

Socioeconomic deprivation is associated with worse health-related quality of life and greater opioid analgesia use while waiting for hip and knee arthroplasty

a cross-sectional study of NHS patients from a single centre in Northern Ireland

From Musgrave Park Hospital,
Belfast, UK

N. Gallagher,¹ R. Cassidy,¹ P. Karayiannis,¹ C. E. H. Scott,² D. Beverland¹

¹Outcomes Unit, Musgrave Park Hospital, Belfast Health and Social Care Trust, Belfast, UK

²Royal Infirmary of Edinburgh, Edinburgh, UK

Correspondence should be sent to N. Gallagher Nicola.Gallagher@belfasttrust.hscni.net

Cite this article:
Bone Jt Open 2024;5(5):
444–451.

DOI: 10.1302/2633-1462.
55.BJO-2024-0046.R1

Aims

The overall aim of this study was to determine the impact of deprivation with regard to quality of life, demographics, joint-specific function, attendances for unscheduled care, opioid and antidepressant use, having surgery elsewhere, and waiting times for surgery on patients awaiting total hip arthroplasty (THA) and total knee arthroplasty (TKA).

Methods

Postal surveys were sent to 1,001 patients on the waiting list for THA or TKA in a single Northern Ireland NHS Trust, which consisted of the EuroQol five-dimension five-level questionnaire (EQ-5D-5L), visual analogue scores (EQ-VAS), and Oxford Hip and Knee Scores. Electronic records determined prescriptions since addition to the waiting list and out-of-hour GP and emergency department attendances. Deprivation quintiles were determined by the Northern Ireland Multiple Deprivation Measure 2017 using postcodes of home addresses.

Results

Overall, 707 postal surveys were returned, of which 277 (39.2%) reported negative “worse than death” EQ-5D scores and 219 (21.9%) reported the consumption of strong opioids. Those from the least deprived quintile 5 had a significantly better EQ-5D index (median 0.223 (interquartile range (IQR) -0.080 to 0.503) compared to those in the most deprived quintiles 1 (median 0.049 (IQR -0.199 to 0.242), $p = 0.004$), 2 (median 0.076 (IQR -0.160 to 0.277; $p = 0.010$), and 3 (median 0.076 (IQR -0.153 to 0.301; $p = 0.010$). Opioid use was significantly greater in the most deprived quintile 1 compared to all other quintiles (45/146 (30.8%) vs 174/809 (21.5%); odds ratio 1.74 (95% confidence interval 1.18 to 2.57; $p = 0.005$).

Conclusion

More deprived patients have worse health-related quality of life and greater opioid use while waiting for THA and TKA than more affluent patients. For patients awaiting surgery, more information and alternative treatment options should be available.

Take home message

- Patients in our region have an extremely poor quality of life (QoL) while waiting for total joint replacement (TJR).
- Deprivation is associated with worse QoL and greater dependence on strong opioids.
- Surgical capacity for TJR must be increased.

Introduction

In recent years, waiting lists for elective total hip arthroplasty (THA) and total knee arthroplasty (TKA) in the UK have increased steadily, and waiting times are the longest they have been in over a decade.¹ This has been compounded by the COVID-19 pandemic, which saw an unprecedented halt in surgeries, and numbers have still not returned to pre-COVID-19 levels.^{2,3} As of May 2021, 3,757 and 4,469 patients were awaiting primary THA and TKA, respectively, in Northern Ireland (NI).⁴ Some of these patients are waiting up to 5.5 years for surgery.⁵ Currently, waiting lists for elective THA and TKA in NI are the worst in the UK, due to a variety of social, political, and economic reasons.⁵

Patients waiting a prolonged time for total joint replacement (TJR) experience a significant deterioration in quality of life (QoL), and an increase in frailty while they wait.^{6,7} The proportion of patients waiting for TJR who were experiencing the worst health-related quality of life (HRQoL) scores (negative scores deemed “worse than death” (WTD)) doubled during the COVID-19 pandemic.⁶ Allowing patients to deteriorate into these poor health states deleteriously affects the outcome of their TJR when they receive it, with WTD patients achieving significantly worse joint-specific function than patients with better preoperative HRQoL.⁸

Recently, our institution has found that just under half of patients (40%) waiting for TJR had WTD QoL scores. Patients in the group who had waited three or more years for surgery had a significantly greater opioid use, antidepressant use, and more joint-related attendances at unscheduled care, including emergency department (ED) and out-of-hours general practitioner (OOH-GP) visits.⁵

Social deprivation has been defined by the American Psychological Association as “limited access to society’s resources due to poverty, discrimination, or other disadvantage.”⁹ Social deprivation can negatively impact access to healthcare, including elective orthopaedic procedures.¹⁰ Those who are most deprived have an increased risk of osteoarthritis of the hip and knee,¹¹ and are more likely to require THA or TKA, but are less likely to have the operation.¹² The under-utilization of TJR by the most deprived patients is a consistent finding across the literature.¹³⁻¹⁷ Studies from several European countries suggest those who are most deprived wait longer for specialist consultation and elective orthopaedic surgery.^{10,18,19}

The primary aim of this study was to determine the effect of deprivation on the HRQoL in patients waiting for THA and TKA at our institution (Musgrave Park Hospital, Belfast). Secondary aims were to determine if deprivation affected: 1) patient demographics; 2) joint-specific function; 3) attendances for unscheduled care; 4) opioid and antidepressant use; 5) having surgery elsewhere; and 6) waiting times for surgery.

Methods

This study used data that had been collected from a previously completed postal survey audit within our institution.⁵ The current study added deprivation level data for which ethical approval was granted by the Trust research department. The reporting of this study has followed the Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) guidelines.²⁰ Patients were eligible for inclusion in the study if they were on the waiting list to receive TJR at our institution for less than three months or more than three years before

30 May 2022. Exclusion criteria included surgery delayed or suspended for medical reasons, unknown/invalid postcode, and indeterminate deprivation level.

For the postal survey audit, 1,007 patients were included: 500 who had been added to the waiting list within three months of the start of the study, and 507 who had been waiting longer than three years. These patients were selected at random using their healthcare number. The Northern Ireland Multiple Deprivation Measure (MDM) 2017²¹ was derived from the postcode of patients’ home addresses at the time of being put on the waiting list. The MDM is made up of seven domains, as shown in [Figure 1](#). This deprivation measure was used to group patients into one of five quintiles, with 1 being the most deprived and 5 being the least deprived.²¹ Six postcodes were unknown or invalid, meaning a deprivation level could not be obtained, leaving a total of 1,001 patients.

Patients who did not respond within four weeks were posted a reminder letter. Patients who did not fully complete the survey were telephoned at least twice to limit any missing data. Questionnaires included the EuroQoL five-dimension five-level score (EQ-5D-5L)²² to assess HRQoL, and the Oxford Hip Score (OHS)²³ or Oxford Knee Score (OKS)²⁴ to assess joint-specific function. The EQ-5D-5L is a validated measure that assesses five health domains:²⁵ mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. There are five possible responses for each question assessed on a five-level Likert scale for each domain from “no problems” to “extreme problems”. It is validated for use in patients awaiting TJR and is commonly used to assess patient’s QoL. A single score is then derived, which ranges from -0.594 to 1, where 0 is death and 1 is full health. Negative scores are defined as a health state WTD.^{6,8} The EuroQoL visual analogue scale (EQ-VAS) was used to rate current health from 0 (worst health possible) to 100 (best health possible). The OHS and OKS are validated scores for use in assessing patients before and after TJR. There are 12 questions with five possible answers giving a score from 0 (worst score possible) to 48 (best score possible).^{23,24} Patients were asked if they had surgery elsewhere, and if so, where, although not all patients who had surgery elsewhere noted where they had surgery. This meant we were unable to confirm whether all the surgeries completed outside our institution had been paid for privately, as some surgeries were carried out on the waiting list initiative (WLI)²⁶ or the cross-border directive (CBD).²⁷ The WLI was performed in the private sector to provide a high throughput of elective THA and TKA, which patients did not need to pay for, while the CBD was a temporary measure put in place which allowed patients to seek and pay for treatment in the private sector, with the costs reimbursed by the Health and Social Care Board following the operation.

Data regarding the prescription of new opioid and antidepressant medication since addition to the waiting list for TJR, and use of OOH-GP and ED services, were obtained from the regional electronic care record (ECR). Only strong opioids, as per the World Health Organization guidance for pain relief,²⁸ were included, with weak opioids (including codeine or co-codamol) not included. The only ED and OOH-GP attendances recorded were those related to the patient’s hip/knee pain since the date they were added to the waiting list. Routine GP appointments are not recorded in the ECR.

Seven Domains of Deprivation



Fig. 1
Seven domains of the Northern Ireland Multiple Deprivation Measure 2017.

Statistical analysis

Statistical analysis was carried out using SPSS v. 29 (IBM, USA). Deprivation level was assessed across five quintiles (quintile 1 = most deprived, quintile 5 = least deprived). Data were assessed for normality using Shapiro-Wilk tests and histograms. Descriptive statistics for the total sample and for the quintiles of deprivation were expressed as means (standard deviation (SD)) for parametric data, or medians (interquartile range (IQR)) for non-parametric data. Categorical variables were compared using chi-squared or Fisher's exact test. Non-parametric continuous variables were assessed with the Mann-Whitney U test or Kruskal-Wallis test. If a statistical difference was observed across all quintiles, post-hoc testing was carried out between individual groups to determine where the statistical difference lay. Statistical significance was set at $p < 0.05$.

Results

Overall, 1,001 patients were eligible for the study (558 females and 443 males, with median age 66.8 years (IQR 59.5 to 74.4)). There were no significant differences in age, sex, or the number having THA or TKA between deprivation quintiles (Table I). Deprivation quintiles did not differ between patients waiting either three months or three years, and there were no significant differences in the number of orthopaedic-related OOH-GP or ED visits, or hospital admissions since being placed on the waiting list according to deprivation quintiles (Table I).

EQ-5D indices were significantly better in the least deprived quintile (median 0.223; IQR -0.080 to 0.503) compared to those in the most deprived quintiles 1 ($p = 0.004$), 2 ($p = 0.010$), and 3 ($p = 0.010$, all Kruskal-Wallis test with posthoc Bonferroni correction) (Table II and Figure 2). A significantly smaller proportion of those from the least deprived quintile had negative WTD EQ-5D indices (29.5%; 38/129) compared to all other deprivation quintiles (41.3%; 239/578); odds ratio (OR) 0.59 (95% CI 0.39 to 0.90); ($p = 0.012$, chi-squared test) (Table II). Total Oxford scores were significantly better in the least deprived quintile compared to the most deprived quintile in patients awaiting TKA (median 13.0 (IQR 7.0 to 18.5) vs median 8.0 (IQR 4.0 to 15.0); $p = 0.049$, Kruskal-Wallis test with posthoc Bonferroni correction), but not in those awaiting THA. A significantly greater proportion of patients from the most deprived quintile were taking opioid analgesia compared to all other quintiles (45/146 (30.8%) vs 174/809 (21.5%); OR 1.74 (95% CI 1.18 to 2.57), ($p =$

0.005, chi-squared test) (Table I and Figure 3). There were no significant differences in the proportion of patients taking antidepressant medication across deprivation quintiles (Table I). QoL variables and function scores were all significantly worse in those taking opioids compared to those not taking opioids (all p -values < 0.05 , chi-squared test; see Supplementary Table i). Significantly more patients in the least deprived quintile had surgery outside our institution compared to those living in all other quintiles (24/192 (12.5%) vs 61/809 (6.1%); OR 1.75 (95% CI 1.06 to 2.89); ($p = 0.027$, chi-squared test) (Table I).

Questionnaires were completed by 707 patients: 398 females (56.3%) and 309 males (43.7%); 250 hips (35.4%) and 457 knees (64.6%), median age 66.4 years (IQR 59.9 to 74.3). There were no significant differences ($p > 0.05$) in age, sex, waiting times for surgery, or deprivation between those who responded to the questionnaires and those who did not. A significantly greater proportion of non-responders were waiting on THA (142/294 vs 250/707 of responders; OR 1.71 (95% CI 1.30 to 2.25); ($p < 0.001$, chi-squared test).

Discussion

HRQoL, although still considerably poor, was better in the least deprived quintile, and opioid use was significantly greater among the most deprived. As expected, significantly more patients in the least deprived quintile had their joint replaced elsewhere compared to those in the most deprived areas. In patients awaiting TKA only, function was significantly better in the least deprived patients.

These findings are largely consistent with previous studies, where the most deprived have greater pain,^{10,29-31} worse QoL scores,¹⁰ more comorbidities,²⁹ lower physical activity levels, and poorer physical and mental health,^{10,30,31} which can deteriorate further with long waiting lists.¹⁰ Deprivation has also been independently associated with a health state WTD.³² Previous studies have found the most deprived patients were more likely to be younger^{10,29,30} and female,³⁰ but there were no differences observed in these demographics in our study.

The King's Fund recently reported that in England, those in the most deprived areas are nearly twice as likely to wait over a year for hospital care compared to those in the least deprived areas. This included elective orthopaedic surgery and other common procedures.³³ Although we found no difference in waiting times between deprivation

Table 1. Demographics, non-scheduled hospital contact, and medication use of those waiting for total joint replacement by deprivation quintile.

Variable	Deprivation quintile					Total (n = 1,001)	p-value
	1 (most deprived; n = 146)	2 (n = 167)	3 (n = 192)	4 (n = 304)	5 (least deprived; n = 192)		
Median age, yrs (IQR)	64.8 (55.9 to 73.9)	67.3 (58.6 to 75.8)	66.8 (58.9 to 74.3)	67.4 (60.6 to 74.8)	66.9 (61.4 to 73.2)	66.8 (59.5 to 74.4)	0.197‡
Female sex, n (%)	84 (57.5)	101 (60.5)	106 (55.2)	162 (53.3)	105 (54.7)	558 (55.7)	0.636§
Knee arthroplasty, n (%)	92 (63.0)	102 (61.1)	121 (63.0)	182 (59.9)	112 (58.3)	609 (60.8)	0.862§
Waiting time over 3 yrs, n (%)	67 (45.9)	82 (49.1)	103 (53.6)	156 (51.3)	96 (50.0)	504 (50.3)	0.696§
Joint arthroplasty elsewhere, n (%)	9 (6.2)	7 (4.2)	16 (8.3)	29 (9.5)	24 (12.5)*	85 (8.5)	0.051§
Orthopaedic-related admissions to hospital, n (%)	21 (14.4)	30 (18.0)	31 (16.1)	39 (12.8)	25 (13.0)	146 (14.6)	0.551§
Orthopaedic-related OOH-GP visits, n (%)	8 (5.5)	13 (7.8)	14 (7.3)	22 (7.2)	13 (6.8)	70 (7.0)	0.946§
Orthopaedic-related ED visits (n, %)	20 (13.7)	25 (15.0)	30 (15.6)	41 (13.5)	31 (16.1)	147 (14.7)	0.919§
Opioid use, n (%)	45 (30.8)†	34 (20.4)	49 (25.5)	55 (18.1)	36 (18.8)	219 (21.9)	0.016§¶
Antidepressant use, n (%)	21 (14.4)	18 (10.8)	26 (13.5)	37 (12.2)	20 (10.4)	122 (12.2)	0.762§

*A significantly greater proportion of the least deprived quintile 5 had their joint replaced outside Musgrave Park Hospital (12.5%; 24/192) compared to all other quintiles (6.1%; 61/809); odds ratio 1.75 (95% confidence interval (CI) 1.06 to 2.89); p = 0.027.

†A significantly greater proportion of patients were taking opioid analgesia in the most deprived quintile 1 (30.8%; 45/146) compared to all other quintiles (21.5%, 174/809); odds ratio 1.744 (95% CI 1.18 to 2.57); p = 0.005.

‡Kruskal-Wallis test.

§Chi-squared test.

¶Significant difference when comparing quintiles 1 to 5 overall.

ED, emergency department; IQR, interquartile range; OOH-GP, out-of-hours general practitioner.

quintiles, all patients in our region are waiting a long time for TJR (5.5 years in some cases) while enduring chronic pain and impaired mobility; therefore, a detrimental effect on physical and mental health is unsurprising. Overall, 39.2% of patients waiting for TJR were in a state WTD, higher than the figures reported by other authors,^{6,8,34} demonstrating the impact of unacceptably long waiting lists. Prior to the COVID-19 pandemic, 19% and 12% of patients waiting for THA and TKA, respectively, had WTD health states.⁸ During the COVID-19 pandemic, this increased to 22% and 35% of patients awaiting TKA and THA, respectively.⁶ Similarly, Clark et al³⁴ in 2023 found that overall, 29% of 174 patients waiting for THA, TKA, and unicompartmental knee arthroplasty during the COVID-19 pandemic were in a state WTD. A significantly smaller proportion of the least deprived patients in our study were living in a state WTD (29.5%) compared to all other deprivation quintiles (41.3%). One possible reason that no difference in waiting times between the deprivation quintiles was found is that patients with the most severe joint-related problems in the least deprived quintile could have paid for surgery privately and therefore would have been removed from the waiting list. Therefore, the least deprived quintile may consist of those with less severe joint disease who have decided to continue to wait, whereas the most deprived quintile consist of those with severe joint-related problems, as well as those with less severe problems, as they cannot afford surgery privately.

The current study also demonstrated significantly better Oxford scores in the least deprived patients waiting for TKA compared to the most deprived patients, with a median difference of five points, equal to the minimal clinically important difference (MCID).³⁵ Edwards et al³⁶ in 2018 also reported worse preoperative OKS in TKA in the most deprived patients.³⁶ Clark et al³⁴ reported that the overall mean OHS/OKS deteriorated significantly from 15.43 when patients were added to the waiting list, to 11.77 14 months into the COVID-19 pandemic. The median Oxford scores in the current study of 9 or 10 highlight the poor function of patients waiting for surgery in our region. Patient-Reported Outcome Measurement Information System (PROMIS) physical and mental scores have previously been found to be worst in the most deprived patients prior to and up to one year following TKA, with the most deprived patients failing to achieve the improvement in mental health scores displayed by less deprived individuals.³⁷

Furthermore, the most deprived patients in our study demonstrated greater opioid use. In our total sample of 1,001 patients, 21.9% used strong opioids, ranging from 18.8% of patients in the least deprived quintile, to 30.8% of patients in the most deprived quintile. As we only included strong opioids in our study, and only new prescriptions since being put on the waiting list, these figures may be lower than what has been reported previously, as most other studies include both strong and weak opioids. For example, opioid

Table II. Patient-reported scores of those waiting for total joint replacement by deprivation quintile.

Variable	Deprivation quintile					Total (n = 707)	p-value
	1 (most deprived; n = 106)	2 (n = 119)	3 (n = 136)	4 (n = 217)	5 (least deprived; n = 129)		
Median EQ-5D Index score (IQR)	0.049 (-0.199 to 0.242)	0.076 (-0.160 to 0.277)	0.076 (-0.153 to 0.301)	0.206 (-0.091 to 0.479)	0.223 (-0.080- 0.503) [§]	0.155 (-0.126 to 0.367)	< 0.001* [‡]
WTD state, n (%)	49 (46.2)	53 (44.5)	63 (46.3)	74 (34.1)	38 (29.5) [¶]	277 (39.2)	0.007 ^{††}
Median EQ-VAS (IQR)	40.0 (20.0 to 70.0)	45.0 (20.0 to 60.0)	35.0 (20.0 to 55.0)	45.0 (25.0 to 62.5)	40.0 (30.0 to 60.0)	40.0 (20.0 to 60.0)	0.195*
Deprivation quintile: patients waiting for THA							
	1 (n = 35)	2 (n = 45)	3 (n = 44)	4 (n = 73)	5 (n = 51)	Total (n = 248)	p-value
Median Oxford Hip Total Score (IQR)	7.0 (4.0 to 13.0)	7.0 (4.0 to 13.5)	8.0 (5.3 to 17.3)	9.0 (6.0 to 18.5)	13.0 (6.8 to 19.0)	9.0 (5.0 to 18.0)	0.062*
Median Oxford Hip Pain Score (IQR)	5.0 (5.0 to 5.0)	5.0 (4.5 to 5.0)	5.0 (4.3 to 5.0)	5.0 (4.0 to 5.0)	5.0 (4.0 to 5.0)	5.0 (4.0 to 5.0)	0.035* [‡]
Deprivation quintile: patients waiting for TKA							
	1 (n = 71)	2 (n = 74)	3 (n = 91)	4 (n = 142)	5 (n = 77)	Total (n = 455)	p-value
Median Oxford Knee Total Score (IQR)	8.0 (4.0 to 15.0)	9.0 (5.0 to 15.0)	8.0 (5.0 to 15.0)	11.0 (5.0 to 18.3)	13.0 (7.0 to 18.5) ^{††}	10.0 (5.0 to 17.0)	0.020*
Median Oxford Knee Pain Score (IQR)	5.0 (4.0 to 5.0)	5.0 (4.0 to 5.0)	5.0 (4.0 to 5.0)	5.0 (4.0 to 5.0)	5.0 (4.0 to 5.0)	5.0 (4.0 to 5.0)	0.490*

*Kruskal-Wallis test.

†Chi-squared test.

‡Significant difference when comparing quintiles 1 to 5 overall.

§Participants living in the least deprived quintile 5 had a significantly higher EuroQol five-dimension (EQ-5D) Index score (quality of life score) compared to participants living in the most deprived quintiles 1, 2, and 3; p = 0.004, p = 0.010, and p = 0.010, respectively.

¶A significantly smaller proportion of patients were living in a state worse than death (WTD) in the least deprived quintile 5 (29.5%; 38/129) compared to all other deprivation quintiles (41.3%; 239/578); odds ratio 0.592 (95% confidence interval 0.39 to 0.90); p = 0.012). NB: A state WTD is defined as and EQ-5D Index score of below zero.

**No differences were observed when comparing individual deprivation quintiles.

††Participants living in the least deprived quintile 5 had a significantly higher total Oxford Knee Score compared to participants living in the most deprived quintile 1 (p = 0.049).

EQ-5D, EuroQol five-dimension questionnaire; EQ-VAS, EuroQol visual analogue scale; IQR, interquartile range; THA, total hip arthroplasty; TKA, total knee arthroplasty; WTD, worse than death.

use has ranged from 40.6% to 52.6% at referral for THA and TKA.³⁸ Strong opioid use alone was much lower at 2.0% to 2.8%.³⁸ Jin et al³⁹ in 2019 reported an even higher proportion using opioids in the year preceding THA and TKA, with 60.2% of patients having any use of opioids, and of those, 12.4% using opioids at least once a month continuously over a period of 12 months. Opioid use closer to our findings has been reported, though both weak and strong opioids were included.^{40,41} In a total of 41,389,332 patients who presented to an outpatient clinic for knee osteoarthritis, 12.8% were prescribed an opioid-based medication, and patients in the lowest income quartile had an increased odds of opioid prescription.⁴⁰ In 316,593 patients who underwent TKA, 7.2% were classed as continuous opioid users in the year preceding surgery.⁴¹ In a large cross-sectional study of over 34,000 patients who were undergoing surgery of various parts of the body, 23% reported preoperative opioid use. In patients waiting for TJR specifically, 33.5% used opioids preoperatively.⁴² In 574 patients who were undergoing THA or TKA, 29% reported current opioid use on the day of their surgery.⁴³ It is possible that the use of opioids is higher in the most deprived patients due to GPs in deprived areas prescribing opioids more frequently. Perhaps GPs in more deprived areas are under greater pressure due to higher numbers of

patients and as such prescribe more opiates due to clinical pressures.

Long-term opioid use preoperatively has been linked with worse functional outcomes, an increased risk of perioperative complications, higher healthcare costs, and higher likelihood of postoperative use.^{38,43,44} TJR patients who consumed opioids preoperatively had an increased length of stay, a 43% higher 30-day unplanned readmission, experienced 35% higher surgical site infection, and 44% higher surgical revision.⁴⁴ In our study, we did not have any postoperative data as patients were awaiting surgery. A large issue with opioid consumption is that patients can become physically and psychologically dependent even within two to ten days of continuous use.⁴⁵ Prescribing opioids for longer than 90 days has been associated with opioid overdose and dependence.⁴⁶ Between 1 April 2021 and 31 March 2022, there were 289,215 people in contact with drug and alcohol services in England, with half of these receiving treatment for problems with opioids.⁴⁷ The National Institute for Health and Care Excellence (NICE) guidelines state that opioids have no role to play in the management of chronic pain;⁴⁸ therefore, other treatment options, such as non-steroidal anti-inflammatory medication or physiotherapy, should be considered for THA and TKA patients with severe pain while waiting for their surgery. Even more critically, surgical capacity needs to be

Median EQ-5D-5L index score according to deprivation quintile

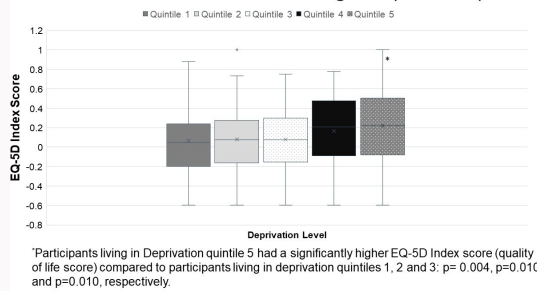


Fig. 2
Median EuroQol five dimension five-level (EQ-5D-5L) index score according to deprivation quintile.

increased to lower the unacceptably long waiting lists in our region.

There were no differences in orthopaedic-related OOH-GP visits, ED attendances, or hospital readmissions according to deprivation level. It appears that deprivation in relation to these variables has not been examined in the preoperative period in other studies. There are, however, contrasting findings with regard to deprivation and unscheduled healthcare attendances or complications within 90 days following TJR. Some studies report no association between deprivation and 90-day postoperative ED visits following TKA,^{37,49} or 90-day readmissions to hospital following THA.⁵⁰ Edwards et al³⁶ actually reported a slightly lower risk of postoperative complications in those who were most deprived. Conversely, there is some evidence of an association between greater deprivation and hospital readmission within 30 or 90 days of TKA.^{49,51} Higher deprivation has also been correlated with a greater risk of undergoing revision surgery and mortality at a mean follow-up of 5.8 years in THA and TKA patients.⁵²

In total, 8.5% of patients had surgery outside our institution. Approximately double the proportion of the least deprived quintile compared to the most deprived quintile had surgery outside our institution (12.5% vs 6.2%); therefore, it is likely that some of these were completed in the private sector. However, we cannot be sure that all the surgeries outside our institution were paid for privately as some surgeries were carried out on the WLI, which patients did not need to pay for, and the CBD, in which patients would have been reimbursed any costs incurred. This demonstrates that the least deprived patients have greater access and more choice when accessing surgery outside of their allocated NHS hospital when put on the waiting list. When public healthcare waiting lists are long, some patients seek care in the private sector, an option that the most deprived can rarely afford, further exacerbating healthcare inequity.¹¹

There were some limitations to the study. BMI, American Society of Anesthesiologists grade, smoking status, and comorbidities were not included as they were not recorded. Primary care attendances within normal hours were not captured, so the GP burden would have been greatly underestimated. As patients were waiting for surgery, no postoperative data such as patient-reported outcome measures were available, which would have led to greater insights into how deprivation affects postoperative outcomes.

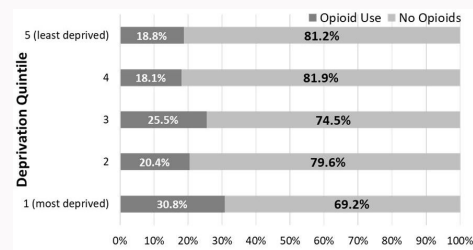


Fig. 3
Opioid use according to deprivation quintile.

Though 8.5% of patients were identified as having had surgery elsewhere, this is likely an underestimate as patients who had surgery elsewhere are regularly removed from the waiting list.

In conclusion, the most deprived patients were living with a worse HRQoL and greater opioid dependence while waiting for TJR compared to less deprived patients. Overall, approximately 40% of patients waiting for TJR were in a state WTD, with 22% consuming strong opioids for pain relief, demonstrating the appalling impact of the extremely long waiting lists for TJR in our region. All patients need to be better cared for, but a particular emphasis is required on those who are most deprived in order to address growing health inequality. Where possible, more information and treatment options other than opioids, such as non-steroidal anti-inflammatory medication or physiotherapy, should be available to all patients during their lengthy wait for TJR. Critically, surgical capacity for TJR must be increased to reduce the lengthy waiting lists and avoid their deleterious effects.

Supplementary material

Table showing the comparison of patient-reported scores of those waiting for total joint replacement for those taking opioids and those not taking opioids.

References

1. **No authors listed.** T&O waiting list the largest for over a decade. British Orthopaedic Association. 2022. <https://www.boa.ac.uk/resource/t-o-waiting-list-the-largest-for-over-a-decade.html> (date last accessed 15 May 2024).
2. **Oussedik S, Zagra L, Shin GY, D'Apollito R, Haddad FS.** Reinstating elective orthopaedic surgery in the age of COVID-19. *Bone Joint J.* 2020;102-B(7):807–810.
3. **Yapp LZ, Clarke JV, Moran M, Simpson AHRW, Scott CEH.** National operating volume for primary hip and knee arthroplasty in the COVID-19 era: a study utilizing the Scottish arthroplasty project dataset. *Bone Jt Open.* 2021;2(3):203–210.
4. **Mayne AIW, Cassidy RS, Magill P, Mockford BJ, Acton DA, McAlinden MG.** The feasibility of achieving Elective Care Framework targets for total hip arthroplasty and total knee arthroplasty in Northern Ireland. *Bone Jt Open.* 2022;3(4):302–306.
5. **Karayiannis PN, Warnock M, Cassidy R, Jones K, Scott CEH, Beverland D.** The painful truth of waiting for hip and knee arthroplasty in Northern Ireland. *Bone Joint J.* 2023;105-B(7):783–794.
6. **Clement ND, Scott CEH, Murray JRD, Howie CR, Deehan DJ, IMPACT-Restart Collaboration.** The number of patients “worse than death” while waiting for a hip or knee arthroplasty has nearly doubled during the COVID-19 pandemic. *Bone Joint J.* 2021;103-B(4):672–680.
7. **Clement ND, Wickramasinghe NR, Bayram JM, et al.** Significant deterioration in quality of life and increased frailty in patients waiting

- more than six months for total hip or knee arthroplasty: a cross-sectional multicentre study. *Bone Joint J.* 2022;104-B(11):1215–1224.
8. **Scott CEH, MacDonald DJ, Howie CR.** "Worse than death" and waiting for a joint arthroplasty. *Bone Joint J.* 2019;101-B(8):941–950.
 9. **Cheng AL, McDuffie JV, Schuelke MJ, Calfee RP, Prather H, Colditz GA.** How should we measure social deprivation in orthopaedic patients? *Clin Orthop Relat Res.* 2022;480(2):325–339.
 10. **Kulkarni K, Shah R, Mangwani J, Dias J.** The impact of deprivation on patients awaiting planned care. *Bone Jt Open.* 2022;3(10):777–785.
 11. **Reyes C, Garcia-Gil M, Elorza JM, et al.** Socio-economic status and the risk of developing hand, hip or knee osteoarthritis: a region-wide ecological study. *Osteoarthritis Cartil.* 2015;23(8):1323–1329.
 12. **Wyatt S, Bailey R, Moore P, Revell M.** Equity of access to NHS-funded hip replacements in England and Wales: trends from 2006 to 2016. *Lancet Reg Health Eur.* 2022;21:100475.
 13. **Karimi A, Burkhart RJ, Hecht CJ, Acuña AJ, Kamath AF.** Is social deprivation associated with usage, adverse events, and patient-reported outcome measures in total joint arthroplasty? A systematic review. *Clin Orthop Relat Res.* 2023;481(2):239–250.
 14. **Alvarez PM, McKeon JF, Spitzer AI, et al.** Socioeconomic factors affecting outcomes in total knee and hip arthroplasty: a systematic review on healthcare disparities. *Arthroplasty.* 2022;4(1):36.
 15. **Hawley S, Edwards CJ, Arden NK, et al.** Descriptive epidemiology of hip and knee replacement in rheumatoid arthritis: an analysis of UK electronic medical records. *Semin Arthritis Rheum.* 2020;50(2):237–244.
 16. **Hartnett DA, Brodeur PG, Kosinski LR, Cruz AI, Gil JA, Cohen EM.** Socioeconomic disparities in the utilization of total hip arthroplasty. *J Arthroplasty.* 2022;37(2):213–218.
 17. **Hartnett DA, Lama CJ, Brodeur PG, Cruz AI, Gil JA, Cohen EM.** Socioeconomic disparities in the utilization of total knee arthroplasty. *J Arthroplasty.* 2022;37(10):1973–1979.
 18. **Laudicella M, Siciliani L, Cookson R.** Waiting times and socioeconomic status: evidence from England. *Soc Sci Med.* 2012;74(9):1331–1341.
 19. **Siciliani L, Verzulli R.** Waiting times and socioeconomic status among elderly Europeans: evidence from SHARE. *Health Econ.* 2009;18(11):1295–1306.
 20. **von Elm E, Altman DG, Egger M, et al.** The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol.* 2008;61(4):344–349.
 21. **No authors listed.** Northern Ireland multiple deprivation measures 2017: description of indicators. Northern Ireland Statistics Research Agency (NISRA). 2017. <https://www.nisra.gov.uk/statistics/deprivation/northern-ireland-multiple-deprivation-measure-2017-nimdm2017> (date last accessed 15 May 2024).
 22. **EuroQol Group.** EuroQol - a new facility for the measurement of health-related quality of life. *Health Policy.* 1990;16(3):199–208.
 23. **Dawson J, Fitzpatrick R, Carr A, Murray D.** Questionnaire on the perceptions of patients about total hip replacement. *J Bone Joint Surg Br.* 1996;78-B(2):185–190.
 24. **Dawson J, Fitzpatrick R, Murray D, Carr A.** Questionnaire on the perceptions of patients about total knee replacement. *J Bone Joint Surg Br.* 1998;80-B(1):63–69.
 25. **Buchholz I, Janssen MF, Kohlmann T, Feng YS.** A systematic review of studies comparing the measurement properties of the three-level and five-level versions of the EQ-5D. *Pharmacoeconomics.* 2018;36(6):645–661.
 26. **No authors listed.** Tackling waiting lists. Northern Ireland Audit Office. <https://www.niauditoffice.gov.uk/files/niauditoffice/documents/2023-10/NI%20Audit%20Office%20Report%20-%20Tackling%20Waiting%20Lists.pdf> (date last accessed 15 May 2024).
 27. **No authors listed.** Options available while on a hospital waiting list. HSE. <https://www2.hse.ie/services/schemes-allowances/options-while-on-a-waiting-list/> (date last accessed 15 May 2024).
 28. **Ventafriida V, Saita L, Ripamonti C, De Conno F.** WHO guidelines for the use of analgesics in cancer pain. *Int J Tissue React.* 1985;7(1):93–96.
 29. **Clement ND, Muzammil A, Macdonald D, Howie CR, Biant LC.** Socioeconomic status affects the early outcome of total hip replacement. *J Bone Joint Surg Br.* 2011;93-B(4):464–469.
 30. **Clement ND, Jenkins PJ, MacDonald D, et al.** Socioeconomic status affects the Oxford knee score and short-form 12 score following total knee replacement. *Bone Joint J.* 2013;95-B(1):52–58.
 31. **Wright MA, Adelani M, Dy C, O'Keefe R, Calfee RP.** What is the impact of social deprivation on physical and mental health in orthopaedic patients? *Clin Orthop Relat Res.* 2019;477(8):1825–1835.
 32. **Clement ND, Afzal I, Liu P, et al.** The Oxford Knee Score is a reliable predictor of patients in a health state worse than death and awaiting total knee arthroplasty. *Arthroplasty.* 2022;4(1):33.
 33. **No authors listed.** People living in the poorest areas waiting longer for hospital treatment. Healthwatch. 2021. <https://www.healthwatch.co.uk/news/2021-09-27/people-living-poorest-areas-waiting-longer-hospital-treatment> (date last accessed 15 May 2024).
 34. **Clark JO, Razii N, Lee SWJ, Grant SJ, Davison MJ, Bailey O.** Oxford Hip and Knee scores deteriorate in patients awaiting lower limb arthroplasty during the COVID-19 pandemic and predict a health state "worse than death." *Bone Jt Open.* 2023;4(3):138–145.
 35. **Khow YZ, Liow MHL, Goh GS, Chen JY, Lo NN, Yeo SJ.** The Oxford Knee Score minimal clinically important difference for revision total knee arthroplasty. *Knee.* 2021;32:211–217.
 36. **Edwards HB, Smith M, Herrett E, MacGregor A, Blom A, Ben-Shlomo Y.** The effect of age, sex, area deprivation, and living arrangements on total knee replacement outcomes: a study involving the United Kingdom National Joint Registry Dataset. *JB JS Open Access.* - 2018;3(2):e0042.
 37. **Gulley ML, Carender CN, Glass NA, Bedard NA.** What is the impact of social deprivation on mental and physical health before and after primary total knee arthroplasty? *Arthroplast Today.* 2023;22:101156.
 38. **Farrow L, Gardner WT, Tang CC, Low R, Forget P, Ashcroft GP.** Impact of COVID-19 on opioid use in those awaiting hip and knee arthroplasty: a retrospective cohort study. *BMJ Qual Saf.* 2023;32(8):479–484.
 39. **Jin Y, Solomon DH, Franklin PD, et al.** Patterns of prescription opioid use before total hip and knee replacement among US Medicare enrollees. *Osteoarthritis Cartil.* 2019;27(10):1445–1453.
 40. **Gwam CU, Emara AK, Ogbonnaya IA, Zuskov A, Luo TD, Plate JF.** Addressing national opioid prescribing practices for knee osteoarthritis: an analysis of an estimated 41,389,332 patients with knee arthritis. *J Am Acad Orthop Surg.* 2021;29(7):e337–e344.
 41. **Kim SC, Jin Y, Lee YC, et al.** Association of preoperative opioid use with mortality and short-term safety outcomes after total knee replacement. *JAMA Netw Open.* 2019;2(7):e198061.
 42. **Hilliard PE, Waljee J, Moser S, et al.** Prevalence of preoperative opioid use and characteristics associated with opioid use among patients presenting for surgery. *JAMA Surg.* 2018;153(10):929–937.
 43. **Goesling J, Moser SE, Zaidi B, et al.** Trends and predictors of opioid use after total knee and total hip arthroplasty. *Pain.* 2016;157(6):1259–1265.
 44. **Blevins Peratikos M, Weeks HL, Pisansky AJB, Yong RJ, Stringer EA.** Effect of preoperative opioid use on adverse outcomes, medical spending, and persistent opioid use following elective total joint arthroplasty in the United States: a large retrospective cohort study of administrative claims data. *Pain Med.* 2020;21(3):521–531.
 45. **No authors listed.** Opioid dependence. The National Institute for Health and Care Excellence (NICE). 2022. <https://cks.nice.org.uk/topics/opioid-dependence/> (date last accessed 15 May 2024).
 46. **No authors listed.** Dependence and withdrawal associated with some prescribed medicines: an evidence review. Public Health England. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/940255/PHE_PMR_report_Dec2020.pdf (date last accessed 15 May 2024).
 47. **Office for Health Improvement & Disparities.** Adult substance misuse treatment statistics 2021 to 2022: report. Gov.uk. <https://www.gov.uk/government/statistics/substance-misuse-treatment-for-adults-statistics-2021-to-2022-report#:~:text=There%20were%20289%2C215%20people%20in,had%20problems%20with%20alcohol%20only> (date last accessed 15 May 2024).
 48. **No authors listed.** Chronic pain (primary and secondary) in over 16s: assessment of all chronic pain and management of chronic primary pain. The National Institute for Health and Care Excellence (NICE). 2021. www.nice.org.uk/guidance/ng193 (date last accessed 15 May 2024).
 49. **Khlopas A, Grits D, Sax OC, et al.** Neighborhood socioeconomic disadvantages associated with prolonged lengths of stay, nonhome discharges, and 90-day readmissions after total knee arthroplasty. *J Arthroplasty.* 2022;37(6S):S37–S43.

50. Mehta B, Goodman S, Ho K, Parks M, Ibrahim SA. Community deprivation index and discharge destination after elective hip replacement. *Arthritis Care Res (Hoboken)*. 2021;73(4):531–539.
51. Arroyo NS, White RS, Gaber-Baylis LK, La M, Fisher AD, Samaru M. Racial/ethnic and socioeconomic disparities in total knee arthroplasty 30- and 90-day readmissions: a multi-payer and multistate analysis, 2007-2014. *Popul Health Manag*. 2019;22(2):175–185.
52. Kamath CC, O'Byrne TJ, Lewallen DG, Berry DJ, Maradit Kremers H. Neighborhood-level socioeconomic deprivation, rurality, and long-term outcomes of patients undergoing total joint arthroplasty: analysis from a large, tertiary care hospital. *Mayo Clin Proc Innov Qual Outcomes*. 2022;6(4):337–346.

Author information

N. Gallagher, BSc (Hons), PhD, Research Coordinator
R. Cassidy, BSc (Hons), MMedSci, PhD, Data Analyst
P. Karayiannis, MSc, FRCSEd, Orthopaedic Consultant Surgeon
D. Beverland, MD, FRCS (Ortho), Orthopaedic Consultant Surgeon
Outcomes Unit, Musgrave Park Hospital, Belfast Health and Social Care Trust, Belfast, UK.

C. E. H. Scott, MD, MSc, BSc, FRCSEd (Tr&Orth), MFSTEd,
Orthopaedic Consultant Surgeon, Royal Infirmary of Edinburgh,
Edinburgh, UK.

Author contributions

N. Gallagher: Writing – original draft, Writing – review & editing.
R. Cassidy: Data curation, Formal analysis, Writing – review & editing.
P. Karayiannis: Data curation, Writing – review & editing.
C. E. H. Scott: Writing – review & editing.
D. Beverland: Conceptualization, Writing – review & editing.

Funding statement

The authors disclose receipt of the following financial or material support for the research, authorship, and/or publication of this article: this study has been supported by Trauma & Orthopaedic Research Charity Northern Ireland (<https://torcni.org>).

ICMJE COI statement

D. Beverland discloses consulting fees; payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing, or educational events; Support for attending meetings and/or travel; and patents (planned, issued, or pending) from DePuy, all of which is unrelated to this paper. C. E. H. Scott declares a department grant for research; and payment or honoraria for

lectures, presentations, speakers bureaus, manuscript writing or educational events from Stryker; consulting fees from Stryker, Smith & Nephew, and Osstec; being on the data safety monitoring for the PASHION trial; and being on *The Bone & Joint Journal* board, all of which are also unrelated to this work.

Data sharing

The data that support the findings for this study are available to other researchers from the corresponding author upon reasonable request.

Acknowledgements

This study was supported by Trauma & Orthopaedic Research Charity Northern Ireland (<https://torcni.org>), and approved by the Belfast Trust Research Office (Ref: 23009DB-SW).

Ethical review statement

This study was approved by the Belfast Trust Research Office (Ref: 23009DB-SW).

Open access funding

The open access funding for this paper was provided by Trauma & Orthopaedic Research Charity Northern Ireland (Charity Number NIC105791).

© 2024 Gallagher et al. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (CC BY-NC-ND 4.0) licence, which permits the copying and redistribution of the work only, and provided the original author and source are credited. See <https://creativecommons.org/licenses/by-nc-nd/4.0/>