BMJ Public Health

Vision impairment and differential access to eye health services in Aotearoa New Zealand: a scoping review

Jaymie Tingkham Rogers [1], Joanna Black [1], Matire Harwood [2], Ben Wilkinson [3], Himal Kandel [4], Jacqueline Ramke [1,5]

To cite: Rogers JT, Black J, Harwood M, *et al*. Vision impairment and differential access to eye health services in Aotearoa New Zealand: a scoping review. *BMJ Public Health* 2024;**2**:e000313. doi:10.1136/bmjph-2023-000313

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/bmjph-2023-000313).

Received 19 June 2023
Accepted 1 February 2024

Check for updates

© Author(s) (or their employer(s)) 2024. Re-use permitted under CC BY-NC. Published by BMJ.

[1]School of Optometry and Vision Science, The University of Auckland, Auckland, New Zealand
[2]Department of General Practice & Primary Health Care, School of Population Health, The University of Auckland, Auckland, New Zealand
[3]Department of Ophthalmology, School of Medicine, The University of Auckland, Auckland, New Zealand
[4]Save Sight Institute, The University of Sydney, Sydney, New South Wales, Australia
[5]International Centre for Eye Health, London School of Hygiene & Tropical Medicine, London, UK

Correspondence to
Jaymie Tingkham Rogers;
j.rogers@auckland.ac.nz

ABSTRACT

Introduction In Aotearoa New Zealand, Māori and Pacific People experience worse health outcomes compared with other New Zealanders. No population-based eye health survey has been conducted, and eye health services do not generate routine monitoring reports, so the extent of eye health inequality is unknown. This information is required to plan equitable eye health services. In this scoping review, we aimed to summarise the nature and extent of the evidence reporting vision impairment, its main causes and access to eye health services by ethnicity in New Zealand.

Methods This scoping review was reported according to Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews. An information specialist conducted a search on MEDLINE and Embase databases in October 2022. Included studies reported outcomes among any population group resident in New Zealand or attendees at New Zealand health facilities. Data screening, full-text review and data extraction were performed independently by two authors. We summarised the characteristics of studies and outcomes, and the results were synthesised narratively.

Results Our search identified 2711 reports, of which 53 (from 47 studies) were included. We mapped 72 outcomes, many of which were access-related (n=32), published since 2000 (n=28) and largely focused on diabetic retinopathy (n=21) or cataract (n=13) in facility-based settings (n=18). Over two-thirds of reported outcomes were disaggregated by at least two ethnicities. When outcomes were disaggregated by ethnicity, Māori and Pacific People were consistently included, and experienced worse access and outcomes compared with other New Zealanders.

Conclusion The findings of this review highlight the presence of ethnic disparity in access to diabetic retinopathy and cataract services. Closing the evidence gap identified for refractive error, glaucoma and macular degeneration service coverage could be a priority for future research. Furthermore, future research can be strengthened to enable consistent monitoring of eye health service coverage over time.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ In many countries, people who are Indigenous, living with socioeconomic disadvantage and marginalised communities face barriers to accessing healthcare.
⇒ Inequity in eye health has historically received insufficient attention in New Zealand, despite evidence of health gaps between Māori and other New Zealanders.

WHAT THIS STUDY ADDS

⇒ The findings of this review highlight the presence of ethnic disparity in access to eye health services, where Māori and Pacific People were consistently underserved compared with other New Zealanders.
⇒ A growing body of research in New Zealand has begun to include an equity component, with studies increasingly disaggregating outcomes by two or more ethnicity groups and consistently reporting results separately for Māori.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Findings from this review encourage the strengthening of future service-based studies to enable consistent monitoring of eye health service coverage over time.
⇒ The ethnic disparity identified among access-related outcomes should prompt further research into uncovering barriers to access to eye health services for underserved communities so that they can be addressed.

INTRODUCTION

In its inaugural World Report on Vision, the WHO called for countries to include eye health in efforts to achieve Universal Health Coverage (UHC).[1] WHO defines UHC as 'all people and communities receive the health services they need without suffering financial hardship'.[2] The emergence of UHC as a priority for WHO is in response to at least half of the people in the world not receiving the health services they need, and these people disproportionately being in under-resourced countries and communities within countries.[2] Accordingly, member states of the United Nations included achieving UHC as one of the targets when adopting the Sustainable

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Development Goals (SDGs) that aim to *leave no one behind*.[3]

Eye health is a large and growing health concern. In 2020, there were an estimated 43 million people who were blind and 295 million people with moderate or severe vision impairment globally.[4] The global population is set to grow and age in the coming decades, so these numbers are projected to increase unless access to good quality services improves for everyone.[4 5] The *Lancet Global Health* Commission on Global Eye Health showed that reduced eye health (including vision impairment) had a negative effect on quality of life, restricted access to education and work opportunities, and had significant financial implications for individuals, communities and countries.[5] Conversely, the Commission demonstrated that improving eye health can advance several of the SDGs, including reducing poverty (SDG1), enabling work (SDG2), improving health and well-being (SDG3) and enabling quality education (SDG4).[5]

In 2019, at the United Nations General Assembly, Aotearoa New Zealand (hereafter referred to as New Zealand) was among the member states that endorsed the commitment to achieve UHC.[6] Furthermore, at the World Health Assembly in 2021, New Zealand endorsed the implementation of two new service coverage indicators for eye health that WHO recommended to help countries monitor progress toward UHC.[7]

All countries have population groups that are underserved by health services, including Indigenous people, marginalised communities and people living in areas of high deprivation.[8] In New Zealand, our Indigenous Māori experience worse access to primary healthcare than other New Zealanders.[9 10] These disparities in access to health services contribute to the inequitable health outcomes observed between ethnic groups.[11 12] Inequity in eye health has historically received insufficient attention in New Zealand.[13] In order to plan and monitor equitable eye health services that contribute to achieving UHC, decision-makers need information on the prevalence and distribution of eye conditions as well as access to eye health services. The aim of this review was to summarise the nature and extent of evidence in New Zealand on the prevalence and distribution of vision impairment and its major causes, and differential access to eye health services, by ethnicity.

Objectives

We aimed to answer the following questions relating to vision impairment and eye health in New Zealand:

1. What is the nature and extent of the available evidence on the prevalence of vision impairment and its major causes?
2. How and in what ways are vision impairment and its major causes distributed across ethnic groups?
3. What is the available evidence on differential access to eye health services for the major causes of vision impairment by ethnicity?

We have used the definition of eye health outlined by the *Lancet Global Health* Commission on global eye health as 'maximised vision, ocular health, and functional ability, thereby contributing to overall health and well-being, social inclusion, and quality of life'[5] and the corresponding definition of eye health services as: 'all types of interventions that improve eye health, encompassing the spectrum of promotion, prevention, treatment and rehabilitation'.[14]

METHODS

Protocol and registration

The study protocol was registered (https://osf.io/yw7xb) in December 2020 and published.[15] This review is reported according to the relevant items of the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews checklist, (online supplemental annex 1).[16] Ethics approval was not sought as this was a review of published literature or publicly available reports.

Patient and public involvement

There was no patient or public involvement in the design or conduct of this study. We will include dissemination of the findings of this review in the community engagement we undertake as part of our ongoing research programme that aims to improve access to eye health services in Aotearoa.

Eligibility criteria

Context and participants: Studies were included if they reported outcomes among any population group resident in New Zealand (whether disaggregated by ethnicity or not), or attendees at New Zealand health facilities (regardless of facility size, public/private sector or level of care). There were no age or gender restrictions.

Type of studies: We included observational studies (eg, cross-sectional, case-control and consecutive case series) and excluded non-consecutive case series, editorials and conference abstracts. We had no time limit or language restrictions.

Outcomes (at least one of):

i. The prevalence of vision impairment.
ii. For each of cataract, uncorrected refractive error, macular degeneration, glaucoma or diabetic retinopathy (the leading causes of vision impairment globally)[17] : the prevalence of the condition; the prevalence of vision impairment due to the condition; or rate of treatment for the condition (must include the number of people treated as a proportion of the number needing treatment *OR* a population denominator).
iii. Access to eye health services (eg, attendance at screening programmes, waiting times for treatment, travel distance or severity of the untreated condition).

We included studies that reported these outcomes by the person (rather than by eye or service visit). Studies with self-reported eye health treatment such as laser or surgery were excluded.

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Information sources

An information specialist searched MEDLINE and Embase databases on 6 December 2020 and updated this on 24 October 2022 (search terms included in online supplemental annex 2). We searched for grey literature that reported data for at least one of our outcomes as described in our protocol.[15]

Study selection

All results from the published literature search were entered into Covidence (www.covidence.org) for screening. Two authors (JTR and one of JR, JB and BW) independently reviewed each title and abstract to exclude irrelevant studies. Full-text articles were reviewed independently by two authors (JTR and one of JR, JB and BW) to exclude studies that did not meet the inclusion criteria. Discrepancies between reviewers were resolved by discussion, and a third reviewer was consulted when needed.

Data charting process

A custom form was developed in Excel for data charting and piloted by JTR, JR and BW; amendments were agreed by consensus. Data extraction was carried out independently for each publication by two authors (from JTR and one of JR, BW or JB). Discrepancies were resolved by discussion and a third reviewer was consulted when needed.

Data items

The data items collected during the data charting process (full details in the study protocol[15]) were: source characteristics (author(s), year of publication and journal); study characteristics (study design, years of data collection and study setting); population characteristics (ethnicity, age group and gender); and outcomes (main findings relevant to our research questions and outcomes).

Synthesis of results

We summarised the characteristics of the included studies, including location and type of study, included population and decade of publication. We then summarised the outcomes reported in these studies in more detail, including the condition and whether it reported prevalence (vision impairment or condition) or access (attendance or treatment) and whether it was disaggregated by ethnicity. Among the studies reporting outcomes for more than two ethnicity groups, we provided a brief summary of the main results across ethnicity groups. We categorised an outcome as reporting each condition or vision impairment based on the description provided by the authors. In addition to presenting the overall summary of studies, we present results published prior to and since 1 January 2000 separately to allow more recent studies to be considered independently.

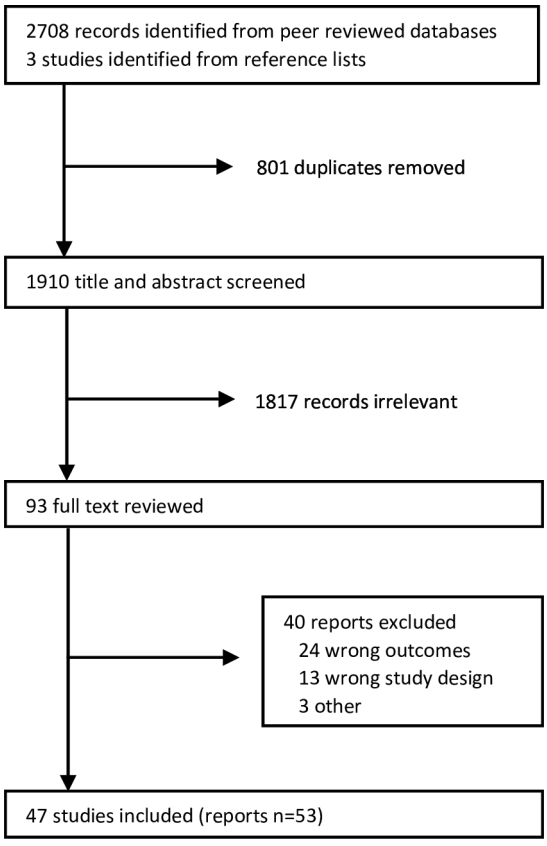

Figure 1 Selection of studies reporting prevalence and distribution of vision impairment, its major causes or access to eye health services by ethnicity in New Zealand, 1960–2022.

RESULTS

Selection of sources of evidence

Our search of published literature and reference lists of included articles identified 2711 unique records for title and abstract screening, and ultimately 53 reports from 47 studies were included in this review (figure 1). There were three studies with more than one published report—the Auckland Cataract Study had five published reports while two further studies each had two reports. Our search of grey literature identified no further studies.

Characteristics of sources of evidence

Of the 47 included studies, the earliest was published in 1965,[18] and almost three-quarters (n=34, 72%) were published since 2000 (online supplemental annex 3). The median sample size across included reports was 853 (IQR 227–3955, range 50–410 099). Only one study[19] reported using a reporting guideline when preparing the publication.

The characteristics of the 47 included studies were heterogeneous (table 1). Approximately one in four studies included a national sample frame (n=13, 28%) with a further one in four conducted in Auckland (n=13, 28%). Just over half of the included studies used data collected at health facilities (n=24, 51%). Nine studies (19%) used population-based sampling—three used each of previously collected data from Statistics New Zealand,

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 1 Characteristics of the 47 included studies reporting prevalence and distribution of vision impairment, its major causes or access to eye health services by ethnicity in New Zealand, 1960–2022.

Characteristic	Period of data collection				Total	
	1960–1999		Since 2000			
	n	%	n	%	n	%
Geographical location						
National	4	31	9	26	13	28
City - Auckland	3	23	10	29	13	28
Region (Waikato, Northland, Canterbury, Otago)	2	15	8	24	10	21
City - Wellington	1	8	3	9	4	9
City - other	3	23	1	3	4	9
Other*	–	–	3	9	3	6
Source of data						
Facility	6	46	18	53	24	51
Register	2	15	3	9	5	11
School	2	15	2	6	4	9
Birth cohort†	1	8	2	6	3	6
Integrated Data Infrastructure (Statistics New Zealand)†	–	–	3	9	3	6
Door-to-door/ population-based sample†	2	15	1	3	3	6
Ministry of Health	–	–	3	9	3	6
Other	-	-	2	6	2	4
Study design						
Cross-sectional	9	69	29	85	38	81
Case series	4	31	4	12	8	17
Cohort	–	–	1	3	1	2
Case control	–	–	–	–	–	–
Age group‡						
Children/youth only	5	38	13	38	18	38
Adults only	4	31	11	32	15	32
All ages	4	31	10	29	14	30
Total	**13**	**100**	**34**	**100**	**47**	**100**

*Includes town, district or South Island.
†Considered to be population-based sampling.
‡Age cut-offs varied.

data of participants recruited door-to-door or within a birth cohort. Similar numbers of studies recruited children and youth only (n=18, 38%), adults only (n=15, 32%) and all ages (n=14, 30%).

Characteristics of outcomes

Across the 53 reports, we identified and mapped a total of 72 outcomes (figure 2, online supplemental annex 4). 26 of these outcomes related to the prevalence of overall vision impairment or vision impairment due to a condition (n=18) or access to eye health services (n=8). Almost two-thirds of these were reported since 2000 (n=17/26, 65%). Among these recent reports, less than one-third used population-based sampling (n=5/17, 29%) and almost all involved only children (n=16/17, 94%). Among studies that enrolled children, four analysed information from the 'B4 School Check' a free nationwide health and developmental examination that includes a general vision screening for 4-year-old children.[20–23]

Across all conditions, 43% of outcomes (n=31/72) described the prevalence or distribution of a condition, 36% (n=26/72) described access-related outcomes, 13% (n=9/72) described the prevalence of vision impairment and 8% (n=6/72) described access in terms of a treatment rate. The conditions with the most outcomes reported were diabetic retinopathy (n=21/72, 29%), and cataract (n=13/72, 18%). Most diabetic retinopathy outcomes described the distribution across retinopathy severity levels (ie, none/mild/moderate/severe) (n=11/21, 52%) among people attending health facilities (n=8) or among people recruited via community screening or

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

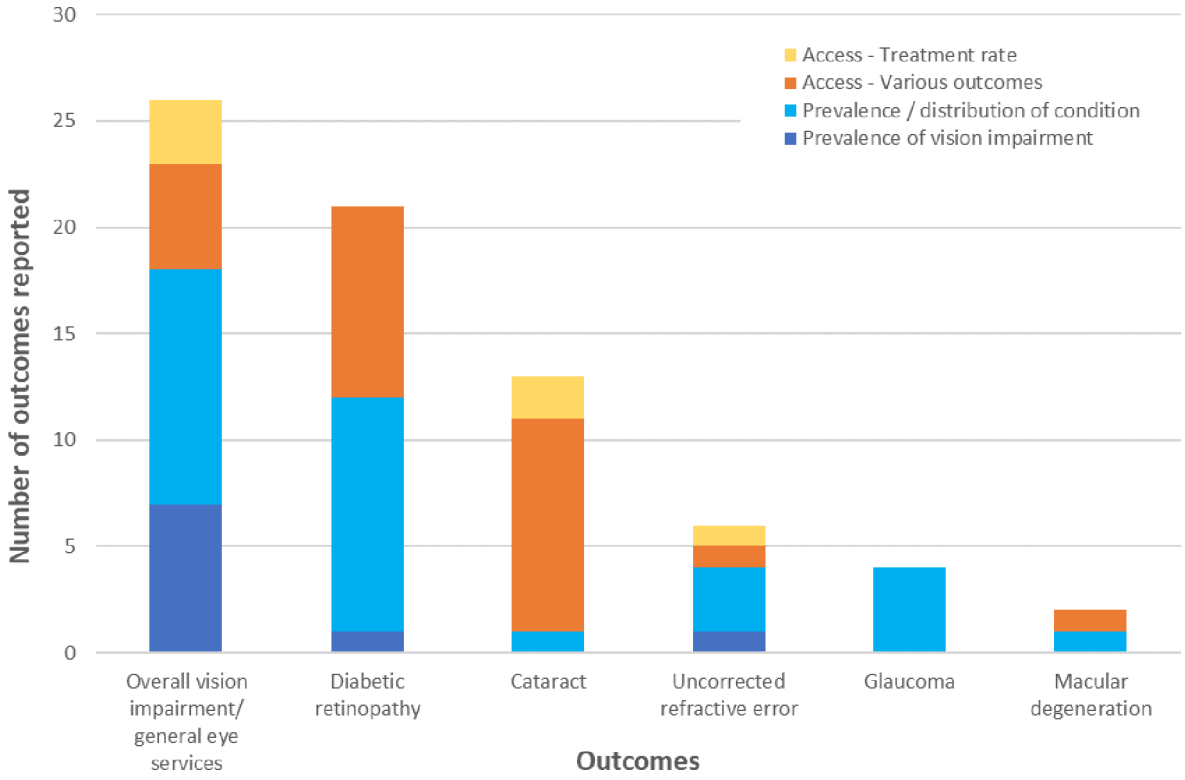

Figure 2 Number of prevalence and access-related outcomes reported in studies of vision impairment, its major causes or corresponding eye health services in New Zealand, 1960–2022.

a door-to-door survey (n=3). All reports that described access to diabetic retinopathy services occurred since 2000 (n=9/21, 43%), reported some measure of attendance and most often included all age groups (n=5) or adults (n=3).

All but one of the 13 cataract outcomes we identified related to access (n=12/13, 92%). Two of these reported a treatment rate in the form of a national cataract surgical intervention rate,[24 25] while the remaining ten were a range of outcomes including preoperative visual acuity, age at presentation and travel time. Among these were five reports from the Auckland Cataract Study,[26–31] which enrolled adults presenting for cataract surgery or waitlisted for surgery at a large public hospital. Most cataract outcomes were observed in adults (n=11/13, 85%),[26–33] and the remainder among all age groups (n=2).[25 34]

Outcomes related to uncorrected refractive error (n=6/72, 8%), glaucoma (n=4/72, 6%) and macular degeneration (n=2/72, 3%) were reported infrequently. Glaucoma was the only condition for which no access-related outcomes were identified.

Over two-thirds of reported outcomes were disaggregated by at least two ethnicities (n=50/72, 69%), increasing from 33% before 2000 (n=7/21) to 84% since 2000 (n=43/51), (figure 3, online supplemental annex 5). When outcomes were reported for two ethnicities (n=10), one of them was always Māori, while the other group varied between New Zealand European,[18 35 36] non-Māori,[18 37–40] or grouped as 'other' ethnicities.[32] When outcomes were disaggregated by >2 ethnicities, New Zealand European, Māori and Pacific People were consistently included, while the other groups tended to include one or more of: Asian, Chinese, Indian or other.

Outcomes were disaggregated by a measure of socioeconomic status much less often than ethnicity (n=16/72, 22%); the socioeconomic status measures most often used were area-level deprivation (n=8/16, 50%) or employment status (n=6/16, 38%). Most studies that reported outcomes disaggregated by area-level deprivation had enrolled children (n=6/8, 75%), and these consistently found worse outcomes for children from households in the most deprived areas (quintile 5) compared with those from households in the least deprived area (quintile 1), including access to government-funded vision screening.[21]

Prior to 2000, no diabetic retinopathy outcomes were disaggregated by ethnicity, but since 2000, most have been disaggregated by >2 ethnicities (n=16/20, 80%) and Indian ethnicity was often one of the groups reported (n=7/20, 35%).[41–44]

Since 2000, most studies reporting cataract outcomes disaggregated findings by >2 ethnicities (n=9/11, 82%). Among these was the Auckland Cataract Study,[26–30] which found Māori and Pacific People underwent cataract surgery 10 years younger than New Zealand Europeans.[26 29] Furthermore the proportion of Māori presenting for cataract surgery (4.7%) at a large public hospital, was lower than the proportion of Māori in the catchment area (8.2%).[31] Studies on glaucoma and refractive error disaggregated outcomes by ethnicity

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

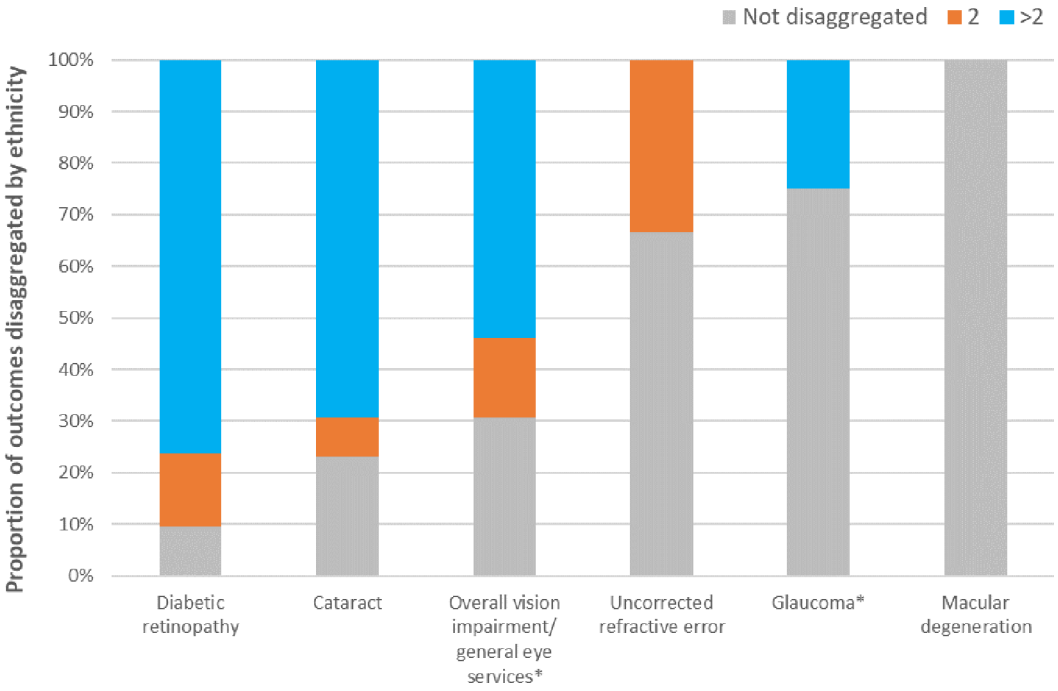

Figure 3 Proportion of outcomes disaggregated by two or more ethnicity groups in studies reporting prevalence or distribution of vision impairment, its major causes or corresponding eye health services in New Zealand, 1960–2022. *Two overall vision impairment outcomes and one additional glaucoma outcome included in the 'not disaggregated' category were reported for only one ethnicity.

less often, with no outcomes by ethnicity prior to 2000 for glaucoma and two outcomes disaggregated by two ethnicities for refractive error.[18 35] No identified macular degeneration-related outcomes had been disaggregated by ethnicity. Two studies described outcomes generated from a population-based sampling of only one ethnicity—one reported glaucoma among a New Zealand European adult population,[45] and one reported vision impairment and its correction among Pacific children.[19]

Among studies that reported outcomes disaggregated by two or more ethnicities, Māori and Pacific People were consistently found to experience worse access to eye health services compared with other New Zealanders. Findings among studies published after 1 January 2000 are summarised in table 2, and a summary of outcomes from 1960 to 2022 is summarised in online supplemental annex 6.

DISCUSSION

This is the first systematic scoping review of studies reporting vision impairment or access to eye health services in New Zealand. We found an absence of evidence on the prevalence of vision impairment in adults. Most studies we identified were conducted in recent decades at a single facility and tended to be focused on specific conditions; approximately one-quarter of studies were national with a further one-quarter conducted in Auckland. Consequently, decision-makers have substantial gaps in the evidence available to them to plan and monitor equitable eye health services. Despite this, we did identify an increase in recent decades in the number of studies reporting outcomes on access to eye health services, as well as studies that disaggregated outcomes across ethnic groups.

While the increase we identified over recent decades in the number of studies reporting access to eye health services is encouraging, there is substantial opportunity to strengthen the eye health evidence available to decision-makers in New Zealand. First, we have very little population-based evidence so commonly rely on analysis of facility-based data. These data have inherent limitations with respect to the underestimation of outcomes relative to the whole population. For example, being included in studies reporting access to diabetic retinal screening, or services for glaucoma or cataract relies on first accessing and then being referred by primary care, which itself has well-documented inequity in access.[10 46] Additionally, included studies on the 'B4 School Check' programme which is voluntary, and dependent on enrolment with either a general practitioner or early childhood facility, also show ethnic disparity in access. These inequities in access to primary or early childhood care and subsequent referral means the twofold to threefold rate observed in included studies by which Māori and Pacific People were underserved by eye health services compared with New Zealand Europeans is likely an underestimate. While this disparity was most often explored for cataract and diabetic retinopathy services and the 'B4 School Check' programme, it is arguably present for other conditions. These findings emphasise the necessity to improve access to primary healthcare, particularly among underserved communities as part of efforts to improve access to and

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 2 Key findings from studies reporting prevalence or distribution of vision impairment, its major causes or corresponding eye health services and disaggregating outcomes by two or more ethnicity groups in New Zealand, 2000-October 2022

Condition*	Outcome (number reported)	Key findings
Overall VI/general eye services	Access – attendance (n=4)	► Preschool vision screening was less likely to be accessible to Māori and Pacific children compared with children of other ethnicities.[22]
	Prevalence or distribution of condition (n=3)	► In a national study of children enrolled in BLENNZ, Māori children were over-represented, being 30.7% of children with vision impairment compared with 23.1% of children in NZ.[37 49 60]
Diabetic retinopathy	Access – attendance (n=4)	► Ethnic disparities were evident in several diabetic retinopathy screening studies, where Māori were underrepresented among those accessing services compared with NZ Europeans.[36 43 61] ► Attendance at diabetes eye services was lowest among Māori and Pacific People compared with other ethnicities.[43 62]
	Prevalence or distribution of condition (n=7)	► Among people with diabetes, Māori and Pacific People were more likely to develop diabetic retinopathy than other ethnicities.[50 63 64] ► Compared with NZ Europeans, moderate and severe retinopathy was 2.8 times more common in Māori and 3 times more common in Pacific People.[50]
Cataract	Access – attendance (n=8)	► Compared with other ethnicities, Māori were under-represented among people attending cataract services.[25 26 31] ► Compared with other ethnicities, Māori and Pacific People tended to present for cataract surgery >10 years younger, and with worse visual acuity.[25 26 29 31 34] ► When referred for operable cataract, the driving distance for Māori was at least 27% longer from their home to their referring optometrist, compared with NZ Europeans.[33]
	Access – treatment rate (n=1)	► Among those prioritised for publicly funded cataract surgery, Māori were under-represented compared with NZ Europeans.[25]
Glaucoma	Prevalence or distribution of condition (n=1)	► In a public hospital-based glaucoma service, Māori and Pacific People were under-represented in people with all subtypes of glaucoma; Māori were particularly underrepresented among people diagnosed with primary open-angle glaucoma.[65]

*Studies on refractive error reported outcomes based on ethnicity only up until 1970, hence was not included in the key findings.
BLENNZ, Blind and Low Vision Education Network New Zealand; NZ, New Zealand; VI, vision impairment.

outcomes of eye health services. It is also likely—given the expense of population-based data gathering—that the reliance on facility-based data will continue, so researchers could focus their attention on strengthening the conduct and reporting of these analyses, such as by using relevant reporting guidelines (eg, the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE[47] or the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD[48]) guidelines) to make explicit the extent to which presented results might overestimate or underestimate the true situation among the broader population.

Despite the absence of evidence of estimates of vision impairment among adults, we identified several studies that described the distribution of vision impairment or conditions among children registered with Blind and Low Vision Education Network New Zealand (BLENNZ). Given that education is compulsory until the age of 16 years, and BLENNZ collaborates very closely with school teachers and education specialists across the country, it seems likely that the estimates of children with vision impairment or blindness based on BLENNZ data are accurate. As such, the prevalence of blindness in New Zealand children of 54 per 100 000,[49] is higher than the rate recently estimated for high-income countries of 30 per 100 000.[5]

In recent decades, New Zealand researchers more consistently disaggregated outcomes across two or more ethnicity groups, including Indigenous Māori. This disaggregation confirms that ethnic disparity in access

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

to eye health services is ubiquitous in New Zealand, with Māori and Pacific People consistently underserved, with subsequent worse outcomes including the twofold greater likelihood of developing sight threatening diabetic retinopathy compared with New Zealand Europeans.[50] Unfortunately, the ethnic disparity observed in New Zealand mirrors findings for Indigenous peoples regionally and globally.[51 52] As partners in Te Tiriti o Waitangi and recipients of government funding, health researchers in New Zealand have an obligation to partner with Māori and achieve equitable health outcomes. The ethnic disparity in service access in studies we identified on diabetic retinopathy and cataract should prompt calls for further research to uncover barriers and facilitators of access to these and other eye health services, notably for Māori and Pacific People and to generate solutions to make services more accessible for underserved groups. This evidence would inform efforts that align with the equity aims of Pae Ora/Healthy Futures Act[53] recently introduced by the Ministry of Health/Manatū Hauora, as well as UHC for eye care.

Substantial gaps in our knowledge of unmet needs across these leading causes of vision impairment remain. While access to services for diabetic retinopathy and cataract has received some attention from researchers in recent decades, service access for people with uncorrected refractive error, glaucoma or macular degeneration has received almost no attention. Given the emphasis on improving effective refractive error coverage globally following the 74th World Health Assembly,[7] and the disparities in service coverage observed elsewhere,[54] our evidence gap for refractive error services could be a priority to address. Further, while the cataract surgical intervention rate reported for New Zealand was defined differently from the indicator endorsed by member states at the World Health Assembly,[55] New Zealand had one of the lowest rates when compared with other Organisation for Economic Co-operation and Development countries.[25] It is likely the situation in New Zealand mirrors the situation in Australia, where effective cataract surgical coverage rates were lower for Indigenous (52%) compared with non-Indigenous Australians (89%).[56]

As previously identified in studies on diabetic retinopathy and its services in New Zealand,[55] reporting outcomes consistently, across the country and over time, would allow comparison and monitoring of change. For example, we identified a broad range of outcomes that reported different aspects of access to cataract services. To assist with monitoring change in access over time, it would be useful if a core set of indicators could be consistently reported. The Eye Care Indicator Menu launched by WHO in 2022 could provide a starting point for potential indicators.[57]

These findings must be considered in the context of several limitations. First, by focusing on the leading causes of vision impairment globally, it does not represent all vision impairment and eye health service research in New Zealand. Notably, we did not include the substantial literature on keratoconus which is common in New Zealand, and seems to be more prevalent among Māori and Pacific People,[58] nor studies that have explored disparities in service access for other conditions, including retinal detachment.[59] Despite the absence of these studies, we believe we have assembled a summary of the research conducted on the eye health conditions affecting most New Zealanders. Second, while not a limitation per se, by undertaking a scoping review rather than a systematic review, we have summarised the type of research undertaken on this topic and what it focused on, rather than comprehensively synthesising the findings of this body of research across all conditions and outcomes. Further, as is common when conducting scoping reviews,[16] we did not complete quality appraisal of the included studies. Given the broad scope of our research question and the heterogeneous studies we identified, we believe our scoping approach was appropriate to provide a summary of the research field to date and hope further research in this area in the coming years will lead to more systematic reviews on specific conditions being feasible.

CONCLUSION

As part of New Zealand realising its aspiration of UHC, eye health and access to services must be improved equitably. This review highlighted a small and growing evidence base to inform these efforts, as well as opportunities to strengthen the available evidence. These opportunities include addressing the evidence gap on services for uncorrected refractive error, establishing consistent reporting on priority outcomes, identifying barriers and facilitators of access to eye health services and designing and evaluating strategies to improve access to services and ultimately eye health for all New Zealanders.

Acknowledgements JTR holds a Senior Health Research Scholarship from the University of Auckland.

Contributors Two authors (JTR and one of JR, JB and BW) independently reviewed each title and abstract. Full-text articles were reviewed independently by two authors (JTR and one of JR, JB and BW). JTR drafted the scoping review with suggestions from JR, MH, JB and HK, who reviewed the manuscript and provided feedback on the draft. The final version of the scoping review was approved by all authors. JTR is the overall guarantor of this study.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs
Jaymie Tingkham Rogers http://orcid.org/0000-0003-2415-8198
Joanna Black http://orcid.org/0000-0002-5100-8796
Matire Harwood http://orcid.org/0000-0003-1240-5139
Ben Wilkinson http://orcid.org/0000-0002-2629-7063
Himal Kandel http://orcid.org/000-0002-6745-6411
Jacqueline Ramke http://orcid.org/0000-0002-5764-1306

REFERENCES

1 World Health Organization. World report on vision. Geneva, 2019. Available: https://www.who.int/publications/i/item/9789241516570
2 World Health Organization. Universal health coverage. 2023. Available: https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc)
3 United Nations General Assembly. Transforming our world: the 2030 agenda for sustainable development. Resolution adopted by the General Assembly. New York, USA. 2015
4 Bourne R, Steinmetz JD, Flaxman S. Trends in prevalence of blindness and distance and near vision impairment over 30 years: an analysis for the global burden of disease study. *Lancet Glob Health* 2021;9:e130–43.
5 Burton MJ, Ramke J, Marques AP, *et al*. The lancet global health commission on global eye health: vision beyond 2020. *Lancet Glob Health* 2021;9:e489–551.
6 United Nations General Assembly. Resolution adopted by the General Assembly high level meeting on universal health coverage. 2019.
7 World Health Organization. Seventy fourth world health assembly agenda. 2021. Available: https://apps.who.int/gb/ebwha/pdf_files/WHA2074/A2074(2012)-en.pdf
8 World Health Organization. World health Statistics 2022: Monitoring health for the SDGs. 2022. Available: https://www.who.int/data/gho/publications/world-health-statistics
9 Ellison-Loschmann L, Pearce N. Improving access to health care among New Zealand's Māori population. *Am J Public Health* 2006;96:612–7.
10 Ellison-Loschmann L, Firestone R, Aquilina L, *et al*. Barriers to and delays in accessing breast cancer care among New Zealand women: disparities by ethnicity. *BMC Health Serv Res* 2015;15:394:394.:.
11 Atlantis E, Joshy G, Williams M, *et al*. Diabetes among Māori and other ethnic groups in New Zealand. In: Dagogo-Jack S, ed. *Diabetes mellitus in developing countries and underserved communities*. 2017: 165–90.
12 Kenealy T, Elley CR, Robinson E, *et al*. An association between ethnicity and cardiovascular outcomes for people with type 2 diabetes in New Zealand. *Diabet Med* 2008;25:1302–8.
13 Silwal P, Watene R, Cowan C, *et al*. Eye care in Aotearoa New Zealand 2022: eye care situation analysis tool (ECSAT): open science framework, 2022. Available: https://osf.io/r2075zs/
14 Ramke J, Ah Tong BA, Stern J, *et al*. Defining eye health for everyone. *Ophthalmic Physiol Opt* 2022;42:1–3.
15 Rogers JT, Black J, Harwood M, *et al*. Vision impairment and differential access to eye health services in Aotearoa New Zealand: protocol for a scoping review. *BMJ Open* 2021;11:e048215.
16 Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-SCR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
17 GBD 2019 Blindness and Vision Impairment Collaborators. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of Avoidable blindness in relation to VISION 2020: the right to sight: an analysis for the global burden of disease study. *Lancet Glob Health* 2021;9:e144–60.
18 Grosvenor T. The visual status of New Zealand's Maoris: a preliminary report. *Am J of Optom* 1965;42:593–605.
19 Hamm LM, Johnson IA, Jacobs RJ, *et al*. Visual impairment and its correction among Pacific youth in Aotearoa: findings from the Pacific Islands families study. *NZ Med J* 2021;134:39–35.
20 Anstice N, Spink J, Abdul-Rahman A. Review of preschool vision screening referrals in South Auckland, New Zealand. *Clin Exp Optom* 2012;95:442–8.
21 Findlay R, Hamm L, Anstice N, *et al*. Vision screening in New Zealand pre-school children: is it equitable. *J Paediatr Child Health* 2021;57:1594–9.
22 Gibb S, Milne B, Shackleton N, *et al*. How universal are universal preschool health checks? an observational study using routine data from New Zealand's B4 school check. *BMJ Open* 2019;9:e025535.
23 Richards N, Reith D, Stitely M, *et al*. The before school check (B4Sc): reporting outcomes and referral rates for all New Zealand children. *NZ Med J* 2019;132:9–19.
24 Derrett S, Bevin TH, Herbison P, *et al*. Access to elective surgery in New Zealand: considering equity and the private and public mix. *Int J Health Plann Manage* 2009;24:147–60.
25 Chilibeck C, Mathan JJ, Ng SGJ, *et al*. Cataract surgery in New Zealand: access to surgery, surgical intervention rates and visual acuity. *NZ Med J* 2020;133:40–9.
26 Kim BZ, Patel DV, McGhee CNJ. Auckland cataract study 2: clinical outcomes of phacoemulsification cataract surgery in a public teaching hospital. *Clin Exp Ophthalmol* 2017;45:584–91.
27 Riley AF, Grupcheva CN, Malik TY, *et al*. The waiting game: natural history of a cataract waiting list in New Zealand. *Clin Exp Ophthalmol* 2001;29:376–80.
28 Riley AF, Grupcheva CN, Malik TY, *et al*. The Auckland cataract study: demographic, corneal topographic and ocular biometric parameters. *Clin Exp Ophthalmol* 2001;29:381–6.
29 Riley AF, Malik TY, Grupcheva CN, *et al*. The Auckland cataract study: co-morbidity, surgical techniques, and clinical outcomes a public hospital service. *Br J Ophthalmol* 2002;86:185–90.
30 Thompson AM, Sachdev N, Wong T, *et al*. The Auckland cataract study: 2 year postoperative assessment of aspects of clinical, visual, corneal topographic and satisfaction outcomes. *Br J Ophthalmol* 2004;88:1042–8.
31 Yoon JJ, Misra SL, McGhee CN, *et al*. Demographics and ocular biometric characteristics of patients undergoing cataract surgery in Auckland, New Zealand. *Clin Exp Ophthalmol* 2016;44:106–13.
32 Clayton C, Malcolm L. Comparative costs of cataract surgery in a public and a private hospital. *NZ Med J* 1989;102:461–3.
33 Wilkinson B, McKelvie J. Evaluating barriers to access for cataract surgery in Waikato: analysis of calculated driving distance and visual acuity. *NZ Med J* 2021;10512.
34 Wang N, Hunt L, McKevie J. Patient-reported quality of life and eligibility for cataract surgery: assessing the relationship between ethnicity and 'impact on life' questionnaire scores in New Zealand. *NZ Med J* 2022;135:19–26.
35 Grosvenor T. Refractive error distribution in New Zealand's polynesian and European children. *Optom Vis Sci* 1970;47:673–9.
36 Papali'i-Curtin AT, Dalziel DM. Prevalence of diabetic retinopathy and maculopathy in Northland, New Zealand: 2011-2012. *NZ Med J* 2013;126:1383.
37 Chong C, Dai S. Cross-sectional study on prevalence, causes and avoidable causes of visual impairment in Māori children. *NZ Med J* 2013;126:31–8.
38 Lim S, Chellumuthi C, Crook N, *et al*. Low prevalence of retinopathy, but high prevalence of nephropathy among Maori with newly diagnosed diabetes-te Wai O Rona: diabetes prevention strategy. *Diabetes Res Clin Pract* 2008;80:271–4.
39 Sandhu SK, Corbett VM, Chepulis L, *et al*. The prevalence of Microvascular complications in Waikato children and youth with type 1 diabetes has reduced since 2003. *NZ Med J* 2020;133:35–44.
40 Sturman D. A statistical approach to eye problems in New Zealand. *Trans Ophthalmol Soc NZ* 1969;21:74–84.
41 Coppell K, Manning P, Anton R, *et al*. Establishing a regional diabetes register and a description of the registered population after one year. *NZ Med J* 2002;115:1160.
42 Hill S, Mullins P, Murphy R, *et al*. Risk factors for progression to Referable diabetic eye disease in people with diabetes mellitus in Auckland, New Zealand: A 12-year retrospective cohort analysis. *Asia Pac J Ophthalmol (Phila)* 2021;10:579–89.
43 Jagadish P, Dalziel D. Discharge outcomes of patients referred to specialist eye clinic from diabetic retinopathy screening in Northland (2014-15). *NZ Med J* 2017;130:89–93.
44 Scott AR, Whitcombe S, Bouchier D, *et al*. Diabetes in children and young adults in Waikato province, New Zealand: outcomes of care. *NZ Med J* 2004;117:1207.
45 Singh A. The prevalence of glaucoma among 45-year-old new Zealanders. *NZ Med J* 2022;135:35–42.

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

46 Harwood H, Rhead R, Chui Z, *et al*. Variations by ethnicity in referral and treatment pathways for IAPT service users in South London. *Psychol Med* 2023;53:1084–95.
47 Vandenbroucke JP, von Elm E, Altman DG, *et al*. Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration. *Int J Surg* 2014;12:1500–24.
48 Nicholls SG, Quach P, von Elm E, *et al*. The reporting of studies conducted using observational routinely-collected health data (RECORD) statement: methods for arriving at consensus and developing reporting guidelines. *PLoS One* 2015;10:e0125620.
49 Chong C, McGhee CNJ, Dai SH. Causes of childhood low vision and blindness in New Zealand. *Clin Exp Ophthalmol* 2019;47:165–70.
50 Simmons D, Clover G, Hope CJ. Ethnic differences in diabetic retinopathy. *Diabet Med* 2007;24:1093–8.
51 Foreman J, Xie J, Keel S, *et al*. Cataract surgery coverage rates for indigenous and non-Indigenous Australians: the national eye health survey. *Med J Aust* 2017;207:256–61.
52 Teo ZL, Tham Y-C, Yu M, *et al*. Global prevalence of diabetic retinopathy and projection of burden through 2045. *Ophthalmology* 2021;128:1580–91.
53 Ministry of Health. Pae Ora (Healthy Futures) Act 2022, 2022. Available: https://www.legislation.govt.nz/act/public/2022/0030/latest/LMS575405.html
54 Foreman J, Xie J, Keel S, *et al*. Treatment coverage rates for refractive error in the national eye health survey. *PLoS One* 2017;12:e0175353.
55 Ramke J, Jordan V, Vincent AL, *et al*. Diabetic eye disease and screening attendance by Ethnicity in New Zealand: a systematic review. *Clin Exp Ophthalmol* 2019;47:937–47.
56 Keel S, Xie J, Foreman J, *et al*. Population-based assessment of visual acuity outcomes following cataract surgery in Australia: the national eye health survey. *Br J Ophthalmol* 2018;102:1419–24.
57 World Health Organization. Eye care indicator menu (ECIM): a tool for monitoring strategies and actions for eye care provision. 2022. Available: https://www.who.int/publications/i/item/9789240049529
58 Patel D, McGhee C. Understanding Keratoconus: what have we learned from the New Zealand perspective? *Clin Exp Optom* 2013;96:183–7.
59 Allbon DS. Retinal detachments in Southern New Zealand: do poorer patients have poorer outcomes? *NZ Med J* 2015;128:18–24.
60 Chong CF, McGhee CNJ, Dai S. A cross-sectional study of prevalence and etiology of childhood visual impairment in Auckland, New Zealand. *Asia Pac J Ophthalmol (Phila)* 2014;3:337–42.
61 Simmons D, Clover G. A case control study of diabetic patients who default from primary care in urban New Zealand. *Diabetes & Metabolism* 2007;33:109–13.
62 Reda E, Dunn P, Straker C, *et al*. Screening for diabetic retinopathy using the mobile retinal camera: the waikato experience. *NZ Med J* 2003;116:1180.
63 Chang LY, Lee AC, Sue W. Prevalence of diabetic retinopathy at first presentation to the retinal screening service in the greater Wellington region of New Zealand 2006-2015, and implications for models of retinal screening. *NZ Med J* 2017;130:78–88.
64 Frederikson LG, Jacobs RJ. Diabetes eye screening in the Wellington region of New Zealand: characteristics of the enrolled population (2002-2005). *NZ Med J* 2008;121:21–34.
65 Mathan JJ, Patel DV, McGhee CNJ, *et al*. Analysis of glaucoma subtypes and corresponding demographics in a new Zealand population. *Biomed Hub* 2016;1:1–8.

BMJ Public Health: first published as 10.1136/bmjph-2023-000313 on 25 March 2024. Downloaded from https://bmjpublichealth.bmj.com on 13 January 2026 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.