | | Most intense | |
| Setting of care | Tier 1 | Tier 1 | Tier 1 and/or Tier 2 |
| Cancer | People who have had cancer treatment and have fully recovered may benefit from dietetic support to maintain a healthy lifestyle and prevent recurrence. | People who have had cancer treatment and are being followed up through outpatient services. may benefit from dietetic support to help recover from cancer and the effects of treatment. ¹ | People with cancer receiving hospital-based care. This is increasingly delivered on an outpatient or day patient basis. ¹ |
| Diabetes | People with a diabetes diagnosis. All people with a diabetes diagnosis should get some level of dietetic support and this should be in a tier 1 setting. | People with a diabetes diagnosis who are using outpatient services (specialist care and/or dialysis). These people are likely to be experiencing complications of diabetes. | People with a diabetes diagnosis who have had at least one acute inpatient admission with a primary diagnosis of diabetes within the year. Avoiding this outcome is the goal of better primary care. |
| Mental illness | People using primary mental health services may benefit from a dietetic assessment in a tier 1 setting. A sub-group will require additional dietetic support for lifestyle changes. | People using primary mental health services who have physical health comorbidities where diet is a factor. These people would benefit from dietetic support within a multidisciplinary tier 1 team. | People with at least one admission to an inpatient mental health facility are likely to have severe mental illness. Dietetic support may be required within inpatient facilities. Post-discharge support could also be beneficial. |

¹ These groups cannot be separately identified in the data due to treatment being increasingly provided in an ambulatory model, including through outpatient services. Outpatient data identifies health speciality but not procedures.

Groups shaded blue and outlined provided scenarios for analysis.

Source: NZIER

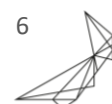
2.4 Dietitian to patient ratios

A literature scan identified best practice dietitian FTE to patient ratios for cancer care and diabetes care, as well as dietitian FTE to patient ratios observed overseas in diabetes care³. For mental health, no best practice ratio was identified in the literature, so a ratio was tested to reflect a need for nutritional assessment for all mental health patients and a high likelihood of need for ongoing dietetic input, given the high prevalence of multi-morbidity in mental health patients.

As a result of the scenario-building process, the scenarios analysed for demand, supply and unmet need are:

- Dietetic care for people receiving publicly-funded cancer treatment through either inpatient or outpatient services or follow-up care through outpatient services. Care is assumed to be provided by the current workforce of publicly-funded District Health Board (DHB)-employed dietitians in non-community clinical roles (e.g. through

³ Published ratios are for type 2 diabetes but these ratios are applied to all people with a diabetes diagnosis in this analysis. It is likely that people with a type 1 diabetes, who represent approximately 10 percent of the VDR population, would benefit from a similar ratio.



outpatient services). A published ratio of dietitians to patients in the context of cancer care provides a benchmark.

- Dietetic care for people with a diabetes diagnosis. Care is assumed to be provided by the current workforce of publicly-funded primary care and community dietitians. Published ratios of dietitians to patients provide benchmarks.
- Dietetic care for people with a diabetes diagnosis who are using outpatient diabetes services (e.g. specialist visits and/or dialysis and home dialysis support). Care is assumed to be provided by the current workforce of publicly-funded primary care and community dietitians. In effect this scenario assumes that primary care and community dietitians prioritise diabetes patients who have developed or are at risk of developing complications. Published ratios of dietitians to patients provide benchmarks.
- Dietetic care for people with mild to moderate mental illness. Care is assumed to be provided by publicly-funded primary and community dietitians. A ratio of dietitians to patients is assumed based on non-mental health ratios of dietetic care.

The analysis compares the observed ratios of dietitians to patients for each scenario to the benchmark ratio(s) and then calculates the resulting unmet need for dietitian FTEs. The analysis is conservative because in each case, the implicit assumption is that the relevant dietetic workforce (DHB hospital dietitians for cancer, and publicly-funded primary and community dietitians for diabetes and mental health) is entirely dedicated to that patient group.

2.5 Population scenarios

Finally, we consider how many dietitians would be needed if a patient-centred medical home model of tier 1 care were available to:

- the most socio-economically deprived decile of the New Zealand population
- the most socio-economically deprived quintile of the New Zealand population.

In these scenarios we consider evidence that areas of high socioeconomic deprivation see high rates of long-term conditions, multimorbidity, and a high prevalence of risk factors. We apply a ratio from a staffing model with a focus on diabetes care, assuming that a similar ratio is needed for the high rates of other conditions and risk factors amenable to dietary intervention, and calculate the shortfall in the current dietitian supply to deliver:

- an aggressive primary prevention approach for all people living in socioeconomically deprived communities.
- a secondary prevention approach for the 31 percent of the population living in socioeconomically deprived areas estimated to be living with multimorbidity.



3 The opportunity and the challenge

New Zealand's health and disability system is about to undergo a once in a generation redesign.

The challenges facing the health and disability system and in particular tier 1 services include:

- Increasing and rapidly ageing population
- Significant unmet need for primary care
- Increasing numbers of complex patients with multiple long term conditions
- Growing inequities for Māori and Pacific people
- A need for health care providers to spend more time with patients to take a holistic approach to complex multi-morbidity and support patient self-management
- Progressive shifting of health services currently provided in a hospital setting out into the community
- A need to provide care closer to patients' homes
- An ageing GP workforce
- Poor coordination between general practice, community health and hospitals.

A major focus of the redesign will be strengthening primary care and tier 1 services to provide improved access, support a shift of services from secondary care into tier 1 settings, improve preventive care, and in so doing, improve equity of access and outcomes across the system.

DHBs are already asking GPs to take on more responsibility for services that have traditionally been provided in tier 2 settings. Increased investment in preventive care will demand even more of primary care teams.

But the current capacity of primary care is constrained. Both GP and nurse workforces are ageing. Existing workloads are already considered high and unsustainable.

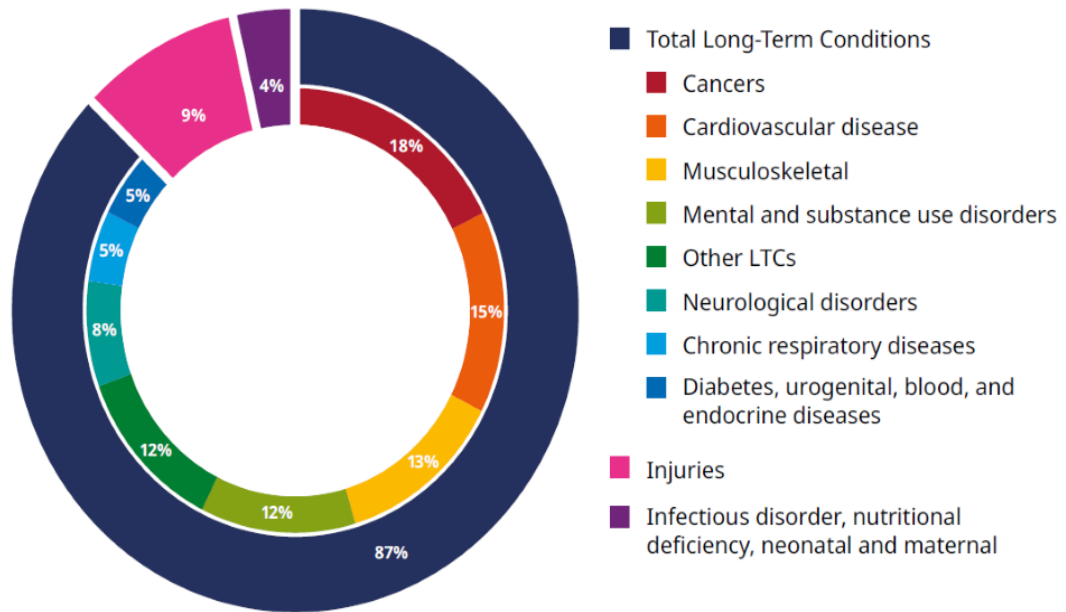
The direction of travel presents an opportunity for greater primary prevention to change the mix of services and improve outcomes for all populations. Solutions that can enable this shift of services from secondary care to tier 1 settings and also strengthen the ability of tier 1 settings to meet the demand for those services while also providing better access and more equitable and preventive care are desperately needed.

3.1 The opportunity: Dietitians are key to addressing current demand drivers

Identifying the appropriate solution requires an understanding of the drivers of the problem. The high and increasing burden of health loss attributable to long term conditions is at the heart of the pressure across tier 1 and tier 2 services.



Figure 3 Leading causes of health loss in the New Zealand population



Source: (Ministry of Health (2018))

Much of this burden is attributable to poor diet and the increase in obesity across all age groups (Howatson, Wall, and Turner-Benny 2015). Poor diet has been estimated to be responsible for 18.2 percent of the total health system cost of cardiovascular disease and diabetes (Jardim et al. 2019).

The impact of non-communicable disease can be devastating for individuals, families and communities, from quality of life impacts, productivity and income loss, and premature death. These impacts are largely preventable through interventions that reduce tobacco use, harmful alcohol use, inadequate physical activity and unhealthy diets (Howatson, Wall, and Turner-Benny 2015).

Other nutritional risks add to the pressure, especially with population ageing. Older people are at high risk of malnutrition and have an increased risk of developing health issues as result of inadequate nutritional intake (North et al. 2018). A 51 percent greater risk of hospitalisation and 54 percent greater risk of mortality were associated with nutritional risk in the Birmingham Study of Ageing (Buys et al. 2014).

But improvement in the nutritional status of individuals through education and better access to healthy food can have a significant impact on well-being (Howatson, Wall, and Turner-Benny 2015).

The evidence in favour of increasing dietetic input in tier 1 services is strong and this report presents only a sample to illustrate the direct impact on all three dimensions of the Triple Aim and beyond. Although the focus of this report is on dietetic services for cancer, diabetes and mental illness, it is important not to ignore the additional benefits of dietitian presence in collaborative team-based tier 1 services as to do so would understate the return on investment that may be achieved.

Impacts on effectiveness of dietetic interventions

A major question that arises in the context of tier 1 services is likely to be why dietetic interventions should be delivered by dietitians and not by nurses, GPs or other professionals, such as nutritionists.

New Zealand-based studies have identified that GPs and practice nurses lack adequate nutrition knowledge to effectively support patients to achieve better outcomes through dietary changes; lack the time required to educate and counsel patients on dietary change; and lack confidence in the effectiveness of dietetic interventions. As a result, dietetic interventions by GPs and practice nurses tend to be inconsistent (Claridge et al., 2014; Parry Strong et al., 2014; Crowley et al., 2015; Ball et al., 2014. As cited in Beckingsale, Fairbairn, and Morris (2016)). With specific expertise in nutrition, counselling for behaviour change, and health promotion, registered dietitians are able to provide more effective dietetic interventions, and because dietitians are a lower cost input than GPs as well, these interventions are highly likely to be more cost-effective.

Dietitians working with GPs and practice nurses in a collaborative tier 1 team can share knowledge and expertise to improve the effectiveness of nutrition-related advice across the team: A study of registered dietitian integration in primary care (Kolasa et al., 2010) noted that the presence of a registered dietitian in a primary care setting increased physicians' comfort and confidence that their practice had the capacity to address childhood obesity.

Impacts on GP workload and access to services

Increased use of dietetic services can significantly reduce GP workloads. Nutrition needs are common in general practice, being a feature of 16 percent to 24 percent of all GP visits (MacDonald Werstuck and Buccino 2018).

Patients with conditions that are treatable or manageable with dietary interventions see GPs more than average. Irritable bowel syndrome (IBS) is one of the top ten reasons for visiting a GP in New Zealand (BPJ 2014).

A new IBS pathway for a dietitian-led gastro clinic showed that dietitians can reduce symptoms (and therefore reasons to see the GP): 63 percent of patients achieved satisfactory control of IBS after receiving specialist dietetic support and 74 percent had improved quality of life (Williams et al. 2016).

Impact on equity

Inequities in health disadvantage Māori, resulting in poorer health outcomes. Early dietetic intervention can potentially improve health outcomes for Māori suffering from diabetes, cancer, cardiovascular disease and other long-term conditions.

The literature on equity dimensions of dietary needs reveals that the cost of healthy eating is equivalent to roughly 44 percent of the disposable income of welfare-dependant families, compared with 18 percent of the income of average-wage families (see for example Kettings, Sinclair, and Voevodin 2009). This means that receiving instructions to eat healthily is often not enough and delivering dietary advice in this way can increase equity gaps rather than close them.

Dietitians work with people to identify budget-friendly solutions and provide food budgeting education as well as acting as powerful advocates in interactions with social services to secure much-needed resources for adequate nutrition where there are recognised health needs.



Return on investment

A scan of the literature on the cost-effectiveness of dietetic interventions revealed significant untapped potential. For example:

- A healthy diet could save the health system an average of approximately NZ\$420 per person per year (Jardim et al. 2019), with higher than average savings for ethnic minorities, older people, and people of lower socioeconomic status. If just ten percent of the New Zealand population could improve its diet, the health system could expect to save \$210 million per year just in cardiovascular disease and diabetes care. But in reality, the savings resulting from improved diets would likely extend far beyond these two conditions: Savings on treatment of dyslipidemia, stroke, osteoarthritis, cancer, osteoarthritis, low back pain, sleep apnoea, asthma, gallbladder disease, dementia and Alzheimer's disease, depression and anxiety, digestive issues and tooth decay could be expected.
- The inclusion of registered dietitians in primary care teams has been shown to be effective and cost-saving in improving both health and economic outcomes. Savings of NZ\$5 to NZ\$99 per dollar spent on nutrition interventions indicate a high return on investment (MacDonald Werstuck and Buccino, 2018).
- A primary care dietitian-led clinic for patients with IBS (described above in terms of improved outcomes) also generated reduced health system costs through 36 percent fewer referrals to specialist care, resulting in a 25 percent cost reduction (Williams et al. 2016).
- The appropriate treatment of malnutrition in primary care results in reduced GP visits by patients and therefore has the potential to release GP time (Gandy 2014) as well as reduced hospital admission (Nash 2017), taking pressure of hospitals which have been facing mounting pressure from acute demand. Reducing the risk of malnutrition should be a focus area for preventing hospital admissions and dietitians should play an important role in admissions prevention strategies.

But the literature scan also identified two important issues:

- Identifying the return on investment from early and preventive interventions, particularly those delivered within multidisciplinary teams, or to people receiving multiple interventions, is extremely challenging and often impossible.
- Cost-effective interventions do not always result in health system savings. Increasing access to services may at least in the short term result in increased costs, but appropriate service design should ensure that greater value in the form of improved health and quality of life are achieved. Closing the access and outcomes gap for underserved requires additional health spending.

3.2 The challenge: Dietitians are a scarce resource

Currently, most dietary interventions by dietitians are limited to patients who are already very unwell. Within DHBs, strict criteria exist to triage patients for access to dietetic support. The vast majority of patients who could benefit from these services do not have access unless they seek private dietetic services.

At the same time, GPs see many patients who need dietary interventions. Although GPs are available to people at a lower cost than private dietitians (due to the current primary care



business model which sees capitation and other primary care payments being directed primarily to subsidise GP services), GPs will not typically provide dietetic input to the same level of effectiveness as a registered dietitian:

- Patients frequently seek doctors' advice on diet, but doctors rate their nutrition knowledge and skills as inadequate (Darer et al. 2004).
- More than one-half of graduating medical students report that the time dedicated to nutrition instruction is inadequate (Association of American Medical Colleges 2004).

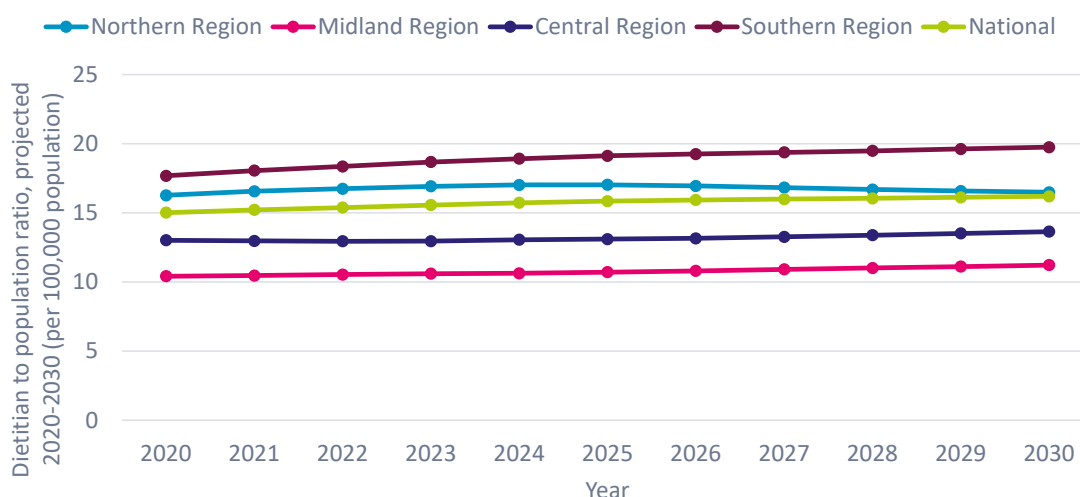
3.2.1 The dietetic workforce

The most recent data (as of 31 March 2020) indicates there are approximately 748 dietitians working in New Zealand (according to Ministry of Health dietitian workforce modelling shared with NZIER by Dietitians New Zealand). This number is projected to increase to 878 by 2030, based on continued rates of workforce entry and exit.

The current and projected regional distribution of dietitians provides for a ratio of 15.0 per 100,000 population nationally, with a range of 10.4 to 17.7 regionally. The ratio of dietitians to population is highest in the Southern Region (17.7 per 100,000 population). And concerning, the projected ratio of dietitians to population is expected to rise then fall slightly in the Northern Region (from 16.3 in 2020 to 17.0 in 2025 and 16.5 by 2030). The Midland Region is and is expected to continue to be the region with the lowest ratio of dietitians to population.

Many dietitians work part-time. As a result, the ratio of FTEs in New Zealand is considerably less than the headcount ratio (9.6 FTEs in 2020, compared with 15.0 headcount ratio). This number is projected to increase to 10.3 FTEs by 2030 based on continued trends of workforce entry and exit.

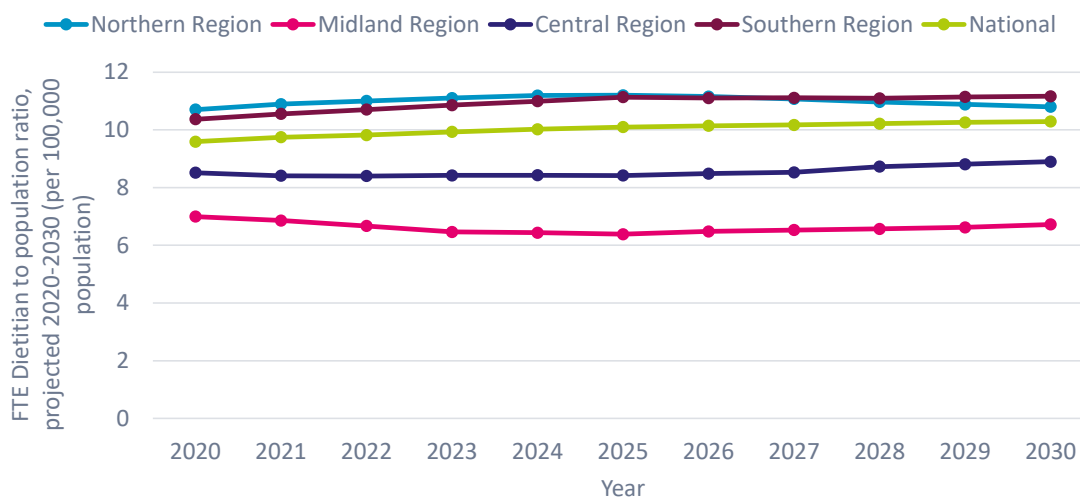
Figure 4 Dietitian to population ratio, projected 2020-2030 by region



Source: NZIER, Ministry of Health



Figure 5 FTE dietitian to population ratio, projected 2020-2030 by region



Source: NZIER, Ministry of Health

Table 3 Distribution of dietetic workforce by setting of work and region

Based on 2020 Dietitian headcount workforce projections

| Region | Publicly funded tier 1 headcount | DHB clinical tier 2 headcount | Other* headcount |
|-----------------|----------------------------------|-------------------------------|------------------|
| Northern Region | 59.4 | 134.4 | 112.2 |
| Midland Region | 19.8 | 44.8 | 37.4 |
| Central Region | 24.1 | 54.5 | 45.5 |
| Southern Region | 40.2 | 90.9 | 75.9 |
| National | 145.3 | 328.5 | 274.2 |

* "Other" means dietitians working in roles that are not publicly-funded tier 1 or DHB clinical tier 2. These may be roles in education, administration, or private sector roles including industry and private practice.

Source: NZIER, MOH, Dietitians Board of New Zealand (2019)

Table 4 Distribution of FTE dietetic workforce by setting of work and region

Based on 2020 FTE Dietitian workforce projections

| Region | Publicly funded tier 1 FTE | DHB clinical tier 2 FTE | Other* FTE |
|-----------------|----------------------------|-------------------------|---------------|
| Northern Region | 39.09 | 88.41 | 73.80 |
| Midland Region | 13.30 | 30.09 | 25.12 |
| Central Region | 15.75 | 35.62 | 29.73 |
| Southern Region | 23.58 | 53.32 | 44.50 |
| National | 92.83 | 209.94 | 175.23 |

* "Other" means dietitians working in roles that are not publicly-funded tier 1 or DHB clinical tier 2. These may be roles in education, administration, or private sector roles including industry and private practice.

Source: Source: NZIER, MOH, Dietitians Board of New Zealand (2019)



According to the Dietitians Board of New Zealand (2019), approximately 43.9 percent of the dietetic workforce currently work in a DHB clinical, non-community setting. These are likely to be hospital-based dietitians, including those in outpatient and inpatient settings. Nationally, this amounts to 328 dietitians and 209.9 FTE. Assuming the same proportion applies regionally, there would be between 45 and 88 dietitians working in DHB clinical, non-community settings across the regions.

Also, according to the Dietitians Board of New Zealand (2019), approximately 13.4 percent of dietitians work in DHB community settings and 6 percent of dietitians work in primary care. These represent the current dietetic workforce employed in publicly-funded tier 1 settings. Nationally, this amounts to 145 dietitians and 92.8 FTE. Assuming the same proportion applies regionally, there would be between 20 and 59 dietitians working in tier 1 settings across the regions.

3.2.2 Benchmarking the supply of dietitians in New Zealand

No definitive ratio of dietitians to population exists that would inform how adequate or inadequate the current dietetic workforce is. However, a range of international figures do provide some potential for benchmarking:

- In 1986 the benchmark figure of 14 dietitians per 100,000 population was obtained from Canadian and US data (Siopis, Jones, and Allman-Farinelli 2020).
- Australia's national average ratio of dietitians to population was 15 per 100,000 in 2017 (Siopis, Jones, and Allman-Farinelli 2020).

These ratios are based on actual workforce data, not on best practice. It is important to note that other countries are facing the same issues as New Zealand, in having under-invested in primary prevention for decades and experiencing a growing burden of demand due to increasing prevalence of long-term conditions.

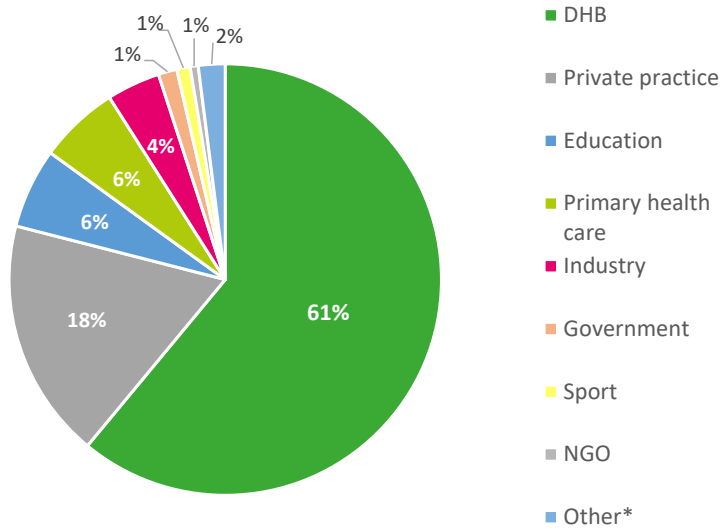
New Zealand's current practising dietetic workforce of 478 (FTE) and population provides for a ratio of only 9.6 dietitian FTEs per 100,000 population. This ratio is expected to increase slightly to 10.3 respectively by 2030.

3.2.3 Scarcity of dietitians in publicly-funded tier 1 settings

According to the 2018/19 Annual Report of the Dietitians Board of New Zealand (Dietitians Board of New Zealand 2019), over 60 percent of dietitians are on a DHB payroll, while only six percent work in primary care. Of those on the DHB payroll, only 22 percent are in community settings, meaning a total of less than 20 percent of dietitians currently work in tier 1 settings while 44 percent of dietitians work in clinical roles in tier 2 settings (DHB, non-community clinical).

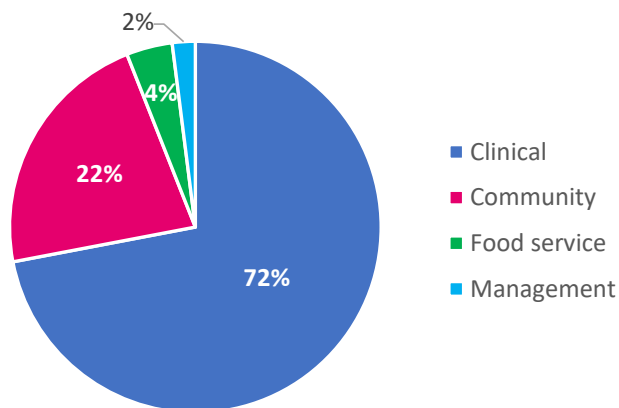


Figure 6 Registered dietitians' main workplace



Source: NZIER, Dietitians Board of New Zealand (2019)

Figure 7 DHB-employed registered dietitians' main workplace



Source: NZIER, Dietitians Board of New Zealand (2019)

There are two fundamental problems with the relative scarcity of dietitians in tier 1 settings:

- The apparent lack of investment in dietetic services in tier 1 settings is inconsistent with the shift that health system decision-makers have been attempting to execute to enable better care, closer to home for New Zealanders.
- Dietitians are skilled at primary prevention interventions and addressing risk factors for a range of long-term conditions, making tier 1 settings the most appropriate setting of care for the majority of dietitians. The scarcity of dietitians in these settings means the health and disability system is failing to obtain the full benefits that the dietetic workforce can offer.



4 Cancer

Cancer is the leading cause of death in New Zealand. The number of people diagnosed with cancer is projected to increase by 50 percent over the next 15 years (Ferlay et al. 2019). An ageing population, earlier cancer diagnosis and improvements in treatment are contributing to an increasing number of cancer patients and cancer survivors.

One in three people who get cancer can be cured if their disease is found and treated in time (Kim et al. 2020). This means more people living as cancer survivors or with cancer as a long term condition, which may mean multiple episodes of treatment with periods of wellness in between.

The pressure on secondary care that has resulted from the expanding population of cancer patients, along with developments in cancer care, has led to cancer care being provided on an increasingly ambulatory basis (through outpatient or day patient services, avoiding overnight stays in hospital) and to an expectation that tier 1 services will begin to play a greater role in cancer services.

Published studies indicate that adults with cancer were more likely than those with other long-term health conditions to be very high (20+ visits per year) or frequent (10-19 visits per year) GP attenders and that one in three adults with cancer were either very high or frequent GP attenders (see for example, National Health Performance Authority (2015). These findings indicate that the trend towards increased cancer survival will place significant pressures on GPs and that tier 1 services must be configured to cater for the needs of this population.

But the type of care offered to cancer patients and survivors should be tailored to their needs. A New Zealand based study identified that at any given time over 40 percent of patients with cancer are receiving only 'usual care' from their GP and that comorbidities are common, with nearly 40 percent having hypertension, 30 percent having gastrointestinal disorders and 24 percent having mood disorders (Kim et al. 2020)– all of these being amenable to dietetic intervention.

New models of care in general practice are needed to ensure that cancer patients have the best possible quality of life and chance of survival. Overseas, comprehensive survivorship care is increasingly provided by an interdisciplinary primary care team including social services, psychology, nutrition, and other allied health professionals (Chaput and Sussman 2019).

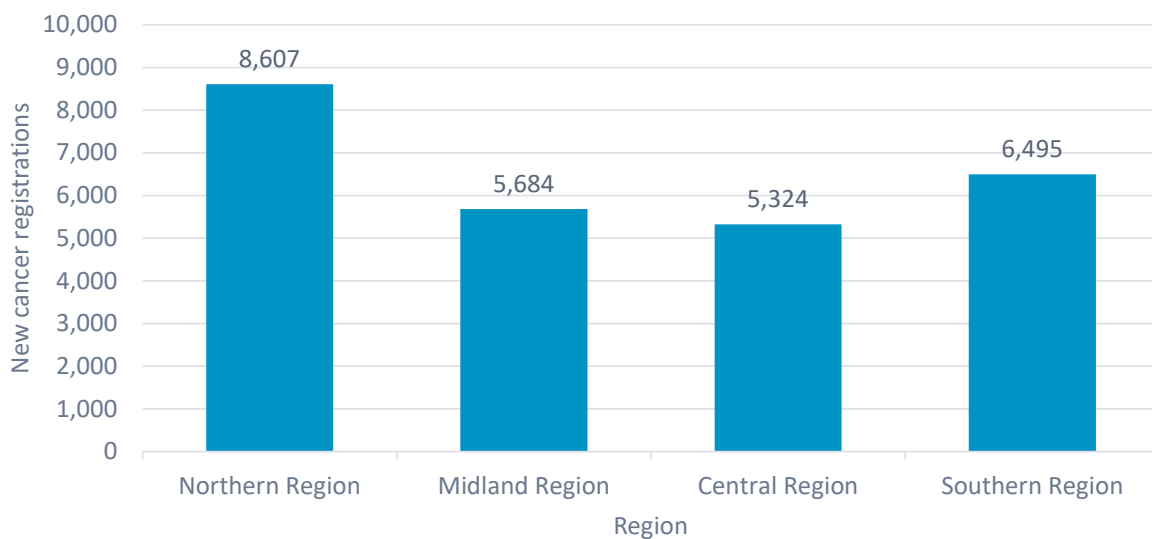
Two critical points to note are that cancer incidence and survival are worse for Māori. It is unclear to what extent this is associated with Māori being less likely to be under follow-up care from their GP during and after cancer treatment (RNZCGP 2020). From an equity point of view, it will be important to strengthen links between tier 1 and tier 2 services.

4.1 Demand for dietitians in cancer care

New cancer registrations are a driver of demand for cancer care and for dietetic services. The New Zealand Cancer Registry (NZCR) shows that in 2018 (the last year available), there were 26,110 new cancer registrations in New Zealand, with the Northern Region experiencing the largest share and the Central Region the smallest share (see Figure 8 below).



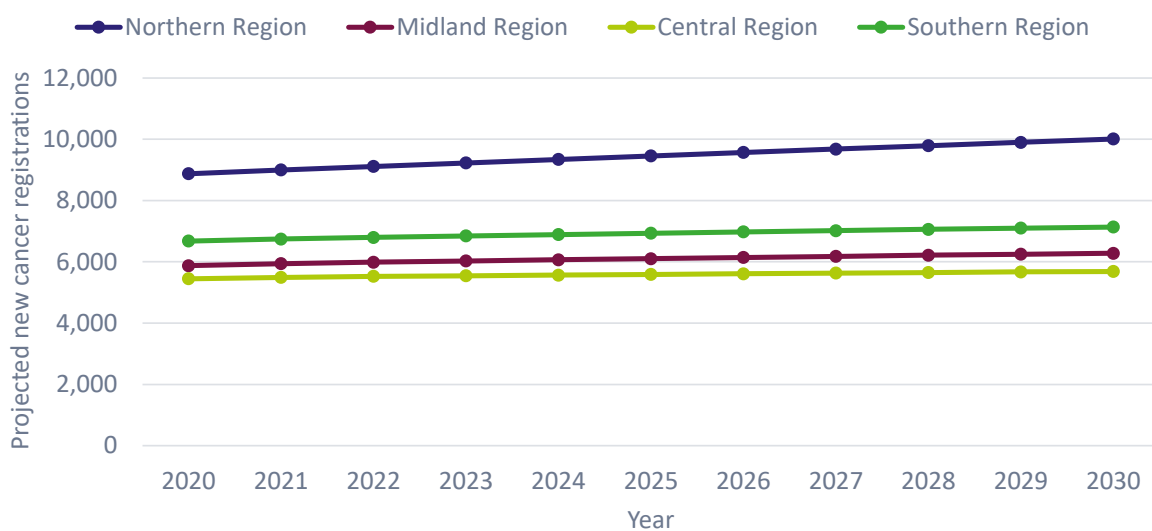
Figure 8 New cancer registrations by region – 2018



Source: NZIER, NZCR

The number of new cancer registrations is expected to continue increasing, reflecting population growth and cancer trends, resulting in an expected 29,112 new cancer registrations across New Zealand in 2030.

Figure 9 Projected new cancer registrations by region



Source: NZIER, NZCR

Anyone newly diagnosed with cancer may benefit from dietetic input. However, dietetic services are most likely to be needed and sought when people are undergoing cancer treatment, recovering from cancer treatment, or at risk of cancer recurrence following treatment.

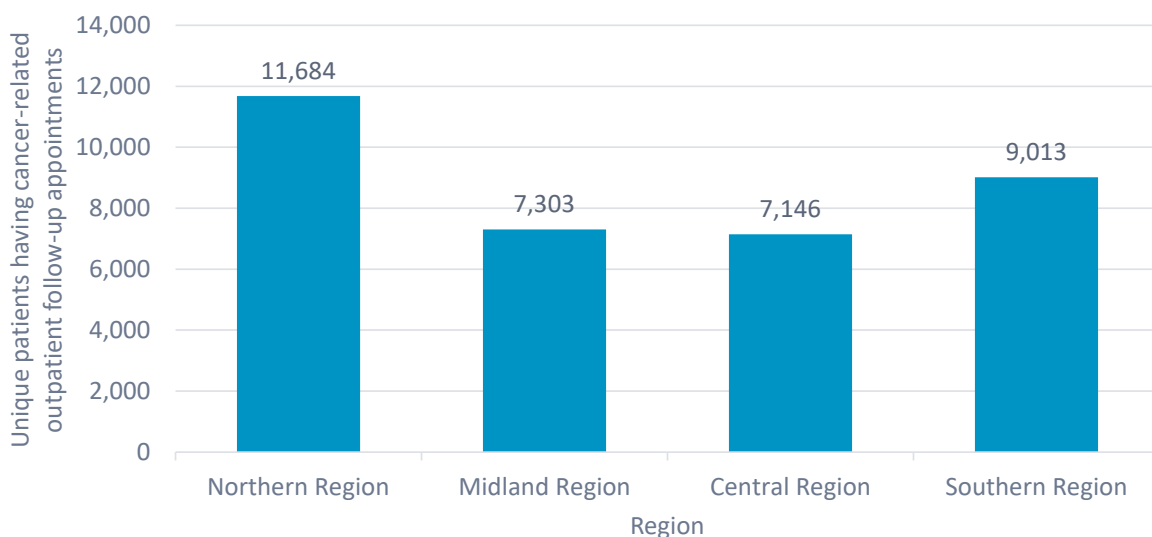


Because a lot of cancer treatment is now provided without overnight stays in hospital, it may be captured in inpatient data as a day patient procedure (in the NMDS dataset) or in outpatient data (in the NNPAC dataset) as a follow-up visit with a cancer specialist.

Unlike inpatient data, outpatient data does not capture procedures. For this reason, it is impossible to separately identify patients undergoing treatment from patients whose treatment is completed but being followed-up by their specialist. For this reason, we combine both groups as people who should have dietetic input to optimise their treatment and recovery.

In 2019/20, 35,146 people across New Zealand were either receiving cancer care as outpatients or being followed up by a cancer specialist.

Figure 10 Unique patients having cancer-related outpatient follow-up appointments by region – 2019/2020

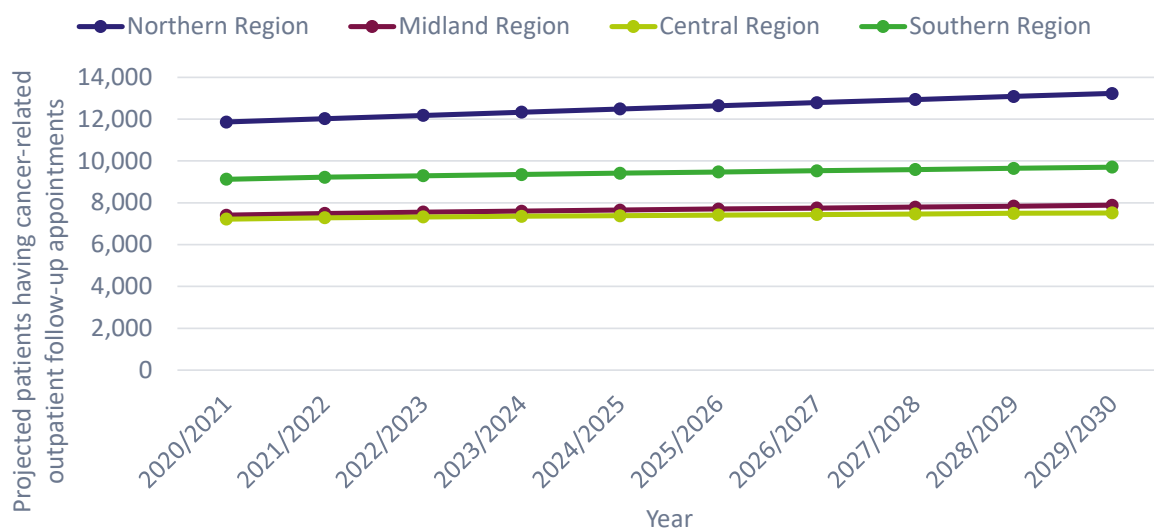


Source: NZIER, NNPAC

Based on population growth and the trend in outpatient follow-up visits for cancer patients, the total number of cancer patients accessing care in this setting is expected to reach 38,591 by 2030.



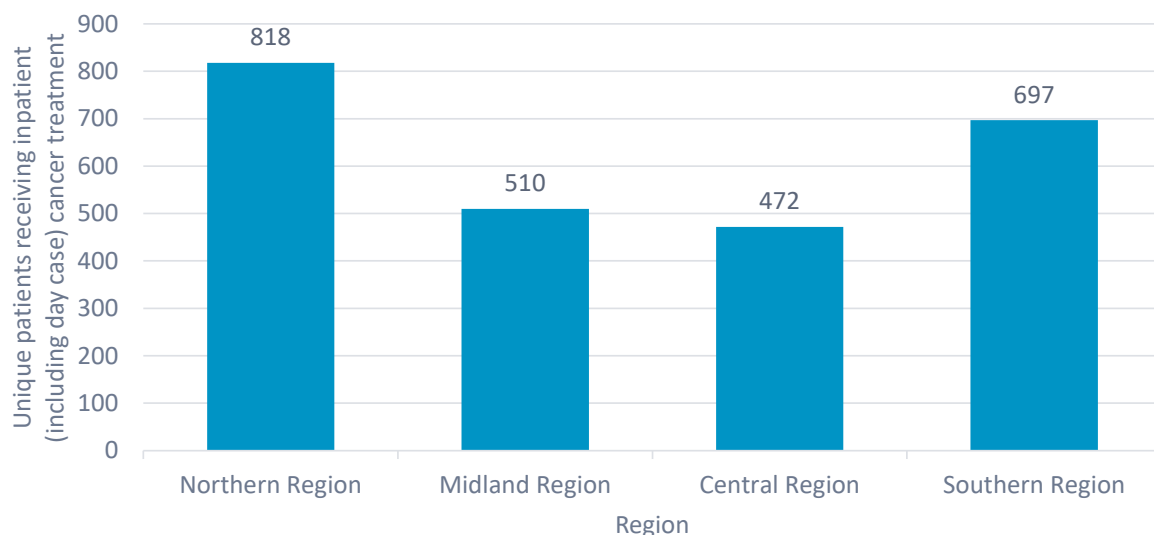
Figure 11 Projected patients having cancer-related outpatient follow-up appointments by region



Source: NZIER, NNPAC

Inpatient data is much more detailed than outpatient data and allows a clearer identification of people receiving cancer treatment. However, due to the increasingly ambulatory nature of cancer care, the number of patients whose cancer treatment is reflected in inpatient data is relatively small, 2,497 people received cancer care in an inpatient context (including day patients and overnight patients) in 2019/20.

Figure 12 Unique patients receiving inpatient (including day case) cancer treatment by region – 2019/2020

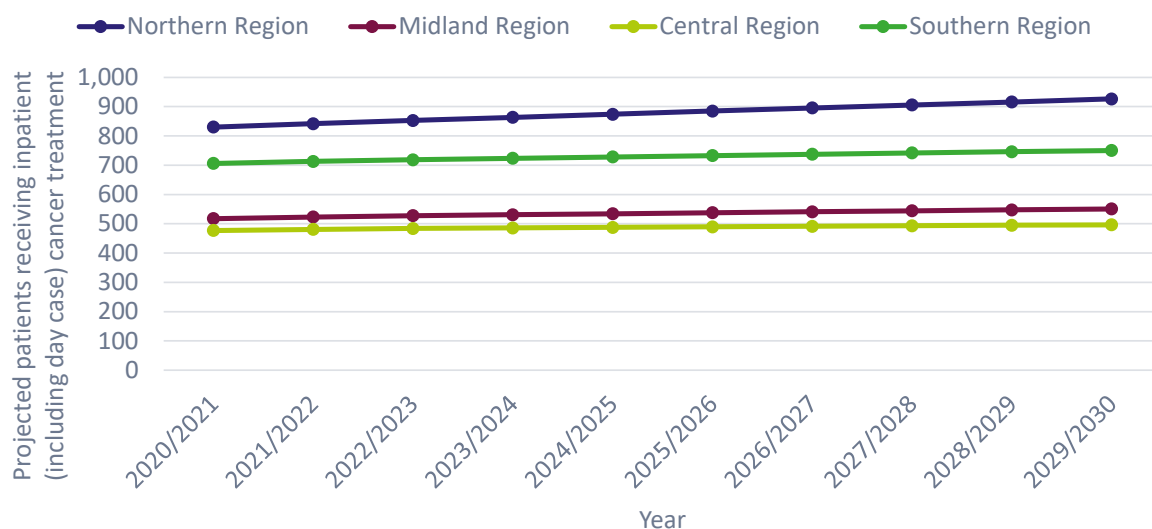


Source: NZIER, NMDS



Based on population growth and the trend in inpatient follow-up visits for cancer patients, the total number of cancer patients accessing care in this setting is expected to reach 2742 by 2030.

Figure 13 Projected patients receiving inpatient (including day case) cancer treatment by region



Source: NZIER, NMDS

The total number of patients undergoing cancer care in an outpatient or inpatient setting or being followed up by a cancer specialist in 2019/20 was 37,643 and is expected to reach 41,333 by 2030.

4.2 Dietitians' potential contribution

In 2019, the Cancer Care at a Crossroads conference was held in Wellington, hosted jointly by the University of Otago and the Cancer Society of New Zealand, in partnership with the Ministry of Health and the New Zealand Society for Oncology (Sarfati et al. 2019). Key themes emerged from the conference, including:

- High quality, accessible, timely, equitable and coordinated treatment and care requires a focus on the whole person and their whānau, not just their disease.
- Prevention is critical to reduce the burden on secondary services, address the equity gaps in cancer incidence and outcomes, and improve quality of life for all New Zealanders. With approximately half of all cancers being theoretically preventable, surprisingly few resources are committed to identifying and implementing effective prevention in New Zealand. Interventions to prevent cancer can be broad-based and determinants-focused. The recommendations of the World Cancer Research Fund focus on maintaining a healthy weight, being physically active, and healthy diet.
- Engagement of primary care will be needed to address the needs of an increasing number of people surviving cancer. As well as surveillance and follow-up of people who have completed secondary care treatment, primary care can monitor and manage comorbid conditions in people with cancer to help improve overall outcomes. The



World Cancer Research Fund recommends that all cancer survivors receive nutritional care guidance from trained professionals.



Source: World Cancer Research Fund, 2018

The vision for cancer care in tier 1 services is holistic person-centred coordinated care with a strong focus on prevention by addressing determinants (environmental influences, infectious agents, nutritional factors, hormonal and reproductive factors (Marahatta et al. 2005) and on improving health outcomes through prevention and management of comorbidities as well as treating their cancer – an imperative that has been signalled in published research (see for example Koroukian, Murray, and Madigan 2006; Kim et al. 2020).

The Government's Cancer Action Plan 2019-2029 states that "it is essential that individuals and whānau who are affected by cancer have access to and understand the benefits of AHPs (allied health professionals) throughout the cancer continuum" (Ministry of Health, 2020b: p.59) to address recognised risk factors and known cancer recovery issues like nutrition.

Because dietitians' work often involves working closely with people to educate them, coach them and identify strategies that work within their unique context, dietitians are used to taking a person-centred approach to care.

Although most dietitians who work with cancer patients work in hospital settings, the increasingly ambulatory nature of cancer care and the need for people to be able to access services closer to home mean that tier 1 settings would be appropriate for dietetic services for cancer patients.

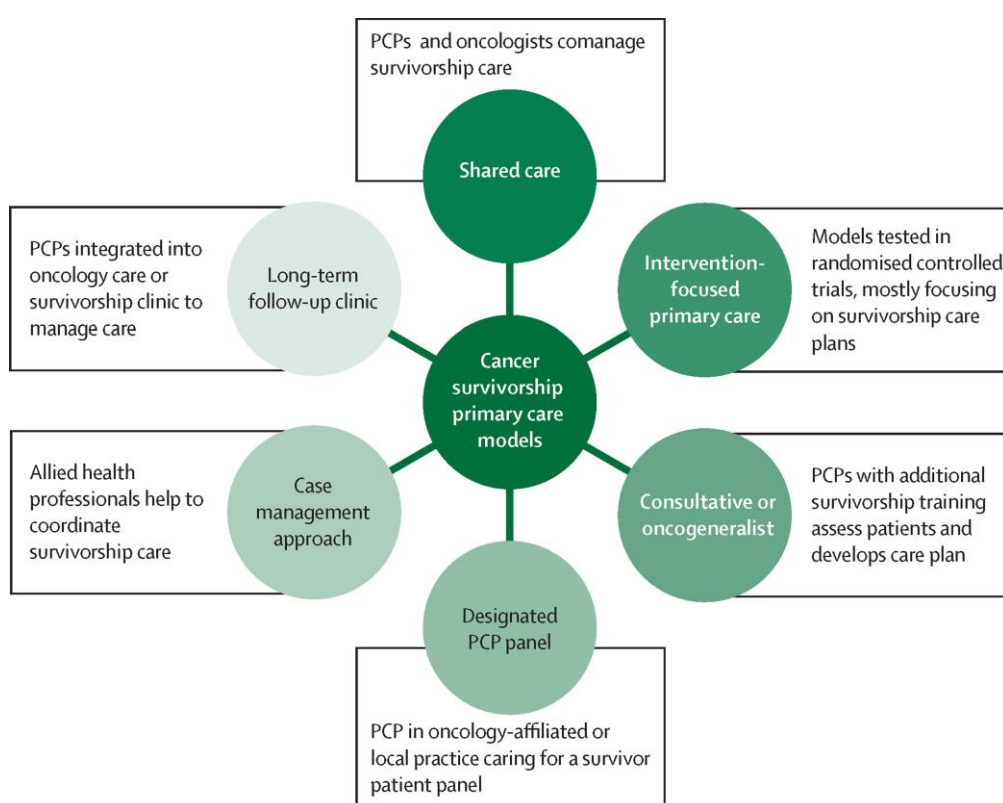
A major advantage of shifting hospital-based dietitians into not just tier 1 settings but general practice teams would be the experience and insight they would bring with them to bolster general practice cancer care.



Dietitians who have shifted from hospital settings to tier 1 settings could also be instrumental in establishing mechanisms for better continuity of care and effective communication with tier 2 providers. Dietitians who are already experienced in cancer care in a secondary care setting will be able to support the establishment of these mechanisms effectively as they already understand what working in a secondary care multi-disciplinary team entails, including communicating with specialists and hospital staff and they already have a familiarity with secondary cancer care and treatment pathways.

These potential contributions of dietitians as well as other allied health practitioners are recognised in the models of cancer survivorship care described by Nekhlyudov, O'Malley, and Hudson (2017).

Figure 14 Models of cancer survivorship care



Source: Nekhlyudov et al., 2017

4.2.1 Effectiveness and value for money

The role of allied health in tier 1 services for cancer survivorship is well established in some jurisdictions. For example, the Good Life Cancer Survivorship Program in the United States is a community-based model created to complement hospital-based oncology rehabilitation programs and address unmet supportive care needs. It is delivered in a community-based integrated multidisciplinary clinic specialising in chronic disease management through allied health services including dietetics, physiotherapy, exercise physiology, psychology and counselling in a person-centred and coordinated model of care. An evaluation of the programme revealed that the most accessed services in the programme were physiotherapy, psychology and dietetic services (Russell et al. 2020).



Working in tier 1 settings, if and when the dietetic workforce is sufficient, means dietitians could also help to reduce the incidence of cancer. A review of studies of the cost-effectiveness of lifestyle-related interventions for the primary prevention of breast cancer indicated that the median cost-effectiveness ratio (in 2018 USD) was \$24,973 per QALY – well below the \$50,000 threshold for cost per QALY gained, and equivalent to approximately NZ\$36,000 (Bellanger et al. 2020).

Macmillan Cancer Support, the Royal College of Anaesthetists, the National Institute for Health Research Cancer and Nutrition Collaboration have called for the introduction of rehabilitation as soon as possible after a cancer diagnosis. Cancer diagnosis was considered to be a ‘teachable moment’ in which patients would be most open to receiving advice to make lifestyle changes and emphasised the importance of providing support for patients to engage in behaviour change: “The opportunity presented by the ‘teachable moment’ that occurs in anticipation of cancer treatment should be exploited to maximum effect to benefit long-term health behaviours and outcomes” (p.33). This prehabilitation was recommended to be delivered by a multidisciplinary team including dietitians.

4.2.2 Equity

Inequities in health disadvantage Māori and Pacific people, resulting in poorer health outcomes from cancer. Māori and Pacific people have higher rates of most preventable cancers; over three times the rate of lung cancer, three to six times the rate of stomach cancer, and three to four times the rate of liver cancer as non-Māori, non-Pacific people. In addition, Māori and Pacific people experience worse survival from cancer (Ministry of Health 2020b). Early dietetic intervention can contribute to reducing these inequities.

Dietitians working in primary care settings improving the effectiveness of cancer care as well as optimising diets to support cancer recovery and minimise the risk of recurrence could support equity by making these services more accessible to Māori and Pacific people.

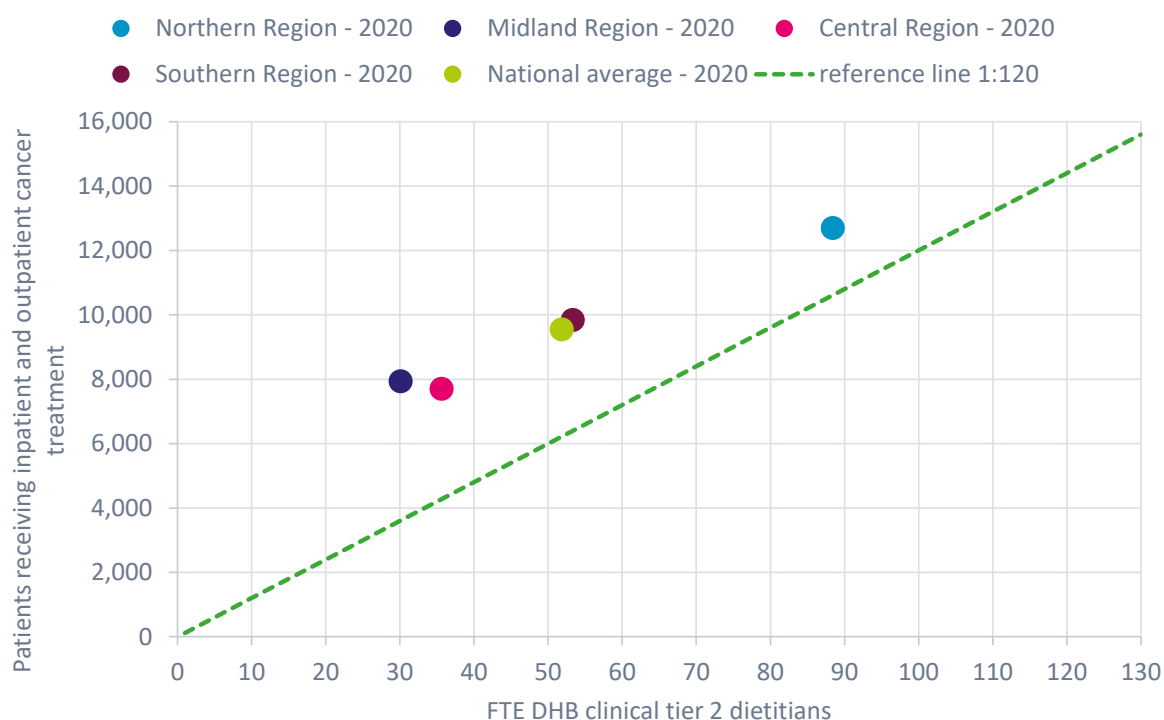
4.3 Potential unmet need for dietitians in cancer care 2020-2030

To calculate the potential unmet need for dietitians in cancer care, we plot the current ratio of DHB-employed dietitians working in clinical, non-community settings for each region alongside a conservative ratio of one dietitian per 120 cancer patients. This ratio is conservative considering the patient acuity staffing guidelines developed by the Clinical Nutrition Management practice group of the American Dietetic Association suggests ratios of 1:65 to 1:75 for medical service (Simmons and Vaughan 1999).

With 328.5 FTE dietitians currently working in DHB-employed clinical (non-community) roles, none of the regions is able to achieve the 1:120 ratio in a tier 2 setting, despite the relatively heavy presence of DHB-employed dietitians in hospitals. The Northern Region has the most favourable dietitian-patient ratio at 1:143, and the Midland Region has the least favourable at 1:263.



Figure 15 Current ratio of individuals receiving inpatient and outpatient cancer treatment to FTE DHB clinical tier 2 dietitians



Source: NZIER

Table 5 Ratio of FTE DHB clinical tier 2 dietitians to patients receiving inpatient and outpatient cancer treatment

Based on FTE and patient 2020-2030 projections and 1:120 ideal ratio

| Region | FTE DHB clinical tier 2 dietitian to patient ratio | | | FTE gap to 1:120 ideal ratio | | |
|-----------------|--|-------|-------|------------------------------|------|------|
| | 2020 | 2025 | 2030 | 2020 | 2025 | 2030 |
| Northern Region | 1:143 | 1:137 | 1:142 | 17.3 | 14.0 | 18.5 |
| Midland Region | 1:263 | 1:288 | 1:274 | 36.0 | 40.1 | 39.7 |
| Central Region | 1:216 | 1:218 | 1:207 | 28.5 | 29.7 | 28.1 |
| Southern Region | 1:184 | 1:172 | 1:171 | 28.6 | 25.6 | 26.2 |

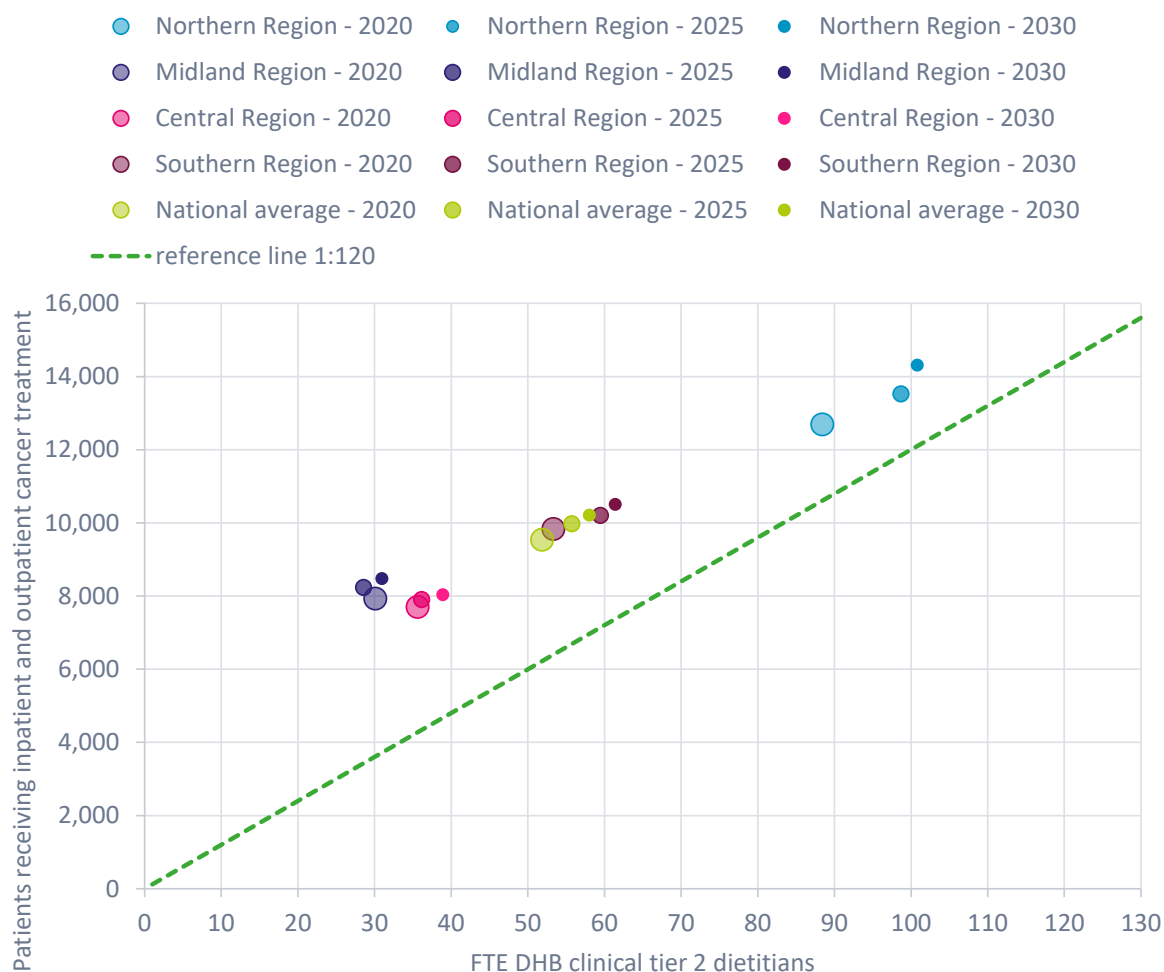
Source: NZIER

Based on these ratios, the number of dietitians needed for cancer care to be delivered across inpatient and outpatient settings with a ratio of 1 dietitian to 120 patients, the regions will require an additional 17.3 to 36.0 FTE dietitians in DHB clinical settings, amounting to 110 FTE dietitians nationally.

Combining workforce projections with cancer patient projections reveals that this service gap is unlikely to be improved by 2030, with all regions failing to make any significant improvement to the ratio (see Figure 16 below).



Figure 16 Projected ratio of individuals receiving inpatient and outpatient cancer treatment to FTE dietitians working in a DHB clinical setting



Source: NZIER

Given that an even smaller percentage of the dietetic workforce is employed in community and primary care settings, an even greater shortfall in dietetic workforce to support a shift of cancer patients to community settings is possible. And while many cancer patients would never be eligible to receive cancer care in community settings, most cancer patients would probably be best served by dietetic support being available in community settings, particularly with increasingly ambulatory cancer care meaning that cancer patients are less likely to have overnight inpatient stays.



5 Diabetes

Diabetes is a complex multisystem metabolic disease affecting an increasing proportion of the New Zealand population. While diabetes affects all age groups, type 2 diabetes – the most common at around 90 percent of cases – is more prevalent in older age groups. Māori and Pacific people develop type 2 diabetes 10-20 years younger than New Zealanders of European descent, and experience worse outcomes, including amputations at a higher rate. Poor outcomes are a result of poor management – which requires a holistic person-centred approach targeting lifestyle as well as proactive prevention, close monitoring and pharmacologic care.

Increasingly, and associated with rising child and youth obesity, type 2 diabetes is being diagnosed in younger age groups more commonly than in the past, increasing the need for careful management to prevent premature death as longer duration of disease increases the risk of complications (Ministry of Health 2011).

Co-existent medical conditions such as asthma or cancer (and/or the treatment of these conditions) can lead to increased metabolic disturbance, creating challenges for the management of diabetes. At the same time diabetes is an independent risk factor for the development of several types of cancer, and negatively affects cancer prognosis: Studies have shown that cancer mortality is significantly higher in people with diabetes (Suh and Kim 2011).

Because care of diabetes patients has improved, life expectancy for people with diabetes has increased. As a result, the population living with diabetes is increasing. New Zealand is now faced with not only increasing numbers of people developing diabetes, but also more people with diabetes living longer, leading to a significant change in the case mix of diabetes patients.

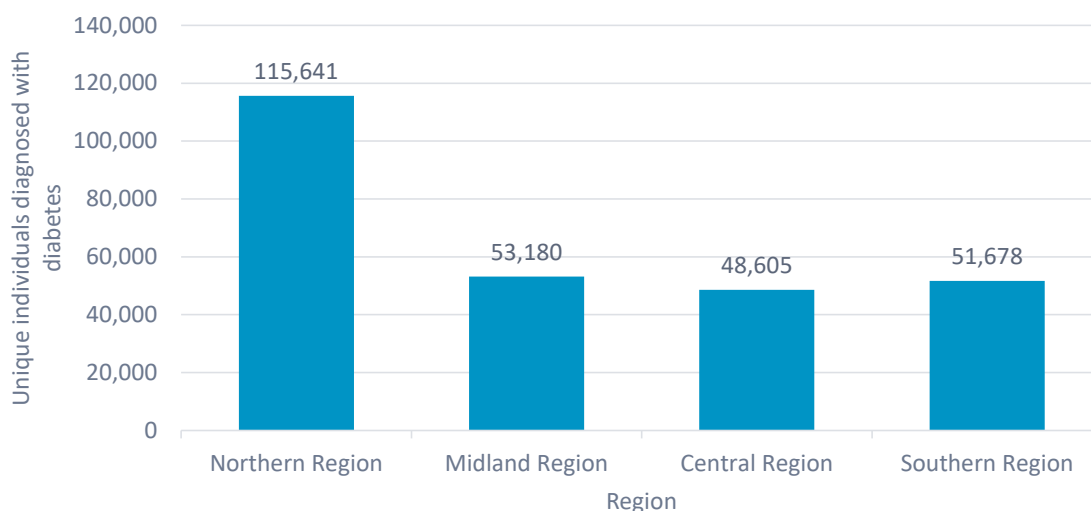
5.1 Demand for dietitians in diabetes care

The Virtual Diabetes Register (VDR) provides the best estimate of diabetes prevalence for New Zealand. The 2020 VDR indicates that there is a total of 269,104 people living with diabetes in New Zealand. Approximately 90 percent of these will be people with type 2 diabetes, although the exact proportion is not known. For this reason, our analysis is based on all diabetes, as indicated by the VDR.

The Northern Region has the highest number of people with diabetes, at 115,641, compared with a national regional average of 67,276. All other regions are below this average with 48,605 to 53,180 people with diabetes in each region.



Figure 17 Unique individuals diagnosed with diabetes by region – 2020

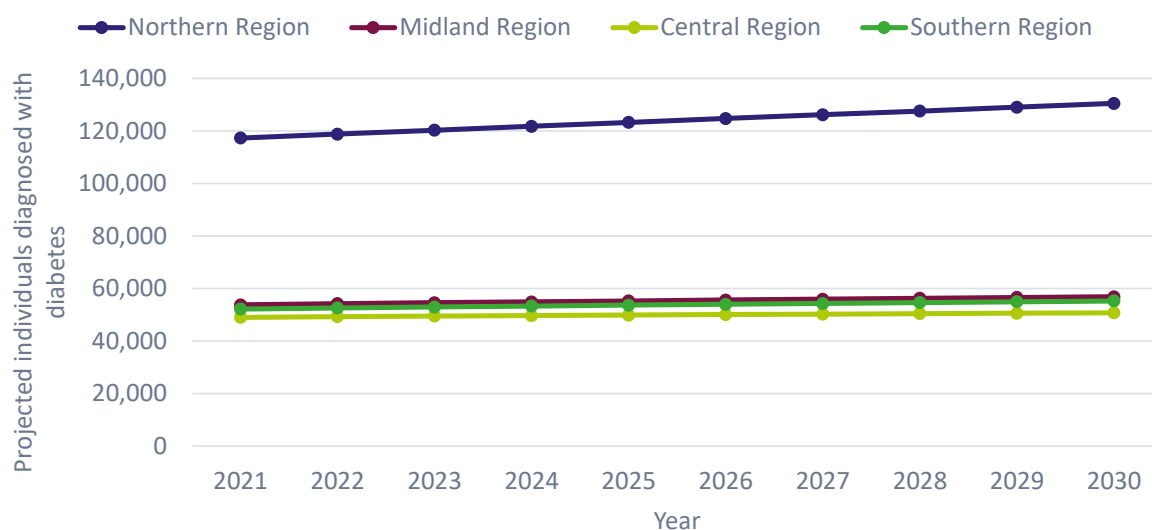


Source: NZIER, VDR

DHB-based analysis of the VDR data reveals that the largest population of people with diabetes is in Counties Manukau, with over 45,000 people with diabetes concentrated in that DHB.

Projecting the population with diabetes through to 2030, based on regional year-on-year increases in population projections indicates a steeper rise in diabetes cases in the Northern Region than elsewhere. Overall, New Zealand is expected to have 293,252 people with diabetes by 2030, leading to even greater demand for diabetes care.

Figure 18 Projected individuals diagnosed with diabetes by region

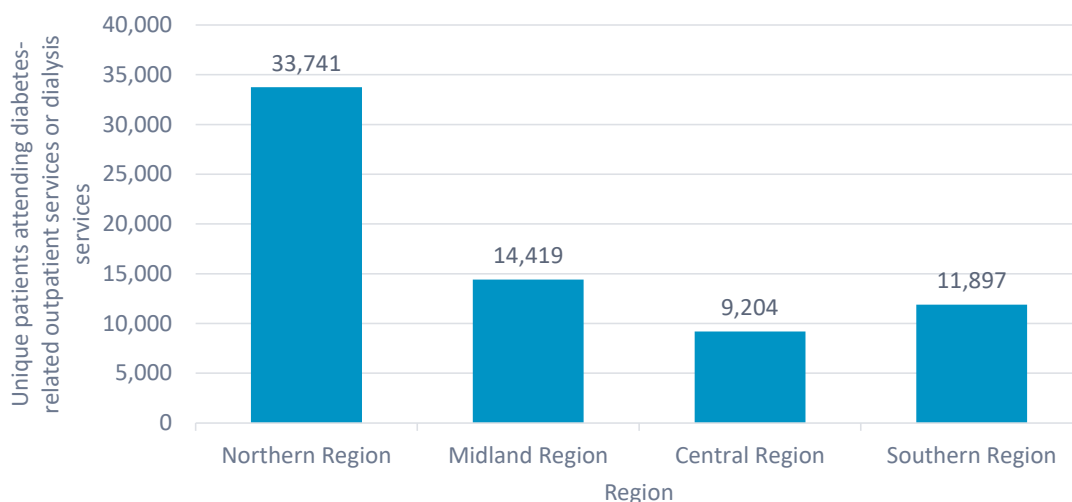


Source: NZIER, VDR



The population of people with diabetes attending outpatient services (including in-centre dialysis or enrolment with home dialysis) is 69,261 including 33,741 in the Northern Region and 9,204 to 14,419 across the other regions (see Figure 19 below)

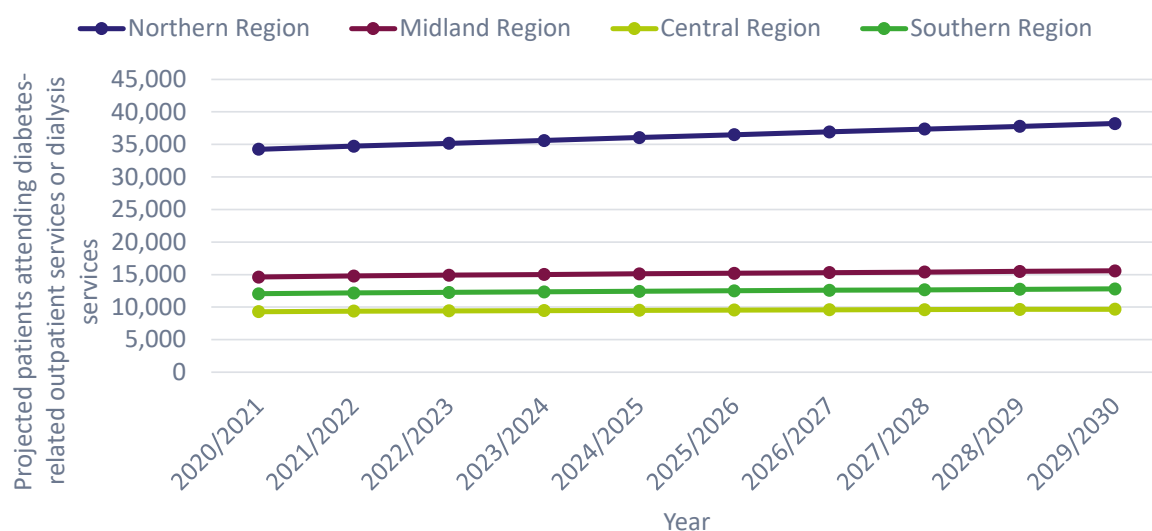
Figure 19 Unique patients attending diabetes-related outpatient services or dialysis services by region – 2019/2020



Source: NZIER, NNPAC

In line with projected increases in the diabetes population, the projected increases in people using diabetes outpatient services indicate that the Northern Region (Figure 20) and particularly Auckland and Waitemata will come under increasing pressure to 2030.

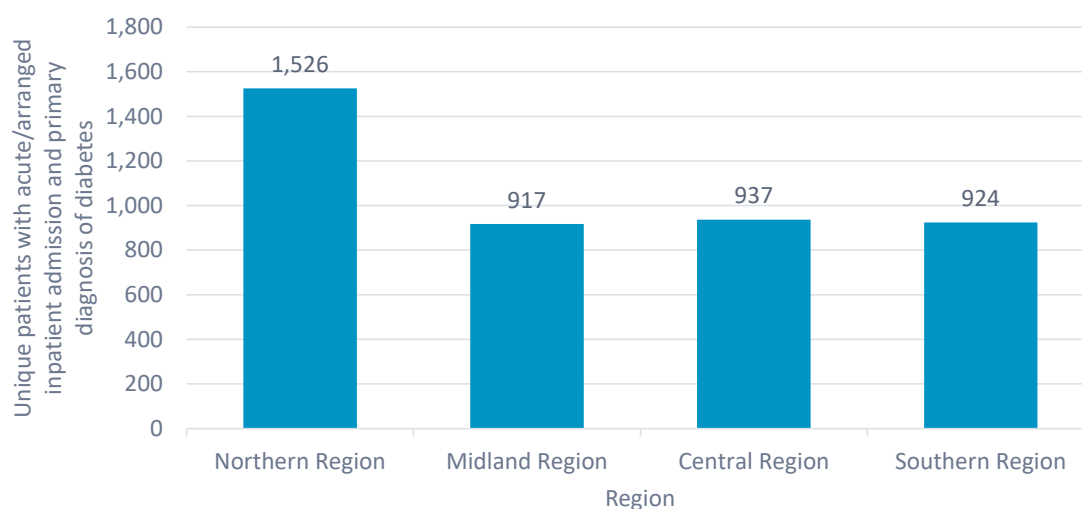
Figure 20 Projected patients attending diabetes-related outpatient services or dialysis services by region



Source: NZIER, NNPAC

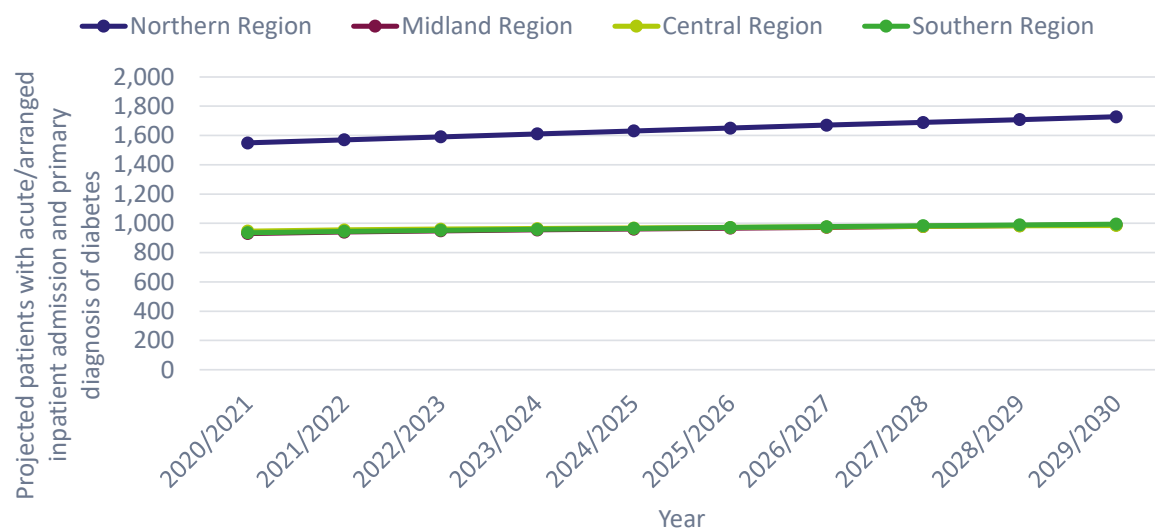


Figure 21 Unique patients with acute/arranged inpatient admission and primary diagnosis of diabetes by region – 2019/2020



Source: NZIER, NMDS

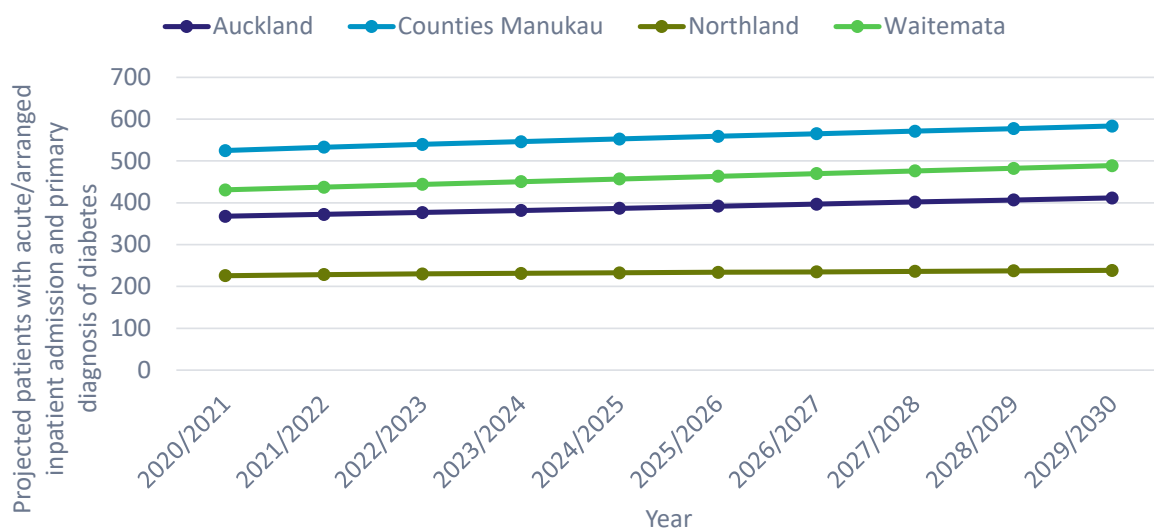
Figure 22 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes by region



Source: NZIER, NMDS

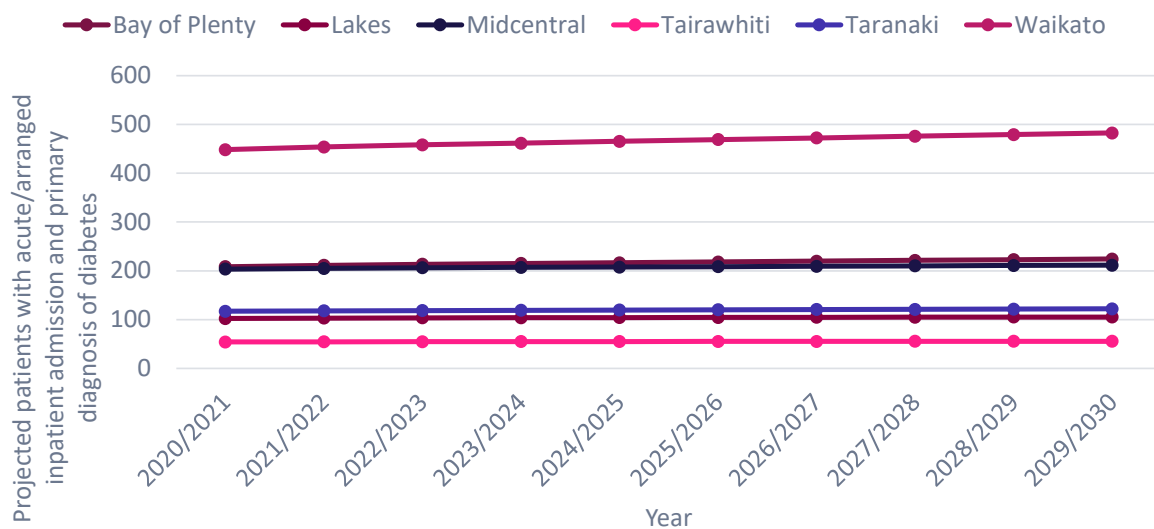


Figure 23 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Northern Region DHBs



Source: NZIER, NMDS

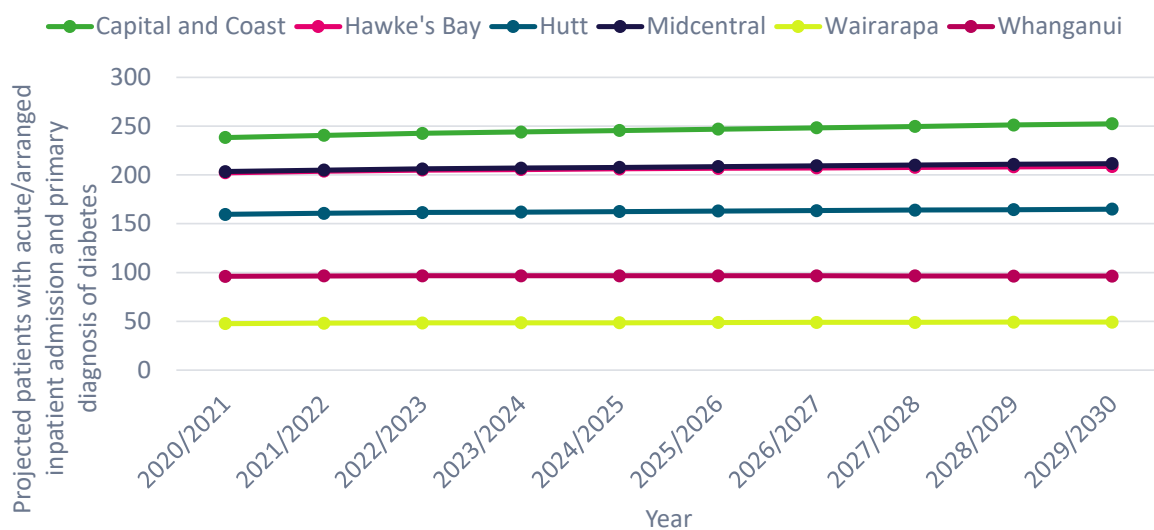
Figure 24 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Midland Region DHBs



Source: NZIER, NMDS

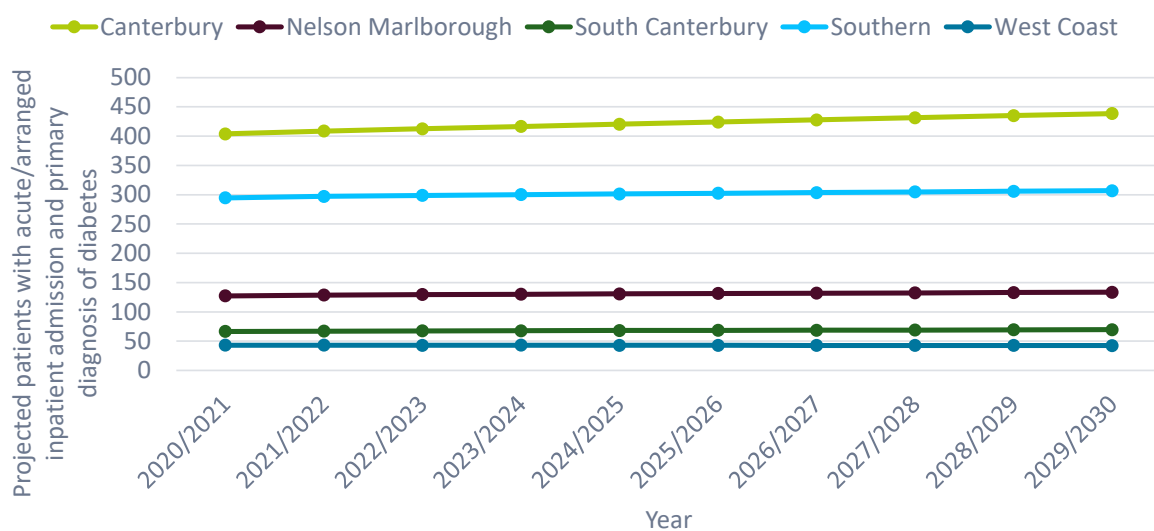


Figure 25 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Central Region DHBs



Source: NZIER, NMDS

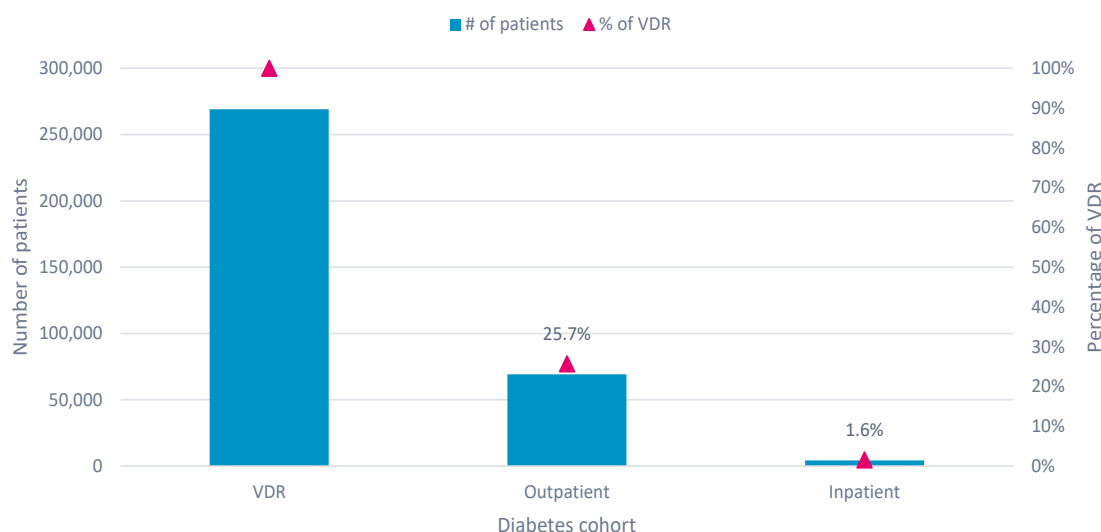
Figure 26 Projected patients with acute/arranged inpatient admission and primary diagnosis of diabetes: Southern Region DHBs



Source: NZIER, NMDS



Figure 27 National attribution of patients accessing outpatient and inpatient diabetes services as a proportion of the VDR population



Source: NZIER, VDR, NNAPC and NMDS

5.2 Dietitians' potential contribution to the solution

Type 2 diabetes is preventable (Jermendy 2005) and early stage Type 2 diabetes is manageable with the potential to avoid or significantly delay the onset of complications.

In 2011, the Ministry of Health undertook a diabetes care workforce review. The review recognised that the model of care for each stage of diabetes consists of:

- Prevention and health promotion
- Primary health care coordinated, multidisciplinary prevention and management, including targeted programmes for high risk and vulnerable groups
- Acute care and specialist multidisciplinary team services
- National quality assurance and improvement oversight Information technology/support structures (Ministry of Health 2011).

Many dietitians already work with people who have diabetes. Dietitians offer evidence-based dietary advice to patients with diabetes taking into account such factors as nutritional status, medication, diabetes control and lifestyle.

The goal of dietitians working with people who have diabetes is to achieve the best diabetes control possible to reduce the risk of complications including cardiovascular disease and kidney failure. Dietitians also work with patients who have existing kidney disease to optimise their nutrition.

Studies have shown that lifestyle intervention, including dietary modification, can:

- Reduce obesity and the risk of developing type 2 diabetes
- Reduce the progression to type 2 diabetes in people with impaired glucose tolerance



- Improve outcomes for people with all types of diabetes by reducing rates of complications
- Reduce the need for specialist care to treat and manage the complications of diabetes
- Reduce acute illness resulting in hospitalisation for people with diabetes
- Support women with gestational diabetes to avoid complications of pregnancy and birth and reduce rates of perinatal mortality.

5.2.1 Effectiveness and value for money

Dietetic care of people with diabetes is best provided within multi-disciplinary models of primary care and much of the available evidence of cost-effectiveness is in this context. For example:

- An evaluation of diabetes education teams comprising nurse and dietitian educators integrated into primary care in Canada found that this model of care can have a clinically meaningful impact on HbA1c (Gucciardi et al. 2020).
- A systematic review and meta-analysis of studies evaluating impacts of nutrition education for type 2 diabetes prevention examined results of 69 studies in terms of weight changes, fasting and 2-hour blood glucose concentration, and HbA1c as well as the delivery agent (dietitian vs. non-dietitian, where non-dietitians were non-medical health educators and community leaders). The meta-analysis identified that dietitian-delivered interventions resulted in greater weight loss as well as being delivered at lower cost per kilo of weight lost (Sun et al. 2017).
- A systematic review of 122 studies over the period 1985–2017 for interventions in type 2 diabetes (Siegel et al. 2020) found that:
 - Integrated, patient-centred care based on the Chronic Care Model for people with type 2 diabetes compared with usual care is associated with highly favourable cost-effectiveness ratios (US\$11,339 per QALY gained).
 - A range of multicomponent interventions including behaviour change and medication adherence compared with usual care have been associated with cost savings or highly favourable cost-effectiveness ratios – on average US\$2,315 per QALY gained).
- Bariatric surgery can be a cost-effective intervention for obese people with type 2 diabetes (cost saving according to (Siegel et al. 2020) and people undergoing bariatric surgery will require dietetic support to help them adapt to required lifestyle changes.
- One of the most compelling pieces of evidence is an evaluation of a dietitian-led diet and lifestyle programme, Moving Away from Pre-diabetes (MAP), showed that this 12 week programme focusing on behaviour change for patients identified as having pre-diabetes resulted in 60 percent of participants no longer meeting clinical criteria for prediabetes. Eighty-one percent of participants had better glycaemic control, body weight and waist circumference after 6 months, and, after 12 months, 43 percent of participants continued to remain prediabetes-free (Hamid, 2016). According to the Treasury CBAX Impacts Database, the marginal value of a case of Type 2 diabetes avoided in terms of health system costs is \$3,894 per year. But dietary intervention that improves body weight and waist circumference is likely also to have an impact on



cardiovascular disease, which according to the Treasury CBAX Impacts Database, has an annual marginal value to the health system of \$7,579.

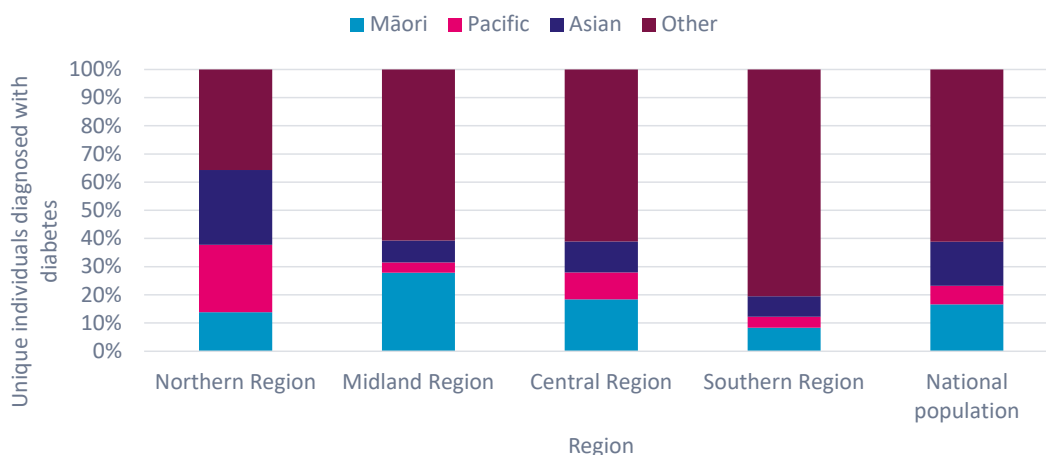
5.2.2 Equity

Dietitians working with people with diabetes may represent the biggest opportunity to address inequities.

Inequities in health disadvantage Māori and Pacific people, resulting in their over-representation amongst those with diabetes. Pacific people with diabetes are over-represented in the Northern Region in particular, and Māori with diabetes are over-represented in the Midland Region in particular (see figure below), the latter being most concerning due to the relative scarcity of dietitians in the Midland Region.

Early dietetic intervention can contribute to reducing these inequities.

Figure 28 Percentage regional ethnic distribution of individuals diagnosed with diabetes



Note: “Other” ethnicity includes New Zealand European, but also other ethnicities not represented by Māori, Pacific and Asian – sometimes referred to as “European/Other”.

Source: NZIER, NNPAC

5.3 Potential unmet need for dietitians in tier 1 diabetes care

Published dietetic staffing ratios from existing services across high income countries describe a range of one registered dietitian FTE per 300–500 patients with diabetes (MacDonald Werstuck and Buccino, 2018). Modelling of a workforce sufficient to provide best practice diabetes care, however, identifies that 1 FTE per 300 would be required in the community setting (Segal et al. 2013). Segal et al. (2013) derived best practice dietetic input to population ratios within a model designed to estimate the total primary care workforce model for diabetes care. The model showed that dietetic input is the most significant component of community-based care for people with diabetes (see Table 6 below).



Table 6 Primary care workforce model for best practice diabetes care

| Occupation | FTEs | Main areas of management (% of clinical workload) |
|---------------------------------|-------|---|
| Dietitian | 3.25 | Dietary advice and management for persons with established type 1 and type 2 diabetes (44%), review of dietary advice in response to social insults (13%) |
| District nurse | 3.15 | Medication compliance support for persons with impaired cognitive ability (68%), community nursing for diabetic foot disorder (31%) |
| Diabetes educator | 2.75 | Diabetes education for persons with established type 1 and type 2 diabetes (54%), social insults (11%), sexual dysfunction (10%) |
| Practice nurse | 2.75 | Preventive care and surveillance in persons with established diabetes (64%) |
| Exercise physiologist | 2.03 | Exercise prescription and management in persons with established type 1 and type 2 diabetes (21%), impaired physical ability (13%), morbid obesity (13%), eating disorder (10%) |
| Psychologist | 1.9 | Psychological support related to sexual dysfunction (45%), eating disorder (22.3%), diagnosed mental health disorder (18.3%), morbid obesity (8.5%) |
| GP | 1.98 | Medical care (58%) and case management and care coordination (42%) |
| Social worker | 1.75 | Social support in response to social insults (54%), poor mental well-being (15%) |
| Podiatrist | 1.56 | Foot care for persons with established type 1 and type 2 diabetes (34%), diabetic foot disorder (22%), neuropathy (17%) |
| Pharmacist | 1.25 | Specialist medications advice for established type 1 and type 2 diabetes (92%) |
| Ethnic/migrant health worker | 0.67 | Care of persons of an ethnic/migrant background (100%) |
| Dentist | 0.36 | Dental care for established type 1 and type 2 diabetes (99%) |
| Occupational therapist | 0.3 | Enabling functional independence for persons with vision impairment (eye complication [35%], neuropathy [31%]) |
| Orthotist | 0.15 | Preparing orthoses for persons with impaired physical ability (100%) |
| Aboriginal health worker* | 0.07 | Care of persons with an indigenous background (100%) |
| Community midwife | 0.02 | Type 2 diabetes in pregnancy (68%), gestational diabetes mellitus (25%) |
| Total | 22.06 | |

*As described in Segal et al., (2013). This workforce would require adjustment for New Zealand requirements and would potentially include Māori and Pacific health workers with a higher FTE in some areas to reflect local population.

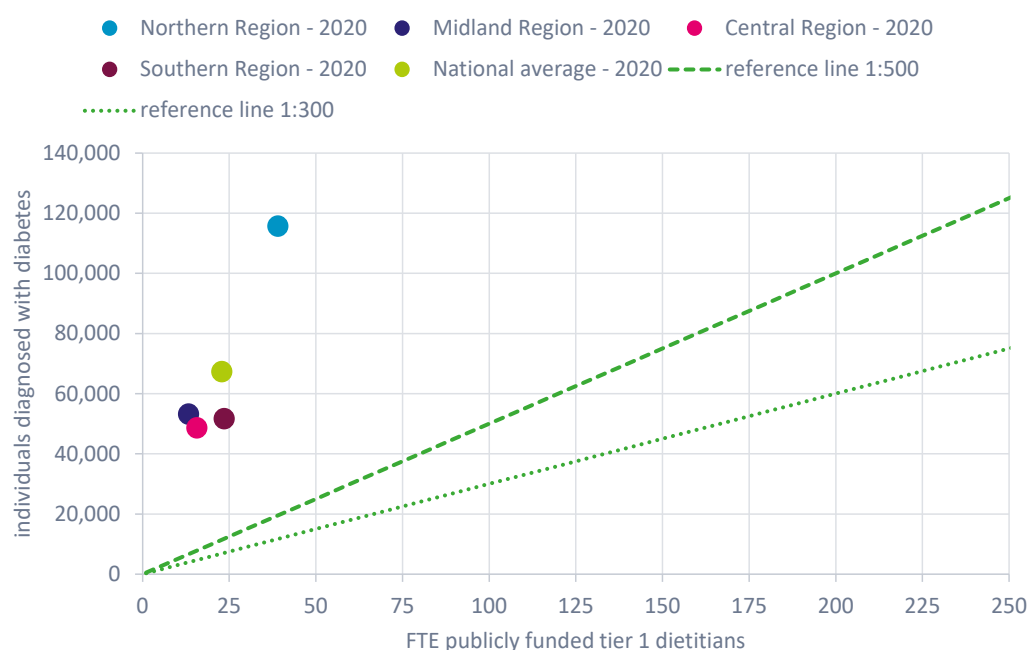
Source: Segal et al. (2013)

Dietitian FTE to patient ratios were calculated and compared with the best practice ratio of 1:300 and the observed ratio of 1:500 (from other jurisdictions) using the publicly-funded



primary and community dietetic workforce and the population of people with a diabetes diagnosis, as indicated by the VDR. New Zealand's ratio of dietitian FTE to patients ranges from 1:2190 to 1:4000 and falls far short of either the 1:300 best practice ratio or the 1:500 ratio observed overseas (see Figure 29 and Table 7 below).

Figure 29 Current ratio of individuals diagnosed with diabetes to FTE publicly-funded tier 1 dietitians



Source: NZIER

Applying population projections to the relevant demographic groups in the VDR and recalculating the ratios using dietetic workforce model projections reveals that the FTE gap to achieve either the best practice ratio or the ratio of 1:500 observed overseas will increase between 2020 and 2030. In total, by 2030, an additional 875 dietitian FTEs will be needed in publicly-funded primary and community roles to provide best practice care to the population with diabetes.

Table 7 Ratio of FTE publicly-funded tier 1 dietitians to individuals diagnosed with diabetes

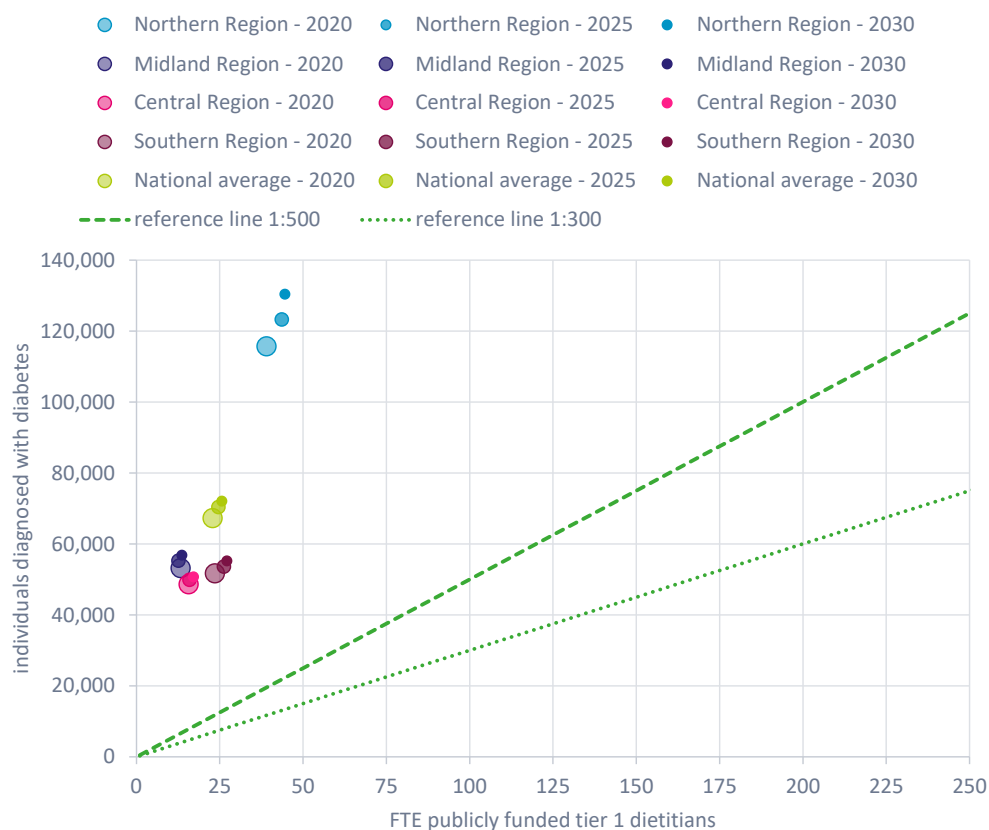
Based on FTE and patient 2020-2030 projections with 1:500 and 1:300 ideal ratios

| Region | FTE tier 1 dietitian to patient ratio | | FTE gap to 1:500 ratio | | FTE gap to 1:300 ratio | |
|-----------------|---------------------------------------|--------|------------------------|-------|------------------------|-------|
| | 2020 | 2030 | 2020 | 2030 | 2020 | 2030 |
| Northern Region | 1:2960 | 1:2930 | 192.2 | 216.3 | 346.4 | 390.2 |
| Midland Region | 1:4000 | 1:4150 | 93.1 | 100.0 | 164.0 | 175.9 |
| Central Region | 1:3090 | 1:2950 | 81.5 | 84.3 | 146.3 | 151.9 |
| Southern Region | 1:2190 | 1:2030 | 79.8 | 83.3 | 148.7 | 156.9 |

Source: NZIER



Figure 30 Projected ratio of individuals diagnosed with diabetes to FTE tier 1 dietitians



Source: NZIER

Because the dietitian to patient ratios are so far from ideal when the entire population with a diabetes diagnosis is used to do the calculations, the calculation was repeated based on only people with diabetes who are accessing outpatient services (including in-centre and home dialysis). Even based on this considerably smaller population, best practice diabetes care in the community is only achievable for the Northern Region and the Midland Region is still not able to offer a 1:500 ratio to this group.

Table 8 Ratio of FTE publicly-funded tier 1 dietitians to individuals attending diabetes-related outpatient services or dialysis services

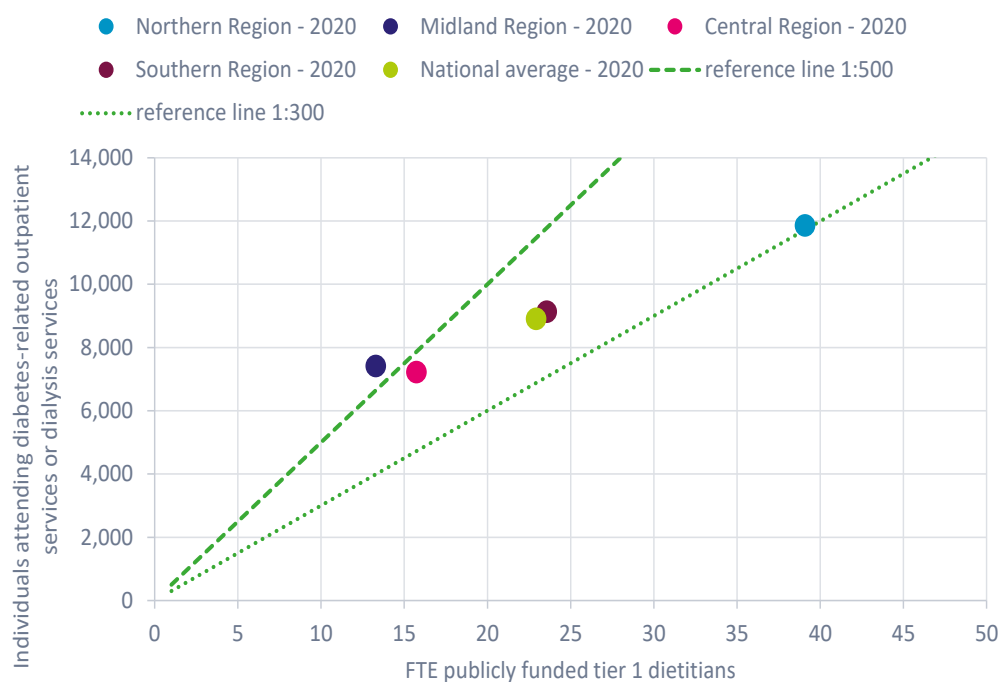
Based on FTE and patient 2020-2030 projections with 1:500 and 1:300 ideal ratios

| Region | FTE tier 1 dietitian to patient ratio | | FTE gap to 1:500 ratio | | FTE gap to 1:300 ratio | |
|-----------------|---------------------------------------|-------|------------------------|-------|------------------------|------|
| | 2020 | 2030 | 2020 | 2030 | 2020 | 2030 |
| Northern Region | 1:303 | 1:300 | -15.4 | -17.8 | 0.4 | 0.0 |
| Midland Region | 1:557 | 1:579 | 1.5 | 2.2 | 11.4 | 12.7 |
| Central Region | 1:459 | 1:439 | -1.3 | -2.1 | 8.3 | 7.9 |
| Southern Region | 1:387 | 1:359 | -5.3 | -7.6 | 6.9 | 5.4 |

Source: NZIER



Figure 31 Current ratio of individuals attending diabetes-related outpatient services or dialysis services to FTE publicly-funded tier 1 dietitians

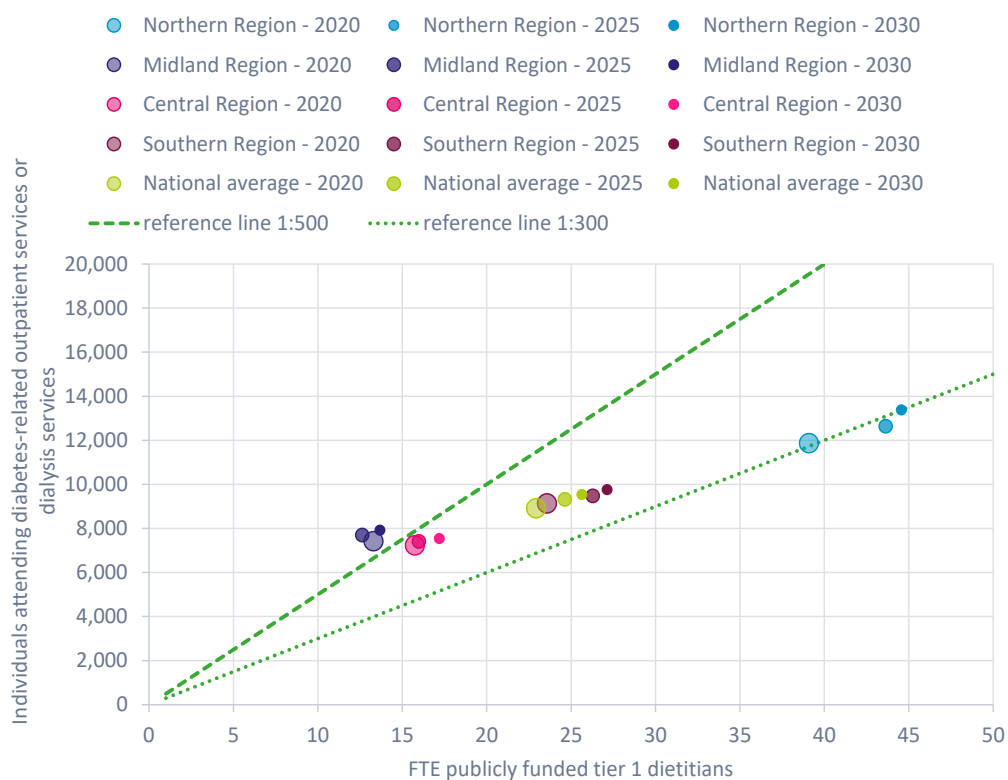


Source: NZIER

Applying population projections to the relevant demographic groups and recalculating ratios using dietitian workforce modelling projections reveals that little improvement is expected by 2030 (see Figure 32 below).



Figure 32 Projected ratio of individuals attending diabetes-related outpatient services or dialysis services to FTE tier 1 dietitians



Source: NZIER

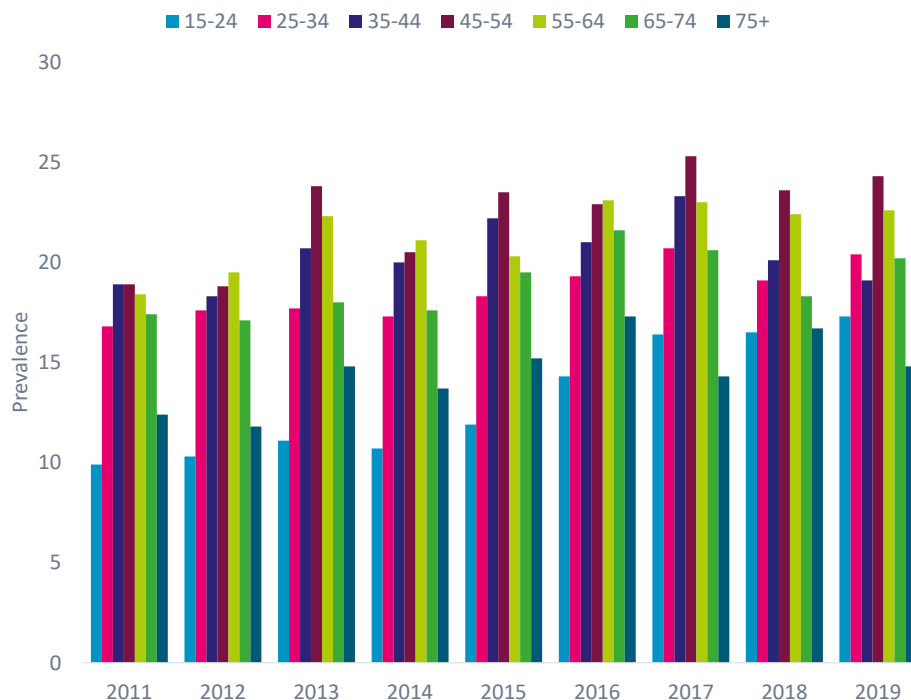


6 Mental health

A mental health crisis creates an additional challenge for primary and community services in particular. Around 500 New Zealanders die by suicide each year and New Zealand's youth suicide rates are the highest in the OECD. (Auckland University 2018). New Zealand's rate of maternal suicide is around five times that of the UK, and Maori are over three times as likely as New Zealand Europeans to die this way (PMMRC 2019). Demand for mental health services has increased significantly between 2008 and 2016 (Auckland University 2018), indicating a need for substantial system response and a focus on prevention.

The New Zealand Health Survey 2019/20 reveals that close to 20 percent of most age groups experience mood and anxiety disorders, which if not managed well, may escalate to a need for crisis support, specialist intervention, and even inpatient mental health admission.

Figure 33 Mood and anxiety disorders by age group, 2011-2019



Source: NZIER, New Zealand Health Survey 2019/20 data

The Government Inquiry into Mental Health and Addiction (2018), as well as many others, Mental Health Services A New Zealand study paints a picture of rising demand at the acute and severe end of the spectrum of mental health services. For example Auckland District Health Board reports an increase from roughly 2000 crisis referrals in 2010 to over 6000 in 2015 (Mulder, Rucklidge, and Wilkinson 2017). Ideally, escalation to crisis referrals would be minimal as mild to moderate mental health needs would be effectively managed in primary mental health services.

To meet high demand at the acute and severe end of the mental health spectrum, a highly specialised, high cost workforce has been deployed: The number of psychiatrists and psychologists almost doubled from 2005 to 2015 (Mulder, Rucklidge, and Wilkinson 2017),



contributing to the need for rapid rise in mental health funding from NZD\$1.1 billion in 2008/2009 to nearly NZD\$4 billion in 2015/2016 (New Zealand Ministry of Health data as cited in Mulder, Rucklidge, and Wilkinson (2017)).

As a result, New Zealand has a relatively high concentration of psychiatrists working in mental health (28.5 per 100,000 population, roughly double Australia and Canada's concentration).

Table 9 Mental health workforce per 100,000 population

Reporting year: ^a 2015, ^b 2016, ^c 2017

| Country | Psychiatrists | Nurses | Social workers | Psychologists |
|--------------------------|---------------|--------|----------------|---------------|
| Australia ^a | 13.5 | 90.6 | | 103.0 |
| Canada ^c | 14.7 | 68.7 | 145.4 | 48.7 |
| Finland ^c | 23.6 | 52.0 | 2.8 | 109.5 |
| France ^c | 20.9 | 98.0 | | 48.7 |
| Netherlands ^a | 20.9 | | | 123.5 |
| New Zealand ^b | 28.5 | 75.1 | | |
| Norway ^b | 48.0 | | | 73.5 |
| USA ^b | 10.5 | 4.3 | 60.3 | 29.9 |

Source: World Health Organization (2019)

Although escalation of mental health needs can occasionally result in admission to inpatient facilities, the ideal setting of care for mental illness is the community and most people's mental health needs can be met in this setting. For those who need more specialist care, the proportion of care that is received in community settings could be increased and, with greater support in the community, reductions in admissions to inpatient mental health facilities may be achievable.

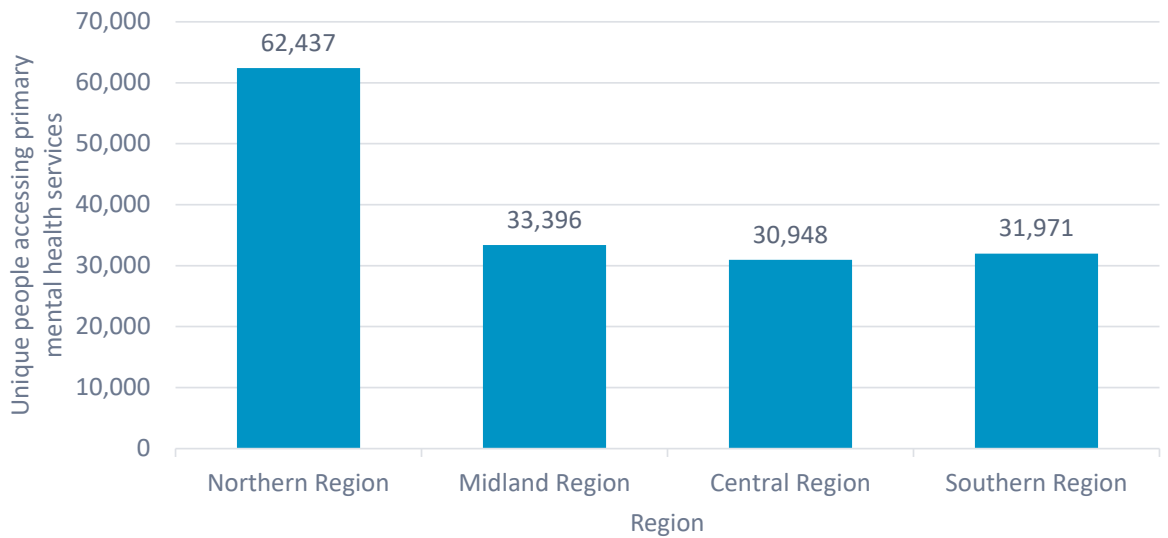
Mental health dietitians work with people of all ages who experience mental illness. This can include anxiety, autism, bipolar disorder, dementia, depression, drug and/or alcohol problems, eating disorders, learning disabilities, personality disorders, and schizophrenia. Reducing the burden of mental health conditions on crisis services and secondary mental health services requires a stronger focus on prevention and management of mild to moderate mental health conditions in tier 1 settings and dietitians could be an important part of this response.

6.1 Demand for dietitians in mental health care

Although anyone experiencing mood and anxiety disorders could benefit from dietetic input, the number of people accessing mental health services provides an estimate of those who are seeking care and would be most likely to access dietetic support if it were available. Nationally, 158,752 people accessed primary mental health services in 2017/18, with nearly 40 percent of these in the Northern Region.



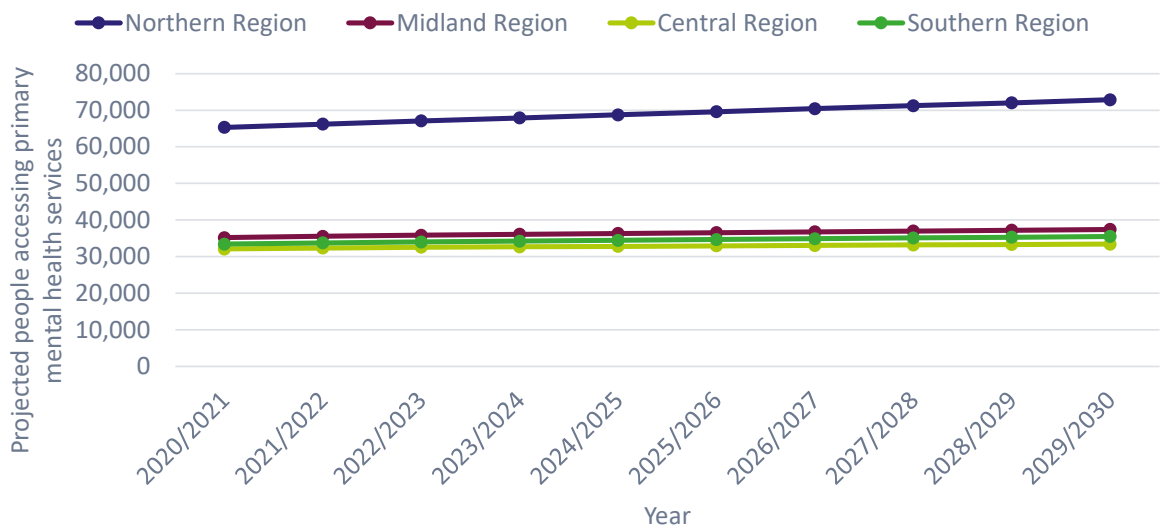
Figure 34 Unique people accessing primary mental health services by region – 2017/2018



Source: NZIER, PRIMHD

Applying the rates of access in demographic groups to projected population growth, reveals that the Northern Region is also expected to see the most growth in demand to 2030.

Figure 35 Projected people accessing primary mental health services by region



Source: NZIER, PRIMHD

6.2 Dietitians' potential contribution to the solution

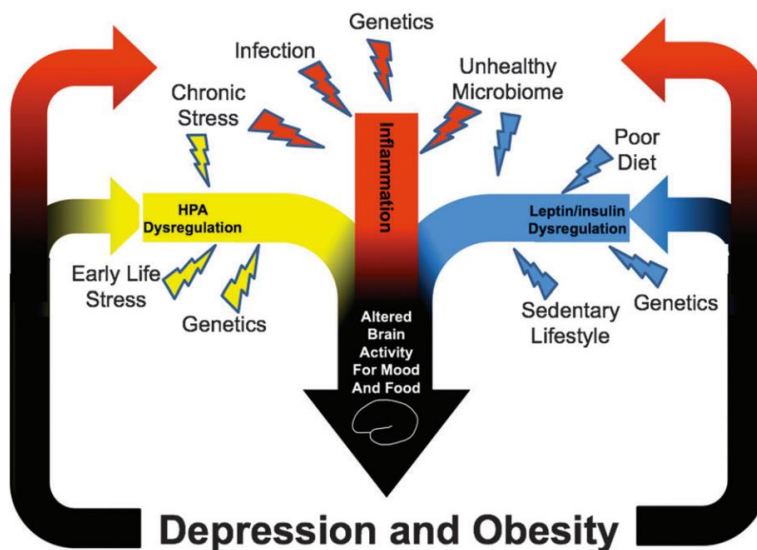
Unhealthy diet is common in both high prevalence and severe mental illness. Research has shown that poor dietary patterns and quality are associated with mental illness, particularly depression and anxiety (Sarris et al. 2014). In addition, poor physical health which may result from poor nutrition is common in people with mental illness and is the greatest contributing factor in the mortality gap between those who suffer long-term mental illness



and those who don't (Teasdale et al. 2017). People with mental illness face a 15 to 25 year life expectancy disparity. This has been found to be caused predominantly by the high rates of obesity, cardiovascular disease (CVD) and diabetes in this population (Newcomer 2007). Consequently, any effort to address outcomes for people with mental illness must include interventions to address these diet-related conditions.

In fact, the relationship between mental illness and obesity-related conditions is bidirectional: each one increases the risk of developing the other. This explains why mental illness, particularly depression, and obesity commonly co-occur and result in a *“progressive downward spiral in a person's health status”* (Milaneschi et al. 2019, 26).

Figure 36 Shared biological pathways influencing depression and obesity



Source: Milaneschi et al. (2019)

This association also explains why treatment strategies that target the shared mechanisms described in Figure 36 above tend to be effective at improving both depression and obesity.

The potential for dietary modification to improve mental health outcomes is supported by the Spanish SUN Cohort Study, which showed an inverse association between adherence to a Mediterranean diet and risk of depression over four years in more than 10,000 people and confirmed that poor mental health being the original causal factor in poor dietary choices within this population is not supported by the data (Sánchez-Villegas et al. 2009).

Registered dietitians have supported people with mental health disorders for many years in public hospitals, mental health facilities, and residential care facilities. Some dietitians work in community-based private practice, but this presents a barrier for poorer people.

People with any mental illness stand to benefit from the services of a registered dietitian. A registered dietitian will complete a nutritional assessment of the person's diet; including foods, beverages, supplements, medications and other lifestyle factors that influence the person's health. Eating patterns, allergies, socioeconomic issues, and spiritual and cultural factors that impact on diet are also included in these holistic assessments. Registered dietitians also consider the person's medical conditions and treatments they are receiving



so that potential food/drug interactions and dietary needs associated with health conditions can be factored into care plans.

The holistic approach that is typical of dietetic services is particularly suited to people facing socioeconomic barriers to wellbeing: Access to secure housing is a common challenge faced by people with mental health conditions and this impacts on their ability to store and prepare healthy food (Dietitians Association of Australia 2019).

6.2.1 Effectiveness and value for money

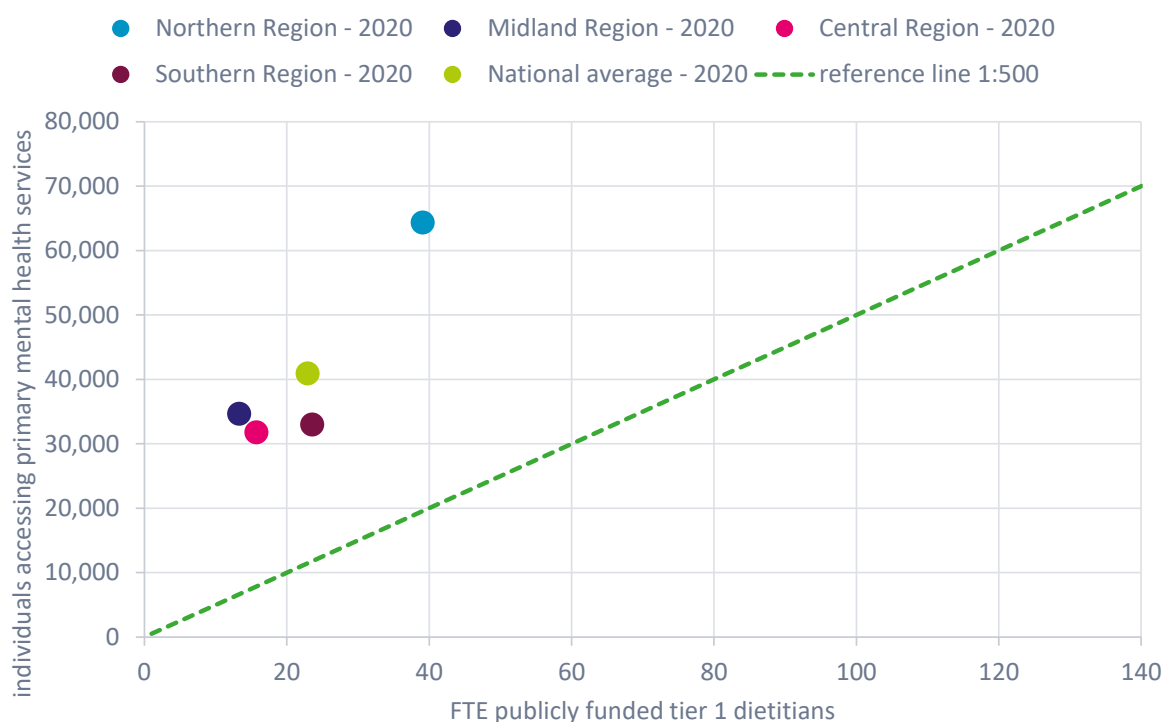
- A meta-analysis of randomised controlled trials analysed the effects of dietary improvement on symptoms of depression and anxiety and found that dietary interventions significantly reduced depressive symptoms and, in females, symptoms of both depression and anxiety (Firth et al. 2019). The analysis also revealed that mental health benefits also result from dietary interventions targeted specifically at weight loss, indicating that a failure to account for both mental and physical health benefits may result in underestimation of the cost-effectiveness of dietary interventions in patients with co-morbidities.
- Dietary intervention studies demonstrate improved mental and physical health outcomes. Dietitians translate nutrition science into practical advice aimed at improving the nutritional status of patients with mental illness, as well as preventing and managing comorbidities across a variety of care settings (Teasdale et al. 2017).
- Dietary interventions are low cost, safe and effective. Two Australian economic evaluations published in 2018 found that dietary interventions were cost effective when compared to social support as treatments for depression (Segal et al. 2020; Chatterton et al. 2018).
- Lifestyle interventions that aim to modify diet and physical activity are effective in reducing body weight and depressive symptoms (see for example American College of Cardiology/American Heart Association Task Force on Practice Guidelines, Obesity Expert Panel, 2013 2014 and Sarris et al. 2014) indicating that team-based interventions involving dietitians and other tier 1 allied health professionals are effective.
- An economic evaluation of an Australian dietary counselling over 7 individual one-hour face-to-face sessions by a registered dietitian for adults with major depression found that compared with a social support control, average total health sector costs (including all health professional visits, hospitalisations, co-payments and medication) were AUD\$856 (2013/14 dollars) lower and average societal costs (health sector costs as well as transportation and productivity costs of both absenteeism and presenteeism) were AUD\$2591 (2013/14 dollars) lower for those receiving dietary support even with costs of food included, while also providing additional QALYs (Chatterton et al. 2018).

6.3 Potential unmet need for dietitians in primary mental health services

No published ratio of dietitians to patients could be found for primary mental health services. A ratio of 1:500 was tested as a starting point. This test revealed that the ratio cannot be achieved currently in publicly-funded primary and community-based services, although the Southern Region is closest to this.



Figure 37 Current ratio of people accessing primary mental health services to FTE publicly-funded tier 1 dietitians



Source: NZIER

Based on the number of people accessing primary mental health services and the proportion of dietitians in publicly-funded primary and community roles, the current ratios of dietitians to patients range from 1:1400 in the Southern Region to 1:2605 in the Midland Region (see Table 10 Ratio of FTE publicly-funded tier 1 dietitians to patients accessing primary mental health services below).

When ratios are recalculated after applying population projections to the relevant demographic groups, the ratios change very little, and even where there is some improvement in the ratio, the increased volume of demand nevertheless means more FTEs are needed to achieve the assumed ideal ratio.

Table 10 Ratio of FTE publicly-funded tier 1 dietitians to patients accessing primary mental health services

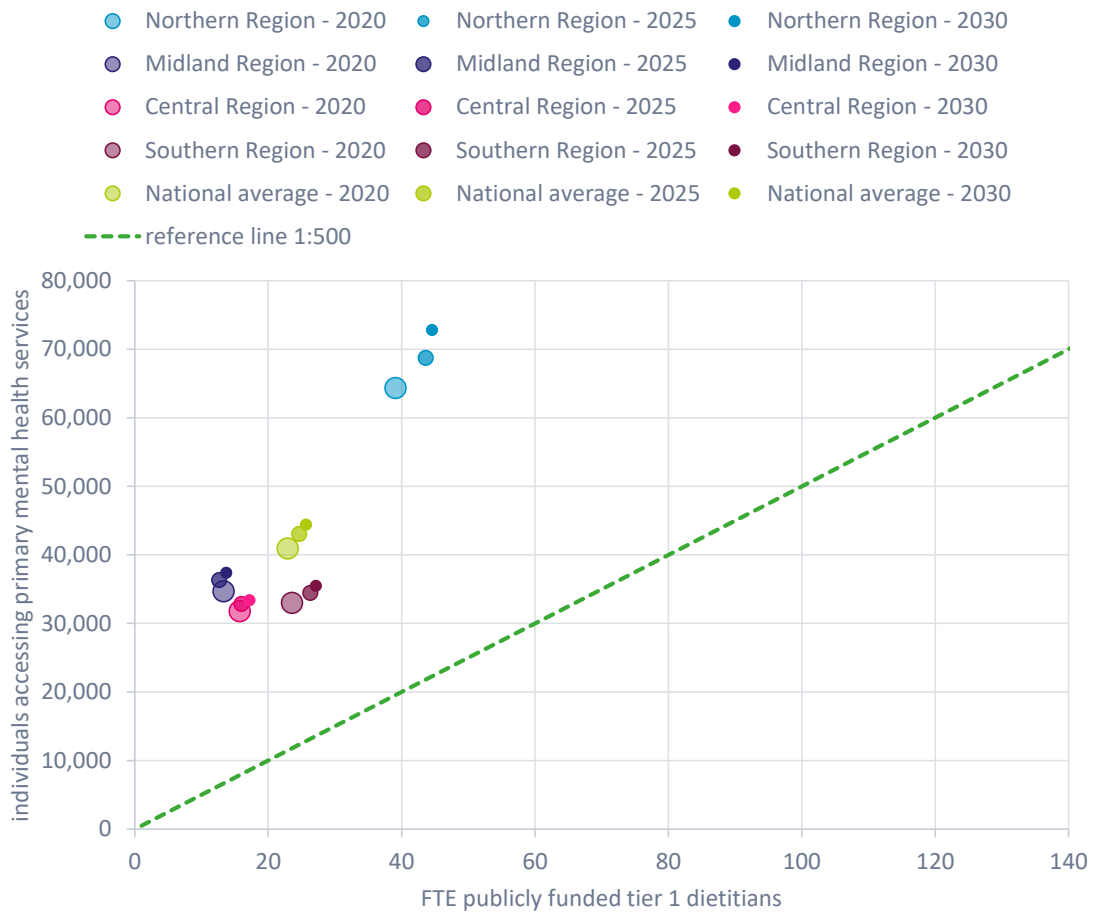
Based on FTE and patient 2020-2030 projections and 1:500 ideal ratio

| Region | FTE publicly funded tier 1 dietitian to patient ratio | | | FTE gap to ideal ratio | | |
|-----------------|---|--------|--------|------------------------|------|-------|
| | 2020 | 2025 | 2030 | 2020 | 2025 | 2030 |
| Northern Region | 1/1645 | 1/1575 | 1/1635 | 89.6 | 93.8 | 101.1 |
| Midland Region | 1/2605 | 1/2876 | 1/2733 | 56.0 | 60.0 | 61.1 |
| Central Region | 1/2016 | 1/2052 | 1/1943 | 47.8 | 49.6 | 49.6 |
| Southern Region | 1/1400 | 1/1310 | 1/1308 | 42.4 | 42.6 | 43.9 |

Source: NZIER



Figure 38 Projected ratio of people accessing primary mental health services to FTE publicly-funded tier 1 dietitians



Source: NZIER

7 Needs-based prevention in high deprivation communities

Segal et al. (2013) derived best practice dietetic input to population ratios within a population needs-based model designed to estimate the total primary care workforce model for diabetes care in Australia. The model showed that dietetic input is the most significant component of community-based care for people with diabetes (see section 5.3).

The needs-based model resembles a variant of a Patient-Centred Medical Home (PCMH) and may be particularly well-suited to highly deprived communities to address the burden of multi-morbidity (including many conditions that would be amenable to similar interventions as diabetes).



Two high level scenarios are considered for rolling this model of care out to highly deprived communities across New Zealand:

- **A primary prevention approach:** The model is rolled out to **entire populations** living in socioeconomically deprived areas, with estimates based on
 - the most deprived decile (10 percent of the population)
 - the most deprived quintile (20 percent of the population)
- **A secondary prevention approach:** The practice model is rolled out **within** populations living in socioeconomically deprived areas, but the model of care is only activated for those who already experience multi-morbidity.

With a population of approximately 5 million, the most socio-economically deprived decile accounts for 500,000 people and the most socio-economically deprived quintile accounts for 1 million people who could potentially benefit from a primary prevention approach.

According to a major population-based study of multi-morbidity in New Zealand (Stanley et al. 2018), up to 31 percent of people in high deprivation areas have multi-morbidity (by pharmaceutical-based definition). As a result, within the above populations, up to 155,000 people in the most-deprived decile and 310,000 people in the most-deprived quintile could potentially benefit from a secondary prevention approach including a high level of dietetic input.

Based on these scenarios, and 3.25 FTE dietitians per 1,000 people, a total of 1625 to 3250 dietitians would be needed in primary care teams in highly deprived areas for a primary prevention strategy and 327 to 830 FTE dietitians would be needed in primary care teams in highly deprived areas for a secondary prevention strategy.

Table 11 Dietitian FTE requirements for a primary prevention approach to multimorbidity in highly deprived communities

| | Dietitian FTE requirement for 1000 people | Total requirement for 10% most deprived communities | Current primary and community dietitian workforce | Current dietitian FTE shortfall | Dietitian FTE shortfall with FTE shift from other settings |
|-------------------|---|---|---|---------------------------------|--|
| 10% most deprived | 3.25 | 1,625 | 93 | 1,532 | 1,054 |
| 20% most deprived | 3.25 | 3,250 | 93 | 3,157 | 2,679 |

Source: NZIER



Table 12 Dietitian FTE requirements for a secondary prevention approach to multimorbidity in highly deprived communities

| | Dietitian FTE requirement for 1000 people | Total requirement for 10% most deprived communities | Current primary and community dietitian workforce | Current dietitian FTE shortfall | Dietitian FTE shortfall with FTE shift from other settings |
|-------------------|---|---|---|---------------------------------|--|
| 10% most deprived | 3.25 | 504 | 93 | 411 | No shortfall |
| 20% most deprived | 3.25 | 1,008 | 93 | 915 | 437 |

Source: NZIER

Amongst the above scenarios, only a secondary prevention approach is achievable for only the most socioeconomically deprived decile (10%), and this is only achievable by shifting the majority of dietitians employed in other settings (including hospitals) into primary and community roles.



8 Dietitians in future tier 1 services

8.1 Publicly-funded tier 1 roles for dietitians

New Zealand has a severe shortage of dietitians. A national priority should be to expand the dietetic workforce. One reason for the current shortage that requires system change is the lack of recognised roles for dietitians in publicly-funded tier 1 services. The creation of recognised roles and support for models of care that require those roles are key to attracting more people into dietetics and providing access where it is most needed.

There are two potential roles for dietitians in tier 1 services: A tier 1 generalist role to improve prevention and healthy lifestyle interventions in a wide range of non-complex patients, and specialist tier roles for more complex cancer, diabetes and mental health patients. Registered nutritionists could potentially fill the tier 1 generalist roles, while registered dietitians are best suited to the tier 1 specialist roles. Currently, nutritionists are not regulated under the HCPA Act, so a competency framework should be developed to ensure all nutrition professionals working in tier 1 services are competent and safe to do so.

Registered nutritionists in the generalist tier 1 role would:

- Support more pro-active prevention to reduce the incidence of many obesity, diet and lifestyle-related long-term conditions, e.g. with screening for malnutrition and pre-diabetes.
- Support people who face socioeconomic, spiritual or other non-medical barriers to adopt and maintain healthy diets.
- Intervene to improve pregnancy outcomes, infant nutrition and child health in vulnerable families.
- Make appropriate referrals to medical professionals, including GPs and specialists, and other allied health professionals.
- Reduce GP workloads, freeing up GP time for more complex patient needs, and help meet demand for care.
- Coordinate care with other community providers and advocate for the needs of people whose health needs require support from social sector agencies (e.g. housing, income support).

Dietitians in the tier 1 specialist cancer, diabetes and mental health roles would:

- Support cancer patients and survivors in their recovery from cancer and cancer treatment and to optimise their health through dietary change, ensuring that the increasing shift to ambulatory care does not deprive cancer patients of much needed dietetic support.
- Enable patients to self-manage long-term conditions where dietary intervention provides a cost-effective strategy for improving patient outcomes.
- Support people with complex comorbid conditions including diabetes, cancer and mental health to identify and implement dietary adjustments that are highly individualised, as well as safe, effective and cost-effective.



- Support people with severe and enduring mental illness to adopt healthy lifestyles that improve well-being and minimise the need for psychotropic medication, and reduce demand for crisis and inpatient care. Supporting this population would be primarily tier 1-based but would provide integrated and coordinated care as patients make use of crisis and respite care and enter or exit inpatient care.
- Help older people live more independently for longer by preventing and treating frailty and implementing effective dietary adjustments for older people with dementia.
- Provide dietetics counselling and education for people with allergies and food intolerances, IBS, IBD, Coeliac, etc.
- Support people to make dietary adjustments after obesity surgery.
- Communicate with tier 2 professionals about patient histories and needs to ensure continuity of care. People with cancer, diabetes and severe and enduring mental health conditions require all aspects of their care to be integrated and coordinated across tier 1 and tier 2 settings.
- Work with GPs, nurses and other allied health professionals to create and implement person-centred holistic care plans and optimise care plans to improve outcomes for complex patients.
- Improve other tier 1 professionals' understanding of dietetic interventions and their confidence in prescribing them.

In addition to these roles, some registered dietitians could extend their role as prescribers, with an update to the list of medications able to be prescribed by dietitians, allowing common medication used for the management of conditions where dietitians play an important role to be prescribed. This would allow dietitians to:

- Provide more comprehensive care for patients whose management requires both medication and lifestyle change, such as people with diabetes.
- Identify the need for patients to adjust dietary intakes alongside medication that can impact on nutritional status, as may be required for patients with diabetes, kidney disease, cystic fibrosis.

Due to the complex interaction between diet and medication registered dietitians already have a high level of knowledge regarding the impact of a wide range of medications on nutritional status and the medical conditions they are used to treat. Dietitians routinely manage a patient's dietary intake alongside their prescribed medication (diabetes, kidney disease and cystic fibrosis are examples of where this is critical to optimising treatment).

Collaborative care including dietitians in tier 1 services would maximise the impact

The current system in which GPs are the first point of contact and manage referrals to other professionals who typically operate independently will limit the effectiveness, cost-effectiveness and safety of increased dietetic input in tier 1 services.

A collaborative team-based model, such as the patient-centred medical home (PCMH) model would broaden the range of nutrition-related problems that could be addressed in primary care by harnessing the skills of a range of professionals and would allow a wider variety of services to be delivered. These might include early detection, self-management



strategies and support, innovative approaches to treatment, monitoring and reassessments, and linking with community resources. These are all elements of comprehensive care and are consistent with a chronic disease management model.

This approach would be consistent with the GP Forward View (NHS England 2016) which signalled a need to make better use of the wider primary care workforce, including three specific recommendations where dietitians can provide an important contribution:

- Collaborative care teams should have a strong focus on population health, prevention and supporting communities.
- Primary care should make better use of the skills of the wider health workforce, e.g. integrated teams should include allied health professionals (such as dietitians).
- More support should be provided to enable patients to manage their conditions themselves.

8.2 Current system barriers to address

Currently, most dietitians are employed in the secondary care setting. A perception that this is the appropriate setting for dietetic services hinders patient access to a full range of cost-effective preventive care.

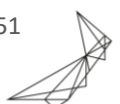
But even dietitians who do work in tier 1 settings are not always accessed appropriately.

In a 1995 pivotal study, Kushner (1995) described the need for change in doctors' dietary counselling practices. In 2010, Kolasa and Rickett (2010), documented the failure to achieve a 75 percent proportion of office visits to include ordering or providing diet counselling for patients with a diagnosis of cardiovascular disease, diabetes, or hypertension: In 2010, only 40 percent of patients received these services ; *"Primary care physicians continue to believe that providing nutrition counseling is within their realm of responsibility. Yet the gap remains between the proportion of patients who physicians believe would benefit from nutrition counseling and those who receive it from their primary care physician or are referred to dietitians and other healthcare professionals."*

Evidence suggests that when referrals do occur, they occur late, when patients are already experiencing negative outcomes (such as significant weight loss in cancer patients – see for example, Lorton et al. (2019). Involvement of dietitians early in an episode of care, to identify any potential need for nutritional support and establish appropriate monitoring is essential to achieving best outcomes for patients. Integration of dietitians within interdisciplinary tier 1 teams is the best way to achieve this.

The organisation of primary care in New Zealand presents a barrier to the integration of allied health services in general, which also affects access to dietetic services:

- Primary care payments and funding arrangements are overly complex , creating administrative burdens for practices that may wish to shift to collaborative team-based approaches. A Canadian study (Wranik et al. 2017) confirms complex funding arrangements as a barrier to dismantling medical dominance in primary care which is a major barrier to optimising use of allied health practitioners like dietitians.
- Primary care funding is largely paid to GPs ('passed on' by PHOs to practices without any effective contractual leverage in relation to 'what happens to the money') who own practices and consequently perceive other staff or contractors as costs to the



business and also derive a significant portion of income from patient co-payments – income that would be forfeit if patients are referred to another practitioner for a series of visits.

- Costs associated with multi-disciplinary approaches and collaborative care models are not well-recognised or reflected in payments.
- A lack of integrated patient management system across primary and community providers has hindered attempts at shared care.
- A lack of infrastructure support has meant facilities do not support co-ordinated, integrated, and collaborative ways of working.
- Although a New Zealand variant of the Patient Centered Medical Home (PCMH) – the Health Care Home (HCH) – has emerged across New Zealand in various forms, limited and inconsistent funding (Hefford 2017) as well as constraints imposed by PHOs have meant that HCHs have failed to make best use of the dietetic (and other allied health) workforce in their communities.

8.3 Unleashing the current potential of dietitians with updated regulation

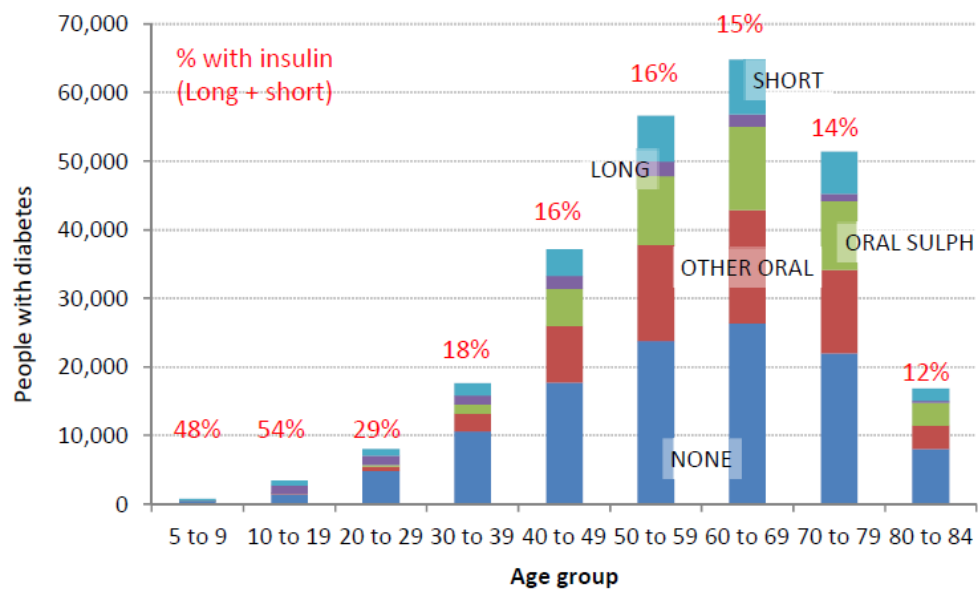
Registered dietitians in New Zealand have prescribing rights (one of only two countries in the world). Approximately 84 percent of the current registered dietetic workforce have this endorsement (Dietitians Board statistics provided by Dietitians New Zealand). However, currently dietitians are only allowed to prescribe subsidised non-prescription items for therapeutic nutrition (special foods, vitamins, minerals and related products).

The ability to prescribe more medicines, including those commonly used in the basic management of long-term conditions, could be safely extended to dietitians to improve access for patients and reduce GP workload.

Best practice management of diabetes indicates that all patients with type 2 diabetes should be prescribed Metformin unless they have contraindications, such as creatinine clearance (CrCl) < 15 mL/min, as it reduces HbA_{1c} levels and may assist with weight loss (Bpac 2019). However a report commissioned by Pharmac (Health Partners Consulting Group 2015) identified that a significant proportion of people with diabetes are not on any medication. Sub-optimal care of people with diabetes could be improved by extending prescribing rights for diabetes medication to dietitians.



Figure 39 Medication of people with diabetes in New Zealand, by age group



Source: Health Partners Consulting Group (2015)



9 Recommendations

The health and disability system is facing a once in a generation redesign which will focus heavily on more effective and efficient services with improved equity of access and outcomes. The health workforce is a critical building block of a high quality, safe, equitable and efficient health system. It needs to be able to support a shift to more pro-active, person-centred, multi-disciplinary approaches, including better primary prevention and more effective secondary prevention, as well as improved access to publicly-funded services to close the equity gaps in both access and outcomes.

We recommend:

- Investing to achieve best practice dietetic input through recruitment and training, especially of Māori and Pacific dietitians, to increase the supply of dietitians in New Zealand and build a nationally representative workforce.
- Developing and funding interdisciplinary collaborative models of care with specific, recognised dietetic roles, including Registered Dietitians and Registered Nutritionists, to provide best practice dietetic support in publicly-funded tier 1 settings.
- Reviewing the prescribing endorsement of dietitians to allow dietitians to prescribe common medications used in the basic management of conditions that dietitians frequently interact with to improve the effectiveness of dietetic services and enable more comprehensive and responsive care.
- Establishing national competency frameworks for specialist and generalist dietitian roles and supporting nutritionist roles in tier 1 settings. Nutritionists can increase the capacity for dietetic interventions for lower risk patients, while dietitians focus on more complex patients.



10 References

- American College of Cardiology/American Heart Association Task Force on Practice Guidelines, Obesity Expert Panel, 2013. 2014. "Expert Panel Report: Guidelines (2013) for the Management of Overweight and Obesity in Adults." *Obesity (Silver Spring, Md.)* 22 Suppl 2 (July): S41-410. <https://doi.org/10.1002/oby.20660>.
- Association of American Medical Colleges. 2004. "2004 Medical School Graduation Questionnaire. All Schools Reports." <https://www.aamc.org/>.
- Auckland University. 2018. "Q+A: How Severe Is New Zealand's Mental Health Crisis?" Public Interest Media. 2018. <https://www.thebigq.org/2018/08/09/how-severe-is-new-zealands-mental-health-crisis/>.
- Beckingsale, Louise, Kirsty Fairbairn, and Caroline Morris. 2016. "Integrating Dietitians into Primary Health Care: Benefits for Patients, Dietitians and the General Practice Team." *Journal of Primary Health Care* 8 (4): 372. <https://doi.org/10.1071/HC16018>.
- Bellanger, Martine, Katharine Barry, Juwel Rana, and Jean-Philippe Regnaud. 2020. "Cost-Effectiveness of Lifestyle-Related Interventions for the Primary Prevention of Breast Cancer: A Rapid Review." *Frontiers in Medicine* 6 (February). <https://doi.org/10.3389/fmed.2019.00325>.
- Bpac. 2019. "Optimising Pharmacological Management of HbA1c Levels in Patients with Type 2 Diabetes: From Metformin to Insulin." <https://bpac.org.nz/2019/docs/hba1c.pdf>.
- BPJ. 2014. "Irritable Bowel Syndrome in Adults." 58. <https://bpac.org.nz/BPJ/2014/February/docs/BPJ58-ibs.pdf>.
- Buys, David R., David L. Roth, Christine S. Ritchie, Patricia Sawyer, Richard M. Allman, Ellen M. Funkhouser, Martha Hovater, and Julie L. Locher. 2014. "Nutritional Risk and Body Mass Index Predict Hospitalization, Nursing Home Admissions, and Mortality in Community-Dwelling Older Adults: Results from the UAB Study of Aging with 8.5 Years of Follow-Up." *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 69 (9): 1146–53. <https://doi.org/10.1093/gerona/glu024>.
- Chaput, Genevieve, and J. Sussman. 2019. "Integrating Primary Care Providers through the Seasons of Survivorship." *Current Oncology* 26 (1): 48–54. <https://doi.org/10.3747/co.26.4687>.
- Chatterton, Mary Lou, Cathrine Mihalopoulos, Adrienne O'Neil, Catherine Itsiopoulos, Rachelle Opie, David Castle, Sarah Dash, Laima Brazionis, Michael Berk, and Felice Jacka. 2018. "Economic Evaluation of a Dietary Intervention for Adults with Major Depression (the 'SMILES' Trial)." *BMC Public Health* 18 (1): 599. <https://doi.org/10.1186/s12889-018-5504-8>.
- Darer, Jonathan D., Wenke Hwang, Hoangmai H. Pham, Eric B. Bass, and Gerard Anderson. 2004. "More Training Needed in Chronic Care: A Survey of US Physicians." *Academic Medicine: Journal of the Association of American Medical Colleges* 79 (6): 541–48. <https://doi.org/10.1097/00001888-200406000-00009>.



- Dietitians Association of Australia. 2019. "The Social and Economic Benefits of Improving Mental Health." https://www.pc.gov.au/__data/assets/pdf_file/0008/240668/sub232-mental-health.pdf.
- Dietitians Board of New Zealand. 2019. "Annual Report 2018/2019." <https://www.dietitiansboard.org.nz/2020/02/21/annual-report-2018-2019/>.
- . 2020. "Annual Report 2019/2020." <https://www.dietitiansboard.org.nz/wp-content/uploads/2020/12/Dietitians-Board-Annual-Report-2020-Online.pdf>.
- Ferlay, J., M. Colombet, I. Soerjomataram, C. Mathers, D. M. Parkin, M. Piñeros, A. Znaor, and F. Bray. 2019. "Estimating the Global Cancer Incidence and Mortality in 2018: GLOBOCAN Sources and Methods." *International Journal of Cancer* 144 (8): 1941–53. <https://doi.org/10.1002/ijc.31937>.
- Firth, Joseph, Wolfgang Marx, Sarah Dash, Rebekah Carney, Scott B. Teasdale, Marco Solmi, Brendon Stubbs, et al. 2019. "The Effects of Dietary Improvement on Symptoms of Depression and Anxiety: A Meta-Analysis of Randomized Controlled Trials." *Psychosomatic Medicine* 81 (3): 265–80. <https://doi.org/10.1097/PSY.0000000000000673>.
- Gandy, Joan, ed. 2014. *Manual of Dietetic Practice*. 5th ed. London: BDA: The Association on UK Dietitians. <https://www.wiley.com/en-ae/Manual+of+Dietetic+Practice%2C+5th+Edition-p-9781118760574>.
- Government Inquiry into Mental Health and Addiction. 2018. "He Ara Oranga : Report of the Government Inquiry into Mental Health and Addiction." <https://mentalhealth.inquiry.govt.nz/inquiry-report/he-ara-oranga>.
- Gucciardi, Enza, Changchang Xu, Michele Vitale, Wendy Lou, Stacey Horodezny, Linda Dorado, Souraya Sidani, and Baiju R. Shah. 2020. "Evaluating the Impact of Onsite Diabetes Education Teams in Primary Care on Clinical Outcomes." *BMC Family Practice* 21 (1): 48. <https://doi.org/10.1186/s12875-020-01111-2>.
- Health Partners Consulting Group. 2015. "Hospitalisations for Diabetes in New Zealand: Measuring the Impact of the Change in Subsidy to Glucose Monitoring Test Strips." An investigation commissioned by PHARMAC. Auckland: HPCG. <https://pharmac.govt.nz/assets/2015-10-07-Health-Partners-Consulting-report-on-clinical-impacts-of-blood-glucose-meters.pdf>.
- Hefford, Martin. 2017. "From Good to Great: The Potential for the Health Care Home Model to Improve Primary Health Care Quality in New Zealand." *Journal of Primary Health Care* 9 (3): 230–33.
- Howatson, Alexandra, Clare R. Wall, and Petrina Turner-Benny. 2015. "The Contribution of Dietitians to the Primary Health Care Workforce." *Journal of Primary Health Care* 7 (4): 324–32. <https://doi.org/10.1071/hc15324>.
- IHME. 2019. "Global Burden of Disease (GBD 2019)." Institute for Health Metrics and Evaluation. <http://www.healthdata.org/gbd/2019>.
- Jardim, Thiago Veiga, Dariush Mozaffarian, Shafika Abrahams-Gessel, Stephen Sy, Yujin Lee, Junxiu Liu, Yue Huang, et al. 2019. "Cardiometabolic Disease Costs Associated with Suboptimal Diet in the United States: A Cost Analysis Based on a Microsimulation



- Model." *PLOS Medicine* 16 (12): e1002981.
<https://doi.org/10.1371/journal.pmed.1002981>.
- Jermendy, György. 2005. "Can Type 2 Diabetes Mellitus Be Considered Preventable?" *Diabetes Research and Clinical Practice*, Proceedings of the 4th Regional Medical Conference on the Treatment of Type 2 Diabetes Mellitus, 68 (June): S73–81.
<https://doi.org/10.1016/j.diabres.2005.03.010>.
- Kettings, Christine, Andrew J. Sinclair, and Melanie Voevodin. 2009. "A Healthy Diet Consistent with Australian Health Recommendations Is Too Expensive for Welfare-Dependent Families." *Australian and New Zealand Journal of Public Health* 33 (6): 566–72. <https://doi.org/10.1111/j.1753-6405.2009.00454.x>.
- Kim, Dong Hyun, Lynne Chepulis, Rawiri Keenan, Chunhuan Lao, Fraser Hodgson, Chris Bullen, and Ross Lawrenson. 2020. "Prevalence of Invasive Cancer in a Large General Practice Patient Population in New Zealand." *Journal of Primary Health Care* 12 (3): 215. <https://doi.org/10.1071/HC19113>.
- Kolasa, Kathryn M., and Katherine Rickett. 2010. "Barriers to Providing Nutrition Counseling Cited by Physicians." *Nutrition in Clinical Practice* 25 (5): 502–9.
<https://doi.org/10.1177/0884533610380057>.
- Koroukian, Siran M., Patrick Murray, and Elizabeth Madigan. 2006. "Comorbidity, Disability, and Geriatric Syndromes in Elderly Cancer Patients Receiving Home Health Care." *Journal of Clinical Oncology* 24 (15): 2304–10.
- Kushner, Robert F. 1995. "Barriers to Providing Nutrition Counseling by Physicians: A Survey of Primary Care Practitioners." *Preventive Medicine* 24 (6): 546–52.
- Lorton, Cliona M., O. Griffin, K. Higgins, F. Roulston, G. Stewart, N. Gough, E. Barnes, A. Aktas, and T. D. Walsh. 2019. "Late Referral of Cancer Patients with Malnutrition to Dietitians: A Prospective Study of Clinical Practice." *Supportive Care in Cancer*, 1–10.
- MacDonald Werstuck, Michele, and Jennifer Buccino. 2018. "Dietetic Staffing and Workforce Capacity Planning in Primary Health Care." *Canadian Journal of Dietetic Practice and Research: A Publication of Dietitians of Canada = Revue Canadienne De La Pratique Et De La Recherche En Dietetique: Une Publication Des Dietetistes Du Canada* 79 (4): 181–85. <https://doi.org/10.3148/cjdp-2018-018>.
- Macmillan Cancer Support, the Royal College of Anaesthetists, the National Institute for Health Research Cancer and Nutrition Collaboration. 2019. "Principles and Guidance for Prehabilitation within the Management and Support of People with Cancer."
- Marahatta, Sujana Babu, Nasta Sharma, Rajendra Koju, Ramesh Kumar Makaju, Porntip Petmitr, and Songsak Petmitr. 2005. "Cancer: Determinants and Progression." *Nepal Medical College Journal: NMCJ* 7 (1): 65–71.
- Milaneschi, Yuri, W. Kyle Simmons, Elisabeth F. C. van Rossum, and Brenda WJH Penninx. 2019. "Depression and Obesity: Evidence of Shared Biological Mechanisms." *Molecular Psychiatry* 24 (1): 18–33. <https://doi.org/10.1038/s41380-018-0017-5>.
- Ministry of Health. 2011. "Diabetes Workforce Service Review." Report of the Diabetes Care Workforce Service Review Team to Health Workforce New Zealand. Report of the Diabetes Care Workforce Service Review Team to Health Workforce New Zealand.



- . 2018. "Health and Independence Report 2017. The Director-General of Health's Annual Report on the State of Public Health." Wellington: Ministry of Health. <https://www.health.govt.nz/publication/health-and-independence-report-2017>.
- . 2020a. *Longer, Healthier Lives: New Zealand's Health 1990-2017: A Report on the Health Loss Estimates of the 2017 Global Burden of Disease Study*. Wellington: Ministry of Heal. <https://www.health.govt.nz/publication/longer-healthier-lives-new-zealands-health-1990-2017>.
- . 2020b. "New Zealand Cancer Action Plan 2019–2029 :Te Mahere Mō Te Mate Pukupuku o Aotearoa 2019–2029." Revised Janaury 2020. Wellington: Ministry of Health. <https://www.health.govt.nz/publication/longer-healthier-lives-new-zealands-health-1990-2017>.
- Mulder, Roger, Julia Rucklidge, and Sam Wilkinson. 2017. "Why Has Increased Provision of Psychiatric Treatment Not Reduced the Prevalence of Mental Disorder?" *Australian & New Zealand Journal of Psychiatry* 51 (August): 000486741772735. <https://doi.org/10.1177/0004867417727356>.
- Nash, Louise. 2017. "Reducing Hospital Admissions Among Frail Elderly People." *CN* 17 (March).
- National Health Performance Authority. 2015. "Healthy Communities: Frequent GP Attenders and Their Use of Health Services in 2012–13."
- Nekhlyudov, Larissa, Denalee M O'Malley, and Shawna V Hudson. 2017. "Integrating Primary Care Providers in the Care of Cancer Survivors: Gaps in Evidence and Future Opportunities." *The Lancet Oncology* 18 (1): e30–38. [https://doi.org/10.1016/S1470-2045\(16\)30570-8](https://doi.org/10.1016/S1470-2045(16)30570-8).
- Newcomer, John W. 2007. "Antipsychotic Medications: Metabolic and Cardiovascular Risk." *J Clin Psychiatry*, 6.
- NHS England. 2016. "GP Forward View." 2016. https://www.google.com/search?q=gp+forward+view&rlz=1C1ONGR_enNZ935NZ935&oq=gp+forward+view&aqs=chrome.0.0l2j0i22i30l8.3007j0j4&sourceid=chrome&ie=UTF-8.
- North, Sylvia M., Carol A. Wham, Ruth Teh, Simon A. Moyes, Anna Rolleston, and Ngaire Kerse. 2018. "High Nutrition Risk Related to Dietary Intake Is Associated with an Increased Risk of Hospitalisation and Mortality for Older Māori: LiLACS NZ." *Australian and New Zealand Journal of Public Health* 42 (4): 375–81. <https://doi.org/10.1111/1753-6405.12793>.
- PMMRC. 2019. Te Pūrongo ā-Tau Tekau mā Toru o te Komiti Arotake Mate Pēpi, Mate Whaea Hoki | Thirteenth Annual Report of the Perinatal and Maternal Mortality Review Committee: Te tuku pūrongo mō te mate me te whakamate 2017 | Reporting mortality and morbidity 2017. Wellington: Health Quality & Safety Commission.
- Raghunandan, Rakhee, June Tordoff, and Alesha Smith. 2017. "Non-Medical Prescribing in New Zealand: An Overview of Prescribing Rights, Service Delivery Models and Training." *Therapeutic Advances in Drug Safety* 8 (11): 349–60. <https://doi.org/10.1177/2042098617723312>.

- RNZCGP. 2020. "New Study Shows GPs Are Increasingly Crucial to Cancer Care in New Zealand." New Zealand Doctor. 2020.
<https://www.nzdoctor.co.nz/article/undoctored/new-study-shows-gps-are-increasingly-crucial-cancer-care-new-zealand>.
- Russell, Lahiru, Rebecca McIntosh, Carina Martin, Janine Scott, Wee Kheng Soo, Bernadette Zappa, Kerry Haynes, Patricia M. Livingston, and Anna Ugalde. 2020. "A Model of Cancer Survivorship Care within a Community Health Setting: The Good Life Cancer Survivorship Program." *Journal of Cancer Survivorship: Research and Practice* 14 (1): 36–42. <https://doi.org/10.1007/s11764-019-00821-6>.
- Sánchez-Villegas, Almudena, Miguel Delgado-Rodríguez, Alvaro Alonso, Javier Schlatter, Francisca Lahortiga, Lluís Serra Majem, and Miguel Ángel Martínez-González. 2009. "Association of the Mediterranean Dietary Pattern with the Incidence of Depression: The Seguimiento Universidad de Navarra/University of Navarra Follow-up (SUN) Cohort." *Archives of General Psychiatry* 66 (10): 1090–98.
<https://doi.org/10.1001/archgenpsychiatry.2009.129>.
- Sarfati, Diana, Christopher GCA Jackson, Scott Macfarlane, Ian Bissett, Bridget Robson, Jason Gurney, Roslyn Kemp, Natalie James, Jonathan Adler, and Nina Scott. 2019. "Cancer Care at a Crossroads: Time to Make a Choice." *New Zealand Medical Journal* 132 (1493).
- Sarris, Jerome, Adrienne O'Neil, Carolyn E. Coulson, Isaac Schweitzer, and Michael Berk. 2014. "Lifestyle Medicine for Depression." *BMC Psychiatry* 14 (1): 107.
<https://doi.org/10.1186/1471-244X-14-107>.
- Segal, Leonie, Matthew J. Leach, Esther May, and Catherine Turnbull. 2013. "Regional Primary Care Team to Deliver Best-Practice Diabetes Care: A Needs-Driven Health Workforce Model Reflecting a Biopsychosocial Construct of Health." *Diabetes Care* 36 (7): 1898–1907. <https://doi.org/10.2337/dc12-1793>.
- Segal, Leonie, Asterie Twizeyemariya, Dorota Zarnowiecki, Theo Niyonsenga, Svetlana Bogomolova, Amy Wilson, Kerin O'Dea, and Natalie Parletta. 2020. "Cost Effectiveness and Cost-Utility Analysis of a Group-Based Diet Intervention for Treating Major Depression - the HELFIMED Trial." *Nutritional Neuroscience* 23 (10): 770–78.
<https://doi.org/10.1080/1028415X.2018.1556896>.
- Siegel, Karen R., Mohammed K. Ali, Xilin Zhou, Boon Peng Ng, Shawn Jawanda, Krista Proia, Xuanping Zhang, Edward W. Gregg, Ann L. Albright, and Ping Zhang. 2020. "Cost-Effectiveness of Interventions to Manage Diabetes: Has the Evidence Changed since 2008?" *Diabetes Care* 43 (7): 1557–92.
- Simmons, Margaret Lau, and Linda A. Vaughan. 1999. "Patient Nutrition Acuity as a Predictor of the Time Required to Perform Medical Nutrition Therapy." *Journal of the American Dietetic Association* 99 (11): 1367–72. [https://doi.org/10.1016/S0002-8223\(99\)00334-X](https://doi.org/10.1016/S0002-8223(99)00334-X).
- Siopis, George, Alexandra Jones, and Margaret Allman-Farinelli. 2020. "The Dietetic Workforce Distribution Geographic Atlas Provides Insight into the Inequitable Access for Dietetic Services for People with Type 2 Diabetes in Australia." *Nutrition & Dietetics* 77 (1): 121–30. <https://doi.org/10.1111/1747-0080.12603>.



- Stanley, James, Kelly Semper, Elinor Millar, and Diana Sarfati. 2018. "Epidemiology of Multimorbidity in New Zealand: A Cross-Sectional Study Using National-Level Hospital and Pharmaceutical Data." *BMJ Open* 8 (5): e021689.
<https://doi.org/10.1136/bmjopen-2018-021689>.
- Suh, Sunghwan, and Kwang-Won Kim. 2011. "Diabetes and Cancer: Is Diabetes Causally Related to Cancer?" *Diabetes & Metabolism Journal* 35 (3): 193–98.
<https://doi.org/10.4093/dmj.2011.35.3.193>.
- Sun, Yu, Wen You, Fabio Almeida, Paul Estabrooks, and Brenda Davy. 2017. "The Effectiveness and Cost of Lifestyle Intervention Including Nutrition Education for Diabetes Prevention: A Systematic Review and Meta-Analysis." *Journal of the Academy of Nutrition and Dietetics* 117 (3): 404–421.e36.
<https://doi.org/10.1016/j.jand.2016.11.016>.
- Teasdale, S. B., K. Samaras, T. Wade, R. Jarman, and P. B. Ward. 2017. "A Review of the Nutritional Challenges Experienced by People Living with Severe Mental Illness: A Role for Dietitians in Addressing Physical Health Gaps." *Journal of Human Nutrition and Dietetics* 30 (5): 545–53. <https://doi.org/10.1111/jhn.12473>.
- Williams, Marianne, Yvonne Barclay, Rosie Benneyworth, Steve Gore, Zoe Hamilton, Rudi Matull, Iain Phillips, et al. 2016. "Using Best Practice to Create a Pathway to Improve Management of Irritable Bowel Syndrome: Aiming for Timely Diagnosis, Effective Treatment and Equitable Care." *Frontline Gastroenterology* 7 (4): 323–30.
<https://doi.org/10.1136/flgastro-2016-100727>.
- World Health Organization. 2019. "WHO Global Health Observatory Data Repository. Human Resources. Data by Country. Last Updated 25 April 2019." WHO. World Health Organization. 2019. <https://apps.who.int/gho/data/node.main.MHHR?lang=en>.
- Wranik, W. Dominika, Susan M. Haydt, Alan Katz, Adrian R. Levy, Maryna Korchagina, Jeanette M. Edwards, and Ian Bower. 2017. "Funding and Remuneration of Interdisciplinary Primary Care Teams in Canada: A Conceptual Framework and Application." *BMC Health Services Research* 17 (1): 351.
<https://doi.org/10.1186/s12913-017-2290-4>.

