Office for National Statistics

Article

Obesity and mortality during the coronavirus (COVID-19) pandemic, England: 24 January 2020 to 30 August 2022

The risk of death during the coronavirus (COVID-19) pandemic among people aged 30 to 64 years with and without obesity

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1 . Main points

- The age-standardised rate of all-cause mortality was higher for people aged 30 to 64 years with obesity (413.4 and 286.0 deaths per 100,000 person-years for men and women, respectively) than those without obesity (317.6 and 217.8, respectively) between 24 January 2020 and 30 August 2022.
- The rate of all-cause death was 1.22 and 1.12 times greater for men and women, respectively, with obesity compared with those without obesity, after adjusting for age, ethnic group, geographical factors, socio-economic characteristics, and smoking status.
- The rate of death involving COVID-19 was 2.12 and 2.22 times greater for men and women, respectively, with obesity compared with those without obesity; this was after adjusting for age, ethnic group, geographical factors, socio-economic characteristics, smoking status, and COVID-19 vaccination status.
- The age-standardised prevalence of several health conditions, such as cardiovascular diseases, diabetes, and asthma, were also higher in people with obesity than people without obesity prior to the COVID-19 pandemic.
- After further adjusting for comorbidities, the rate of death involving COVID-19 remained 1.64 and 1.62 times greater for men and women with obesity, respectively, compared with those without obesity; this suggests that some, but not all, of the excess risk associated with obesity may be attributed to comorbidities.

These are Experimental Statistics. The methods are currently under development, which means that the estimates are provisional. We advise caution when using the data.

Statistician's comment

"People with obesity have been at higher risk of dying from COVID-19 compared with people without obesity. They also experienced higher mortality from causes not involving COVID-19. Obesity is linked with several other health conditions, such as cardiovascular diseases, diabetes, and asthma, which may lead to worse COVID-19 outcomes and also increase the risk of death in general. This partly explains why people with obesity have higher rates of death involving COVID-19 than people without obesity."

Vahé Nafilyan, Senior Statistician, Health Analysis and Life Events Division, Office for National Statistics

2 . Mortality rates in people with and without obesity

Previous studies have shown that people with obesity were at elevated risk of severe coronavirus (COVID-19) outcomes early in the COVID-19 pandemic (summarised in this report by Public Health England and in this meta-analysis, published in Frontiers in Endocrinology). In this study, we assessed whether people aged 30 to 64 years with obesity have continued to experience higher rates of death involving COVID-19 and death not involving COVID-19 than those without obesity, during the period 24 January 2020 to 30 August 2022 (see the Data sources and quality section for more information about the study population).

The age-standardised mortality rate (ASMR) for all-cause death was higher for people with obesity (413.4 and 286.0 deaths per 100,000 person-years for men and women, respectively) than people without obesity (317.6 and 217.8, respectively). ASMRs for deaths involving COVID-19 and deaths not involving COVID-19 are available in our accompanying datasets.

After adjusting for factors associated with obesity and risk of mortality (age, ethnic group, geographical factors, socio-economic characteristics, and smoking status), the rate of all-cause death was 1.22 and 1.12 times greater for men and women, respectively, with obesity compared with those without obesity (Figure 1).

The rate of death involving COVID-19 was 2.12 and 2.22 times greater for men and women, respectively, with obesity compared with those without obesity. This was after adjusting for age, ethnic group, geographical factors, socio-economic characteristics, smoking status, and COVID-19 vaccination status.

The adjusted rate of death not involving COVID-19 was 1.14 and 1.04 times greater for men and women, respectively, with obesity compared with those without obesity.

These results relate to statistical associations and do not necessarily imply cause-and-effect relationships.

Figure 1: People with obesity had higher adjusted rates of all-cause mortality, death involving COVID-19, and death not involving COVID-19 than those without obesity

Hazard ratios for all-cause death, death involving COVID-19, and death not involving COVID-19, for people with obesity relative to people without obesity, stratified by sex, England: 24 January 2020 to 30 August 2022

Notes:

1. ONS figures based on deaths occurring between 24 January 2020 to 30 August 2022 and registered by 30 August 2022, of people aged 30 to 64 years in the ONS Public Health Data Asset; these figures are provisional.

2. All estimates are adjusted for age, ethnic group, region, rural/urban classification, Index of Multiple Deprivation (IMD) quintile group, National Statistics Socio-economic Classification (NS-SEC), highest qualification held, household tenure, and smoking status. The comparison of death involving COVID-19 is also adjusted for COVID-19 vaccination status.

Download the data

.xlsx

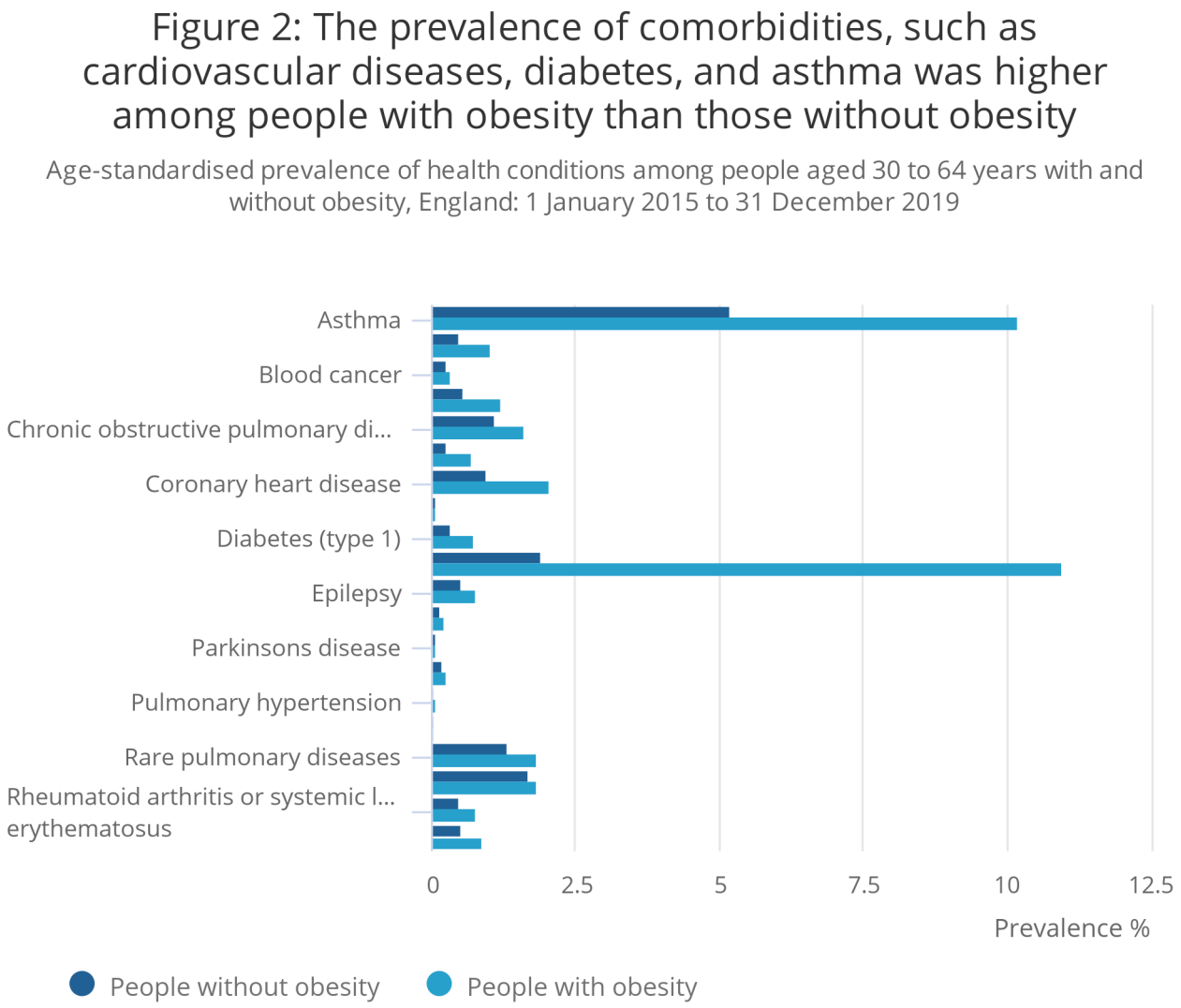
3 . Comorbidities in people with obesity

Differences in the rate of death involving coronavirus (COVID-19) between people with and without obesity may be partly explained by people with obesity having a higher prevalence of several health conditions. For instance, the prevalence of cardiovascular diseases, diabetes, and asthma over the five years prior to the COVID-19 pandemic (1 January 2015 to 31 December 2019) was higher among people with obesity than those without obesity (Figure 2).

After adjusting for these health conditions, the rate of death involving COVID-19 remained 1.64 and 1.62 times greater for men and women with obesity, respectively, compared with those without obesity. This suggests that some of the differences in the risk of death involving COVID-19 was driven by people with obesity having a higher prevalence of these comorbidities. However, these comorbidities did not explain all of the excess risk associated with obesity.

Figure 2: The prevalence of comorbidities, such as cardiovascular diseases, diabetes, and asthma was higher among people with obesity than those without obesity

Age-standardised prevalence of health conditions among people aged 30 to 64 years with and without obesity, England: 1 January 2015 to 31 December 2019



Source: Office for National Statistics – Obesity and mortality during the coronavirus (COVID-19) pandemic, England: 24 January 2020 to 30 August 2022

Notes:

1. Prevalence estimates based on General Practice Extraction Service (GPES) Data for Pandemic Planning and Research (GDPPR) data between 1 January 2015 and 31 December 2019.

4 . Obesity and mortality during the coronavirus (COVID-19) pandemic, England data

Obesity and mortality during the coronavirus (COVID-19) pandemic, England
Dataset | Released 14 October 2022
All data relating to Obesity and mortality during the coronavirus (COVID-19) pandemic, England.

5 . Glossary

Age-standardised mortality rates

Age-standardised mortality rates allow comparisons between populations that may have different proportions of people of different ages. The 2013 European Standard Population is used to standardise rates.

Confidence intervals

Confidence intervals use the standard error to derive a range in which we think the true value is likely to lie. A confidence interval gives an indication of the degree of uncertainty of an estimate and helps to decide how precise a sample estimate is. It specifies a range of values likely to contain the unknown population value. These values are defined by lower and upper limits.

Cox proportional hazards regression

Cox proportional hazards regression is used to measure the association between a time-to-event outcome (such as death) and a characteristic of interest (in this case, obesity). It can be used to adjust for other characteristics expected to be related to both the characteristic of interest and the outcome.

Deaths involving coronavirus (COVID-19)

Deaths involving coronavirus (COVID-19) include those with an underlying cause, or any mention, of International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) codes U07.1 (COVID-19, virus identified), U07.2 (COVID-19, virus not identified), or U09.9 (post-COVID condition). A doctor can certify the involvement of COVID-19 based on symptoms and clinical findings - a positive test result is not required.

Hazard ratio

A hazard ratio is a measure of how often a particular event occurs in one group compared with how often it occurs in another group (the reference group), at any particular point in time. A hazard ratio greater than 1 shows that the rate of the event occurring is higher in the group of interest compared with a reference group, while a hazard ratio of less than 1 shows that the rate is lower in the group of interest compared with a reference group.

6 . Data sources and quality

These analyses use data from the Office for National Statistics' (ONS) Public Health Data Asset (PHDA). The PHDA covers England only and combines:

- Census 2011 records
- death registrations data
- electronic health records (Hospital Episode Statistics (HES) and General Practice Extraction Service (GPES) Data for Pandemic Planning and Research (GDPPR))
- National Immunisation Management Service (NIMS) data

The inclusion criteria required study participants to be:

- enumerated at the 2011 Census
- aged 30 to 64 years at the start of the study period (24 January 2020)
- linked to the 2011 to 2013 NHS Patient Register (to obtain an NHS number)
- linked to at least one GDPPR record (to identify active NHS patients during the coronavirus (COVID-19) pandemic)
- resident in England according to GDPPR

Evidence of obesity was identified from GDPPR (primary care) records. We classified people with obesity as those with a recorded body mass index (BMI) score of 30 kg/m^2 or higher, or if they had a diagnosis code for obesity between 1 January 2010 and 31 December 2019.

As a measure of absolute risk, we calculated age-standardised mortality rates (ASMRs) by obesity status and sex, as deaths per 100,000 person-years at risk, standardised to the 2013 European Standard Population. We calculated ASMRs for all-cause deaths, deaths involving COVID-19, and deaths not involving COVID-19.

Several factors such as age, ethnic group, and socio-economic status may be related both to obesity and the risk of death. We used Cox proportional hazards models to estimate the difference in the risk of death while adjusting for these factors. The models were fitted separately by sex and were adjusted for age, ethnic group, geographical factors (region, rural/urban classification), socio-economic characteristics (Index of Multiple Deprivation quintile group, highest qualification, National Statistics Socio-Economic Classification, household tenure), and most recently recorded smoking status (from primary care records). The models for death involving COVID-19 were further adjusted for COVID-19 vaccination status (no vaccination, one dose, two doses, or three doses) as a time-varying covariate.

Strengths and limitations

The primary strength of the study is the use of nationwide linked population-level data. This combines a rich set of demographic and socio-economic factors from the 2011 Census with electronic health records. This meant that we could adjust for a range of factors related to both obesity and mortality.

The PHDA only contains information for individuals who were enumerated at the 2011 Census. It does not include:

- people living in England in 2011 who did not participate in the Census (estimated to be approximately 5% of the population)
- respondents who could not be linked to the 2011 to 2013 NHS Patient Registers (5.4% of Census respondents)
- people who have immigrated since 2011

Because we used GDPPR to define the population at risk, the study population does not include people who were not registered with a general practitioner (GP) in England during the pandemic.

The prevalence of obesity in the study population was 28.7%. This is slightly lower than previous estimates from the Health Survey for England 2019. This may be because people who had no recorded body mass index or diagnosis code for body weight category in GDPPR (35.9% of the study population) were included in the "people without obesity" group. The most likely impact of this on the results is an underestimation of the association between obesity and mortality, as some people with obesity will have been misclassified as not having obesity.

The analysis does not capture changes in obesity status over time. Some people who were classified as people with obesity based on pre-pandemic GDPPR records may have since lost weight and no longer meet the criteria for obesity. Similarly, those classified as being without obesity may have since developed obesity. In addition, we could not identify whether the BMI measurement was taken during or shortly after pregnancy, which may result in some misclassification.

People were classified as smokers based on their most recently recorded smoking status in GDPPR over the period 1 January 2015 to 31 December 2019. 4.4% of the study population had an unknown smoking status. We did not differentiate between current smokers and former smokers in this analysis. We also did not account for duration of smoking or smoking frequency. Therefore, the adjustment for smoking status is likely to be incomplete.

The results in this release are based on people aged 30 to 64 years. Therefore, the findings may not be generalisable to people outside this age range. We focussed on this age group for two reasons. First, COVID-19 mortality in the working age population is of interest because it is a group with low mortality in general, and which saw a large increase in excess mortality during the pandemic. Second, excluding people aged over 64 years helped to mitigate against survivor bias, which can be an issue in older age groups. Since obesity is linked to a higher risk of death, people with obesity who survive until they are older may differ from those without obesity in ways that cannot be measured in our data. This would make it difficult to compare the risk of death between the two groups.

We could not control for all factors that may be related to both obesity and COVID-19 mortality because not all such factors are measured on the Census or recorded in electronic health records. As a result, the estimated associations may not fully reflect the causal effects of obesity on the risk of death.

Some of the characteristics included in the model were measured at the 2011 Census and therefore may not represent individuals' circumstances at the time of the COVID-19 pandemic. To mitigate this, we excluded people aged under 30 years, whose circumstances are most likely to have changed since 2011. We also updated place of residence based on information from primary care records. As a result, information on area deprivation, rural /urban classification, and region were up to date at the beginning of the pandemic.

7 . Related links

Coronavirus (COVID-19) latest insights
Interactive tool | Updated as and when data become available
Explore the latest data and trends about the coronavirus (COVID-19) pandemic from the Office for National Statistics (ONS) and other official sources.

8 . Cite this article

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