

Article

The impact of bariatric surgery on monthly employee pay and employee status, England: April 2014 to December 2022

The change in monthly employee pay and employee status attributable to having had bariatric surgery, in different time periods after surgery, compared with six months before surgery.

Contact:
Health Research Group
Health.Data@ons.gov.uk
+44 1329 444110

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1 . Main points

- Bariatric surgery is an effective intervention to improve the health of people living with obesity and help prevent the development of obesity associated health conditions; the impact of this intervention on labour market outcomes is not well understood.
- Compared with the six-month period before having bariatric surgery, there was a sustained average increase in earnings from six months to five years after surgery (the end of our follow-up time) among working-age individuals in England who received NHS bariatric surgery between April 2014 and December 2022.
- This average increase in pay was largely the result of an increased probability of being in work, rather than an increase in working hours or hourly pay.
- Among everyone in the dataset (both employees and not), monthly pay initially decreased on average compared with pre-surgery, then reached pre-surgery levels by the fourth month after surgery and continued to increase, reaching an average of £84 more than pre-surgery levels 54 to 60 months after surgery.
- Among those in work, very little average change was found in monthly pay up to five years after surgery, suggesting that an increase in working hours or hourly pay was not the main factor behind the average increase in pay.
- The probability of being a paid employee initially decreased after surgery, before increasing to reach 4.3 percentage points higher than pre-surgery levels 54 to 60 months after surgery.

All the datasets used for this analysis have been de-identified in a secure virtual environment before they are combined and analysed. In line with the [Code of Practice for Statistics](#), the de-identified linked data will only be used for statistical production and research. Read more in [Section 5: Data sources and quality](#).

2 . Results of the analysis

We used fixed effects regression modelling (see [Section 4: Glossary](#)) to estimate average changes in monthly employee pay and employee status that are attributable to bariatric surgery, among working-age individuals in England at different time periods after NHS bariatric surgery compared with the six-month period before the month of surgery.

We calculated the average change in monthly employee pay for everyone in the sample and among only those in work. We accounted for changes in labour market outcomes over calendar time (reflecting changes in background economic conditions) and individuals' age (as individuals' pay and likelihood of working tend to vary throughout their working lives) over the follow up time.

These main results are shown in Figure 1. Further analysis including breakdowns by age group, sex, ethnicity, region and relative level of area deprivation can be found in our [accompanying dataset](#).

Figure 1: There was a sustained average increase in monthly employee pay from six months to five years after bariatric surgery, largely resulting from an increase in the probability of being a paid employee

Changes in monthly employee pay (overall and among those in work) and the probability of being a paid employee with time since bariatric surgery, compared with the six-month period before surgery, among 25- to 64-year-olds who underwent NHS bariatric surgery between 1 April 2014 and 31 December 2022, England

Notes

1. Data include individuals who had an NHS bariatric surgery procedure between 1 April 2014 and 31 December 2022, with either a primary diagnosis of obesity or a secondary diagnosis of obesity with a primary diagnosis of an obesity related condition, aged 25 to 64 years at time of surgery and resident in England.
2. The bar plotted from month 0 to 1 is the month in which the surgery occurred.
3. The error bars are 95% [confidence limits](#).
4. Pay is [gross monthly earnings](#) paid to employees, in 2023 equivalent values.
5. Being a paid employee is defined as receiving a monthly pay greater than £0.

3 . Data on the impact of bariatric surgery on monthly employee pay and employee status

[The impact of bariatric surgery on monthly employee pay and employee status, England](#)

Dataset | Released 23 October 2024

Descriptive statistics and model estimates for the change in monthly employee pay and employee status attributable to having had bariatric surgery, in different time periods after surgery, compared with six months before surgery. Includes breakdowns by age group, sex, region, ethnic group and Index of Multiple Deprivation quintile group. April 2014 to December 2022.

4 . Glossary

Bariatric surgery

The term “[bariatric surgery](#)” describes a group of surgical weight-loss procedures where changes to the digestive system are made to decrease absorption and/or restrict food intake. This is done by reducing the amount of intestine that food passes through and/or by reducing the size of the stomach.

The [eligibility criteria for bariatric surgery on the NHS](#) includes a body mass index (BMI) of 40 or more (lower for some ethnic groups), or between 35 and 40 with serious obesity related comorbidities, and having previously tried other weight-loss methods such as dieting, exercise and medicine.

Bariatric surgery has been shown to be the [most effective obesity treatment for sustained weight-loss](#), leading to [lower disease risk, including for type 2 diabetes, hypertension and heart disease, and reduced all-cause mortality](#) in people living with obesity.

Fixed effects regression models

A fixed effects regression model is a statistical model that can be applied to panel data, where there are multiple measurements per individual.

Within the fixed effects model, an individual’s labour market status in any time period is compared with their own previous status, meaning that all sources of time-invariant confounding (the effect of factors that do not change over time and that influence both the likelihood of treatment and labour market status) are implicitly controlled for.

Sources of time-varying confounding (such as calendar time and ageing) are accounted for by including them as additional terms in the fixed effects regression model. [Confidence intervals](#) are calculated using clustered standard errors to account for correlation between the measurements for each individual.

5 . Data sources and quality

Linked dataset

We used an extension of the Public Health Data Asset (PHDA) to include data on employee pay. The deidentified, linked dataset comprises:

- Census 2011 and Census 2021
- Hospital Episode Statistics (HES) Admitted Patient Care (APC) records from 1 April 2009 to 31 December 2022
- Office for National Statistics (ONS) death registrations, covering deaths registered from 1 April 2014 to 31 December 2023 and occurring up to 31 December 2022
- Pay As You Earn (PAYE) Real-Time information (RTI) records from HM Revenue and Customs (HMRC) covering 1 April 2014 to 31 December 2022

We have previously described the data security processes we employ in an [Office for National Statistics blog post](#).

All the datasets used for this analysis have been de-identified so no individual's attribute information can ever be directly identified from the data held by ONS. This is because information that can be used to directly identify individuals such as names, addresses and NHS numbers have been removed in a secure virtual environment before the datasets are combined and analysed. In line with the [Code of Practice for Statistics](#), the de-identified linked data will only be used for statistical production and research; it cannot be used for operational purposes, such as making decisions over individuals' access to healthcare or benefits. More information on the use of data at the ONS can be found in our article on [Sources of Data](#). Ethical approval for this work was provided by the [National Statistician's Data Ethics Advisory Committee](#).

Census ID was linked to HMRC records via the [Demographic Index \(PDF, 550KB\)](#). A report detailing methodology for this linkage will be released soon. Census ID was linked to the HES and death registration datasets using the Patient Register (PR) 2011 to 2013 for the Census 2011 and the 2019 Patient Demographic Service (PDS) for Census 2021. For inclusion in the study dataset, individuals were required to have a census record (either in 2011 or 2021) that could be linked to NHS and HMRC information.

The PAYE data were calendarised in line with the methods described in [Monthly earnings and employment estimates from Pay As You Earn Real Time Information \(PAYE RTI\) data: methods](#) to derive monthly employee pay ([gross earnings](#)). Where an individual had a Census ID linking to multiple monthly PAYE records, pay was summed across all matching records for each month.

Negative monthly pay records were imputed to be zero, and monthly pay above the 99.9% centile was set to the value at the 99.9% centile. Monthly pay was deflated to 2023 prices using the [Consumer Price Index including owner occupier's housing costs](#) (CPIH). Being a paid employee was defined as receiving any amount of pay in a month.

Data inclusion criteria

Individuals were included if they had a record of bariatric surgery in HES between 1 April 2014 and 31 December 2022, with either a primary diagnosis of obesity, or a secondary diagnosis of obesity with a primary diagnosis of an obesity related condition.

ICD-10 and OPCS-4 codes used to identify bariatric surgery, obesity and obesity related conditions are provided in our [accompanying dataset](#). Where there were multiple qualifying records for an individual, the earliest was taken. Individuals were excluded if they had a record for prior bariatric surgery between 1 April 2009 and 31 March 2014.

Sociodemographic information was linked to these individuals from the 2011 Census if available, and the 2021 Census if not. The sample was restricted to individuals resident in England, as recorded in HES if available and Census if not, and aged 25 to 64 years on the date of bariatric surgery. The resultant cohort contained 40,662 individuals.

We created a sample of unexposed individuals, comprising individuals enumerated in the 2011 Census, who did not have a record for bariatric surgery between 1 April 2009 and 31 December 2022. These individuals were sampled using stratified sampling by sex and five-year age band to match the age-sex distribution in the bariatric surgery cohort. The resultant sample contained 49,921 individuals. The purpose of this sample was to adjust more accurately for time-varying confounders, which would be partially collinear with the within-individual treatment effect in the exposed cohort.

Follow-up

Individuals were followed-up for a maximum of five years pre- and post-surgery, between 1 April 2014 and 31 December 2022. Follow-up time was censored at the earliest of death and turning age 69 years, and before turning age 21 years.

Quality

The PHDA is a population-level dataset for England. Of the 50,585,645 individuals with a non-imputed record in the 2011 Census, and resident in England at the time of the 2011 Census, 94.4% (47,729,962) could be linked to both NHS and HMRC information. Of the 54,409,066 individuals with a non-imputed record in the 2021 Census, and resident in England at the time of the 2021 Census, 93.3% (50,739,686) could be linked to both NHS and HMRC information.

The PAYE data cover employees only, therefore self-employed people are recorded as receiving £0 pay and categorised as not a paid employee for the purposes of this analysis (approximately 13% of working people are self-employed rather than employees, as recorded in the [Labour Force Survey](#)). People who are employed but not currently receiving pay (for example, on maternity leave and not receiving maternity pay) are also categorised as not a paid employee.

We did not have reliable data on hours worked. Therefore, we were unable to distinguish changes in hours worked from hourly pay changes. We were also not able to distinguish sick pay from regular pay, thus we could not investigate the effects of bariatric surgery on long-term sickness absence.

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6 . Related links

[Using the power of linked data to understand factors preventing people from working](#)

Blog | Released 1 October 2023

Emma Rourke explains how linked, population-level data can improve our understanding of the interplay between health and work, with the goal of improving the wellbeing of individuals and the economy.

[Labour market overview, UK](#)

Statistical bulletin | Released monthly

Estimates of employment, unemployment, economic inactivity and other employment-related statistics for the UK.

[Rising ill-health and economic inactivity because of long-term sickness, UK: 2019 to 2023](#)

Article | Released 26 July 2023

Experimental statistics estimating the different health conditions of the working-age population and those economically inactive because of long-term sickness.

7 . Cite this statistical bulletin

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