Concise Report

Need for and receipt of hip and knee replacement—a national population survey

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Objectives. Hip and knee joint replacements are effective, and yet little is known about how closely the need for joint replacement matches supply in different population groups. Our objective was to compare the prevalence of existing joint replacements with that of need in population groups in England.

Methods. A total of 7101 people aged 60 yrs or older, representative of the population of England, were interviewed. Participants were asked about both receipt and need for joint replacement, socio-economic status and co-morbidity. ‘Need’ classification was based on hip or knee pain and difficulty walking, with adjustment for potential surgical contraindications. Associations between participants’ characteristics and both need and receipt were estimated.

Results. The prevalence of existing joint replacement (receipt) was 6% [95% confidence intervals (CI) 5, 6], and this was lower in the North than the South [adjusted odds ratio (OR) 0.72, CI 0.53, 0.96]. In contrast, the prevalence of estimated need was higher in the North (OR 1.27, CI 1.03, 1.58). Need was greater in women than men (OR 1.30, CI 1.09, 1.53), and showed an increasing gradient from the wealthiest to poorest quintile (ORs 1.00, 1.52, 2.18, 2.49, 3.23). In contrast, receipt did not differ significantly by sex or socio-economic group.

Conclusions. People living in the North of England, women and the less wealthy experience relatively high levels of need, yet do not receive relatively more hip and knee joint replacements.

Key words: Osteoarthritis, Hip, Knee, Arthroplasty, Socio-economic factors.

Introduction

Arthritis is the commonest cause of disability, is a frequent reason for medical consultations, and causes considerable costs to the health service and to society [1–3]. Pain and disability in the knee or hip joint caused by osteoarthritis can be effectively treated by surgical replacement of the joint [4–8].

Higher need for hip and knee joint replacement has been found in women and in those with lower socio-economic status in the Somerset and Avon Survey of Health and other regional studies [9–15]. Similar variations in need have been reported from Sweden, Canada and the USA [16–20]. These variations in need follow the familiar pattern of worse general health and disability in England being associated with lower socio-economic position, female gender and living in the North [21, 22]. The inverse care law [23] appears to apply to joint replacement, and those with lower socio-economic status experience lower rates of joint replacement in both England [24, 25] and the USA [26–29].

There has been no previous estimate of both need and receipt of hip or knee joint replacement on a national sample in England. We present data on the national distribution of symptomatic indications for hip or knee joint replacement surgery, and of existing joint replacements, with detailed estimation of comorbidities and socio-economic status, including direct measures of wealth. We include replacements carried out in the independent sector, which accounts for approximately one-quarter of hip or knee joint replacements [30].

We aimed to estimate the prevalence of need and receipt of hip and knee joint replacements, and to estimate their associations with respondent characteristics. We wanted to determine which population groups in England most needed a hip or knee joint replacement, and whether they were also the most likely to receive one.

Methods

Data collection

The English Longitudinal Study of Ageing (ELSA) is an interview survey of a sample of the population of England aged 50 yrs or older. During 2002, interviewers collected data using face-to-face interviews in participants’ homes. The sample was drawn from the Health Survey for England sample, which was designed to be representative of the English population living in private households, and was stratified by health authority and deprivation. The questions on joint replacement were administered only to those aged 60 yrs or over, the age group of those who receive over 85% of hip and knee replacements in England [31]. All analyses in this study refer only to this age group. The survey methodology is described in more detail elsewhere [32].

Participants were asked about receipt of joint replacement, pain and functional limitation (Table 1) as well as diagnosed illness, smoking and socio-economic status. Obesity had been...
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Interviews were achieved with 3885 women and 3216 men, giving
Results

were also excluded, because claudication is a possible cause of
intermittent claudication on the Edinburgh questionnaire [38]
caused by either chest pain or shortness of breath. Those with
lung disease or cancer, and difficulty walking a quarter of a mile
to surgery: reported diagnosis of a heart attack, stroke, chronic
of need those with the following possible contraindications
contraindications to surgery. We excluded from the classification
of the hip can present with knee pain, and less than half of those
knee replacement together rather than separately because arthritis
from the classification of need. We estimated need for hip and
knee replacement together rather than separately because arthritis
of the hip may present with knee pain, and less than half of those
with knee pain may have pain affecting one hip or knee joint only [9].
We excluded hip replacements due to fracture, as they are often
emergency operations, and have different aetiology from elective
hip replacement.

Estimation of need

Classification of need for hip or knee joint replacement required
respondents to be troubled often by pain, with pain in the knee or
hip when walking on the flat rated as 5 or more on a scale of 0–10,
plus some or much difficulty or inability to walk a quarter of a
mile. These criteria are consistent with the conclusions of the
National Institutes of Health Consensus Development Panel on
total hip replacement, and consensus statement on total knee
replacement [33, 34]. The criteria are simpler than the three
most widely used scoring systems for hip and knee disability
(New Zealand, WOMAC and Lequesne), but measure similar
domains of self-rated pain and functional activity [35–37].

We excluded all those with a previous hip or knee replacement
from the classification of need. We estimated need for hip and
knee replacement together rather than separately because arthritis
of the hip may present with knee pain, and less than half of those
with knee pain may have pain affecting one hip or knee joint only [9].
We excluded hip replacements due to fracture, as they are often
emergency operations, and have different aetiology from elective
hip replacement.

Statistical analysis

The data were weighted to adjust the respondent age and sex
distribution to the Census 2001 non-institutionalized population
distribution. Binary logistic regression modelling was used to
evaluate the independent determinants of having received one
or more replacement knee or hip joints, and of needing a hip or
knee joint replacement. The independent variables included in
the model were: age, sex, smoking status, education, occupational
class, obesity, total wealth and geographic region. They were
chosen on the basis that they were likely to influence joint
replacement rates. The statistical software used was STATA SE 8.

We conducted a sensitivity analysis to estimate the effect of
contraindications to surgery. We excluded from the classification of
need those with the following possible contraindications
to surgery: reported diagnosis of a heart attack, stroke, chronic
lung disease or cancer, and difficulty walking a quarter of a mile
cause by either chest pain or shortness of breath. Those with
intermittent claudication on the Edinburgh questionnaire [38]
were also excluded, because claudication is a possible cause of
leg pain and difficulty walking.

Results

Interviews were achieved with 3885 women and 3216 men, giving
a total of 7101 eligible sample members, out of 10 599 invited to
participate (response rate 67%). Data were present for all the
variables in the regression analysis for ‘receipt’ on 6028 people,
for all variables for ‘need’ on 5641 people, and for all variables
for ‘need with no major contraindication’ for 5524 people.
The application of the weights as described before made a very slight
difference to the results, and weighted data were used in the
following analyses.

Prevalence of existing joint replacement

The prevalence of a lifetime receipt of hip or knee joint
replacement, excluding hip replacements due to fracture, in the
weighted population aged 60 yrs or over was 6% [95% confidence
interval (CI) 5, 7] in women, 5% (CI 5, 6) in men and 6% (95% CI 5, 6) overall (Table 2).

Receipt was lower in the North than the South [adjusted odds
ratio (OR) 0.72, 95% CI 0.53, 0.96]. It did not differ significantly
by sex, wealth (population quintiles), education or occupational
class. As expected, lifetime prevalence in those aged 75 and over
was greater than in those aged 60–74 (OR 1.98, 95% CI 1.57,
2.50). Receipt was lower for current smokers (OR 0.6, 95% CI
0.39, 0.94) (Table 3).

Prevalence of need for joint replacement

The prevalence of need for hip or knee joint replacement in those
aged 60 and over was 16% in women (95% CI 14, 17), 12% in
men (95% CI 10, 13) and 14% (95% CI 13, 15) in men and women
overall (Table 2). The need for joint replacement was 30% higher
in women than men (OR 1.30, 95% CI 1.09, 1.53) (Table 3). Need
showed an increasing gradient from the wealthiest to poorest
quintile (ORs 1.00, 1.52, 2.18, 2.49, 3.23). It was higher for current
smokers (OR 1.39, 95% CI 1.09, 1.77) (Table 3).

Sensitivity analysis

Among the respondents classified as in ‘need’, 412 people (44%)
reported either a contraindication to surgery or intermittent
claudication, and were excluded from the classification of ‘need
with no major contraindication to surgery’. After exclusion of
those with potential contraindications, the overall prevalence
of need was 6% (95% CI 5, 6). Repeating the regression analysis
using this measure of need showed that the excess of need
previously seen in poorer quintiles, and in smokers, either
disappeared or reduced, and the gradient of increasing need
from rich to poor disappeared (Table 3).

Discussion

In this national population-based study, we found a mismatch
between need and receipt for hip and knee joint replacements.
Need in the North of England is 30% higher than in the South,
yet existing replacements are 30% less prevalent. Women have
30% higher need than men, yet receive replacements no more
frequently. The poorest fifth of the population experience nearly
three times as much need as the wealthiest, and replacements are
Our estimate of potential need for hip or knee replacement surgery of 6% is slightly higher than previous estimates, which is not surprising given an older population and broad definition of need. Previous estimates of need vary from 2.4% in people aged over 35 yrs in Avon and Somerset [13, 14], to 3.4% in North Yorkshire, Wiltshire and Sheffield and Tameside [10–12, 39], and 4.5% among women and 2.1% among men in Canada [19].

**Limitations**

The estimate of need for joint replacement relies on self-reported pain and disability, and these preliminary findings require confirmation using radiological and skilled clinical examination. Our method was designed to produce a reasonably accurate epidemiological estimate of need, given a low correlation between radiography and disease, and unsatisfactory evidence to define criteria for knee or hip replacement [7, 14, 40].

There is a possibility that some of our subjects were suffering from referred back pain, rather than pain originating in the knee or hip, although respondents were asked separately about pain in the hip, knee and back. Any misclassification for this reason is unlikely to have affected all groups similarly, making bias unlikely. No account was taken of respondents’ willingness to consider hip and knee arthroplasty, but this is unlikely to introduce a bias as willingness to consider arthroplasty has not been shown to be associated with sex, education or income, nor to differ between hips and knees [18, 19, 41].

**Implications**

Our findings suggest that access to hip or knee replacement is reduced by barriers which exist particularly for people living in the North, for women, and for the less wealthy; however, they need to be confirmed by other studies. The barrier for the less-wealthy groups appears, at least partly, to be high levels of co-morbidity among the poor, and this inequality is at least partly explained by higher comorbidity in the less-wealthy quintiles. The fewer replacements in smokers are also explained by higher comorbidity levels. These findings are unlikely to be due to inaccurate estimation of wealth or exclusion of replacements provided by the private sector.

This study provides the first national estimate of both need and receipt of hip or knee joint replacement. Strengths of the study are that it includes detailed estimates of socio-economic status rather than indirect measures, it allows for differential rates of comorbidities, and it includes joint replacements from both the National Health Service and independent sector.

**Exclusions were diagnosed: heart attack (including myocardial infarction or coronary thrombosis), stroke (cerebral vascular disease), chronic lung disease such as chronic bronchitis or emphysema, or cancer or a malignant tumour (excluding minor skin cancers), difficulty with walking a quarter of a mile caused by either chest pain or shortness of breath and grade 2 intermittent claudication (Edinburgh claudication questionnaire [38]).***

***NS-SEC, National Statistics Socio Economic Classification.
in less-wealthy groups, and so are several other diseases, yet it is these comorbid illnesses that may be preventing access to needed hip and knee replacement.

For those in the North, there appear to be fewer opportunities to have a joint replacement than in the South. For women, the data suggest no simple explanation, and further research is needed to demonstrate where in the pathway from pain and disability to joint replacement the barriers to treatment occur. One possible barrier may be the views of referring practitioners on the patient characteristics associated with a favourable outcome from hip replacement [42]. There may be a case for targeted funding to reduce avoidable mobility disabilities in lower-access regions and groups.

**Table 3. Multivariate weighted analysis: odds ratios for receipt of a hip or knee replacement, and for need of a hip or knee replacement, including and excluding those with major contraindications (binary logistic regression)**

| Key messages |
|--------------|
| **Rheumatology** |
| • Joint replacements are 30% rarer in the North than the South of England, despite higher need. |
| • Women and less-wealthy people experience higher need for joint replacement than men and wealthier groups, and relatively more of this need goes unmet. |

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**Ethics committee and reference number**

The London Multi-Centre Research Ethics Committee granted ethical approval for the study, and the subjects gave informed consent to participate. Reference No. MREC/04/2/006.

The authors have declared no conflict of interest.

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