

Update and projections for New Zealand's ophthalmology workforce

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ABSTRACT

AIM: The aim of this study was to update and project the growth of ophthalmologists in New Zealand. This will help decision makers better understand the current ophthalmologist workforce and make appropriate resource allocations.

METHOD: Supply and demographics of ophthalmologists in New Zealand were obtained from the Medical Council of New Zealand, Health Workforce New Zealand and Health New Zealand – Te Whatu Ora. Ophthalmology trainee numbers were extracted from the annual reports of the Royal Australian and New Zealand College of Ophthalmologists (RANZCO). New Zealand population statistics were extracted from the Stats NZ database. A simulation model was developed to project the growth of ophthalmologists from 2024 to 2050.

RESULTS: In March 2023, there were 175 practising ophthalmologists in New Zealand. Overall, there were 34.0 ophthalmologists per million population, with 201.4 ophthalmologists per million for those aged ≥ 65 years. To maintain the current ratio, an additional 20 practising ophthalmologists are needed by 2050.

CONCLUSION: The ratio of ophthalmologists per million population aged ≥ 65 years is projected to drop by 1.5% annually. To meet the demand of an increasing and ageing population, and RANZCO's goal of 40 ophthalmologists per million population, there needs to be an increase in ophthalmologist training positions from the current 5-year average of 6.6 to 11 new trainees annually, and a more effective distribution of the ophthalmologist workforce.

The eye health workforce plays a positive role in improving the quality of life of those with vision impairment. Timely detection and consistent follow-up are pertinent to ensure optimal treatment and delay preventable progression of eye conditions. Unfortunately, the demand for eye care is increasing faster than the rate at which ophthalmologists are being trained. In the last two decades, the prevalence of blindness has dropped from 4.8% to 3.1%, and 90 million people world-wide have had their vision impairment treated or prevented.¹ However, with population growth and ageing, by 2050 the global prevalence of vision impairment and blindness are projected to double.² Vision impairment is known to negatively impact both physical and mental health, with known associations such as increased falls in older people,³⁻⁷ employment barriers,⁸⁻¹¹ social isolation,¹² loss of independence,¹² depression^{13,14} and mortality.¹⁵

The last assessment of global Human Resources for Eye Health found that the global population of ophthalmologists was growing at less than half the rate of the population over age 60.¹⁶ There is a need for an assessment of the future needs for New Zealand's ophthalmologist workforce. In New Zealand, the population aged 65 and above is projected to rise by 64% between 2023 and 2050,

to make up one quarter of the population.

New Zealand has not had a comprehensive review of eye care workforce availability since the Eye Health Workforce Service Review in 2010.¹⁷ The World Health Organization's eye care situation analysis tool (ECSAT) was developed to summarise the current eye health situation and identify areas of eye care services that need strengthening. Workforce and infrastructure are one of the six major health system blocks in ECSAT. Results from ECSAT Aotearoa 2022 found that although there only needs to be minor strengthening in this area, there are still workforce shortages in ophthalmology (particularly outside urban centres), ongoing dependence on internationally trained ophthalmologists and limited vocational training opportunities.¹⁸ This paper aims to assess the current workforce and project the demand and supply of ophthalmologists for New Zealand up to 2050.

Methods

The number of all active practising ophthalmologists (as of 7 March 2023) in New Zealand was obtained from the Medical Council of New Zealand's (MCNZ) register of doctors. The locations of ophthalmologists were determined

using registered location on MCNZ and by searching publicly available information on the internet. Ophthalmologists who were not practising in New Zealand were excluded. Ophthalmologists practising in more than one region were assumed to spend equal time in each region. The collated list was then circulated to all ophthalmology departments in Health New Zealand for confirmation. Demographic data, ophthalmology training body and full-time equivalent (FTE) (including distribution

across public and private sectors) were provided by the Analytics and Intelligence section of Health New Zealand – Te Whatu Ora. New Zealand population statistics were extracted from the Stats NZ database.¹⁹

The growth of ophthalmologists was projected with the following simulation model (see Figure 1), with 2022 as the baseline year. Data sources for key variables and their assumptions are summarised in Table 1.

Table 1: Model parameters and assumptions.

Variable	Data source	Assumptions
Current workforce in base-line year (2023)	The number of ophthalmologists reported by the MCNZ in their annual report	NA
The number of new New Zealand-trained graduates from RANZCO VTP	The number of new trainees to the RANZCO VTP programme (2010–2023) was extracted from the annual reports of RANZCO and recorded as the number of new graduates 5 years later	All trainees completed their 5-year VTP (100% pass rate at the end of the VTP) with no time taken off for non-training purposes (e.g., research, part-time, maternity leave) Assumed to follow <i>Normal</i> (6.29, 1.07) distribution The mean and standard deviation of the number of new graduates are 6.29 and 1.07 respectively
The retention rate of new graduates from RANZCO VTP, New Zealand ^a	HWNZ	Estimated to be 80% by HWNZ Retention rate estimated at 71% in survey ²⁰ Assumed to follow <i>Uniform</i> (0.7, 0.8) distribution
The number of vocationally registered international medical graduates	The number of vocationally registered internationally trained ophthalmologists reported by the MCNZ in their annual medical workforce report (2010–2023)	Assumed to follow <i>Normal</i> (2.71, 2.27) distribution. The mean and standard deviation of the number of new internationally trained doctors are 2.71 and 2.27 respectively
The retention rate of internationally trained ophthalmologists ^a	HWNZ	Estimated to be 87% by HWNZ Retention rate estimated to be 71% in survey ²⁰ Assumed to be <i>Uniform</i> (0.7, 0.9)
The number of retired ophthalmologists		Assumed to be between 2–5% of previous year's workforce ²⁰ <i>Uniform</i> (0.02, 0.05)

^a Retention defined as vocational registration in New Zealand after 1 year.

Abbreviations: MCNZ = Medical Council New Zealand; NA = not applicable; RANZCO = Royal Australian and New Zealand College of Ophthalmologists; VTP = vocational training programme; HWNZ = Health Workforce New Zealand.

Distributions: normal (mean, standard deviation); uniform (minimum, maximum).

All statistical analyses were performed using RStudio (version 4.2.2).

Results

Current workforce in New Zealand

There are currently 184 ophthalmologists registered with MCNZ (including provisionally registered ophthalmologists working in specialist medical officer roles), of whom 175 are actively practising and 9 are either practising overseas or not currently practising in New Zealand (and were thus excluded from the analyses). The geographic districts of Health New Zealand – Te Whatu Ora were used to define locations of practice. For those working across different regional divisions, the time spent working in each region was assumed to be split equally. Overall, there were 34 ophthalmologists per million population in New Zealand. The highest density was in the Auckland Region (Te Toka Tumai Auckland, Waitematā and Counties Manukau districts were combined for this review) at 39.5 ophthalmologists per million population. Whanganui, West Coast and South Canterbury districts had the lowest density in the country, with less than 20 ophthalmologists per million population. Most regions had between 30–40 ophthalmologists per million population. Figure 2 gives the geographic distribution of practising ophthalmologists across New Zealand.

There was a total of 188.7 FTEs for ophthalmology across New Zealand, based on the MCNZ workforce data as of March 2023. This was collated from the compulsory annual survey at re-registration. Of the 175 ophthalmologists, 47.4% worked within the public sector, 48.9% in the private sector and the remainder were within academic or government departments. Almost three quarters (72.7%) of New Zealand's vocationally registered ophthalmologists had completed their training with the Royal Australian and New Zealand College of Ophthalmologists (RANZCO) and 64.8% were graduates from New Zealand medical schools. Less than half (40.3%) of vocationally registered ophthalmologists were below 50 years of age. Just over one quarter of the workforce was female (27.3%). There was under-representation of Māori (2.3%) and Pacific (1.7%) ophthalmologists relative to the New Zealand population of Māori (17.3%) and Pacific people (8.9%).

Figure 3 shows the number of ophthalmologists by year in New Zealand, by specialist training

body and whether they were graduates of a New Zealand medical school. Since 2010, on average the ophthalmic specialist population grew by 2.8% annually. Over the same time, the population aged ≥65 years grew by an average of 3.4% annually. This same trend is seen globally, with the ageing population growing at a faster rate than that of ophthalmologists.²¹

Projected workforce

Projections from our simulation model show that by 2050, with the assumptions set out in Table 1, New Zealand will be served by 189 (95% prediction interval 184–194) ophthalmologists. To maintain the current ratio of 33.98 ophthalmologists per million population, an additional 20 ophthalmologists would be needed. RANZCO's Vision 2030 set a goal of 40 ophthalmologists per million population.²² To meet this target, New Zealand will require an additional 48 ophthalmologists in 2040 and 57 in 2050. If there are no changes in retention and retirement rates, New Zealand would need to increase the annual number of vocational training programme (VTP) trainees from the current 5-year average of 6.6 to 8 to maintain the current ophthalmologist ratio, and to 11 to meet the goal of 40 ophthalmologists per million population (Figure 4). The scenario where a trainee takes 6 years to complete training was also considered and simulation results showed that an additional 2 ophthalmologists are needed by 2050 to meet current and projected ophthalmologist ratios, i.e., 22 and 59 ophthalmologists respectively.

The outlook for the population aged ≥65 years was also projected (Figure 5) as 62.1% of services within ophthalmology are devoted to those in this age group.¹⁶ For this cohort, the number of ophthalmologists per million population aged ≥65 years has been decreasing from 220 in 2010 to 202 in 2023. Assuming similar trends, in 2050 the ratio of ophthalmologists per million population aged ≥65 years is predicted to be 133. The mean annual percentage increase in the predicted number of ophthalmologists from 2024 to 2050 is 0.27%, which is 7 times less than the median predicted annual 1.8% population growth for this age group.

The New Zealand female ophthalmologist workforce has increased from an average of 18% in 2010 to 27% in 2023. The Medical Deans Australia and New Zealand publishes yearly reports on commencing and graduating medical students. Data from the yearly reports showed that the proportion of female students has fluctuated around 55% over the past 15 years, with an overall

Figure 3: Trends of New Zealand ophthalmologist workforce (2010–2023).

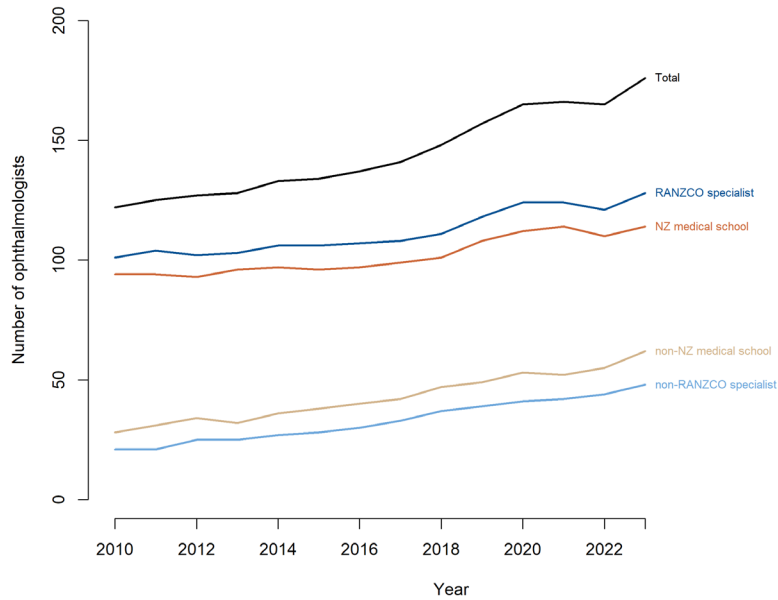
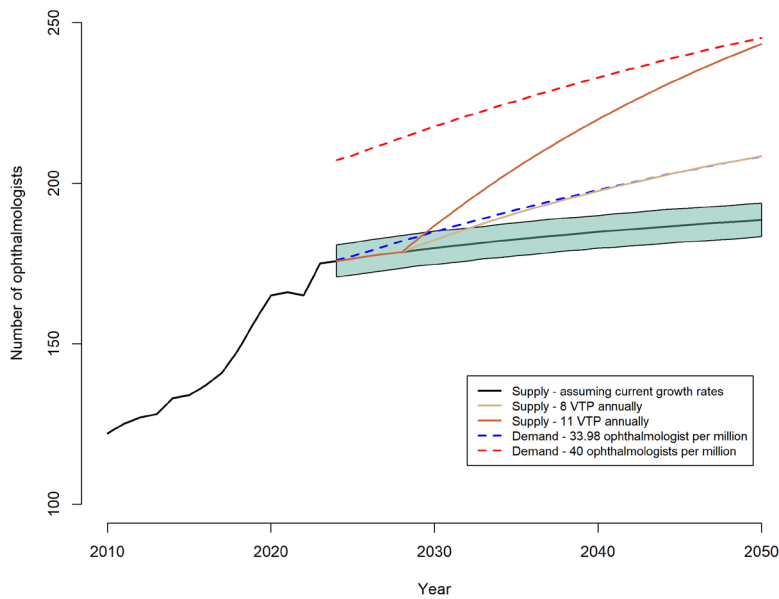


Figure 4: New Zealand ophthalmologists: projected supply and demand.



increasing trend, but has remained under 60%. A non-linear asymptotic regression model was fitted to the percentage of female ophthalmologists and used to project the female workforce in 2050, assuming an asymptote of 60%. This projection and associated prediction interval are shown in Figure 6. Projection to 2050 showed that by 2050,

37.9% (95% prediction interval 34.8–40.6%) of the ophthalmologist workforce in New Zealand will be female.

As data from the Analytics and Intelligence section of Health New Zealand – Te Whatu Ora were available only from the year 2020, we combined this with data published by MCNZ in

Figure 5: Number of ophthalmologists per million population aged ≥65 years.

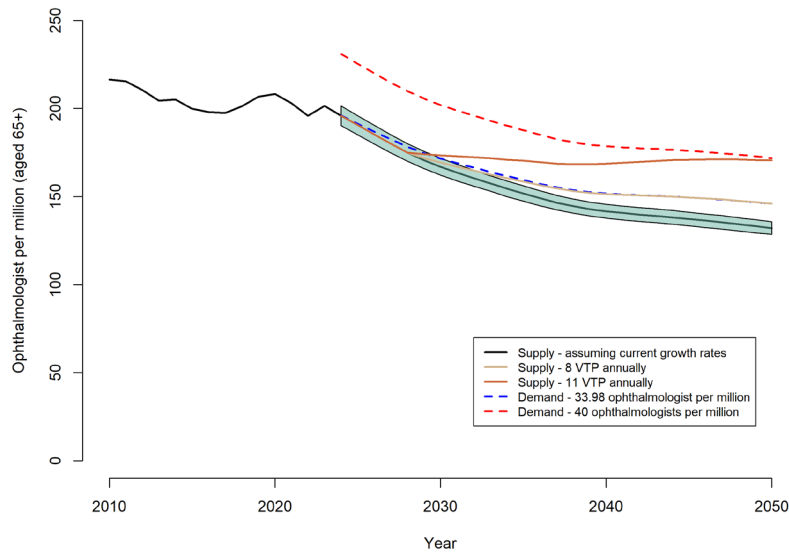
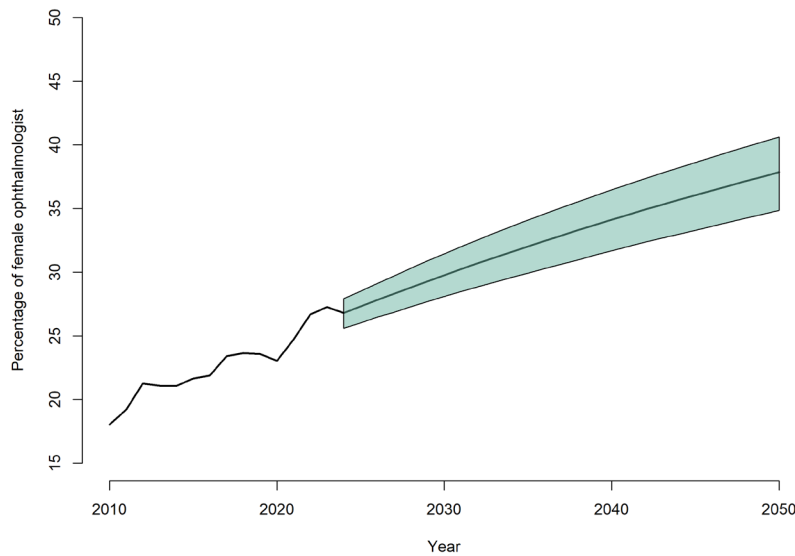


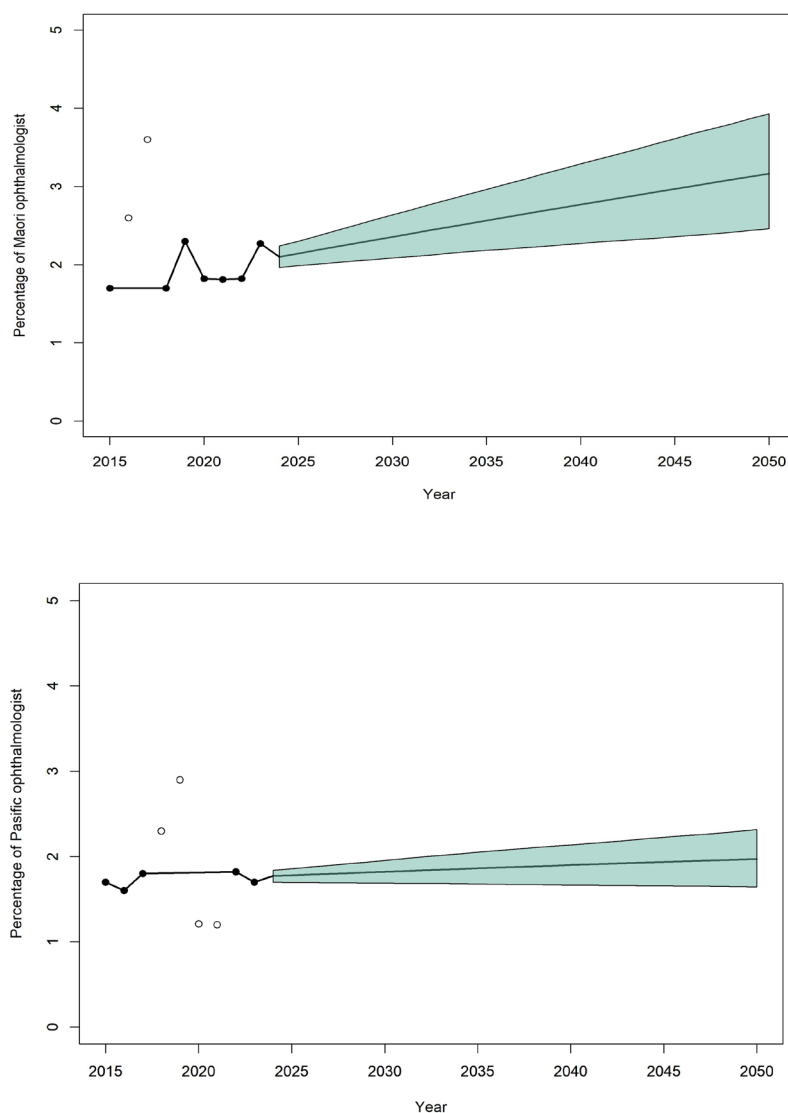
Figure 6: Projected percentage of the female ophthalmologist workforce.



their annual New Zealand Medical Workforce report to project the percentage of Māori and Pacific ophthalmologists. The projections and associated prediction intervals are shown in Figure 7. The percentages of Pacific ophthalmologists from 2018 to 2021, and from 2016 to 2017 for Māori ophthalmologists, were omitted when fitting the non-linear least squares models. We set asymptotes of 20% and 7% in our non-linear models for the percentage of Māori and Pacific

ophthalmologists, respectively. This is with reference to the annual reports of commencing medical students and graduating medical school graduates in New Zealand over the last 10 years. By 2050, the percentages of Māori and Pacific ophthalmologists are estimated to be 3.2% (95% prediction interval 2.5–3.9%) and 2.0% (95% prediction interval: 1.6–2.3%) respectively. This represents 6 Māori and 4 Pacific ophthalmologists by 2050 assuming current growth trends. This is

Figure 7: Projected percentage of the Māori and Pacific ophthalmologist workforce.



a significant under-representation considering Stats NZ's projection that by 2043, 21% and 11% of New Zealand's population will be Māori and Pacific respectively.

Discussion

An updated inventory of the ophthalmologist workforce helps with healthcare resource planning and delivery by providing an overview of the current number and distribution of ophthalmologists in New Zealand and the projected gap in workforce. New Zealand's ophthalmologist density of 34 ophthalmologists per million population is one of the lowest

when compared to other high-income countries. The International Council of Ophthalmology survey in 2015 reported ophthalmologist density in other high-income countries such as Japan, Singapore, Switzerland, Sweden, Australia, the United Kingdom and the United States ranged from 40 to 114 ophthalmologists per million population.¹⁶ The recommended ratio proposed by RANZCO of 40 ophthalmologists and 7.7 trainees per million population may be applicable in New Zealand. However, changes in practice over the next decades including new technologies, treatments and shared-care models may change this target.

The number of new trainees in New Zealand has

increased from the 5-year average of 5.6 in 2015 to 6.6 in 2023. Results from our simulation model are conservative estimates given the assumptions that all trainees completed their training within 5 years with a 100% passing rate. The actual number of new fellows graduating from a VTP is expected to be less than this, as shown in our sensitivity analysis—if it takes 6 years to complete a VTP, the gap is further widened. A survey carried out in 2008 estimated an average of 4.5 new ophthalmologists per year.²⁰ Increasing the number of training positions would be a solution to address the supply issue; however, this is dependent on national health funding for eye healthcare.

Māori and Pacific people continue to be under-represented within the ophthalmologist workforce. There is an overall increasing trend; however, at the current growth rate, the workforce will be far from achieving proportions representative of the national population demographics by 2050. RANZCO New Zealand's Te Tiriti o Waitangi and Pasifika Eye Health Action plans have committed to expand the Māori and Pacific eye care workforce. Strengthening existing mentoring programmes and enhancing ophthalmology exposure to Māori and Pacific medical students may encourage more to choose ophthalmology as a career. If New Zealand continues to rely on internationally trained ophthalmologists to fill workforce gaps, achieving a representative workforce will prove exceedingly challenging. By improving the pipeline for New Zealand medical students to train in ophthalmology and ensuring locally trained ophthalmologists are retained, this will also lead to a more equitable increase in Māori and Pasifika ophthalmologists.

There are several limitations to our model. The ideal proportion of ophthalmologists per population for those older than age 65 years is unknown and will be influenced by many variables including individual productivity, healthcare system efficiency and the distribution of care with other eye care providers. Our assumptions for new RANZCO

VTP graduates do not consider trainees who take time off during training, embark on several fellowship programmes or delay their entry into practice. Any increase in the number of years to complete training will only widen the gap between the actual and ideal numbers of ophthalmologists. There are limited historic data on the actual number of Māori and Pacific ophthalmologists, limiting the reliability of our predictions; however, it is evident that these demographics are under-represented in the workforce.

Furthermore, technological innovation,²³ advances in healthcare services delivery—for example, the increasing use of both synchronous and asynchronous teleophthalmology²⁴—and the up-skilling and scope expansion of other eye care professionals may help relieve demand on the ophthalmologist workforce.²⁵ New Zealand has seen positive outcomes with the introduction of nurse-led clinics for intravitreal injections and macular review, with an increased volume of patients seen within a centre even when the ophthalmologist workforce remained stable.²⁶ Rational and safe division of labour between ophthalmologists, clinical nurse specialists and optometrists is crucial to ensure that the provision of care for the population does not come at the expense of quality care.

Continued attention is imperative to ensure that the New Zealand ophthalmic workforce is representative of the community it serves, particularly with respect to geographic distribution, gender and ethnicity. The gap between the ophthalmology workforce and the numbers needed in New Zealand is increasing, especially with an ageing population. The ratio of ophthalmologists to total population is projected to drop by 9.8% in 2050 to 30.6 ophthalmologists per million population if no initiatives are taken to train and retain our ophthalmologist workforce. Immediately increasing the number of training positions to 11 annually will ensure that New Zealand achieves RANZCO's target of 40 ophthalmologists per million population by 2050.

COMPETING INTERESTS

None.

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