




Improving equitable access to publicly funded bariatric surgery in Queensland, Australia

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ABSTRACT

Background. People living in regional Queensland, Australia, have less access to health care than their metropolitan neighbours; a gap that is wider if they are also of Aboriginal and Torres Strait Islander ethnicity. The Bariatric Surgery Initiative (BSI) aims to provide metabolic bariatric surgery as a public service accessible to all Queenslanders for patients with morbid obesity according to need, regardless of location or ethnicity. **Methods.** We investigated the BSI's progress in closing the metro-regional gap by comparing the distribution of referrals for surgery with the geographic and ethnic spread of obesity across Queensland in 2017–2019. **Results.** Regional Queensland is home to 59.8% of Queensland's individuals with obesity, whereas 40.2% live in metropolitan Brisbane. In contrast, 47.8% of referrals were from regional areas, with 52.2% received from Brisbane. We found that more patients from metropolitan than regional areas underwent metabolic bariatric surgery, probably due to a paucity of referrals from regional locations. Aboriginal and Torres Strait Islander peoples were able to access the service and all patients realised significant health benefits after surgery. **Conclusions.** The BSI improved access to this service, and inequities in metro-regional access may depend on patient choice and healthcare provider awareness of the BSI. **Trial registration.** This initiative was a quality improvement study focused on providing access to care rather than a clinical trial; as such it was not registered as a clinical trial.

Keywords: Aboriginal and Torres Strait Islander, diabetes, epidemiology, ethnicity, geographic distribution, health economics, health equity, metabolic bariatric surgery, obesity.

Introduction

Obesity is most prevalent in Queensland's remote areas (Fig. 1), and the lowest rates occur in some inner-regional and metropolitan areas. Over half of Queensland's population (56.3%) lives in regional areas, and variation in population density and obesity rates means that 59.8% of Queensland's individuals with obesity live outside Greater Brisbane (Table 1). Furthermore, the proportion of Australia's Aboriginal and Torres Strait Islander population is highest in Queensland's more remote hospital and health services (HHSs; e.g. 69% of the Torres and Cape population are Indigenous),¹ and ~37.9% of the Aboriginal and Torres Strait Islander population live in Brisbane.² Aboriginal and Torres Strait Islander peoples, hereafter referred to as Indigenous people, are 1.5-fold more likely to have obesity than non-Indigenous people, and 45% self-identified as having obesity in 2018–19.³ Although Indigenous people are prioritised in all surgical services, they also report poorer access to healthcare services,^{4,5} which is exacerbated by social and cultural issues.^{6,7} Thus, there is an increased need for healthcare services to support Queenslanders with obesity living in regional and remote areas, particularly those of Indigenous descent.

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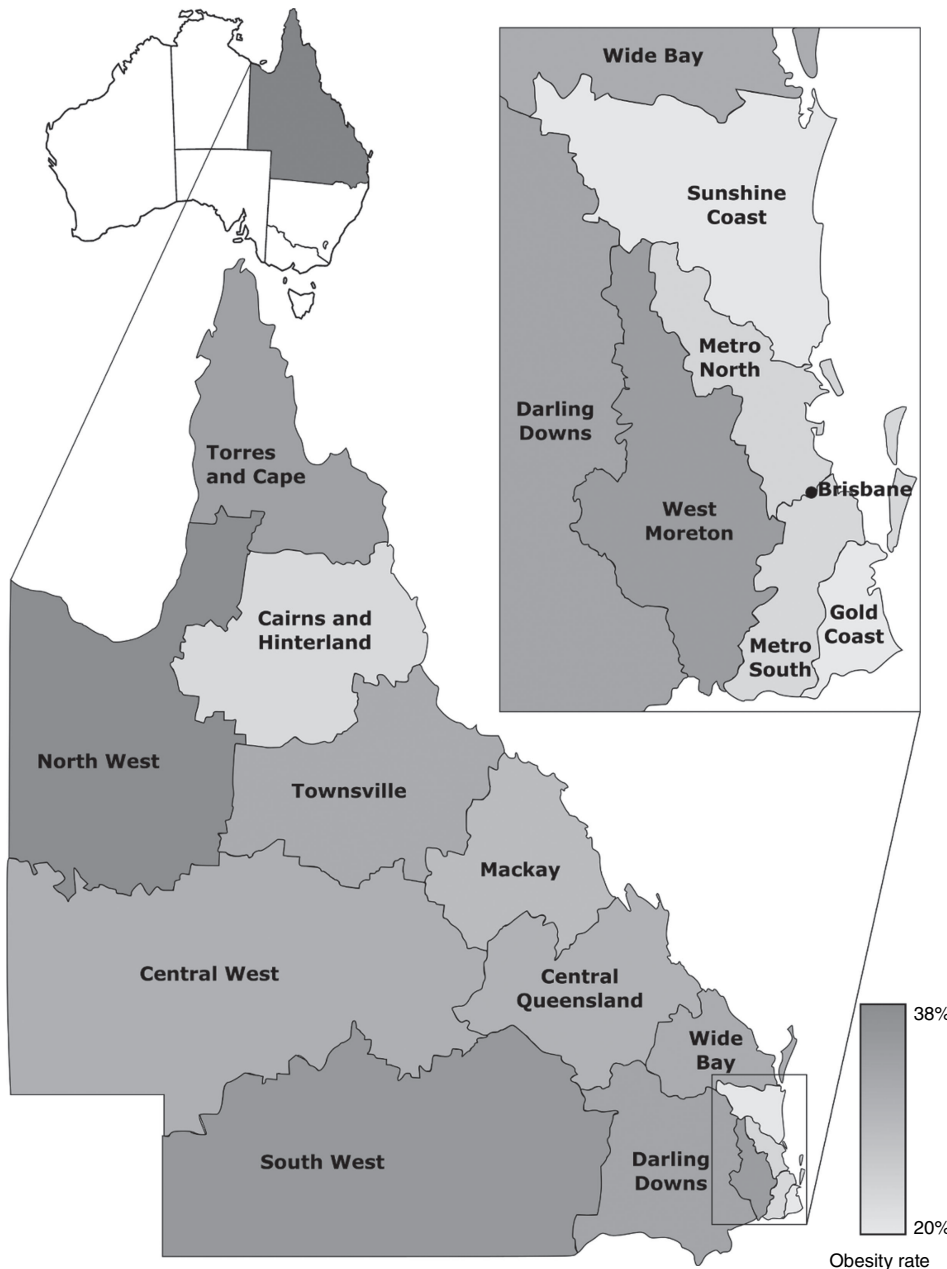


Fig. 1. Obesity rates across Queensland HHSs. Source: Figure created by the authors using the geographic location and obesity rate of each Queensland HHS available in the 2020 Report of the Chief Health Officer of Queensland.¹

Access to publicly funded bariatric surgery

Bariatric surgery is currently the most effective treatment for obesity^{9,10} and is a feasible approach to weight loss, and can potentially mitigate the long-term consequences from diabetes.¹¹ Bariatric surgery has been available in the public system under limited circumstances since 2003, but a framework for the public provision of bariatric surgery in Australia was not developed until 2020, some 3 years after this current study commenced.^{12–14} Access to bariatric surgery was hindered by socioeconomic inequalities, and most bariatric surgeries were performed in the private sector.^{15–17} To manage growing demand for a publicly funded bariatric surgery service, Queensland Health developed the Bariatric

Surgery Initiative (BSI) and a pilot study commenced in 2017.⁸ The BSI aimed to develop a fair and equitable assessment and prioritisation process to make the procedure available to those in need who stand to benefit the most, regardless of their location and ethnicity.¹⁷

From September 2017 to August 2019, patients were referred to the BSI through submission of an electronic form to the Metro South Primary Care Partnerships Unit (acting as a central referral hub for BSI patients). Referrals were accepted from specialists at HHS outpatient clinics; Indigenous patients could also be referred by Aboriginal health workers, Aboriginal community-controlled health organisations, through the Aboriginal and Torres Strait

Table 1. Distribution of obesity and referrals to the BSI across regional and metropolitan HHSs in Queensland.

	Metropolitan n (%)	Regional n (%)
Location of individuals with obesity	506,166 (40.2)	752,905 (59.8)
Indigenous	15,185 (23.2)	50,359 (76.8)
Non-Indigenous	490,981 (41.1)	752,905 (58.9)
Source of referrals to the BSI	155 (52.2)	142 (47.8)
Indigenous	36 (56.3)	28 (43.7)
Non-Indigenous	119 (51.1)	114 (48.9)
Patients who had surgery	114 (53.7)	98 (46.3)
Indigenous	26 (63.4)	15 (36.6)
Non-Indigenous	88 (51.5)	83 (48.5)

Source: The distribution of individuals with obesity across regional and metropolitan Queensland was calculated by the authors using population and obesity data from the 2020 Report of the Chief Health Officer of Queensland.¹ Referrals and outcome data were collected by the BSI.⁸ Indigenous, Aboriginal and Torres Strait Islander peoples; non-Indigenous, people of other descent. Metropolitan HHSs consist of the Metro North and Metro South HHSs; regional HHSs consist of Cairns and Hinterland, Central Queensland, Central West, Darling Downs, Gold Coast, Mackay, North West, South West, Sunshine Coast, Torres and Cape, Townsville, West Moreton and Wide Bay.

Islander Health units, or through rural and remote general practitioners in the absence of local specialist services. The BSI's eligibility and exclusion criteria were previously reported.⁸ Eligible patients consisted of those with obesity (body mass index, BMI >35 kg/m²), type 2 diabetes (T2DM) and potentially reversible obesity-related comorbidities. Following assessment by an expert multidisciplinary team, eligible patients underwent bariatric surgery in Brisbane between December 2017 and August 2020. Regional patients' travel and accommodation costs were supported by targeted subsidies and, when clinically appropriate, telehealth was implemented for follow-up when patients returned home. Follow-up data on patients' clinical outcomes and quality of life were collected up to 12 months after surgery, and the clinical and patient-reported outcomes of the BSI were published.⁸ In brief, most patients had substantial health benefits to weight, diabetes status and comorbidities.

This paper focuses on the distribution of referred patients with the aim of assessing the BSI's progress in closing the metro-regional gap in providing equitable access to bariatric surgery. We also consider the engagement of Indigenous patients with the service and compare their outcomes with those of non-Indigenous patients. Specifically, we consider the clinical characteristics at referral and the rates of progression to surgery with a view to assessing equity of access to the BSI. Clinical and patient-reported outcomes collected before surgery (at referral) and at 12 months after surgery are reported in Supplementary File S1.

Methods

Access equity

Access to the BSI service was defined as referral to the BSI and does not account for later withdrawal. We estimated the number of potential candidates for surgery in each Queensland HHS using population and obesity prevalence data (Supplementary Table S1)¹ and estimated obesity rates per 100,000 population by HHS. Given that data at the HHS level on the prevalence of T2DM were not available, Primary Health Network values from the Australian Diabetes Map¹⁸ were mapped to the relevant HHSs.

Statistical analysis

Descriptive statistics (frequency, mean \pm s.d.) were calculated for patient outcomes at baseline/referral and 12 months. The chi-squared test was used to investigate associations between nominal or ordinal dependent variables. Similarly, differences between the means of interval-dependent variables were examined using ANOVA. Analyses were performed using SAS (version 9.4; SAS Institute) or IBM SPSS (version 27.0, IBM Corp.). For simplicity we refer to the Metro North and South HHSs as 'metropolitan', which covers most of Greater Brisbane, and all other HHSs as 'regional'.

Ethics

Ethics approvals for the evaluation were received from the Metro South HHS and Griffith University Human Research Ethics Committees on 20 September 2018 and 2 August 2019, respectively, with additional amendments approved on 18 January 2021 (Project HREC/18/QPAH/427).

Results

Referred patient information

The BSI received referrals for 297 patients. These 297 patients were 18–66 years old (mean, 52 \pm 8.1 years), 57.6% were female, and 21.5% were Indigenous Australians. The cohort's average BMI was 46.1 \pm 7.0 kg/m² and, with average haemoglobin A1c at 8.77 \pm 1.45%, all patients required oral medication for diabetes and had comorbidities, most commonly hypertension (89.2%), dyslipidaemia (84.5%) and sleep apnoea (64.5%).

Distribution of referrals relative to obesity

The distribution of BSI referrals across Queensland's metropolitan and regional HHSs was compared with the percentage of individuals with obesity (i.e. potential candidates for surgery) in each service area. Overall, 47.8% of referrals were from regional areas, with 52.2% received from metropolitan Brisbane (Table 1). This contrasts with the

distribution of Queensland's individuals with obesity, 59.8% of whom reside in regional areas, while 40.2% live in Brisbane. The mean referral rate from regional HHSs was 18.9 patients per 100,000, whereas the mean referral rate from metropolitan HHSs was 30.6 patients per 100,000 individuals with obesity: 62% greater (Supplementary Table S1).

There were no referrals from North West HHS and only one from South West HHS, where obesity prevalence is highest (Supplementary Table S1). The regional Darling Downs, Gold Coast, Torres and Cape, and Mackay HHSs are also notable for their significantly lower referral rates. For example, the referral rate from Mackay was less than one-third of its obesity rate: 1.0% vs 3.9% of referrals and of the population with obesity, respectively, and with a referral rate of 6.1 patients per 100,000, it is the second most-underrepresented after North West (no referrals). The Gold Coast follows as the third most-underrepresented area: even though it is home to 9.9% of Queensland's adults with obesity, only 3.4% of referrals were received from this HHS (Supplementary Table S1). In contrast, some HHSs were overrepresented in referrals. Substantially higher referral rates were noted for Metro North (31.3% vs 19.0% of referrals vs population with obesity), Cairns and Hinterland (8.8% referrals vs 4.6% population with obesity) and Central West, with 1.0% of the referrals and 0.3% of the population with obesity.

Although 76.8% of Indigenous Australians with obesity in Queensland live in regional areas, more than half of the referrals for Indigenous patients (56.3%) were from metropolitan HHSs (Table 1). This contrasts with the referral distributions of non-Indigenous patients, which were similar across metropolitan and regional areas (51.1% metro vs 48.9% regional). Overall referral rates were higher for Indigenous patients than non-Indigenous patients. However, the overall rates are distorted by differences between metropolitan and regional referral rates for Indigenous compared with non-Indigenous patients (Supplementary Table S1). The mean referral rate for regional non-Indigenous patients with obesity was 16.2 patients per 100,000; this was substantially lower than the metropolitan referral rate for non-Indigenous patients of 24.2 per 100,000. In contrast, the mean referral rate of regional Indigenous patients was 55.6 patients per 100,000 versus the metropolitan referral rate for Indigenous patients of 237.1 per 100,000. This referral rate for Indigenous patients from regional areas is less than 25% of the rate for Indigenous patients from metropolitan areas.

Progression to surgery

From the 297 referrals received, 212 patients had bariatric surgery during the follow-up period of the study, 42 were excluded based on the inclusion/exclusion criteria, and 43 remained under review for surgery, partially due to COVID-19-related delays. Just over half (53.7%, 114 of 297) of those who had surgery were from metropolitan HHSs

(Table 1). The remaining 46.3% were from regional HHSs, mostly Cairns and Hinterland (8.8%), West Moreton (9.4%), Wide Bay (5.7%) and Central Queensland (5.7%) (Supplementary Table S1).

As shown in Table 1, 53.6% of Indigenous patients referred by regional HHSs progressed to surgery (28 referrals vs 15 surgeries), in contrast to 72.2% of those from metropolitan services (36 referrals vs 26 surgeries). Consequently, nearly two-thirds (63.4%) of the Indigenous patients who had surgery were from Brisbane (Table 1). This contrasts with non-Indigenous patients, for whom the proportions of referrals and surgeries from metropolitan and regional areas were more similar (referrals: 51.1% metro vs 48.9% regional; surgery: 51.5% metro vs 48.5% regional; Table 1).

Discussion

Access to health care is a multifactorial issue affected not only by physical proximity, but also financial affordability and cultural acceptability.¹⁹ A 2020 survey of 1024 Australians highlighted cost as the main barrier to accessing care.²⁰ By providing publicly funded bariatric surgery that is open to eligible patients across Queensland, the BSI aimed to lower both financial and geographic barriers for those likely to gain substantial benefit. The development of a central referral hub for all patients, their pathology and clinical assessment, was fundamental to piloting a new healthcare service, coordinating access to surgery, and prioritising patients from across Queensland. Similarly, allowing Aboriginal health workers, Aboriginal community-controlled health organisations, Aboriginal and Torres Strait Islander health units, and general practitioners in rural and remote areas, in the absence of local specialist services, to directly refer Indigenous persons, enabled them to have easier access to the BSI.

Although nearly 60% of Queensland's adults with obesity live outside Greater Brisbane, less than half of the patients who were referred (47.8%) or had surgery (46.0%) were from regional areas. Fewer regional referrals to the BSI were received for both Indigenous and non-Indigenous patients. Nevertheless, regional patients who were referred were as successful as their metropolitan peers in progressing through the BSI care pathway from referral to surgery; for example, 73% of referred regional patients had surgery, compared with 75% of metropolitan patients.

The engagement of Indigenous patients was dominated by metropolitan settings, and fewer referrals were received for Indigenous patients in regional areas despite higher obesity rates in these areas. The difference in referral rates across HHSs is important because access to the service potentially had greater facilitation in some HHSs, particularly for Indigenous patients, and thus, requires further investigation.

The lack of referrals from some areas could also be caused by patients declining being referred. Indeed, the

relatively low referrals for Indigenous patients from regional HHSs could be a result of cultural differences and the historical reluctance of Indigenous peoples in remote regions to access mainstream health care.¹⁹ Patients of all ethnicities in regional areas may also be deterred by travel and financial barriers (although these are lowered substantially by targeted government subsidies) or unable to leave their home or work for a sufficient period.²¹ If this is the case, additional telehealth could be offered to support these patients prior to and following surgery, as demonstrated recently.²² Patients may also be unwilling to proceed with bariatric surgery for health or lifestyle reasons. In total, 29 patients were excluded from the service after either cancelling appointments ($n = 16$: 8 metropolitan vs 8 regional) or continuing to smoke ($n = 13$: 5 metropolitan vs 8 regional), which highlights the fundamental role of patients' agency in their health status. Bariatric surgery requires long-term behaviour and lifestyle change, and patients' willingness to commit to this is fundamental for achieving and maintaining successful outcomes,^{23,24} but may be challenged by obesogenic environments^{25,26} and social stigma.²⁷

The lower number of regional referrals may be the consequence of poor awareness of the BSI among healthcare providers in regional Queensland. Future efforts should investigate why fewer referrals are forthcoming from regional areas with high obesity rates by examining doctors' awareness of the service, the overall health status of each area's population with obesity, and what proportion of these individuals are both eligible for the BSI and willing to receive bariatric surgery through the public system. Here, equity may lie not only in matching referrals to obesity prevalence, but also in educating care providers and ensuring the availability of the service to those actively seeking better health.

Health improvements and patient reported outcomes

Despite the discrepancy in referral volumes, patients' health outcomes were excellent regardless of ethnicity, and Indigenous patients were as satisfied with the service as their non-Indigenous peers (Supplementary Table S2). This is particularly important because it suggests that the cultural competence and care provision of the BSI were appropriate and met the needs of all. Respect and cultural sensitivity are fundamental in equitable healthcare provision,^{19,28} particularly in a culturally and ethnically diverse nation such as Australia, and these outcomes bode well for the future accessibility of the BSI to Indigenous Australians.

Limitations

Although BMI is an accepted indicator of obesity in average populations, the value that indicates obesity (i.e. adiposity above 25%) varies between ethnic groups.^{29,30} This study

did not collect detailed data on patients' ethnic characteristics and thus, BMI was used as a broad indicator of obesity. Furthermore, to examine whether referrals to the BSI truly met clinical need, it is necessary to consider what proportion of the population are affected by obesity, their diabetes status and comorbidities, and whether these patients are interested in bariatric surgery. Although we considered diabetes prevalence data (by both HHS and ethnicity), data on the prevalence of both obesity and diabetes by Indigenous status in each HHS are needed to support further conclusions, particularly given that the prevalence of obesity and diabetes is higher in Indigenous populations and varies with location.³ Given Indigenous Australians' well-documented difficulty in accessing health care and their generally poorer health outcomes,²⁸ it is heartening to see high levels of engagement by Indigenous Australians with the BSI. Finally, the small sample size of 297 referrals might limit the generalisability of the findings.

Conclusion

The development of the central referral hub and the screening process enabled equitable access to bariatric surgery from across Queensland as well as the selection of people who will benefit the most from bariatric surgery. Although additional work is necessary to refine the program, its engagement of both Indigenous and non-Indigenous patients from both metropolitan and regional areas and their positive health outcomes after surgery, suggest that the BSI represents significant progress in the equitable provision of bariatric surgery in Queensland. This framework provides sustainable bariatric surgery services that can be extended to other specialty services and across other jurisdictions.

Supplementary material

Supplementary material is available [online](#).

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Data availability. The clinical data used are government owned. An application for data access under the Public Health Act 2005 must be approved by the data custodian and the Director General of Queensland Health. The data that support this study will be shared upon reasonable request to the corresponding author.

Conflicts of interest. PS and his team received funding from Queensland Health for the evaluation of this healthcare service. MC had royalties paid for authorship of a textbook chapter from Cambridge University Press, (Chapter 23, Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology). JP and KW were administrators of the BSI employed by Queensland Health. VC and GH are bariatric surgeons employed by Queensland Health. GH provided lectures for Medtronic, Johnson & Johnson and St Vincent's Private Hospital Northside, and was a proctor and consultant for Medtronic and Johnson & Johnson. These organisations had no involvement in this study.

Declaration of funding. PS was the recipient of an NHMRC Senior Research Fellowship (GNT1136923). PS was involved in designing and implementing various aspects of the Bariatric Surgery Initiative. PS is the guarantor of this work and, as such, had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. PS also received a consultancy from Queensland Health to undertake the evaluation of the BSI. No supporting source had any involvement in this study.

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