

Access to Endoscopic Sinus Surgery: Effects of Ethnicity and Deprivation Status in the Waikato Region, New Zealand

Te Āhei Atu ki te Hāpara Pākohu Ihu mā te Pūtiro Rāroto: Ngā Pānga o te Mātāwaka me te Tūnga Pakukore kei te rohe Pōtae, Aotearoa

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Abstract

Deprived communities and minority population groups experience barriers in accessing health care. We investigated the provision of endoscopic sinus surgery (ESS) at Waikato Hospital over three years. The ethnicity and deprivation status of patients were compared with the Waikato and total New Zealand population. The waiting time to clinic appointment and surgery and the distance travelled by patients were captured. Europeans were significantly over-represented compared with the Waikato and total New Zealand population. No Pacific patients were seen. Binomial logistic regression models controlling for ethnicity, deprivation score and distance from the hospital were not significantly different in terms of waiting times.

Keywords: sinusitis, surgical procedure, ethnic groups, minority groups, socio-economic status, delivery of health care, New Zealand

Whakarāpopotonga

Ka kite wheako ngā hapori pakukore me ngā taupori iti i ngā tauārai whiwhi tiaki hauora. I mātaihia e mātou te whakarato hāpara pākohu ihu mā te pūtiro rāroto (ESS) i te Hōhipera o Waikato mō te toru tau te roa. I whakatauritea te tūnga mātāwaka me te pukukore ki te taupori o Waikato me te taupori katoa o Aotearoa. I hopukina te roa o te wā tatari kia whiwhi tāpuitanga me te hāpara me te tawhiti ka haerehia e ngā tūro. I āta kitea te maha inati o ngā Pākehā ina whakatauritea ki ngā taupori o Waikato me te taupori katoa o Aotearoa. Kāore tētahi tūro Moananui-a-Kiwa i whai wāhi. Kīhai i tino rerekē ngā taura whakaheke huarua ā-taurangi whakamauru mō te whakahaere i te mātāwaka, te rahi pakukore me te tawhiti i te hōhipera i runga anō i te roa o ngā wā tatari.

Ngā kupu matua: pākohu ihu kakā, ngā mātāwaka, ngā rōpū iti, te tūnga ohapori, te whakarato tiaki hauora, Aotearoa

Chronic rhinosinusitis (CRS) is a chronic, idiopathic inflammatory disorder (Fokkens et al., 2020; Orlandi et al., 2016) that is thought to affect around 10 per cent of the adult population in Western societies (Hastan et al., 2011). It is defined primarily on the basis of symptoms, those being nasal obstruction, rhinorrhoea, smell disorder and facial pressure, lasting for more than 12 weeks. CRS is known to have a significant impact on quality of life as well as causing enormous health care costs (Soler et al., 2011; Wahid et al., 2020). Endoscopic sinus surgery (ESS) is offered for the management of clinically refractive CRS (Fokkens et al., 2020) and is one of the most commonly performed surgeries across the world (Bhattacharyya, 2010; Philpott et al., 2015). It has been shown to provide clinically significant and durable improvements in quality of life in patients with CRS (Sahlstrand-Johnson et al., 2017; Smith et al., 2019).

Resource constraints such as limitations in availability of theatres and surgeons and backlogs of patient waiting lists limit the provision of care to patients with CRS in New Zealand. A survey found that 68 per cent of surgeons in the public sector in New Zealand experienced severe restrictions when performing surgical procedures due to resource constraints (Raymont & Simpson, 2009). Another survey of patients attending general practice (GP) in Canterbury, New Zealand noted that elective surgery was the area of greatest unserved health needs, with otolaryngology (ORL) assessment accounting for nearly 15 per cent of the unserved non-orthopaedic surgeries (McGeoch et al., 2017). These unserved health needs were also associated with greater socio-economic deprivation and those receiving high health-use subsidies.

In New Zealand, approximately 70 per cent of the population is European while 17 per cent identify themselves as Māori. Other populations include Asian (15 per cent), Pacific Peoples (8.1 per cent) and Middle Eastern, Latin American or African (MELAA) ethnicity (1.5 per cent). A previous study of GP referrals to the Waikato

Hospital ORL Department suggested that Indigenous and minority ethnicities were underrepresented in new referrals to rhinology services (Cate et al., 2021). We are not aware of other published ethnicity data regarding CRS and its care in either New Zealand or Australia.

International literature suggests that those of low socioeconomic status (SES) and minority populations such as African Americans and Hispanics have a higher burden of sinonasal disease (Geramas et al., 2018; Mahdavinia et al., 2016). Furthermore, those with lower SES were found to have scarring, dysplastic changes and chronic mucosal inflammation associated with longstanding, inadequately treated CRS disease (Kuhar et al., 2019). The exact mechanisms by which such associations occur and the effect size are still to be elucidated. Despite the association with worse disease, however, rhinology utilisation was lower in less economically advantaged (Hastan et al., 2011; Soler et al., 2011) and minority ethnic groups (Geramas et al., 2018; Samuelson et al., 2017; Soler et al., 2012). By way of example, it was reported in a large American study of 27,731 patients, with a high level of statistical significance, that of those with sinusitis, 41.7 per cent of White, 34.5 per cent of African American, 34.9 per cent of Hispanic and 33.3 per cent of Asian patients accessed a medical specialist for their sinusitis care (Soler et al., 2012). In another study of 1341 CRS patients, college education was significantly associated with greater ability to access tertiary level rhinology care (Samuelson et al., 2017). This aligns with what is known more generally about inequities with regards to the provision of health care to different populations.

As a part of a wider goal to tackle health inequities in our population, we wanted to explore these issues around access to rhinology services further. Our primary objective was to analyse the demographics of the patients accessing ESS at Waikato Hospital. Having already studied rhinology referrals coming into our department, we aimed to focus on the processes within our hospital,

from the time of referral to the time of surgery. We hypothesise that similar to the international findings, minority and Indigenous populations in New Zealand or patients living in more deprived neighbourhoods may be underrepresented in undergoing ESS due to barriers in access to health care. Our secondary hypotheses were that these populations may also experience relatively longer delays in accessing ESS once referred, and that access is worse for those who live a greater distance from the hospital. In this study, we hope to identify existing inequities within our hospital processes, thus directing potential interventions to help address them.

Method

A cross-sectional study was performed of all cases of ESS at Waikato Hospital between January 2017 and December 2019 under the care of a subspecialty rhinologist.¹ Prospectively collected operating theatre records were reviewed retrospectively by a single researcher (ARK). A logbook of all operations performed under the care of the primary surgeon (AW) was exported and hospital records were reviewed directly for inclusion and exclusion criteria as well as data collection. Where the required data were not available from the electronic record, the written notes were accessed and reviewed. The primary data were stored under password protection.

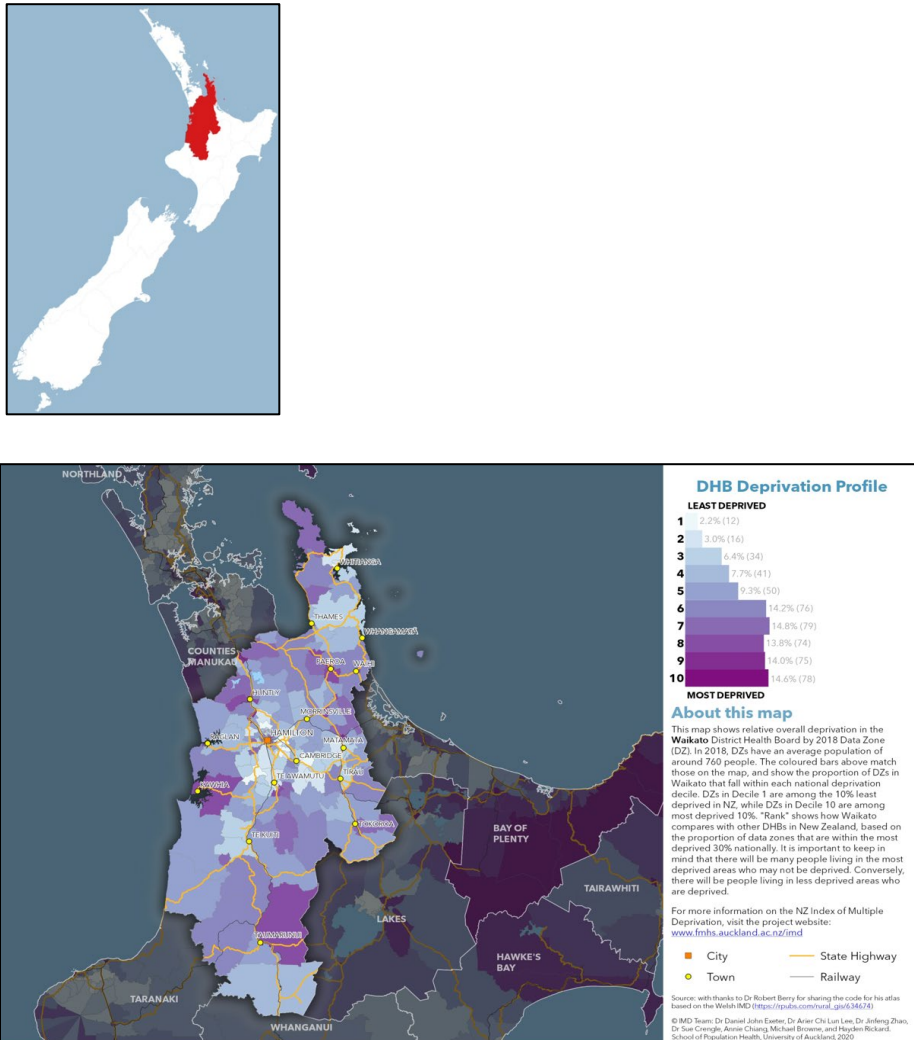
To best capture patients with primary CRS rather than secondary CRS (e.g., due to dental sepsis), only those patients who had comprehensive ESS (i.e., complete sphenoidectomy with frontal recess dissection) were included. To perform direct comparisons with pre-existing data regarding the Waikato region, patients who resided outside of the Waikato region at the time of surgery were excluded from the analyses. The following clinical details were collected: age, gender, ethnicity, area of residence, deprivation score, date of referral to the ORL department, and waiting time for both the first clinic appointment and subsequent surgery.

Ethnic composition in the total study population was assessed by categorising the patients into a single ethnic group according to Stats New Zealand Level 1 priority ethnicity classifications (Ministry of Health NZ, 2017). Then, the data set was compared with the ethnicity composition seen in the total population living in the Te Whatu Ora | Health New Zealand – Waikato region (previously known as Waikato DHB) catchment area (referred to in the study as the Waikato population), as taken from the New Zealand Index of Multiple Deprivation (IMD18) (Exeter, Lee, et al., 2020). A map outlining the catchment area is outlined in Figure 1.

Deprivation was measured using IMD18 (Exeter, Lee, et al., 2020). Each patient was geocoded and assigned to the data zone (neighbourhood) and corresponding IMD18 decile rank from 1 (least deprived) to 10 (most deprived) (Exeter, Lee, et al., 2020). In this study, we also assigned quintiles of deprivation, with quintile 1 representing the least-deprived 20 per cent of areas across New Zealand and quintile 5 the most-deprived 20 per cent of areas. For the 2018 version of the IMD, data zones were created using the approach by Zhao and Exeter (2016) by aggregating 2018 Census Statistical Area 1 (SA1) boundaries to have a target population between 500 and 1200, with a mean 2018 Census population of 761. Further information about the IMD, its indicators and domains is available in Exeter, Browne, et al. (2020). The composition of deprivation experienced by the study population was compared with the deprivation circumstances experienced by the Waikato population using the IMD18 data set (Exeter, Lee, et al., 2020).

Access to ESS was measured by calculating the waiting time from first referral to the ORL department to both first clinic appointment and the date of surgery. The waiting times were then compared across ethnicity, deprivation score and distance between patients' place of residence and Waikato Hospital, as calculated using Google Maps.

Figure 1: 2018 New Zealand Index of Multiple Deprivation profile for Te Whatu Ora | Health New Zealand – Waikato region



Source: Image courtesy of The IMD Team, © School of Population Health, University of Auckland (Exeter, Lee et al., 2020).

Statistical analysis

Descriptive statistics were used to report mean, standard deviation (SD), median and range. Descriptive statistics and logistic regression were used to compare the ethnic and deprivation composition in the study population to both the wider Waikato and total New Zealand populations. Distance from hospital versus ethnicity and deprivation was calculated using one-way ANOVA.

Waiting time for ethnicity when adjusted for deprivation score and distance from hospital was calculated using a multiple regression model. Ethnicity, deprivation score and distance from hospital were used as the independent variables. Waiting time for clinic and surgery was used as the dependent variables in each model. In the model investigating waiting time for surgery, waiting time for clinic was used as an additional independent variable. The total variance explained by the model was calculated using the *R*-squared value.

Before statistical analysis was carried out, all patients were de-identified and given a randomly generated study number. Differences between the means were reported as mean and 95% confidence interval (95% CI). Unless otherwise stated, $p < 0.05$ was considered statistically significant. Where appropriate, Bonferroni correction was applied. In all cases, two-tailed *p*-value was reported. All statistical analyses were carried out using IBM SPSS (v. 27) except logistic regression analysis, which was done using R (v. 4.1.1).

Results

Patient characteristics

One hundred and sixty-nine patients met the eligibility criteria and were included in the final statistical analysis. Fifty-six per cent of the study population were male. The median age (range) in the total population was 51 years (9, 81). (See Table 1 for a summary of study findings.)

Ethnicity

When assessing equity in distribution of ESS across ethnicities, logistic regression found a significant difference between the composition seen in the study population and both the Waikato and total New Zealand populations. (See Table 1 for a full comparison.)

In the study population, 75 per cent of patients identified themselves as Europeans. This incidence was significantly higher than both the Waikato and total New Zealand populations, both of which showed a European population of 61 per cent ($p = 0.001$, odds ratio (95% CI) 1.8 (1.3, 2.6)). In contrast, the incidence of Asian patients in the study population (5 per cent) was significantly lower when compared with the total New Zealand (15 per cent) and Waikato (10 per cent) populations ($p < 0.001$, odds ratio 0.3 (0.1, 0.6), and $p = 0.04$, odds ratio 0.5 (0.2, 1.0), respectively).

Although the proportion of Māori patients seen in the study population (18 per cent) was higher than the total New Zealand population (15 per cent), it was lower than the Waikato population (24 per cent). This observation was not statistically significant ($p = 0.16$, odds ratio 1.3 (0.9, 2.0), and $p = 0.09$, odds ratio 0.7 (0.5, 1.1), respectively). No patients identified themselves as Pacific Peoples in our study population compared with 3 per cent in the Waikato and 7 per cent in the total New Zealand populations. With no data available for the study population, an accurate odds ratio was not able to be calculated ($p = 0.67$, odds ratio 0, and $p = 0.64$, odds ratio 0, respectively).

The proportions of MELAA population were very similar across all three populations, with the study population showing 2 per cent and both the Waikato and total New Zealand populations showing just 1 per cent. Although statistically non-significant, the odds ratios suggest that the study population showed a higher distribution probability than both the Waikato and total New Zealand populations ($p = 0.13$, odds ratio 2.2 (0.8, 5.9), and $p = 0.25$, odds ratio 1.8 (0.7, 4.8), respectively).

Table 1: Population data according to ethnicity¹

Ethnicity	Population type	Population count (<i>n</i>, %)	Odds ratio (95% CI)	<i>p</i>-value
European	Study	126 (75%)	Ref.	—
	Waikato ³	255,003 (61%)	1.8 (1.3, 2.6)	0.001*
	Total NZ	2,888,223 (61%)	1.8 (1.3, 2.6)	0.001*
Māori	Study	31 (18%)	Ref.	—
	Waikato ³	99,165 (24%)	0.7 (0.1, 1.1)	0.09
	Total NZ	683,766 (15%)	1.3 (0.9, 2.0)	0.16
Pacific Peoples	Study	0 (0%)	Ref.	—
	Waikato [§]	12,288 (3%)	0	0.67
	Total NZ	317,958 (7%)	0	0.64
Asian	Study	8 (5%)	Ref.	—
	Waikato ³	39,936 (10%)	0.5 (0.2, 1.0)	0.04*
	Total NZ	704,265 (15%)	0.3 (0.1, 0.6)	0.001*
MELAA ²	Study	4 (2%)	Ref.	—
	Waikato ³	4584 (1%)	2.2 (0.8, 5.8)	0.13
	Total NZ	62,664 (1%)	1.8 (0.7, 4.9)	0.25
Other	Study	0 (0%)	Ref.	—
	Waikato ³	4506 (1%)	0	0.71
	Total NZ	52,365 (1%)	0	0.71

Source: Exeter, Browne, et al. (2020).

- Notes: 1. These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) and/or the Longitudinal Business Database (LBD), which are carefully managed by Stats NZ. For more information about the IDI and LBD, please visit <https://www.stats.govt.nz/integrated-data/>
2. MELAA: Middle Eastern, Latin American, and African ethnicity
3. Waikato: Te Whatu Ora (Health New Zealand) – Waikato population
4. * = significant *p*-value

Area deprivation

The median deprivation score (range) across the study population was 7/10 (1, 10). Most of the patients in the study population belonged to quintiles 4 and 5, which contained the most-deprived patient populations (25 per cent and 36 per cent, respectively). The least number of patients were seen in quintiles 1 and 2, which contained the least-deprived patient populations (11 per cent and 12 per cent, respectively). (See Table 2 for a full comparison.)

The incidence of least-deprived patients (quintile 1) was lower in the study population (11 per cent) than the total New Zealand population (20 per cent) but higher than the Waikato population (6 per cent). Logistic regression analysis found the differences to be statistically significant ($p = 0.01$, odds ratio 0.5 (0.3, 0.8), and $p = 0.001$, odds ratio 2.2 (1.4, 3.5), respectively).

However, we also saw a larger proportion of highly deprived patients (quintile 5) within the study population (35 per cent) than in both the Waikato (28 per cent) and total New Zealand (20 per cent) populations. Logistic regression analysis found the differences to be statistically significant ($p = 0.04$, odds ratio 1.4 (1.0, 1.9), and $p < 0.001$, odds ratio 2.2 (1.6, 3.0), respectively).

Access to ESS

The mean distance travelled by study patients to access ESS at Waikato Hospital was 42 km (SD = 47). The furthest a patient had travelled was 184 km. One-way ANOVA found no significant differences in the distance travelled across ethnicities ($p = 0.22$), or across deprivation scores ($p = 0.40$). European and Māori patients travelled similar distances on average (42 km and 49 km, respectively). The results show that distance was not necessarily a barrier for Māori accessing ESS, as they had similar travel distance to Europeans ($p = 0.99$). Table 3 shows a comparison of distance

travelled and waiting times according to ethnicity and area deprivation.

Table 2: Population data according to deprivation in quintiles

Quintile	Population type	Population count (<i>n</i> , %)	Odds ratio (95% CI)	<i>p</i> -value
1	Study	19 (11%)	Ref.	—
	Waikato ²	22,347 (6%)	2.2 (1.4, 3.5)	0.001*
	Total NZ	934,467 (20%)	0.5 (0.3, 0.8)	0.01*
2	Study	20 (12%)	Ref.	—
	Waikato ²	58,932 (14%)	0.8 (0.5, 1.3)	0.33
	Total NZ	947,754 (20%)	0.5 (0.3, 0.8)	0.01*
3	Study	27 (16%)	Ref.	—
	Waikato ²	94,680 (23%)	0.6 (0.4, 0.9)	0.03*
	Total NZ	933,489 (20%)	0.8 (0.5, 1.2)	0.21
4	Study	43 (25%)	Ref.	—
	Waikato ²	114,711 (28%)	0.9 (0.6, 1.2)	0.42
	Total NZ	935,994 (20%)	1.4 (1.0, 1.9)	0.07*
5	Study	60 (35%)	Ref.	—
	Waikato ²	115,632 (28%)	1.4 (1.0, 1.9)	0.04
	Total NZ	954,714 (20%)	2.2 (1.6, 3.0)	<0.001*

Source: Exeter, Browne, et al. (2020).

- Notes: 1. These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) and/or the Longitudinal Business Database (LBD), which are carefully managed by Stats NZ. For more information about the IDI and LBD, please visit <https://www.stats.govt.nz/integrated-data/>
2. Waikato: Te Whatu Ora (Health New Zealand) – Waikato population
3. * = significant *p*-value

Table 3: Distance travelled and waiting times according to ethnicity and area deprivation

		Mean (SD) distance travelled (km)	Mean (SD) waiting time for clinic (days)	Mean (SD) waiting time for surgery (days)
Ethnicity	European	42 (45)	143 (128)	321 (266)
	Māori	49 (60)	147 (199)	289 (167)
	Pacific Peoples	—	—	—
	Asian	10 (11)	90 (40)	249 (218)
	MELAA ¹	41 (64)	135 (5.2)	174 (80)
	Total	41 (47)	141 (142)	309 (246)
	<i>p</i> -value	0.22	0.41	0.57
Deprivation quintile	1 (least deprived)	27 (30)	164 (146)	371 (247)
	2	48 (51)	144 (114)	275 (262)
	3	51 (54)	130 (32)	311 (238)
	4	43 (47)	109 (61)	264 (259)
	5 (Most deprived)	39 (48)	162 (204)	332 (235)
	Total	42 (47)	141 (142)	309 (246)
	<i>p</i> -value	0.40	0.71	0.14

Note: 1. MELAA: Middle Eastern, Latin American, and African ethnicity.

Following referral from either a GP or another specialist, patients waited on average 144 days (SD = 145) before being seen in the ORL clinic. From the first clinic appointment to a surgical procedure, patients waited on average 317 days (SD = 249). A univariate multiple regression model found that there were no

significant differences in the waiting time for either a clinic appointment or ESS across ethnicities, once area deprivation score and the distance travelled to reach the hospital were accounted for ($p = 0.41$ and $p = 0.57$, respectively). In the analyses of waiting times for ESS, there were no significant differences between ethnicities regardless of the initial waiting time for a clinic appointment. The *R*-squared value suggested that the individual factors only accounted for 3.3 per cent of the variance in waiting for the clinic appointment and 6.2 per cent of the variance in waiting time for surgery. This suggests that the individual factors of ethnicity, area deprivation score and distance travelled to reach the hospital were not significant predictors of a patient's waiting time for either a clinic appointment or surgery.

Discussion

Our primary hypothesis was that Māori and Pacific Peoples were relatively underrepresented in accessing ESS at Waikato Hospital. We found that Europeans in the study sample were clearly overrepresented when compared with both the Waikato and total New Zealand populations. Noting the significant risk of a type 2 error, the hypothesis that Māori and Pacific Peoples specifically are underrepresented was not proven although the described trend might assist with power calculation for future studies. It is noteworthy that no patients of Pacific ethnicity were seen in the study population, noting also that the Waikato population has a lower proportion of Pacific Peoples than the nation average (Ministry of Health NZ, 2019).

Contrary to our secondary hypothesis, we saw a large proportion of patients who had a low SES. This finding contrasted with international literature where those with a higher median income and therefore a higher SES were twice as likely to be seen in a rhinology clinic (Samuelson et al., 2017). In New Zealand, unlike in the United States, patients can access free rhinology services through

the publicly funded health care system, once referred by the GP. This may explain why SES was not a significant factor in our study for patients accessing ESS.

We are not aware of any specific study of sinonasal surgery in New Zealand or Australia that has particularly investigated patients' ethnicity. However, across other surgical specialties in New Zealand, we see that Māori have less access to surgical services despite having a higher burden of disease. A systematic review of other surgical specialties also found that although Māori present with higher prevalence of surgical disease, they were more likely to experience delays in treatment and have lower access to surgical services (Rahiri et al., 2018). When we assess studies from overseas, data from the National Health Interview Survey in the United States show that White adults with sinusitis were more likely to have seen a medical specialist and have undergone a surgical procedure in the last 12 months than the minority ethnic groups (Soler et al., 2012). In a retrospective study of 1344 patients, the number of patients who underwent surgery was similar for all races despite African Americans showing a greater severity of CRS (Mahdavinia et al., 2016).

There are unique needs of Indigenous and minority populations that our health care system may be failing to address, thus creating barriers to rhinology care. Within the primary health care setting, a recent study from the United States suggests that patients with higher incomes or educational attainment may have more regular primary care visits and therefore would have a lower threshold to be referred to a specialist for nasal symptoms (Samuelson et al., 2017). In New Zealand, the 2019/20 Health Survey found that Māori are 1.5 times more likely to have an unmet need in accessing a GP due to cost. Furthermore, due to a lack of transport, Māori were 2.9 times and Pacific Peoples 2.5 times more likely to have an unmet need in accessing a GP than their counterparts (Ministry of Health NZ, 2020). These populations may, therefore, be less likely

to be seen in primary care and so be less likely to be referred to rhinology services. A recent study looking at the experiences of Māori in New Zealand health care systems found that Māori patients minimised their pain and severity of symptoms to avoid pressuring staff (Graham & Masters-Awatere, 2020). Similarly, Samoan patients were found to be more likely to voice agreement than ask for clarification of information they did not understand, often answering questions in a way that they thought the health care professionals wanted to hear (Fuimaono et al., 2019). These patients may, therefore, be less inclined to seek a specialist referral from their GP. Within the tertiary health care setting, Māori and Pacific Peoples were more likely than New Zealand Europeans to miss a specialist appointment (Ahmadi et al., 2021; Milne et al., 2014), and this was significantly correlated with length of waiting time for a specialist clinic appointment (McPherson et al., 2019).

Limitations and future directions

We looked exclusively at patients who had undergone comprehensive ESS under the care of a single surgeon and as such the population presented in this study is relatively small. To obtain a full picture of inequity and barriers to access for patients with CRS, ideally we would study the entire patient journey, from the community through to the operating theatre and beyond, across a broader spectrum of patients. This would help us further clarify where our health care system is creating barriers in access to hospital care for Indigenous and minority ethnicities. While the rates of CRS in different ethnic groupings in New Zealand are unknown, we are only able to correlate percentages in our patient cohort to general community populations and not to specific data for CRS in the community. While we remain suspicious that rates of CRS in Māori are at least as high, if not higher, as those in European populations, we have no data to support this.

In our study, we did not assess the severity of CRS symptoms for each ethnic group. International literature suggests that minority ethnic groups such as African Americans experience the largest impact of sinusitis in terms of work absenteeism (Soler et al., 2012) and that African American patients with refractory CRS needing surgery had worse objective measure of disease severity when compared with White and Latino patients (Mahdavinia et al., 2016). This is an area of research that is lacking both internationally and locally here in New Zealand. We plan, therefore, to conduct a prospective study from our clinic assessing subjective and objective measures of CRS severity correlated for each ethnicity. This information along with our study findings would provide a more complete picture of equity in access to rhinology services.

Conclusion

In conclusion, European patients were over-represented in our ESS cohort, suggesting that our systems favour European patients. Most significantly, there were no Pacific Peoples seen in the study population. Although this may represent a type 2 error in a relatively small study, people of different ethnicities had a similar waiting time for clinic and surgery once deprivation status and the distance travelled to reach the hospital were accounted for. In a health care system where not all patients who merit public hospital treatment can access it, we advocate specifically considering the care of patients from Indigenous and minority ethnicities. We also challenge all surgeons to review patient ethnicity within their caseload in the pursuit of improvements for Indigenous and minority populations. There remains much that we do not know, however, particularly relating to ethnic differences in CRS prevalence in New Zealand and variation in clinical severity of CRS across patient groups. There are, therefore, many avenues for this area of research to be expanded, and in the short-term we propose to specifically focus future studies on

variation in subjective and objective disease severity with respect to ethnicity.

Note

- 1 The study was approved by the Auckland Health Research Ethics Committee (Reference: 1242) and the Waikato DHB Research Office, including Maori Research Review Committee input (Reference: RD020020).

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