Equity of access to NHS-funded hip replacements in England and Wales: Trends from 2006 to 2016

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Summary

Background Elective hip replacement is a cost-effective means of improving hip function. Previous research has suggested that the supply of hip replacements in the NHS is governed by the inverse care law. We examine whether inequities in supply improved in England and Wales between 2006 and 2016.

Methods We compare levels of need and supply of NHS funded hip replacements to adults aged 50+ years, across quintiles of deprivation in England and Wales between 2006 and 2016. We use data from routine health records and a large longitudinal study and adjust for age and sex using general additive negative-binomial regression.

Findings The number of NHS-funded hip replacements per 100,000 population rose substantially from 272.6 and 266.7 in 2002, to 539.7 and 466.3 in 2018 in England and Wales respectively. Having adjusted for age and sex, people living in the most deprived quintile were 2.36 (95% CI, 1.69 to 3.29) times more likely to need a hip replacement in 2006 than those living in quintile 3, whereas those living in the least deprived quintile were 0.45 (95% CI, 0.39 to 0.69) as likely. Despite this, people living in the most deprived quintile were 0.81 (95% CI, 0.78 to 0.83) times as likely in England and 0.93 (95% CI, 0.84 to 1.04) as likely in Wales to receive an NHS-funded hip replacement in 2006 than those living in quintile 3. We found no evidence that these substantial inequities had reduced between 2006 and 2016.

Interpretation With respect to hip-replacement surgery in England and Wales, policy ambitions to reduce healthcare inequities have not been realised.

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Keywords: Hip replacements; Equity; Trends; Socio-economic deprivation

Introduction

Elective hip replacement is a common form of planned surgery where a damaged hip joint is replaced with an artificial one. 109.6 thousand hip replacements were carried out in England and Wales in 2019, 85% of which were funded by the National Health Service (NHS).[1]

97% of patients receiving an NHS-funded hip replacement in 2018–19 reported an improvement in hip function and 93% thought that the result of their operation was good or better.[2] The cost-effectiveness has been estimated at approximately £7,200 per quality adjusted life year (QALY), considerably lower than the current UK National Institute for Health and Care Excellence (NICE) threshold of £20,000–30,000 per QALY.[3,4]

The principle of equity requires that health services are distributed in line with a population's ability to benefit. Patients with similar levels of need should have an equivalent chance of accessing a service irrespective of their personal characteristics or the area in which they

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Research in context

Evidence before this study

An earlier comprehensive analysis of equity of access to joint replacements in England in 2002, found that having adjusted for need, people living in the most deprived areas were 69% less likely to receive a hip replacement than those living in the least deprived areas. Soljak et al found that people living in more deprived areas had lower hip function at the time of surgery. Neuberger found that this led to worse outcomes after surgery, and that this effect was compounded by poorer postoperative care. Cookson found that socio-economic inequalities in access to hip replacements (not need adjusted) in England were greater than those seen in Denmark and Portugal and had not changed significantly between 2002 and 2009.

Added value of this study

We present trends in socio-economic inequities in elective hip replacements between 2006 and 2016 across two countries, England and Wales. We examine the results with respect to waiting times for surgery.

Implications of all the available evidence

Having adjusted for age and sex, people living in areas of higher socio-economic deprivation, are more likely to benefit from a hip replacement, but are less likely to receive the intervention. These inequities are present in both England and Wales despite differences in policy context. Health policy ambitions to reduce these inequities have not been realised. In areas of low socio-economic deprivation, the rate of private funding of hip replacements appears to be associated with waiting times for NHS-funded care.

live. In his 1971 paper, titled 'the inverse care law', Julian Tudor Hart argued that "*the availability of good medical care tends to vary inversely with the need for it in the population served*".[5]

An analysis of hip replacements in England in 2002, found that having adjusted for need, residents of the most deprived areas received substantially lower levels of elective hip replacement surgery than their counterparts living in less deprived areas.[6]

The health systems in England and Wales have undergone many changes since 2002. Substantial increases in resource levels in the mid and late 2000s were linked to policy objectives to improve access and reduce waiting times. Control of the health system was devolved in 1999 and the policies adopted by the four nations have subsequently diverged. Policies in England have centred on using competition and patient choice to drive efficiency and responsiveness. In Wales, collaboration is favoured over competition and engagement with private sector providers is discouraged.[7] Whilst the global economic downturn between 2007 and 2009 provide a common shock to governments in both England and Wales, there were subtle differences in the policy responses. Real-term funding changed little in England in the years following the recession. In Wales health spending was initially reduced before it was increased again in 2014.[8] A major restructure to the NHS took place in 2011 and 2012, but the scope of this reorganisation was limited to NHS services in England.[9]

We explore whether equity of access to hip replacements has improved or deteriorated since 2002 and whether differences in these trends can be seen in England and Wales.

Methods

Setting and population

Our analysis examines the need for and supply of elective hip replacements for people aged 50 years and over in England and Wales between 1st January 2002 and 31st December 2018. Our analysis focuses on people aged 50 years and over since the substantial majority of elective hip replacements are performed on this group, and also because our source of data on need for hip replacement was limited to this age group. Direct comparisons between need and supply by deprivation quintile and country are made over the shorter period from 1st January 2006 and 31st December 2016. We include primary and revision surgery including total hip replacements, total prosthetic replacement of the head of femur, hybrid prosthetic hip replacement, and resurfacing arthroplasty of hip joint. We include revision surgery since our need estimates include those who have undergone hip surgery. Although primarily focused on NHS-funded hip replacements, we present data on privately-funded hip-replacements for context.

Data sources

Information on the supply of NHS-funded hip replacements were obtained from anonymised routine health care records supplied by UK National Health Service (NHS) hospitals and independent providers that are funded by the NHS. Hospital Episode Statistics (HES) and the Patient Episode Dataset for Wales (PEDW) contain details of all admissions, attendances, and appointments funded by the NHS in England (HES) and Wales (PEDW).[10,11] Admissions involving hip replacement surgery were identified using the Office of Population Census and Surveys Classification of Interventions and Procedures version 4 (OPCS-4) codes (see supplementary table 1). Elective procedures for patients aged over 50 years were identified using the method of admission and age fields respectively. Multiple records for

individuals were retained. A small number of cases had missing age, sex or Lower Super Output Area (LSOA) of residence (5.2% in England). Given the limited scale of this missing data, these cases were excluded from our analysis and no imputation was carried out.

Aggregate data on the provision and funding type for hip replacements was obtained on request from the National Joint Registry (NJR). Counts of activity were available by country and year but not by age, sex, or deprivation.

Elective waiting times in England and Wales for the trauma and orthopaedic specialty were obtained from NHS England and StatsWales websites respectively.[12,13]

To estimate the need for hip replacement surgery in England we used individual level data from the English longitudinal study of ageing (ELSA), a prospective cohort study of community dwelling adults aged 50 years or more living in England.[14] ELSA data are collected every two years via computer-assisted personal interviews and self-completion questionnaires, with additional nurse visits every four years to obtain clinical data. The initial sample contained data on over 12,000 participants aged 50 years or more in 2002. Sampling for ELSA is based on households included in the Health Survey for England (HSE).[15] The cohort has been refreshed five times since wave 1 to ensure it remains representative of the population. To make the respondent sample more representative of the population and reduce bias from non-random non-response we applied wave-specific sample weights, supplied by ELSA. We extracted data for 2006, 2008, 2010, 2012, 2014 and 2016 (waves 3–8). We excluded data from earlier years (2002 and 2004) since some survey questions relating to the survey respondent's hip function took a different form in these years. In the absence of similar data on need for hip replacements for residents of Wales, we assume that the distribution of age-sex-adjusted need across deprivation quintiles in Wales, follows those observed in England.

The need for hip surgery was measured using the Oxford Hip Score (OHS), a joint specific, patient reported outcome measure designed to assess hip function, mobility and pain. OHS is commonly used as part of an assessment for hip replacement surgery.[16] A recent review identified 20 studies that examined the instrument and concluded that there was good evidence of its reproducibility, internal consistency, content validity, construct, responsiveness, interpretability and acceptability.[17] It comprises of 12 questions with 5 levels in each question. Individuals can score between 0 and 48. A score of 29 or less may indicate moderate to severe hip arthritis and is used in here as a proxy for the need for surgical intervention. OHS was estimated for each individual in the ELSA cohort using responses in the ELSA survey. See Supplementary file 2.

Anonymised patient-level data on the NHS-funded supply and need for hip replacements was accompanied by data on an individual's age, sex and the level of deprivation of their Lower Super Output Area (LSOA) of residence. LSOAs are an output geography created for the 2011 Census and, on average, contain the homes of 1500 residents.[18] These geographies were updated somewhat in 2011 so we mapped 2001 to 2011 LSOAs using a lookup file supplied by the Office for National Statistics. The English Indices of Deprivation 2019 (IMD2019) and the Welsh Index of Multiple Deprivation (WIMD2019), are weighted summary measures of the relative deprivation of LSOAs across several domains including income, employment, health, education, housing, living environment and crime.[19,20] IMD2019 and WIMD2019 differ somewhat in composition and derivation. LSOAs were separately grouped in England and Wales into 5 quintiles of deprivation, with 20% of LSOAs assigned to each quintile. Different versions of the IMD were applied across the waves of the ELSA Study: IMD 2004 for wave 3, IMD 2007 for wave 4, IMD 2010 for waves 5 to 7 and IMD 2015 for wave 8. Deprivation quintile data for ELSA participants were obtained under special license.

Mid-Year population estimates from 2000 to 2018 were obtained from the Office for National Statistics (ONS) by single year of age for males and females for each LSOA in England and Wales.

Statistical analysis

Our initial analysis sought to illustrate the unadjusted proportion of the ELSA cohort that were in need of a hip replacement, and the proportion of the population receiving NHS-funded hip replacements by age, sex deprivation quintile and year.

Our core analysis sought to compare the distribution of need and NHS-funded supply of hip replacements in England and Wales across quintiles of deprivation. We developed three sets of regression models to explore (1) the need for hip replacement and the NHS-funded supply of hip replacements in (2a) England and (2b) Wales. Our outcome variables were counts of patients in need of hip replacements (1) and counts of NHS-funded hip replacements (2a and 2b). We used negative binomial regression since our outcome variables were counts and that we had no prior knowledge of the dispersion of these counts. Our covariates were age, sex and deprivation quintile. Age was treated as a numeric variable by single-year-of-age, grouping together those aged 90 years and over. Sex was treated as a dichotomous factor level variable representing males and females. Deprivation quintile was included in the model as a design (dummy) variable, with quintile 3 (the middle quintile) as the reference category. The weighted survey sample sizes from ELSA (1) and the population sizes (2a and 2b) by age, sex and deprivation quintile, were used as offset variables. General additive regression was used to fit smoothed thin-plate splines given the non-linear

relationship between age and our outcome variables, allowing age to interact with sex. The models were stratified by year corresponding to the ELSA survey waves (1) or the year of hospital admission (2a and 2b). The model coefficients for deprivation quintiles were exponentiated to produce age and sex adjusted Incidence Risk Ratios (IRRs) by year for need and supply. Model fit was assessed with reference to the Akaike and Bayesian Information Criteria (AIC and BIC) and the significance of the model coefficients. A summary of the formulation of the three models can be found in Supplementary file 3.

Having adjusted for age and sex, we compared the distribution of need and supply by deprivation quintile over time, by fitting simple linear models through the unexponentiated coefficients for deprivation quintiles from the need (1) and supply models (2a and 2b). We forced the linear models to intercept the x-axis at IMD quintile 3 (the reference category). We calculated the difference in the slopes between the need (1) and supply models (2a and 2b) as our summary metric of inequity. We used a bootstrapping approach, with one thousand replications, to estimate confidence intervals for these differences in slopes drawing from the confidence intervals around the coefficients for deprivation quintiles from the underlying need and supply models.

All analysis was conducted using R version 3.6.1.

Role of the funding source

The funders had no role in the design and conduct of the study.

Results

Unadjusted rates of need and supply of NHS-funded hip replacements in 2006

Table 1 shows the estimated proportion of the population in need of and receiving an NHS-funded hip replacement in England and Wales in 2006 by deprivation quintile.

The number of hip replacement procedures carried out for patients aged 50 years and over in England and Wales more than doubled between 2002 and 2018, from 47,971 to 117,726 with average annual admissions of 75,901.3 in England (s.d. = 22,502.3) and 4490.8 in Wales (s.d. = 881.5). Populations and corresponding rates per 100,000 persons also increased from 272.6 and 266.7 in 2002, to 539.7 and 466.3 in 2018 in England and Wales respectively. See Figure 1a.

Increases in the rate of admissions were observed in all deprivation quintiles in England and Wales between 2002 and 2018. The largest increases were seen in the least deprived quintile by 122% in England (from 260.8 to 580.2 per 100,000 population) and by 71% in Wales (from 271.9 to 466.1 per 100,000 population). The smallest increases were seen in the most deprived quintile, by 75% in England (from 247.1 to 433.5 per 100,000 population) and by 65% in Wales (from 244.3 to 404.1 per 100,000 population). See Figure 1b.

Deprivation quintile	Need (England)	Supply (England)	Supply (Wales)
1 - most deprived	9220	278.3	333.9
2	5090	320.0	338.7
3	3970	343.8	355.6
4	2790	336.6	390.4
5 - least deprived	1780	321.4	359.6

***Table 1*: Estimated rate of the population in need of, and receiving, NHS-funded hip replacement in England and Wales in 2006 per 100,000 population aged 50+ years by deprivation quintile.**

Age-sex adjusted incident risk ratios for need and supply of NHS-funded hip replacements across deprivation quintiles in 2006

We observe a strong gradient in the incident risk ratio for need of hip replacement across deprivation quintiles in 2006. Having adjusted for age and sex, people living in the most deprived quintile were 2.36 (95% CI, 1.69 to 3.29) times more likely to need a hip replacement in 2006 than those living in quintile 3, whereas those living in the least deprived quintile were 0.45 (95% CI, 0.39 to 0.69) as likely. See Figure 1c.

We observe a shallower gradient, in the opposite direction, for the supply of NHS-funded hip replacements across deprivation quintiles in 2006, in both England and Wales. Having adjusted for age and sex, people living in the most deprived quintile were 0.81 (95% CI, 0.78 to 0.83) times as likely in England and 0.93 (95% CI, 0.84 to 1.04) times as likely in Wales to receive an NHS-funded hip replacement in 2006 than those living in quintile 3. See Table 2 for incident risk ratios for the other quintiles of deprivation. We note that whilst the point estimates for each year are somewhat sensitive to the selection of the reference category (quintile 3), the overall trend is not.

Changes in age-sex adjusted incident risk ratios for need and supply of NHS-funded hip replacements across deprivation quintiles

Figure 2a and Table 2 illustrates the changes in incidence risk ratios for need and supply of NHS-funded hip replacements in England and Wales over time. There were no significant changes in the relative need for hip replacements between deprivation quintiles between 2006 and 2016. We similarly note no significant changes in the rate of supply of NHS-funded hip replacements, relative to deprivation quintile 3, across all deprivation quintiles in Wales and the most deprived

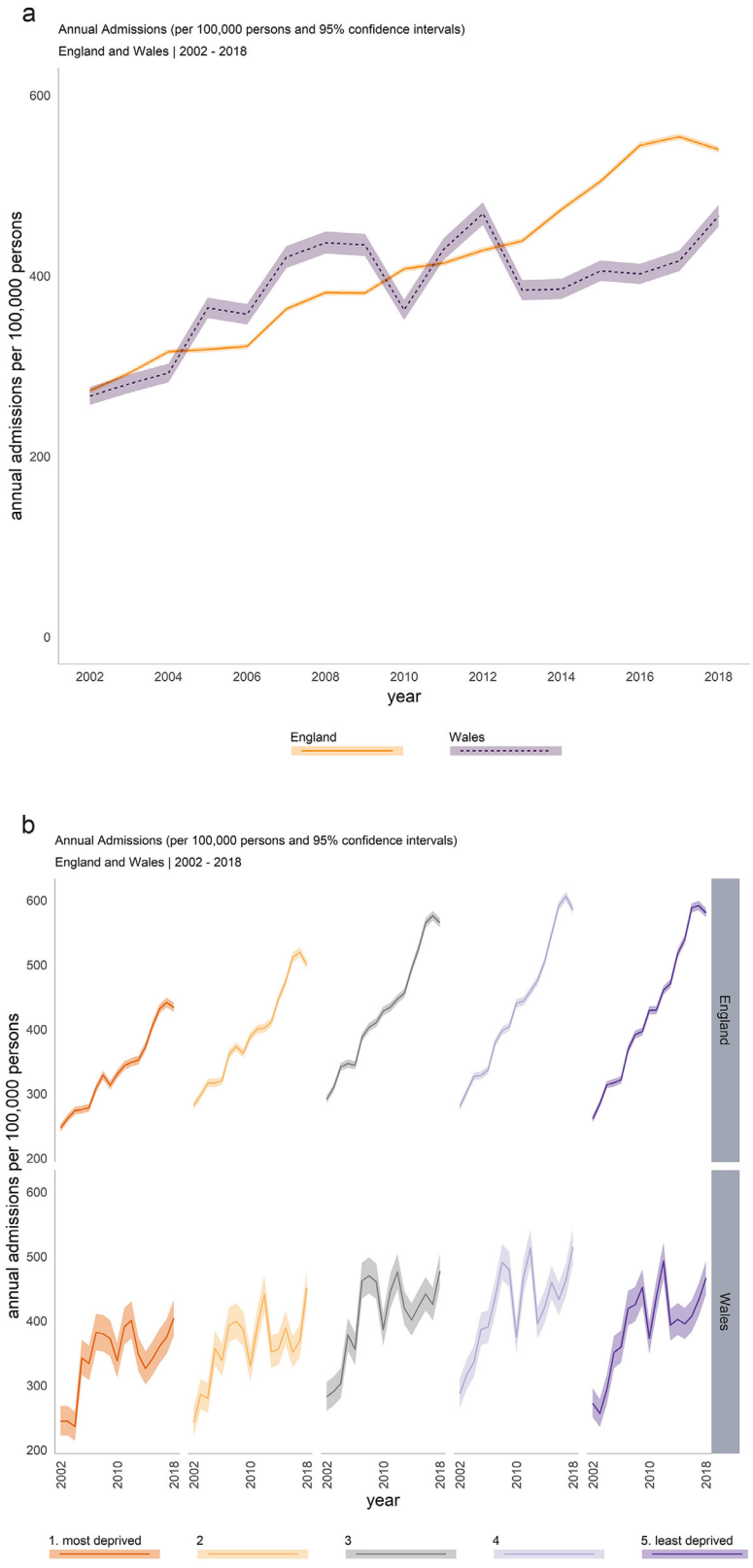

Figure 1. (a) Annual admissions (per 100,000 persons and 95% confidence intervals), England and Wales, 2002–2018. (b) Annual admissions by deprivation quintile (per 100,000 persons and 95% confidence intervals), England and Wales, 2002–2018. (c) Adjusted incidence risk ratios; need (demand) and supply, 2006.

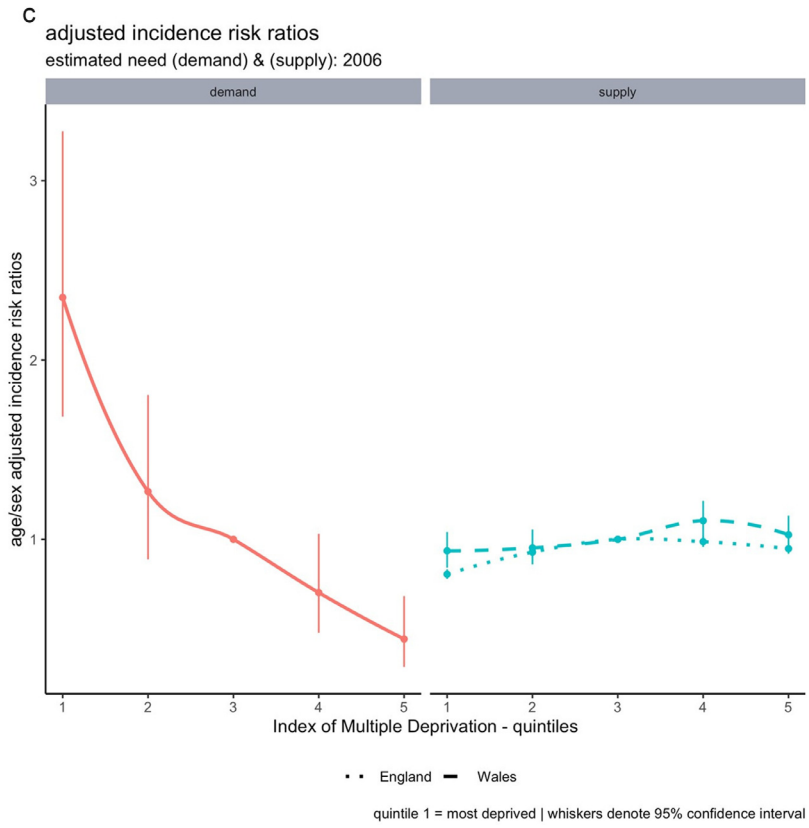

Figure 1. Continued

quintiles in England. However, we note a steady upward trend in the relative rates of supply in the least deprived quintiles in England between 2002 and 2014. In particular, the incidence risk ratio for the supply of NHS-funded hip replacements in the least deprived quintile in England increased from 0.95 (95% CI, 0.92 to 0.98), relative to quintile 3, in 2006 to 1.04 (95% CI, 1.01 to 1.07) in 2014. These upward trends in incidence risk ratios in the least deprived parts of England have reversed since 2014, but remain above the 2006 levels.

Summary changes in equity of supply of NHS-funded hip replacements between 2006 and 2016

Figure 2b provides a visual representation of the differences in levels of need and supply between quintiles of deprivation in England and Wales every two years between 2006 and 2016. Each panel shows the gradient in age-sex adjusted need (red) and supply (blue) for one year and country. The chart illustrates that the strong negative slope in age-sex adjusted need for hip replacements across deprivation quintiles and the shallow positive slope in NHS-funded supply of hip replacements is maintained over the period from 2006 to 2016 in both England and Wales. Moreover, we find no evidence that the difference between the need and supply slopes changed between 2006 and 2016. See Table 3 and Figure 2c.

Waiting times and privately-funded procedures

Between 2007 and 2013 the percentage of patients waiting for more than 26 weeks for elective treatment within the trauma and orthopaedic specialty dropped from 75% to 10% in England, before steadily rising to 25% by 2019. Waiting times in the same specialty in Wales also increased over the last decade, with the percentage of patients waiting more than 26 weeks rising from 12% in 2009 to 35% in 2019. See Figure 3. These trends in waiting times for orthopaedic surgery are mirrored in most other forms of elective care.[12,13]

Between 2013 and 2019, when waiting times were deteriorating, the percentage of hip replacement procedures that were privately funded, increased from 12% in both countries, to 16% in England and 15% Wales. Given the costs associated with privately-funded hip-replacements, it is likely that uptake of this route is more common amongst people living in the least deprived areas.

Year	IMD Quintile	Need		Supply - England		Supply -Wales	
2006	1	2.36	[1.69 3.29]	0.81	[0.78 0.83]	0.94	[0.84 1.04]
	2	1.27	[0.90 1.81]	0.93	[0.90 0.96]	0.95	[0.86 1.05]
	3	1.00	ref	1.00	ref	1.00	ref
	4	0.71	[0.48 1.03]	0.99	[0.96 1.02]	1.10	[1.00 1.21]
	5	0.45	[0.29 0.69]	0.95	[0.92 0.98]	1.03	[0.93 1.13]
2008	1	2.95	[2.11 4.12]	0.82	[0.79 0.85]	0.81	[0.74 0.90]
	2	1.76	[1.24 2.50]	0.93	[0.90 0.95]	0.85	[0.78 0.94]
	3	1.00	ref	1.00	ref	1.00	ref
	4	1.16	[0.81 1.66]	0.99	[0.96 1.02]	1.05	[0.96 1.14]
	5	0.66	[0.44 1.00]	0.98	[0.95 1.00]	0.91	[0.83 1.00]
2010	1	3.29	[2.39 4.53]	0.79	[0.76 0.81]	0.89	[0.80 0.98]
	2	1.92	[1.37 2.68]	0.92	[0.89 0.95]	0.86	[0.78 0.95]
	3	1.00	ref	1.00	ref	1.00	ref
	4	1.13	[0.80 1.60]	1.03	[1.00 1.05]	0.97	[0.89 1.06]
	5	0.85	[0.58 1.23]	1.00	[0.98 1.03]	0.97	[0.89 1.06]
2012	1	3.33	[2.39 4.63]	0.80	[0.78 0.83]	0.86	[0.79 0.95]
	2	1.75	[1.22 2.49]	0.91	[0.88 0.94]	0.94	[0.86 1.02]
	3	1.00	ref	1.00	ref	1.00	ref
	4	1.17	[0.81 1.68]	1.02	[0.99 1.05]	1.08	[1.00 1.17]
	5	0.68	[0.45 1.03]	1.02	[0.99 1.05]	1.04	[0.96 1.13]
2014	1	3.95	[2.57 6.07]	0.79	[0.77 0.81]	0.84	[0.76 0.93]
	2	3.07	[2.00 4.72]	0.93	[0.90 0.95]	0.90	[0.82 0.99]
	3	1.00	ref	1.00	ref	1.00	ref
	4	1.59	[1.01 2.49]	1.02	[0.99 1.04]	1.05	[0.96 1.15]
	5	1.03	[0.63 1.67]	1.04	[1.01 1.07]	1.00	[0.91 1.09]
2016	1	2.48	[1.70 3.62]	0.80	[0.78 0.82]	0.85	[0.77 0.93]
	2	1.40	[0.94 2.08]	0.93	[0.90 0.95]	0.81	[0.74 0.89]
	3	1.00	ref	1.00	ref	1.00	ref
	4	0.98	[0.65 1.47]	1.04	[1.01 1.06]	0.98	[0.90 1.07]
	5	0.66	[0.43 1.03]	1.03	[1.00 1.06]	0.92	[0.84 1.00]

Table 2*: Adjusted incidence risk ratios for need and NHS-funded supply of hip replacements in England and Wales 2006 to 2016. *Figures in brackets denote 95% confidence intervals).

Discussion

Key findings

In 2006, people living in more deprived areas were more likely to need a hip replacement than their counterparts in more affluent areas. These relative differences in need were sustained over the subsequent decade. But people living in deprived areas were less likely to receive an NHS-funded hip replacement than people living in other areas in 2006. This perfect illustration of the inverse care law confirms earlier research. Although the supply of NHS-funded hip replacements increased substantially between 2006 and 2016, the relative under-supply to people living in the most deprived areas did not improve. We note that 'health inequalities' and 'healthcare inequities' featured prominently in healthcare policies in both countries during this period, despite substantial differences in health policy.

In fact, it was the least deprived areas that saw the greatest increase in supply of NHS-funded hip replacements over this period. These changes appear to be associated with NHS waiting times. When waiting times improve, the most affluent segments of the population opt for NHS-funded treatment and reduce their reliance on privately-funded care, switching back when waiting times deteriorate.

Relation to existing literature

An earlier comprehensive analysis of equity of access to joint replacements in England in 2002, found that having adjusted for need, people living in the most deprived areas were 69% less likely to receive a hip replacement than those living in the least deprived areas.[5] Other studies found that people living in more deprived areas had lower hip function at the time of surgery.[21,22] Neuberger found that this led to worse outcomes after surgery, and that this effect was compounded by poorer postoperative care.[23] Cookson found that socio-economic inequalities in access to hip replacements (not

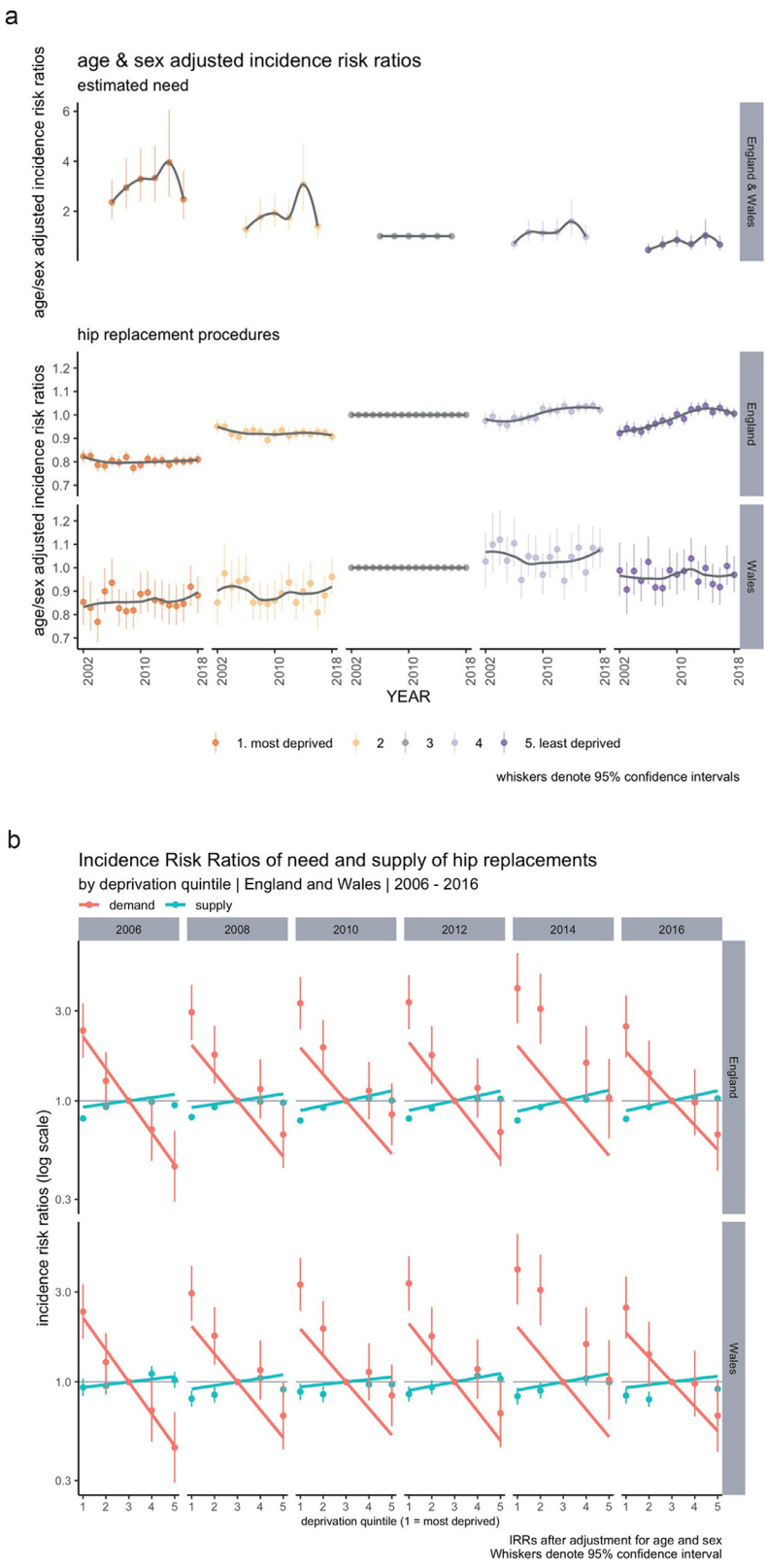

Figure 2. (a) Age and sex adjusted incidence risk ratios, estimated need and supply, time series. (b) Incidence risk ratios of need and supply of hip replacements by deprivation quintile, England and Wales, 2006–2016. (c) Difference in slope of supply and need model coefficients across deprivation quintiles, England and Wales, 2006–2016.

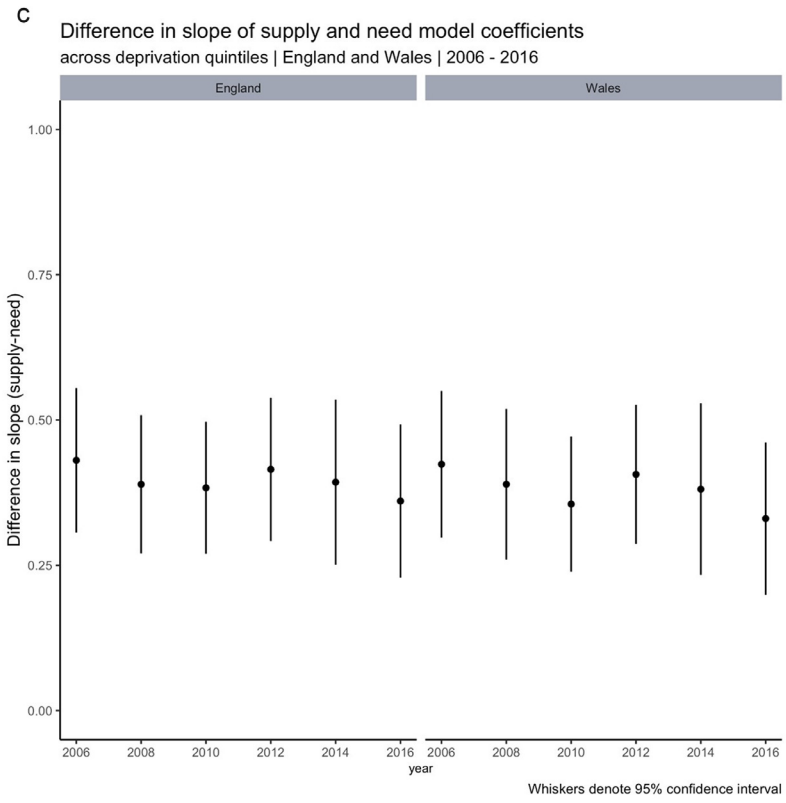

Figure 2. Continued

Year	Slope Difference (England)			Slope difference (Wales)		
2006	0.43	[0.31	0.55]	0.42	[0.30	0.54]
2008	0.38	[0.27	0.49]	0.38	[0.26	0.51]
2010	0.38	[0.27	0.50]	0.35	[0.24	0.47]
2012	0.42	[0.30	0.53]	0.41	[0.29	0.53]
2014	0.40	[0.25	0.54]	0.38	[0.24	0.53]
2016	0.36	[0.23	0.49]	0.33	[0.20	0.47]

***Table 3*: Difference in slopes of age-sex adjusted need and NHS-funded supply for hip replacements across deprivation quintiles in England and Wales, 2006 to 2016.**

need adjusted) in England were greater than those seen in Denmark and Portugal and had not changed significantly between 2002 and 2009.[24] Kirkwood reported that patients from socio-economically deprived areas benefitted most from policies to reduce elective waiting times for NHS-funded hip replacements in Scotland.[25]

Limitations

Our study compares levels of need and supply of hip replacements in England and Wales over time. Whilst our supply data was country specific, we were only able to identify detailed data on need in England. We assumed that the distribution of age-sex-adjusted need for hip replacements across deprivation quintiles in Wales, follows those observed in England. Whilst the longitudinal study is carefully constructed to support inferences about the older population as a whole, sample sizes impact on the precision of these estimates.

Our estimates of need are derived from questions asked as part of the ELSA survey. There is good, but not perfect alignment of these questions and those that form the Oxford Hip Score instrument. Moreover, the derived Oxford Hip Scores can only be regarded as a proxy for the need for hip surgery.

The measures of deprivation used in our three datasets (supply in England, supply in Wales, and need in England) used different measures of deprivation, raising issues of comparability. We note however than many of the underlying metrics used to construct these indices are in common and that the measures are highly correlated. Furthermore, our analysis operates at the level of quintiles of deprivation, rather than at the level of individual areas. This would limit the opportunity for inconsistencies to affect the results.

Our analysis shows little change in levels of inequity at a national level. This may obscure counter-balancing sub-national improvements and deteriorations.

Our analysis assumes that having adjusted for need, differences in levels of supply, between areas of high and low deprivation, are unwarranted. It is possible however, that these disparities represent systematic

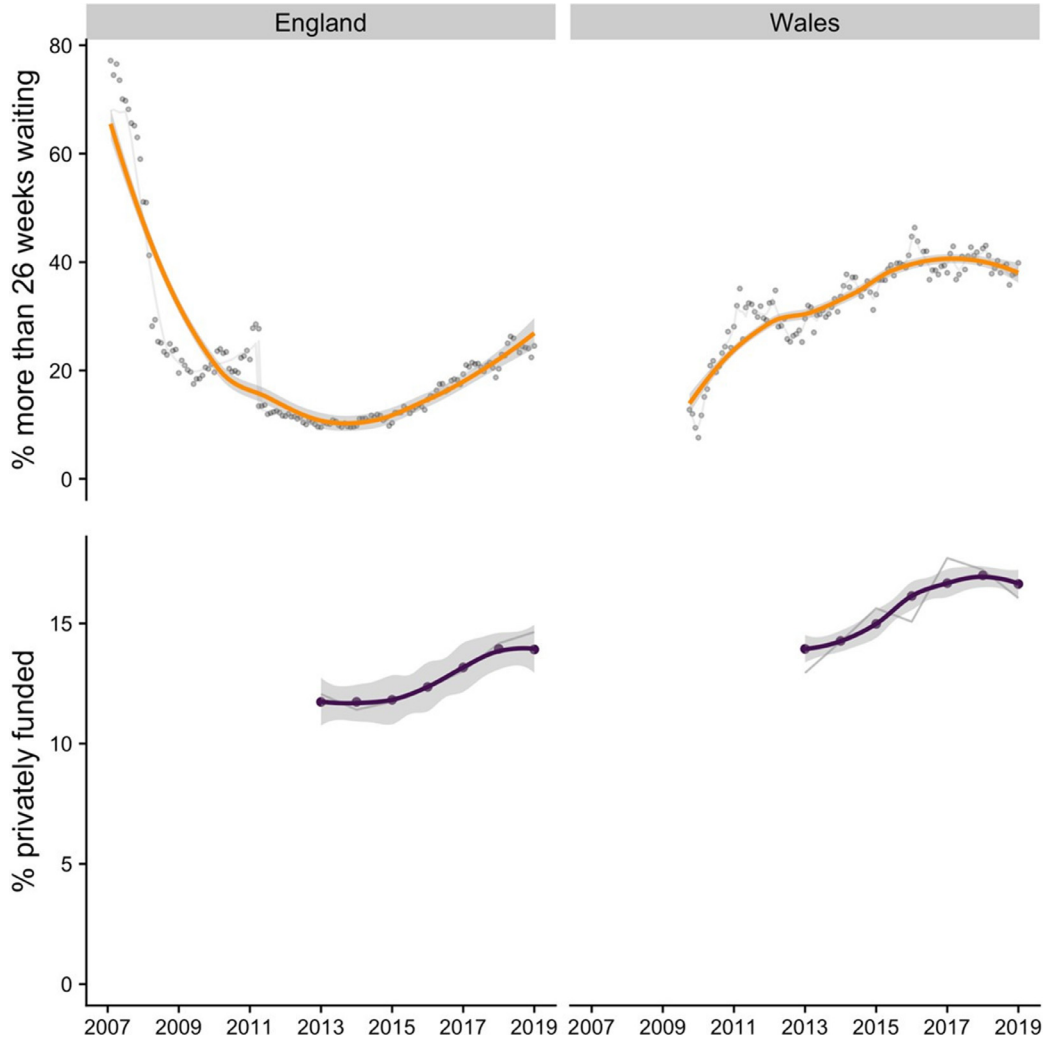

Figure 3. Percentage of patients waiting more than 26 weeks and privately funding treatment, England and Wales, time series.

differences in the choices that patients make when weighing up the risks and benefits of hip surgery. The shared decision-making paradigm is prominent in joint replacement services. We are not aware however of any research that suggests that the lower supply of hip replacements to patients from more deprived areas, reflects informed patient choice. Indeed, a US study of osteoarthritis patients found no significant association between income levels and decisions to proceed with hip or knee surgery.[26]

Implications for practice, policy, and research

Successive health policies across the four devolved health systems in the UK, have sought to reduce health inequalities and inequities in the supply of NHS services. Our analysis suggests that with respect to hip-replacement surgery in England and Wales, these ambitions have not been realised. Our research offers little support for policies focused on waiting times targets, and the use of the independent sector that were adopted in England, or for policies calling for greater collaboration, as was the case in Wales. More potent policy initiatives may be warranted. These might, for example, include (1) aligning provider payments with policy objectives, so that providers working with under-supplied populations receive a higher level of compensation per patient, (2) the development and consistent application of equitable criteria to place those eligible for surgery in priority order, (3) training and guidance for practitioners to reduce the risk of inadvertent bias in shared-decision making processes, and (4) targeted support and advocacy for patients living in deprived communities. Routine monitoring of supply inequities may serve to raise the profile of this issue and bring focus to mitigation efforts. Opportunities to reduce the rate of

hip pathology in the most deprived communities should also be explored.

Waiting times for NHS treatment had been increasing steadily for several years before jumping sharply with the SARS-CoV-2 pandemic. This has been associated with an increase in the proportion of the most affluent segments of the population opting to privately fund hip-replacements. We should expect this trend to continue unless specific mitigations are put in place. Whilst increases in privately funded treatment may free up constrained NHS resources in the short term, it risks undermining the principle of the NHS as a high-quality responsive service capable of meeting the needs of the whole population. Further research on this topic is warranted.

Conclusion

Rates of NHS-funded hip replacements increased substantially in England and Wales between 2002 and 2018. Having adjusted for need, people living in the most deprived areas had a lower rate of access to NHS-funded hip replacement surgery. These inequities did not improve between 2006 and 2016 in either England or Wales. More potent policy interventions may be required to address inequities in the supply of hip-replacements.

Ethics

The data used in this study are available in the SAIL Databank at Swansea University, Swansea, UK. All proposals to use SAIL data are subject to review by an independent Information Governance Review Panel (IGRP). Before any data can be accessed, approval must be given by the IGRP. The IGRP gives careful consideration to each project to ensure proper and appropriate use of SAIL data. When access has been approved, it is gained through a privacy-protecting safe haven and remote access system referred to as the SAIL Gateway. SAIL has established an application process to be followed by anyone who would like to access data via SAIL https://www.saildatabank.com/application-process.

Contributors

SW conceived of the research and conducted the analysis of supply of NHS funded hip-replacements in England and of waiting times and privately-funded provision. RB conducted the analysis of supply of NHS funded hip-replacements in Wales and produced the manuscript charts. PM carried out the analysis of need for hip replacements. MR provided clinical insight and service context. SW, RB, MR, PM contributed to the draft manuscript and signed-off the final manuscript text.

Data sharing statement

Data on NHS-funded hip replacement procedures for persons resident in Wales were extracted and analysed from PEDW held within the Secure Anonymised Information Linkage (SAIL) Databank (www.saildatabank.com) respectively. SAIL is a state of the art, remotely accessible, privacy-protecting Trusted Research Environment (TRE), accredited under the Digital Economy Act. SAIL holds and provides access to linked de-identified data from multiple sources at individual, household, and multiple ecological levels, for the population of Wales.

Data on NHS-funded hip replacement procedures for persons resident in England were extracted from the Admitted Patient Care Hospital Episode Statistics, supplied by agreement by NHS Digital (DARS-NIC-05206-L1V6D).

ELSA Data for this analysis were obtained from the UK Data Service on wave 1 to 9 of ELSA and included a special licensed IMD quintile variable.

Data on the provision of privately funded hip replacements was provided by the National Joint Registry (NJR) was provided for the purposes of research and approved by the NJR Research Committee.

Declaration of interests

The authors have no conflicts of interest to declare.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.lanepe.2022.100475.

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