

Musculoskeletal elective treatment waiting times and labour market outcomes, England: 2014 to 2025

Relationship between time waited for elective inpatient treatment for conditions of musculoskeletal pain and labour market outcomes.

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1 . Main points

- Among working-age NHS patients receiving elective inpatient treatment for conditions of musculoskeletal (MSK) pain in England between 1 April 2015 and 31 March 2023, longer waiting times led to significant reductions in gross employee pay, up to five years after treatment; this was after accounting for factors related to both waiting times and post-treatment pay, using an instrumental variable approach.
- The largest estimated reductions in annual earnings were observed for patients with "other joint disorders", where each additional four weeks of waiting led to a £487 reduction in annual earnings in the fourth year after treatment.
- For patients with "osteoarthritis", the largest reduction in annual earnings for each additional four weeks waited was of £301, in the fourth year after treatment.
- For patients with "back, neck and MSK pain", the largest reduction in annual earnings for each additional four weeks of waiting time was of £329, in the third year after treatment.
- For patients with "other MSK conditions", the largest reduction in earnings was of £392, in the third year after treatment.
- There was no statistical evidence of a relationship between waiting times for elective inpatient treatment for MSK conditions and subsequent employee status or benefit receipt.

2 . Data on musculoskeletal elective treatment waiting times and labour market outcomes

[Musculoskeletal elective treatment waiting times and labour market outcomes. England: 2015 to 2025](#)

Dataset | Released 9 September 2026

Relationship between time waited for elective inpatient treatment for conditions of musculoskeletal pain and labour market outcomes.

3 . Glossary

Instrumental variable

An instrumental variable is a measure that is directly related to the exposure variable of interest (such as individual waiting times) but not the outcome variable of interest (such as pay, employment status or benefit receipt). It can be used to produce more reliable estimates of the relationship between the exposure and the outcome when it is not possible to adjust for potentially important confounding variables.

One such variable is severity of the musculoskeletal (MSK) condition being treated, which was not available in the study dataset. Individuals with more severe illness may be prioritised for treatment (that is, they may have shorter waiting times) and their labour market outcomes may also be worse (that is, they may be less likely to be working and earning, and more likely to be receiving benefits). This would bias estimates of the relationship between waiting times and labour market outcomes.

To overcome this bias, we estimated each patient's waiting times using the average waiting time among patients treated within the same hospital, MSK condition group, and referral year-month. These aggregate average waiting times are a proxy for system-wide congestion, which would partly determine individual patients' waiting times but not their individual labour market outcomes.

Fixed effects linear regression

A fixed-effects regression model is a statistical model that can be applied to datasets in which individual observations are clustered within groups, such as individual patients within hospitals, MSK condition groups, and year-months of referral. These models implicitly control for all sources of group-level confounding (that is, factors related to both the exposure of interest and the outcome), without needing to estimate group-specific coefficients in the model.

In this analysis, we fitted the models using two-stage least squares. The relationship between individual waiting times and the instrumental variable was estimated in the first stage, then the fitted values were used in the second-stage model to estimate the relationship between waiting times and labour market outcomes.

4 . Data sources and quality

Study data

We created a person-level dataset by linking NHS Hospital Episode Statistics (HES) Admitted Patient Care (APC) records with:

- sociodemographic characteristics from the 2011 Census (the most recently collected census data available at the start of our study period)
- Office for National Statistics death registration data
- Benefits and Income Dataset (BIDs) from the Department for Work and Pensions (DWP), covering the period of April 2014 to September 2021
- Pay As You Earn (PAYE) Real Time Information (RTI) records from HM Revenue and Customs (HMRC), [calendarised to monthly observations](#), covering the period of April 2014 to March 2025

The study population included 1,019,897 individuals, who:

- were counted in the 2011 Census
- could be linked to NHS and HMRC records
- were admitted to a hospital in England during the study period, from 1 April 2015 to 31 March 2023
- had a primary [International Statistical Classification of Diseases and Related Health Problems 10th Revision \(ICD-10\)](#) diagnosis code classified as "musculoskeletal (MSK) pain" (for code lists, see our [accompanying dataset](#))
- had an elective (non-emergency) admission with a waiting time from decision-to-admit to admission of less than two years
- were aged between 25 and 65 years at the time of admission

For patients with more than one elective admission during the study period, we used their first record that met the previously described criteria.

Analysis methods

Across the three outcome measures (gross employee earnings, employee status and receipt of any benefit), we used a series of fixed-effects linear regression models to assess the relationship between waiting time for treatment and labour market outcomes. We used an instrumental variable, derived from hospital-level average waiting times within each MSK condition group and referral period, in place of individual waiting times. For detailed definitions of these concepts, see [Section 3: Glossary](#).

We modelled age at time of admission as a restricted cubic spline. We also adjusted for the year and month of referral, hospital of care, and three-digit [Office of Population Censuses and Surveys Classification of Interventions and Procedures version 4 \(OPCS-4\)](#) treatment code as fixed-effects.

We also adjusted for the labour market variables of interest (gross employee earnings and employee status, derived from HMRC PAYE RTI records, and receipt of any benefit, derived from DWP BIDs records) in the year prior to treatment. It was important to control for these variables because they are determinants of post-treatment labour market outcomes.

We adjusted the models for the following 2011 Census variables, which may be related to both healthcare waiting times and labour market outcomes:

- sex
- ethnicity (White, Asian, Black, Mixed or Multiple Ethnic Group, Other)
- highest qualification (Level 1, Level 2, Level 3, Level 4, Apprenticeship, No Qualifications)
- National Statistics Socio-Economic Classification (NS-SEC)
- self-reported long-term health condition or disability ("No long-term health conditions", "Day-to-day activities reduced a little by long-term health conditions", "Day-to-day activities reduced a lot by long-term health conditions", "Day-to-day activities not reduced at all by long-term health conditions")
- self-reported general health ("Very Good Health", "Good Health", "Fair Health", "Bad Health", "Very Bad Health")
- rural or urban residence
- [Index of Multiple Deprivation \(IMD\)](#) quintile group

We used the fixed-effects linear regression models to estimate both the average reduction in earnings (British pounds, deflated to 2023 prices) with each additional four weeks waited in each year of follow-up, and the average change in the probability (percentage points) of being employed, or of receiving any benefit in the last month of each year of follow-up, per each additional four weeks waited.

Outcomes were evaluated one, two, three, four, and five years post-treatment. We also stratified our models by sex, age group and IMD quintile group.

Statistical uncertainty was quantified by 95% [confidence intervals](#) around the point estimates.

Strengths and limitations

Strengths of the analysis include the large, population-level dataset and our use of linked administrative health and labour market data, with socio-demographic information from the 2011 Census.

We performed data linkage successfully for nearly all 2011 Census respondents with a high degree of accuracy, as reported in our [2011 Census linkage to DWP master key and encrypted NINo methodology](#).

Limitations include the fact that the analysis only covers people who received elective treatment during the study period, meaning it does not include those who were referred for treatment but were still waiting for it or who did not go on to receive treatment by the end of the study period. Our findings may also not apply to all people with MSK conditions over the study period, including NHS patients not admitted to hospital, and individuals with MSK conditions who were treated privately.

5 . Related links

[Associations between elective inpatient treatment and monthly earnings and employment: a national linked data study in England](#)

Journal article | 19 June 2026

Research published in the European Journal of Public Health exploring the associations between receiving inpatient treatment and the subsequent labour market outcomes.

[The labour market consequences of extended waiting times for elective inpatient healthcare: an observational study in England using national data](#)

Journal article | 8 December 2025

Preprint research, hosted by medRxiv, exploring the effects of extended waiting times for inpatient treatment on labour market outcomes.

6 . Cite this statistical bulletin

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