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Representation of Asian ethnic sub-groups in Aotearoa's regulated health workforce pre-registration students

Navneet N Lal, Gabrielle McDonald, Andrew Sise, Warwick Bagg, Zoe Bristowe, Paul Brunton, Chris Hendry, Bridget Kool, Damian Scarf, Susan Shaw, Collin Tukuitonga, Jonathan Williman, Denise Wilson, Peter Crampton

ABSTRACT

AIM: To provide a socio-demographic profile of Asian students enrolled in their first year of a health professional programme in polytechnics and universities in Aotearoa New Zealand and to explore differences in enrolment rates (ERs) within Asian sub-groups and by socio-economic deprivation, citizenship status, urban/rural location and gender.

METHODS: Ethnic group/sub-group and socio-demographic characteristics of students enrolling within 21 health professional programmes were collected and averaged over 5 years (2016–2020). Age- and ethnicity-matched denominator data from the 2018 Census were used to calculate yearly ERs and ratios (ERR) using generalised linear modelling with the European ethnic group as the reference.

RESULTS: The overall ER for Asian students was higher than for Europeans (ERs [95% confidence interval: 280 [269–292] per 100,000 population aged 18–29 per year vs 149 [144–154]). However, Indian, Chinese and Southeast Asian students were under-represented in occupational therapy (ERR: 0.33–0.67, p=<0.017), midwifery (ERR: 0.46–0.61, p=<0.002) and paramedicine (ERR: 0.23–0.29, p<0.001). There were proportionately fewer female Asian students compared with European students (68% vs 82%, p<0.001).

CONCLUSION: This novel research provides detailed information on Asian sub-group representation in health professional programmes in Aotearoa. Taken in the context of known health needs of different Asian sub-groups, these data may facilitate health workforce planning and targeted policies within health professional programmes in order to better match the health workforce to population health needs.

Training and retaining health professionals who reflect the communities they serve should be a key driver of health workforce development because ethnic concordance and lived-experience–informed practice improves outcomes for under-served populations—a powerful strategy to improve health outcomes and reduce inequities.[1–5] The *Pae Ora (Healthy Futures) Act 2022*[6] states that the health sector should develop and maintain a health workforce that is representative of the communities it serves. Despite this, Aotearoa New Zealand's (Aotearoa) health workforce inadequately mirrors the society it serves, particularly for Māori (Aotearoa's Indigenous population) and Pacific populations.[7,8]

Te Tiriti o Waitangi, the foundational constitutional document of Aotearoa, states that Māori retain the right of self-determination and the benefits of protection and citizenship, which afford Māori rights-based entitlement to equal health outcomes.[9,10] Despite this, since British colonisation of Aotearoa in the first half of the nineteenth century, the rights of Māori have been systematically breached—with Pākehā benefitting from these actions at the expense of Māori—causing marginalisation and oppression.[11] This has resulted in inequitable outcomes across a number of areas, including but not limited to the realms of health and education, with substantial under-representation of Māori in nearly all aspects of the health workforce.[12]

In responding to structural inequities and under-representation of Māori professionals in the health workforce, affirmative action selection policies for entry into health professional programmes have been developed at both universities of Auckland and Otago.[13–16] Because Pacific people also experience structural inequities that result in inequitable social and economic outcomes and under-representation in the health workforce, affirmative action selection policies for entry into health professional programmes also apply to Pacific students.[15,16] While these steps have helped to increase the number of Māori and Pacific

peoples in Aotearoa's health workforce, there is still significant under-representation that continues to drive health inequities, as highlighted by us previously.[7,8,13] Māori and Pacific students have significantly lower enrolment rates (ERs) in health professional programmes (99 and 100 per 100,000 of eligible population, respectively) compared with NZ European students (152 per 100,000). The under-representation of Māori students in health workforce training is at odds with the health sector's commitment to Te Tiriti o Waitangi and is of particular concern given the significant health inequities experienced by Māori.

The current study is part of a wider series of analyses aimed at exploring the demographics of health professional students in Aotearoa.[7,8] The overall aim for the wider study is to provide a socio-demographic profile of all students enrolled in their first year of a health professional programme offered within Aotearoa's tertiary institutions. These data can be leveraged by future national and local initiatives to inform, monitor and enable the regulated health professional workforce to better reflect Aotearoa's society as a whole. Our preliminary analysis exploring the demographics of health professional students in Aotearoa indicated that Chinese and Southeast Asian students had higher overall rates of enrolment compared with other ethnic groups.[7,8] However, as was the case with all ethnic groups, ERs for the pan-Asian group had a linear negative relationship with increasing small area deprivation (New Zealand Index of Deprivation [NZDep] 2018), indicating that disparities exist within and among Asian students.

Asians comprise the third largest ethnic population in Aotearoa (following Europeans and Māori)[17] and have well-documented healthcare needs.[18–20] The first Chinese immigrants arrived in Aotearoa at the time of the Otago gold rush in the 1860s.[21] Asian immigration to Aotearoa has accelerated over recent decades, with about 17% of the population now identifying as Asian.[22] Despite increasing research on Asian health, the Asian grouping is poorly reflected in Aotearoa's health policies,[23] perhaps leading to the false impression that there are no specific unmet healthcare needs for this community.[20,24]

"Asian" ethnic group

Statistics New Zealand (Stats NZ) defines ethnicity as a measure of cultural affiliation[25] and not a measure of race, ancestry, nationality or citizenship. While the definition of ethnicity provided by Stats NZ[25] focusses on identity, in contemporary Aotearoa the concept of ethnicity can equally be understood as a marker of societal power differentials, and the differences in health outcomes that are observed as a result. The term "Asian" lacks a universal and uncontested meaning, but gained currency through usage by the state; for example, by Stats NZ, Aotearoa's lead government statistical agency.[26] Stats NZ defines "Asians" as individuals with origins in the Asian continent, spanning countries bordered by the Pacific Ocean in the east to Afghanistan (inclusive) in the west. It includes geographies as disparate as Japan and India while excluding the Middle East and Central Asia (Table 1).[27] Despite the obvious deficiencies of "Asian" being used as a pan-ethnic grouping, the term has salience for health because of the context: Aotearoa is a racialised colonial society where the state categorises a significant proportion of the world's population into one ethnic grouping—Asian—in a way that reflects the imperial and colonial history of England.

There is huge diversity within Asians in Aotearoa and health outcomes vary between different Asian sub-groups. These differences in health outcomes are often missed when data are aggregated and examined for the pan-Asian group, masking important differences due to an averaging effect. For example, Indian and other South Asian ethnic populations experience high rates of low birth weight and pre-eclampsia,[28–30] cardiovascular and metabolic diseases,[18,19] nutrient deficiencies[18] and poor youth mental health.[31] The Chinese ethnic sub-group has low rates of perinatal and maternal morbidity and mortality, but high rates of gastric cancer, stroke and smoking.[32] The "Other Asian" category problematically groups people from countries such as Sri Lanka, Japan and Korea (Table 1) and their healthcare needs remain poorly characterised. Essentially, the Asian grouping agglomerates diverse ethnic groups with specific unmet healthcare needs that require tailored solutions.

Understanding the needs of those in the Asian ethnic group in the context of health and education is complicated by the "model minority myth", the "healthy migrant effect" and "divide and conquer" strategies rooted in colonisation. The model minority myth is the perception of high economic and academic achievement in certain minority groups (particularly Asian) attributed to work ethic and merit, which is used to undermine

Table 1: The Asian pan-ethnic grouping as classified by Statistics New Zealand and broken into its four constituent levels with population counts and proportions (%) of the total population from the 2018 Census data.[17] Overlapping cells denote how the individual ethnic groups (on the right) are reconstituted into sub-groups, groups and pan-ethnic groups (on the left).

Level 1	Level 2	Level 3	Level 4	Population in 2018
Asian 707,598 (15%)			Asian, NFD*	11,811 (0.25%)
	Southeast Asian 126,072 (2.7%)		Southeast Asian, NFD*	6,219 (0.13%)
			Filipino	72,612 (1.5%)
			Cambodian	9,672 (0.21%)
			Vietnamese	10,086 (0.21%)
		Other Southeast Asian 27,483 (0.58%)	Burmese	2,475 (0.053%)
			Indonesian	6,033 (0.13%)
			Lao	1,608 (0.034%)
			Malay	3,729 (0.079%)
			Thai	10,623 (0.23%)
			Southeast Asian, NEC†	1,638 (0.035%)
	Chinese 248,919 (5.3%)		Chinese, NFD*	231,387 (4.9%)
			Hong Kong Chinese	3,177 (0.068%)
			Cambodian Chinese	1,413 (0.03%)
			Malaysian Chinese	4,866 (0.10%)
			Taiwanese	6,570 (0.14%)
	Indian 241,050 (5.1%)		Indian, NFD*	221,916 (4.7%)
			Fijian Indian	15,132 (0.32%)
			South African Indian	1,632 (0.035%)
	Other Asian 91,143 (1.9%)	Sri Lankan 16,920 (0.36%)	Sri Lankan, NFD*	4,245 (0.090%)
			Sinhalese	9,171 (0.20%)
			Sri Lankan Tamil	3,501 (0.074%)
		Other Asian 20,418 (0.43%)	Afghani	5,250 (0.11%)
			Bangladeshi	2,337 (0.050%)
			Nepalese	3,630 (0.077%)
			Pakistani	6,135 (0.13%)
			Eurasian	1,389 (0.030%)
			Japanese	18,141 (0.39%)
			Korean	35,664 (0.76%)

NFD* = not further defined; NEC† = not elsewhere classified.
Only ethnic groups with 1,000 (0.02% of the population) or more responses have been shown here.

the existence of structural racism.[33–35] The healthy migrant effect posits that migrants enter the country with a high quality of health that deteriorates over time given the difficulties in sustaining adequate standards of nutrition, housing, income and healthcare. Consequently, the health of many Asian migrants in Aotearoa deteriorates faster than expected following migration.[36] The British Empire deliberately employed divide and conquer strategies to dissipate solidarity between minority groups through the establishment of a racial hierarchy (white supremacy)[37] and propagandised assimilation while exploiting minority groups for labour.[38]

Acknowledging the diversity among Asians in Aotearoa, this sub-study aims to provide a socio-demographic profile of Asian students enrolled in their first year of a health professional programme and explore if differences are found in ERs within Asian sub-groups and by socio-economic deprivation, citizenship status, urban/rural location and gender. It is not our intention in this paper to recommend policy solutions or specific selection policies: any such responses to observed misalignments between unmet health need and health workforce composition will need to be considered within the context of specific health professional programmes.

Methods

This section describes the materials and methods relevant to the current study focussed on students of Asian origin. A more detailed overview of the methods and data sources used in the wider series of analyses that this study is a part of is provided in Crampton et al.[8]

Programme and student eligibility

During the 5-year data collection period (2016–2020) students were eligible if they were within their "first professional year" (e.g., second year of medicine) of a health professional programme that would lead to registration under the *Health Practitioners Competence Assurance Act 2003*.[39]

Students were included if they were citizens or permanent residents and self-identified with an Asian ethnicity. European students were included for reference purposes, which included students classified as NZ European and Other European as both groups form the majority population and overall share the most privilege within the context of Aotearoa as a racialised colonial society.

Students without recorded ethnicity, gender, citizenship status, school decile or NZDep2018 classification (see Variables) data were excluded.

Data sources

Data were sourced from the central records of participating institutions.[8] Of the eligible institutions, 10 of 23 provided data. Non-participating institutions cited privacy concerns as their reason for not participating and were mostly composed of nursing, psychology/psychotherapy and paramedicine (complete breakdown found in Crampton et al.).[8]

Denominator populations were matched to the central records from the 2018 Census "usually resident population" according to gender, ethnicity, NZDep2018 and age band of each programme (see Appendix Table 1).

Variables

Variables included: ethnicity, area-level socio-economic deprivation (NZDep2018), secondary school socio-economic decile, citizenship status, urban/rural location (based on the Geographic Classification for Health 2018 or GCH2018) and gender.

In Aotearoa, self-identification of ethnicity occurs at the point of ethnicity data collection, although we note that the educational data we draw from do not align with Ministry of Health ethnicity data protocols[40] as only three (as opposed to six) responses are recorded. Ethnicity was self-identified by students and collected by institutions upon enrolment. Ethnicity was analysed according to the Stats NZ ethnicity data protocols using prioritised or total response reporting methods.[27] Level 1 groupings (Asian and European) were created by "prioritised response" (single ethnicity assigned with priority given to Asian before European) and level 2, 3 and 4 sub-groups were created using "total response" (a single student could be counted in multiple ethnic groups) in order to capture the different Asian sub-groups that students identified with.[27,40,41] Level 2 sub-groups were used to ensure there were sufficient counts to adequately power statistical analyses.

Socio-economic deprivation was measured using NZDep2018.[42] NZDep2018 scores were assigned to each student's home address at the time of their first enrolment at their tertiary institution. Scores range from 1 (least) to 10 (most socio-economically deprived). During the study period, the Ministry of Education used a separate scoring system (school decile) to indicate the extent to which each school draws students from low socio-economic communities, ranging

Table 2: Data completeness (prioritised ethnicity) (number [%]).

Variable	Asian, N=5,460	European, N=12,411	Total, N=20,606*
Ethnicity	5,460 (100%)	12,411 (100%)	20,514 (100%)*
Gender	5,460 (100%)	12,410 (100%)	20,605 (100%)*
Age	5,168 (95%)	12,060 (97%)	19,454 (94%)*
Secondary school name/ location	5,195 (95%)	12,149 (98%)	19,935 (97%)*
Secondary school in New Zealand	4,433 (81%)	11,928 (96%)	18,671 (91%)*
Secondary school decile	4,100 (75%)	11,218 (90%)	17,382 (84%)*
New Zealand residential address	4,654 (85%)	11,691 (94%)	18,438 (89%)*
New Zealand Index of Deprivation coded	4,655 (85%)	11,676 (94%)	18,416 (89%)*

*The totals provided above account for the entire cohort in the original study,[8] including non-Asian and non-European students.

from 10 (least) to 1 (most socio-economically deprived).

Citizenship status was collected and verified by institutions upon enrolment and classified as citizen or resident. Urban/rural location was classified according to the GCH2018 classification tool using students' home addresses.[43] GCH2018 classifies locations as urban (U1: major urban area; U2: large urban area) or rural (R: medium and small urban area to rural settlement or other) based on drive time to access major urban centres.

Gender was self-identified; however, many institutions restricted options to male/female. This limitation meant we could not meaningfully include gender-diverse students within our analyses.

Data completeness

Missing data for the whole cohort, including non-Asian and non-European students, were very low for gender (missing=1), ethnicity (missing=92), age (missing=0 for all except for one institution, which did not provide age: n=1,152), low for secondary school (missing=671) and relatively low for school decile (1,935 overseas, 1,289 unknown/ not codable). NZDep and urban/rural location were available for about 90% of students (again excluding one institution's students, and otherwise would have been 95%+) (Table 2).

Statistical analyses

Analyses were conducted in Microsoft Excel and R studio. Unadjusted ERs and 95% Wilson binomial confidence intervals (CI) were calculated as the number of students enrolling per 100,000 population per year (ethnicity and age matched according to programme-specific age bands) (Appendix Table 1). Population estimates for each ethnic grouping/sub-group were taken from the 2018 Census. Representation was quantified with enrolment rate ratios (ERR), calculated using Poisson regression with European as the model intercept (reference group). ERRs and their derivates (i.e., Log_2[ERR]) were qualitatively interpreted by the terms "well represented" (enrolment rate of an ethnic grouping was higher than the reference population—European—and statistically significant), "equally represented" (ER of an ethnic grouping was equal to European) and "under-represented" (ER of an ethnic grouping was lower than European and statistically significant). Heat maps were constructed using ggplot2[44] and ggtree,[45] where row (programmes) and column data (ethnicity) were ordered by hierarchical clustering (Euclidean distance) of Log_2-transformed ERRs (which makes colour scales symmetric).

Intersectional characteristics (gender, NZDep2018, GCH2018 urban/rural classification)

were only available for level 1 ethnic groupings (see Table 1). The relationship between intersectional characteristics and ERs was modelled via Poisson regression, allowing for model interactions between gender and area (urban/rural location), and gender and NZDep2018. Relationships between individual programme ERs and NZDep2018 were modelled with linear regressions. The resulting correlation coefficients were output to cluster analysis alongside gender (fraction of females) and rurality (fraction of students from rural areas) to allow visualisation of converging and diverging associations. Fractions of female or rural students were calculated from ERs rather than counts.

To account for multiple comparisons, all p-values were corrected for false discovery rate (FDR) using the Benjamini–Hochberg method.

Results

This study included 14,193 students, of whom 9,609 (47%) were European and 4,584 (22%) were Asian (Table 3). There were several baseline differences between groupings. The Asian grouping, compared with the European grouping, were younger (19 years [interquartile range (IQR) 19–22] vs 20 years [IQR 19–25], p<0.001), had fewer females (68% vs 82%, p<0.001), were from more socio-economically deprived neighbourhoods (NZDep2018 quintile 1–2: 17% vs 30%, p<0.001) and fewer were from rural locations (2.1% vs 14%, p<0.001) (Table 3). Both ethnic groups predominately came from schools with high deciles; however, more Asian students attended low-decile schools (1–3) (12% vs 6.8%, p<0.001). Compared with Europeans, more Asian students were permanent residents (30% vs 14%, p<0.001), indicating a higher proportion of first-generation immigrants.

Overall ER by level 1 Asian ethnic groupings

Across all programmes, the overall ER was higher for Asian students (ER [95% CI]: 280 [269–292] per 100,000 population aged 18–29 per year) (Figure 1A) than Europeans (149 [144–154] per 100,000 population aged 18-29 per year) (Figure 1A). However, level 2 ethnic sub-group ERs showed considerable heterogeneity, i.e., Indian ERs (160 [147–174] per 100,000 aged 18–29 per year) were similar to European, while "Other Asian" ERs were much higher (659 [610–712] per 100,000 aged 18–29 per year) (Figure 1A).

ERRS by programme and level 2 Asian ethnic groupings

All four Asian sub-groups exhibited converging associations (unidirectional effect) towards well represented (Log_2[ERR]>0 or ERR>1) within optometry and optical dispensing, dental technology, oral health, medical laboratory science, podiatry, pharmacy and dentistry (Figure 1B, Appendix Table 1). Converging associations towards under-representation (Log_2[ERR]<0 or ERR<1) were evident among Indian, Chinese and Southeast Asian sub-groups in occupational therapy (ERRs: 0.33–0.67, p=<0.017), midwifery (ERRs: 0.46–0.61, p=<0.002) and paramedicine (ERRs: 0.23–0.39, p<0.001) (Figure 1B, Appendix Table 1). Divergent associations were also evident, with Indian and Chinese sub-groups under-represented in nursing (ERRs: 0.42 and 0.59, both p<0.001) while Other Asian and Southeast Asian sub-groups were adequately represented (ERRs: 1.43 and 1.67, both p<0.001) (Appendix Table 1). Similar trends were evident with physiotherapy, medical imaging and osteopathy (Figure 1B, Appendix Table 1).

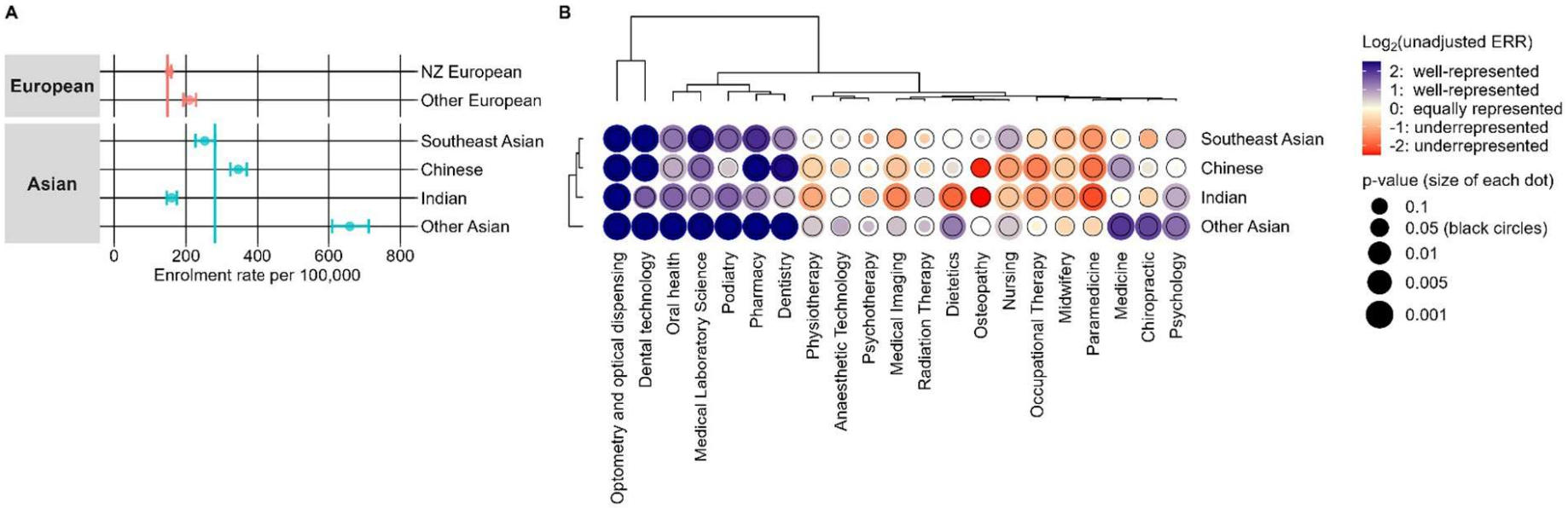
Unadjusted student ERs (average number of students per 100,00 ethnicity-matched population aged 18–29 years per year) across all health professional programmes are shown in Graph A in Figure 1. The average enrolment rate of the European grouping is shown as a pink vertical line and the Asian grouping as a teal vertical line. The individual data points represent the enrolment rate and 95% CIs of level 2 ethnic subgroups. In Figure 1 Graph B, the ERs of Asian ethnic subgroups have been quantified as unadjusted ERRs (sub-group enrolment rate divided by European ER and Log_2 transformed to make the scale symmetric and centred at 0) and grouped according to health professional programmes. The ERRs and their derivates (i.e., Log_2[ERR]) were qualitatively interpreted by the terms: well represented (ER of an ethnic grouping was higher than the reference population—European—and statistically significant), equally represented (ER of an ethnic grouping was equal to European) and under-represented (ER of an ethnic grouping was lower than European and statistically significant). Red shades denote "under-represented" while blue denotes "well represented". The size of each dot denotes p-values corrected for multiple comparisons (see Appendix Table 1 for values), with the black circles indicating the statistical significance (p=0.05) threshold. Data points have been ordered by hierarchical clustering using Euclidean distance to show converging associations between programme Log_2(ERR) and ethnic sub-groups.

Table 3: Socio-demographic characteristics of students within Asian and European ethnic groupings.

Characteristic	Asian, N=4,584*	European, N=9,609*	p-value†
Age (mid-year)	19 (19–22)	20 (19–25)	<0.001‡
Gender			<0.001§
Male	1,443 (31%)	1,674 (17%)	
Female	3,141 (68%)	7,935 (82%)	
Diverse¶	3 (0.060%)[5]	11 (0.11%)[5]	
NZDep2018 quintiles			<0.001#
1–2 (least deprived)	716 (17%)	2,767 (30%)	
3–4	960 (23%)	2,204 (24%)	
5–6	981 (23%)	1,866 (21%)	
7–8	920 (22%)	1,401 (15%)	
9–10 (most deprived)	605 (14%)	842 (9.3%)	
School deciles (grouped by tertile)			<0.001#
8–10 (least deprived)	1,976 (52%)	4,385 (50%)	
4–7	1,379 (36%)	3,752 (43%)	
1–3 (most deprived)	471 (12%)	592 (6.8%)	
Rurality by three aggregated groups (GCH)			<0.001#
U1: major urban area	3,791 (91%)	6,303 (69%)	
U2: large urban area	302 (7.2%)	1,535 (17%)	
R: smaller urban and rural areas	89 (2.1%)	1,243 (14%)	
Citizenship			<0.001#
New Zealand citizen	3,219 (70%)	9,015 (94%)	
New Zealand permanent resident	1,365 (30%)	594 (6.2%)	

*Median (interquartile range); n (%).
†p-values have been false discovery rate–corrected for multiple comparisons.
‡Wilcoxon Rank-Sum test.
§Fisher's exact test.
¶Gender-diverse individuals are shown here (gender totals will be >N in header) but not included elsewhere.
#Pearson's Chi-squared test.

Figure 1: Student enrolment rates by health professional programme and level 2 Asian ethnic groupings (total response ethnicity).



Intersectionality

NZDep2018

Across all socio-economic deprivation indices, ERs were higher (compared with Europeans) for students within the Asian ethnic grouping except for females within NZDep2018 decile one (ERR [95% CI]: 1.08 [0.99–1.19], p=0.099) (Appendix Table 2). With increasing NZDep2018 scores, ERRs increased for both males (NZDep1 to NZDep10: 2.21 [1.98–2.47] to 2.87 [2.56–3.22], p<0.001; respectively) and females (NZDep1 to NZDep10: 1.08 [0.99–1.19] to 1.40 [1.27–1.55], p<0.001; respectively), indicating that students from the Asian ethnic grouping were more likely to have lived in areas with higher socio-economic deprivation than Europeans (Appendix Table 2).

When analysed by individual programmes, negative correlations were observed between ER and NZDep2018 (higher ERs with lower deprivation) for optometry and optical dispensing, radiation therapy, medical imaging, dentistry, chiropractic, physiotherapy, pharmacy and medicine (Figure 2A, Appendix Table 3) for both the European and the Asian ethnic groupings. More programmes (17 vs nine) had significant negative correlations between NZDep2018 and ERs among the European grouping compared with the Asian ethnic grouping (Appendix Table 3). Dental technology was the only programme that exhibited a significant negative correlation between ER and NZDep2018 for the Asian ethnic grouping but not the European.

Gender

Only four of the 10 included institutions provided data on gender-diverse students. The proportion of gender-diverse students was low in the Asian ethnic grouping (0.06% compared with 0.11% European). The Asian grouping contained fewer females compared with the European (68% vs 82%, Table 3). Males from the Asian ethnic grouping were also more likely to come from areas with lower socio-economic deprivation scores (ERR at NZDep1 for females: 1.08 [0.99–1.19] vs 2.21 [1.98–2.47] for males, p<0.001; Appendix Table 2).

Rurality

Rural students from the Asian ethnic grouping were under-represented across the health professional programmes (2.1% vs 14%, p<0.001; Asian grouping vs European respectively). This disparity did not meet statistical significance when comparing ER with ERRs (Appendix Table 2). However, osteopathy, psychotherapy and dietetics contained no rural students from the Asian ethnic grouping. Similarly, dental technology contained no rural European students. By contrast, paramedicine drew the highest proportion of rural students from the Asian grouping (Figure 2B).

Associations between intersectional variables

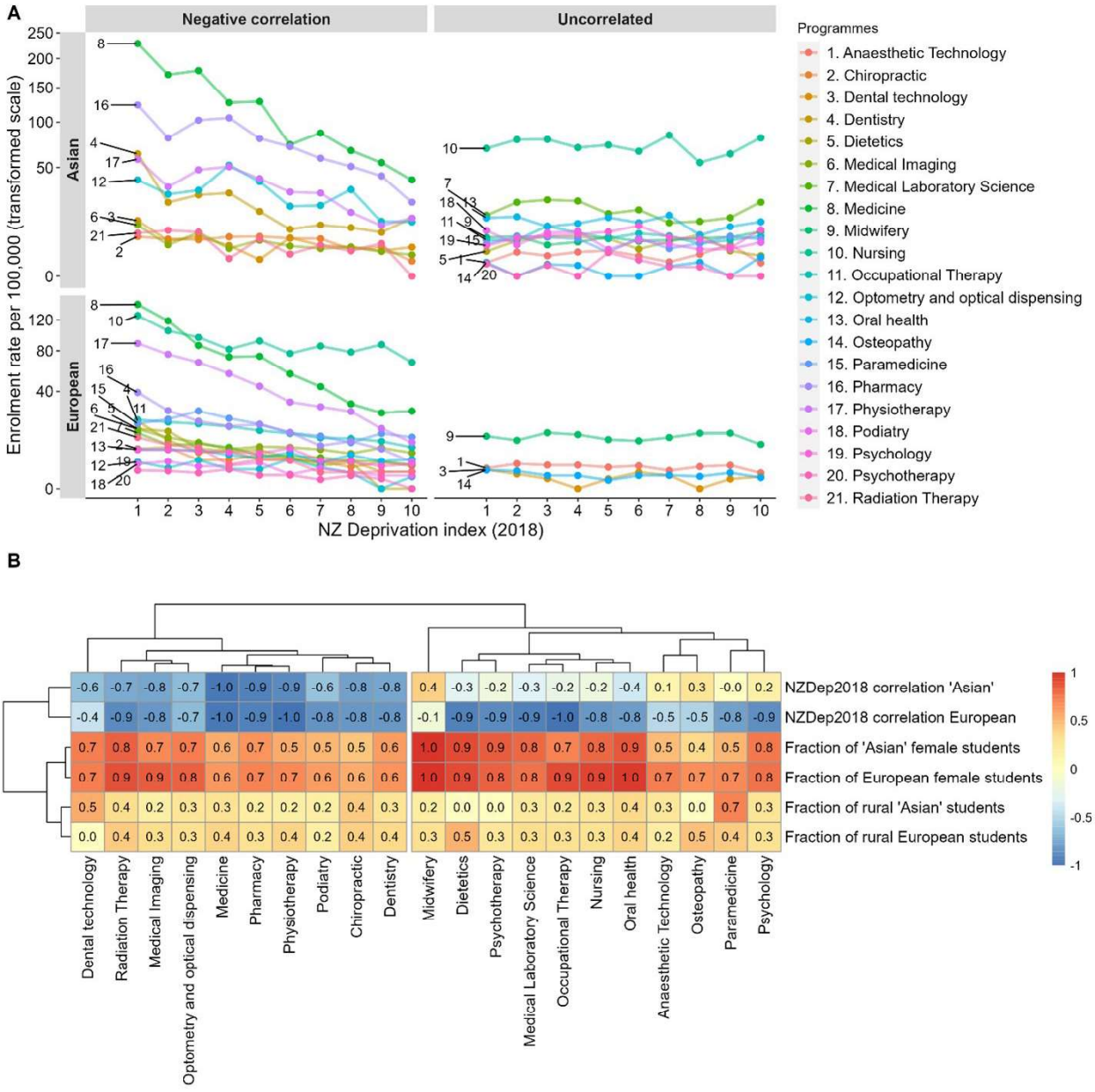
Hierarchical cluster analysis of all three intersectional variables (NZDep2018, gender, rurality) revealed two prominent clusters of programmes: those with converging associations between the Asian grouping and the European (left block, Figure 2B) and those with diverging associations (right block, Figure 2B). Programmes with converging associations (dental technology, radiation therapy, medical imaging, optometry and optical dispensing, medicine, pharmacy, physiotherapy, podiatry, chiropractic, dentistry) showed that the compositions of their students were similar regardless of ethnic grouping, i.e., similarly strong negative correlations between ER and deprivation index, similar proportions of females and similar proportions of rural students. Programmes with diverging associations (midwifery, dietetics, psychotherapy, medical laboratory science, occupational therapy, nursing, oral health, anaesthetic technology, osteopathy, paramedicine and psychology) had weaker correlation coefficients between NZDep2018 and ERs among the Asian grouping but not the European, and higher proportions of females for both ethnic groupings.

The relationship between ERs (number of students per 100,000 ethnicity-matched population aged 18–29 per year) and NZDep2018 index is shown using line charts in Figure 2 Graph A (treating NZDep2018 as a continuous variable) for each health professional programme with the Asian ethnic grouping and European (Europeans) faceted vertically (Appendix Table 3). Significant negative correlation coefficients (higher ERs observed with lower deprivation scores) have been faceted horizontally. The y-axes have been square root–transformed to allow easier visualisation of the individual lines. Intersectional variables (Pearson's correlation coefficients between ER and NZDep2018, fraction of females and rural students) were hierarchically clustered and displayed as a heat map in Figure 2 Graph B.

Discussion

This is the first nationally co-ordinated study of the socio-demographic composition and

Figure 2: Comparison of the relationship between enrolment rates and socio-demographic profile between health professional students from Asian and European ethnic groupings (prioritised ethnicity).



representation of first year Asian students enrolled across individual health professional programmes in Aotearoa. The findings add to the evidence base on representation of populations within health workforce training programmes nationally,[7,8] and highlight the importance of disaggregating data for the pan-Asian group to gain a better understanding of difference within and among Asian sub-groups.

Compared with European students, the Asian grouping overall had less privileged socio-economic backgrounds, more frequently attended high schools with lower socio-economic decile scores and had lower citizenship rates. Despite these disparities, the overall ER for the Asian grouping was higher than that for the European. While the Asian grouping was well represented overall within the health workforce in training, they were under-represented in specific programmes: midwifery, occupational

therapy and paramedicine—these correspond to areas of unmet healthcare need for this population.[18,19,28–30,32]

At the sub-group level, overall ERs varied widely, highlighting the need to examine Asian sub-groups separately. Several programmes showed divergent representation patterns among sub-groups: Indian and Chinese students were under-represented in physiotherapy, medical imaging, osteopathy and nursing, while the South-east and Other Asian sub-groups were equally or well represented. Indian students were under-represented in dietetics, while students from the Other Asian sub-group were well represented. Students from the Chinese and Other Asian sub-groups were well represented in medicine, whereas the Indian and Southeast Asian sub-groups were equally represented. The Indian and Other Asian sub-groups were well represented in psychology, but Indian students trended toward under-representation in psychotherapy.

Intersectional variable analysis divided programmes into two groups; the first group (dental technology, radiation therapy, medical imaging, optometry and optical dispensing, medicine, pharmacy, physiotherapy, podiatry, chiropractic and dentistry) tended to draw students from more privileged socio-economic backgrounds and had reduced gender imbalance across both the European and the Asian groupings. By contrast, the second group (midwifery, dietetics, psychotherapy, medical laboratory science, occupational therapy, nursing, oral health, anaesthetic technology, osteopathy, paramedicine and psychology) tended to draw in more females, and ERs were not associated with NZDep2018 for the Asian grouping but were for the European.

The overall proportion of females in the Asian grouping was lower than that for Europeans and while this may be interpreted as reduced gender imbalance, it was associated with reduced representation in programmes that were disproportionately composed of females. This is particularly concerning considering Indian and other South Asian populations suffer high rates of perinatal and maternal morbidity and mortality[28] and students from these communities are under-represented in midwifery. Poor perinatal and maternal outcomes for this population have been attributed to systemic barriers to accessing culturally appropriate health services.[28] These issues are particularly amenable to lived experience–informed practice. The latest midwifery workforce survey (2022) represents students in this study (2016–2020) entering the workforce and shows that among 3,085 registrations only 30 midwives (<1%) were Indian,[46] which was fivefold lower than the proportion of Indians in Aotearoa's total population at that time.[17] Since the Indian population is projected to increase[36] (and has done so according to the latest census data),[22] Indian representation in midwifery relative to the Indian population can be expected to worsen and recruitment strategies must account for this.

In Aotearoa, several health conditions occur at higher rates among Indians and South Asians, which likely contribute to poor perinatal and maternal outcomes including cardiovascular disease, and metabolic and blood disorders.[18,19,28–30,32] Health professional programmes that aim to manage these conditions (midwifery, dietetics, paramedicine, physiotherapy, occupational therapy) had relatively poor Indian student representation in the current study, and the underlying reasons for this need further exploration. This study identified differences between Asian and European students by socio-economic background and gender. Programmes lacking representation from the Asian grouping had higher proportions of females overall, perhaps indicating a barrier to entry for females in the Asian grouping. Other factors, like pressure to uphold the model minority myth,[33–35,47] may divert students from the Asian grouping to professions with higher salaries and higher social standing within their communities. We are not aware of any studies to compare our results with.

There were several limitations in this study. The participation rate among tertiary institutions was 10 out of 23 eligible institutions. It was not possible to measure any bias in the calculation of ERs of Asian students that may have resulted from the non-participation of 13 institutions. As discussed above, the Asian grouping does not properly represent the immense diversity of its constituent communities and potentially masks differences in their healthcare needs and representation within the health workforce in training because of averaging various characteristics.[26,48] That intersectional characteristics were only available for level 1 ethnic groupings is a limitation, and this issue persists even to level 2 sub-groups—for example, Other Asian includes individuals from South and East Asia, making findings non-specific and difficult to interpret. This study is based on enrolment data only; data on course completion rates, employment rates within Aotearoa post-qualification and how many graduates leave Aotearoa once qualified were not

collected. In addition, Aotearoa grants a 3-year job search visa after graduating, but this study was not able to measure whether international students of Asian ethnicity contributed to the health workforce after graduation. Institutional collection of gender-diverse data was inconsistent and insufficient for analysis. Lastly, data were collected over 5 years and cannot provide trends over time. Longitudinal analyses should be the subject of future investigations.

This novel research provides detailed information on Asian sub-group representation in health professional programmes in polytechnics and universities in Aotearoa. Taken in the context of known health needs of different Asian sub-groups, these data may facilitate health workforce planning and targeted policies within health professional programmes in order to better match the health workforce to population health needs. We recommend that the health and tertiary education systems should, together, ensure that there is improved measurement of ethnicity, including more complete and more accurate collection of Asian sub-group data for the health workforce in training with a view of monitoring and meeting healthcare needs of diverse Asian communities.