



Regional Variation in Unmet Need for Metabolic Surgery in England: a Retrospective, Multicohort Analysis

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Abstract

Metabolic surgery provision is severely limited despite extensive supportive trial evidence. This study estimated the eligible population and the unmet need for metabolic surgery within English regions. Health Survey for England, National Diabetes Audit and population estimates were used to estimate the metabolic surgery eligible population by English region. Hospital Episode Statistics data was examined for metabolic surgery procedure volume by region (2013–2019). Regression analysis examined factors associated with metabolic surgery eligibility. 7.3% of the English population is potentially eligible for metabolic surgery; equivalent to 3.21 million people. Only 0.20% of the eligible English population receive metabolic surgery per year (regional variation 0.08–0.41%). The metabolic surgery eligible population was more likely to be female, older, have fewer educational qualifications and live in more deprived areas.

Keywords Bariatric surgery · Health services research · Obesity · Health equity

Introduction

Metabolic surgery improves functional impairment and cardiovascular disease and reduces cancer risk and mortality related to obesity and type 2 diabetes (T2DM) [1, 2]. The recent coronavirus pandemic has proven to have poorer outcomes for persons with obesity [3] which has brought focus to the provision of weight management services [4]. The National Institute for Health and Clinical Excellence's (NICE) guidelines for metabolic surgery in 2014 [5] recommends metabolic surgery for patients with a body mass index (BMI) > 40 kg/m² or 35–40 kg/m² with a “significant disease that could be improved if they lost weight” or BMI 30–35 kg/m² with recent-onset T2DM. The guidelines are similar across Europe as well

as internationally from the National Institutes of Health (USA) [6, 7].

The rates of metabolic surgery in the National Health Service have increased 20-fold (approximately 250/year to 5500/year) between 2000 and 2016 [8, 9], but these are limited understanding of the provision of metabolic related to the number of individuals eligible. The aim of this study was to determine the proportion of the English population that are potentially eligible for metabolic surgery using national guidance and compare this to the delivery of metabolic surgery within regions of England.

Methods

Data Sampling

The Health Survey for England (HSE) versions for 2010 to 2014 were used to estimate the population potentially eligible for metabolic surgery. The Health Survey for England is a nationally representative annual cross-sectional survey of the population living in private households in England [10]. Information was collected via trained interviewers who administered the interview face-to-face in participants' households.

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Data Collection

Valid BMI was calculated and coded into groups: $< 35 \text{ kg/m}^2$, $35\text{--}40 \text{ kg/m}^2$, and $> 40 \text{ kg/m}^2$. Data were collected on the obesity-related comorbidities T2DM, hypertension, stroke, ischaemic heart disease and osteoarthritis. Data was also collected on age, gender, ethnicity (White/Black/Asian/mixed/other), highest educational qualification (school/further-education/university/none), social class (managerial and professional/intermediate/routine-manual/other) and which of the 10 English regions they resided in.

Study Outcomes

The primary outcome for the study was to define the eligible population for metabolic surgery within the HSE respondent population. Secondly, the study compared the delivery of metabolic surgery with the potentially eligible population by region in England. Using the current NICE criteria, eligibility for metabolic surgery was defined as BMI $> 40 \text{ kg/m}^2$, BMI $35\text{--}40 \text{ kg/m}^2$ with an obesity-related comorbidity or BMI $30\text{--}35 \text{ kg/m}^2$ with a diagnosis of type 2 diabetes. People with recent-onset T2DM and Asian ethnicity are also eligible with BMI 27.5 kg/m^2 . Comorbidity reports from HSE respondents did not define type of diabetes. Therefore, based on previous HSE analyses, the study estimated 90% of the respondents stating they had diabetes had type 2 diabetes mellitus. Additionally, to define the “recently diagnosed patient with type 2 diabetes” identified as eligible in NICE guidance, data was secured on duration of type 2 diabetes for patients with BMI $30\text{--}35 \text{ kg/m}^2$ from the National Diabetes Audit. Recent onset was defined as less than 10 years in agreement with NICE guidance.

Metabolic Surgery Volume

The volume of metabolic surgery performed in England was calculated using Hospital Episode Statistics from NHS Digital through the publicly available Statistics on Obesity, Physical Activity and Diet [11] from 2014 to 2019. Finished consultant episodes (FCE) with a primary diagnosis of obesity (E66) and procedure codes for metabolic surgery were included (appendix).

Statistical Analysis

Statistical analysis was performed using SPSS version 26.0 software (Statistical Package for the Social Sciences software, Version 22, SPSS Chicago (IL), USA). Multivariable logistic regression analyses were performed to evaluate the associations with meeting NICE criteria for metabolic surgery with the HSE respondent population. All statistical tests were two-

sided, with the threshold of significance set at a *P* value of less than 0.05.

Results

There were 40,840 adult respondents to HSE in the years 2010 to 2014, of which participants were excluded from this study for missing data on BMI ($N = 6806$) and comorbidities ($n = 24$) leaving 34,034 participants for inclusion in the final study sample (Fig. 1). The NDA data for years 2015–2017 reported that 63.8% (415,035/651,030) of patients had recent-onset T2DM.

Metabolic Surgery—Eligible Population

Following survey weightings, 7.3% of the community-dwelling population in England have fulfilled the NICE guidance for metabolic surgery. (2.6%: BMI $> 40 \text{ kg/m}^2$, 2.1%: BMI $35\text{--}40 \text{ kg/m}^2$ with an obesity-related comorbidity, and, after adjustment with the NDA data, 2.6%: BMI $30\text{--}35 \text{ kg/m}^2$ with presumed recent-onset T2DM). Using the mid-2018 adult English population estimate (44.02million), this would indicate a potentially eligible population of 3.21million.

Variation by English Region

There was variation between 6.1 and 9.7% in the proportion of the population potentially eligible for metabolic surgery between English regions (Fig. 2). From 2013 to 2019, there were 39,253 metabolic surgery FCEs (mean 6542 FCEs annually). This equates to 0.20% of potentially eligible patients undergoing metabolic surgery annually. The rates in English regions varied between 0.08 and 0.41% (Fig. 3).

Factors Associated with Metabolic Surgery Eligibility

The association of sociodemographic variables with eligibility for metabolic surgery is shown in Table 1. The eligible population was more likely to be female, older and have lower socioeconomic class and educational attainment, with higher social deprivation. Intermediate and other social classes were associated with reduced metabolic surgery eligibility compared with managerial and professional classes. Ethnicity was not associated with metabolic surgery eligibility.

Discussion

This study has uniquely demonstrated that 7.3% of adults in England are potentially eligible for metabolic surgery according to NICE guidance. Using mid-2018 year population estimates, this equates to a population of 3.21 million. Eligible

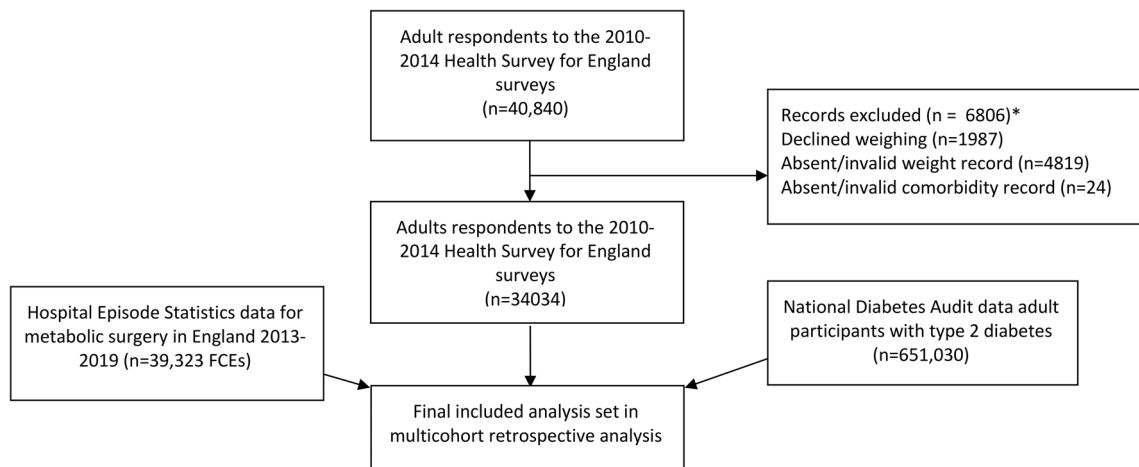


Fig. 1 Cohort flow diagram for inclusion in the study KEY: FCE: Finished consultant episodes. *Some records may have been excluded for multiple reasons

adults were more likely to be female, older and have a lower educational attainment and higher social deprivation. Considering the annual 6500 metabolic surgery procedure volume, this equates to 0.20% of the potentially eligible English population undergoing metabolic surgery per year. This extends previous work showing proportionally higher need for and lower delivery of metabolic surgery in the UK compared with Europe based on average national BMI rates [6].

There are several potential explanations for the poor implementation of metabolic surgery despite NICE guidance. First,

at the patient level, this study has shown that eligible adults are more likely to have poorer educational attainment and higher deprivation indicating a form of inverse care law. Second, stigma surrounding obesity treatment and willingness or ability to meet strict criteria for accessing weight management services, or indeed capacity within these services, in England may present a barrier to uptake [12, 13]. Third, studies on primary care practitioners in the UK suggest there is limited awareness of the role of metabolic surgery and perhaps even a level of bias against the provision of this treatment to patients who are obese [14].

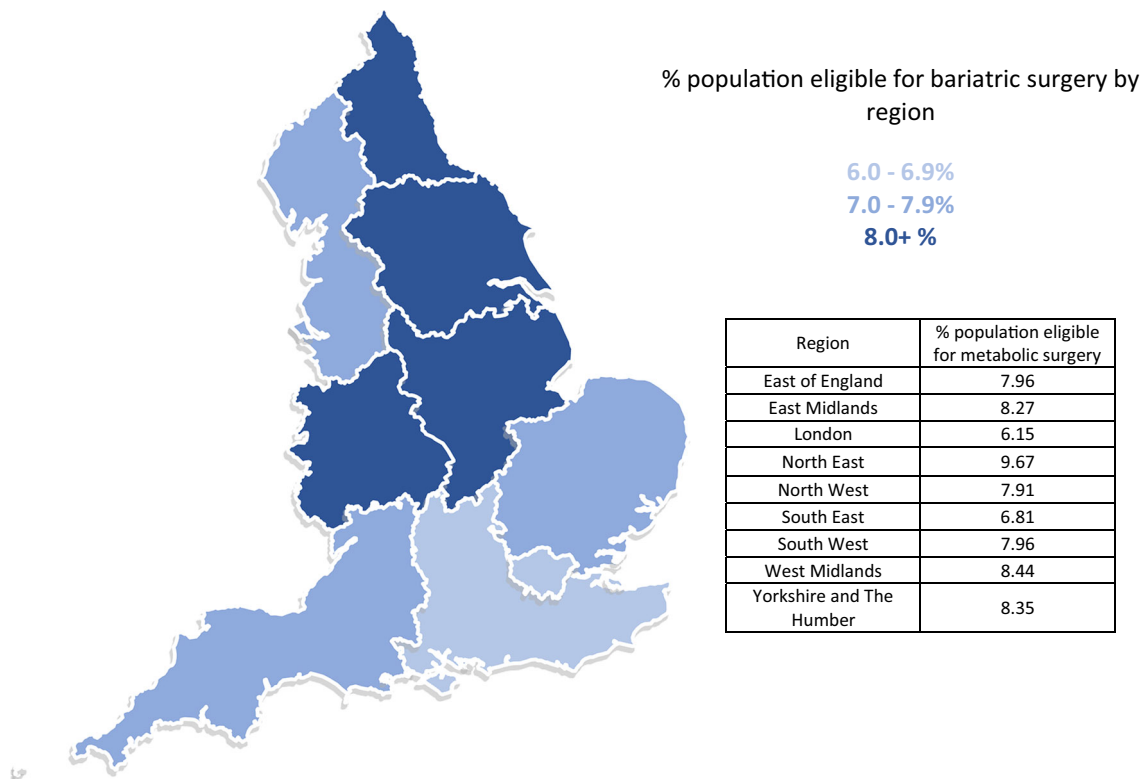


Fig. 2 England region map showing proportion of the population eligible for metabolic surgery

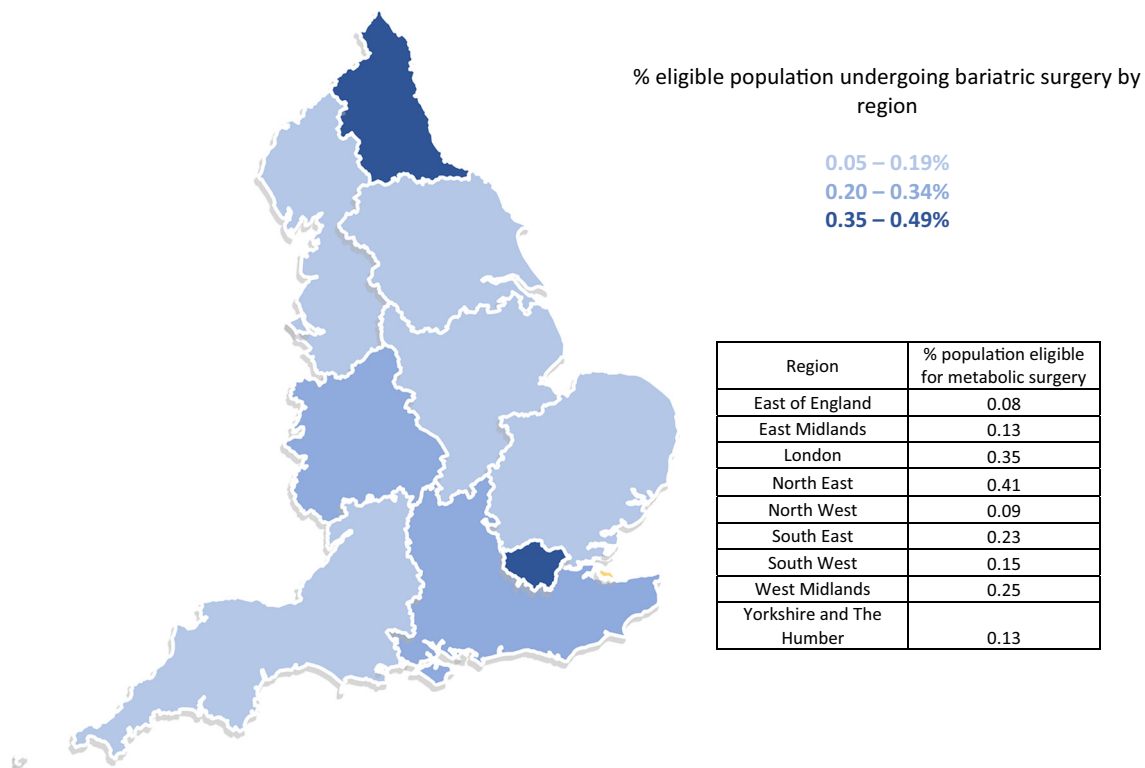


Fig. 3 Map of proportional rate of metabolic surgery as a percentage of the potentially eligible population according to English region

Table 1 Multivariate regression of sociodemographic factors for association with metabolic surgery eligibility (HSE 2010)

	Odds ratio (95% confidence intervals)	<i>p</i>
Age (years)		< 0.001
18–44	Reference	
45–64	2.62 (2.36–2.91)	
65+	3.07 (2.73–3.45)	
Gender		< 0.001
Male	Reference	
Female	1.21 (1.11–1.31)	
Ethnicity		0.760
White	Reference	
Black	1.04 (0.78–1.39)	
Asian	0.96 (0.80–1.15)	
Mixed	0.83 (0.58–1.19)	
Other	0.76 (0.37–1.56)	
Highest educational qualification		< 0.001
Degree (university)	Reference	
A-level (further education)	1.50 (1.30–1.72)	
O-level (school)	1.78 (1.54–2.06)	
No qualifications	2.47 (2.13–2.87)	
Social class		< 0.001
Managerial and professional	Reference	
Intermediate	0.84 (0.74–0.95)	
Routine and manual	1.01 (0.90–1.13)	
Other	0.62 (0.47–0.82)	
Index of multiple deprivation		< 0.001
1 (least deprived)	Reference	
2	1.08 (0.94–1.24)	
3	1.28 (1.12–1.46)	
4	1.51 (1.32–1.73)	
5 (most deprived)	1.61 (1.40–1.86)	

There are some important limitations. The disadvantages of routine collected data, such as HES, have been described in detail elsewhere [15]. However, the HES dataset has been used previously for the reporting of the provision of NHS public-funded bariatric surgery in England. With regard to the HSE dataset, a proportion of respondents did not have a BMI available for analysis because of refusal or invalid weight recording. Additionally, the self-reported comorbid conditions rely on patient recall. However, not all of these comorbidities could be included as the HSE did not provide data about some obesity-related comorbidities such as non-alcoholic steatohepatitis and obstructive sleep apnoea. Extrapolating this national level data from a comparatively moderate sample size from several non-linked datasets may introduce a margin of error in the study estimates. However, the HSE data were weighted for non-response, and the HSE was specifically designed to be representative of private households. Additionally, the study used surrogate data extrapolation from the National Diabetes Audit to define recent-onset type 2 diabetes. Finally, the HSE dataset prevented derivation of those patients who would not wish to proceed with metabolic surgery or who would be unfit to do so.

The current eligibility rate for metabolic surgery far exceeds current service delivery, which has both financial and workforce resource implications for the NHS. In England, with the decision to move the commissioning of metabolic surgery from a national perspective to a more locally delivered version through Clinical Commissioning Groups (CCG) [16], there is the risk that metabolic surgery access has become less uniform and that these current study findings of 5-fold regional variation between the East of England and London mask more extensive variation at the smaller CCG level. Coupled with the socio-demographic characteristics of those meeting eligibility criteria, any service change needs to ensure equitable access to metabolic surgery on the basis of need. Further exploration of the equity of access to metabolic surgery at local and regional levels is urgently required.

Conclusion

The limited current volume of bariatric surgery provided in England only benefits a tiny fraction of the general population who are eligible for it; this failing is compounded by marked regional variation. The approximately 6500 operations performed annually in England contrast markedly with up to 3.21million eligible patients (before adjustment for fitness and desire for surgery). Possible solutions include (a) reducing stigma around surgery; (b) continuing to publicize the personal and societal benefits of metabolic surgery with the public, primary care and the cardiovascular and metabolic physician community and (c) encouraging more funding and commissioning of metabolic surgical services.

Author Contribution ACC, AA, RCM, LA, WH, GS and CMP were involved in research design. ACC, AA and CMP were involved in data acquisition. ACC, AA, RCM, LA, WH, GS and CMP were involved in data interpretation, production of the manuscript and critical revisions. All the authors approved the final submitted manuscript.

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Data Availability The data used in this study is publicly available; however, the authors will share details of their analysis dataset on request.

Compliance with Ethical Standards

Disclaimer The funders had no role or input in the construction or reporting of the study.

Ethics Approval This article does not contain any studies with human participants or animals performed by any of the authors; therefore, no approvals are required.

Informed Consent Informed consent does not apply to this study.

Conflict of interest The authors declare that they have no conflict of interest.

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