In depth: Long COVID

13 April 2021

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KEY INSIGHTS:

- **There is no internationally agreed definition of long COVID, which may be a single syndrome or a cluster of different post-infection complications**.

- **ONS estimates there were 932,000 people in the community population with self-reported post-COVID symptoms in England (1.7% of the population)** on 6 March 2021, with around 1 in 5 having symptoms after five weeks and nearly 1 in 7 having symptoms lasting more than 12 weeks. The most common symptoms at five weeks were fatigue (12%), cough (11%), and headache (10%).

- **Long COVID is most prevalent in the under 70s** - between 22 April 2020 and 6 March 2021 ONS estimates five-week prevalence was 23% in those aged 25-34 years, 26% in 35-49s, 25% in 50-69s and 16% in the over 70s.

- **Long COVID disproportionately affects ethnic minorities and women.** Groups that were previously considered at 'low risk' from COVID-19 are being affected by long COVID, including children, younger and middle aged adults, those with no pre-existing health conditions, and those who experienced mild disease and were not hospitalised with COVID-19.

- **Long COVID risks impacting the economy through absenteeism.** We estimate that from around 390,000 working age adults who could have experienced long COVID, 61,755 (16%) of them had symptoms that significantly reduced their ability to perform day-to-day activities, leading to 1.4 - 2.8 million working days lost. The cost of absenteeism due to long COVID symptoms was estimated between £158 - £316 million for the period from March 2020 to March 2021. This cost is only indicative and should be refined as new evidence emerges.

- **Long COVID risks adding pressures to both the secondary and primary care sectors.** 67% of GPs reported looking after patients with COVID-19 symptoms lasting longer than 12 weeks and preliminary data from an ongoing study at 31 UK hospitals suggests that long COVID patients may need specialist care.

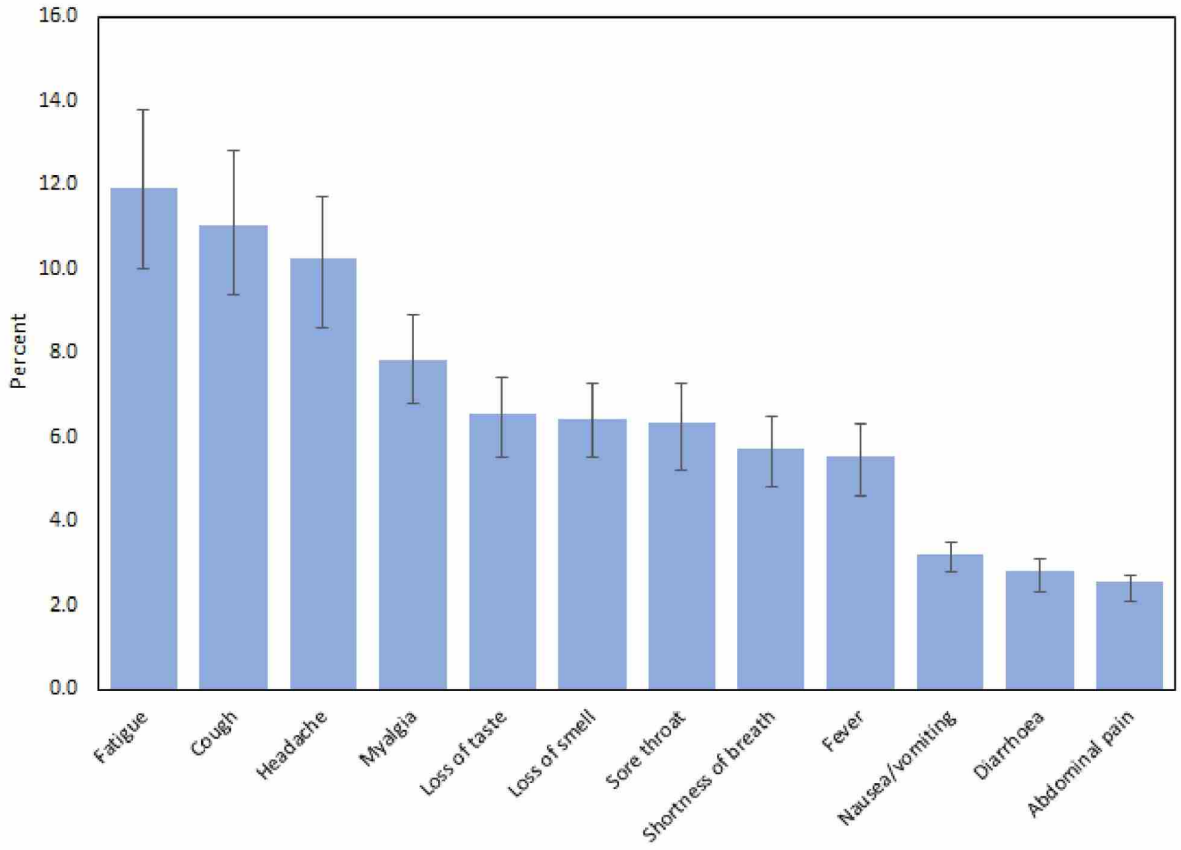
- **Healthcare workers are likely to be at particular risk of long COVID.** ONS estimated that in January 2020 COVID prevalence among those in patient-facing roles was almost double that of non-patient facing roles. In comparison to non-essential workers, healthcare workers had a more than sevenfold greater risk of severe COVID-19.

A. What is the agreed definition of long COVID (incl. symptoms, causes, risk factors, and prevalence amongst age and gender cohorts)?

1. **There is no internationally agreed definition of long COVID, which may be a single syndrome or a cluster of different post-infection complications**. NICE has identified three phases of post-COVID-19 infection, the latter two of which are commonly described as long COVID:[1]
    - Acute COVID-19: signs and symptoms of COVID-19 for up to four weeks,
    - Ongoing symptomatic COVID-19 (signs and symptoms of COVID-19 for between 4 and 12 weeks), and
    - Post-COVID-19 syndrome: signs and symptoms of COVID-19 that continue for more than 12 weeks and are not explained by an alternative diagnosis.
2. **ONS estimates there were 932,000 people in the community population with self-reported post-COVID-19 symptoms in England (1.71% of the population) at 6 March 2021**. Between 22 April 2020 and 6 March 2021, based on over 20,000 Coronavirus (COVID-19) Infection Survey (CIS) participants who tested positive for COVID-19 from a swab sample during study follow-up, 21% had symptoms five weeks after testing positive and 13.7% after 12 weeks.[2]
3. The National Institute for Health Research (NIHR) conducted a rapid evidence review in October 2020 and suggested that the symptoms described by early research and patient experiences could represent multiple different syndromes, including post-intensive care syndrome, post-viral fatigue syndrome, long-term COVID syndrome, and those with permanent organ damage to the heart and lungs.[3] The ONS identified the most common symptoms at five weeks were fatigue (12%), cough (11%), and headache (10%) (Figure 1).[2] A study conducted by King's College London based on data from the ZOE app identified two main groups: those with respiratory symptoms and others with multisystemic symptoms, which affect any system in the body and often overlap and/or fluctuate, including fever and gastroenterological problems. It is difficult to assess what proportion of people reporting symptoms will require medical care and which symptoms are directly associated with COVID-19 virus.[4]
4. **Long COVID is most prevalent in the under 70s** - between 22 April 2020 and 6 March 2021, ONS estimates five-week prevalence was 23% in those aged 25-34 years, 26% in 35-49s, 25% in 50-69s and 16% in the over 70s. Prevalence at five weeks was slightly higher in females than males, at 23% and 18% respectively.[5] SAGE research suggests females under 50 are twice as likely to report severe fatigue, over five times more likely to report incomplete recovery or a new disability, and over six times more likely to report increased breathlessness compared to males under 50.[6] Other studies found that long COVID was more likely given female sex, increasing age and Body Mass Index (BMI), the development of 5 or more symptoms during the first week of acute infection, and among patients suffering from asthma.[7]

Note: ONS plans to update the prevalence estimate on a monthly basis, including stratification by severity and duration, and evaluating a range of risk factors for long COVID symptoms (such as age, sex, ethnicity, occupation, pre-existing conditions, and COVID-19 variant).

Figure 1: Estimated five-week prevalence of symptoms among Coronavirus Infection Survey (CIS) participants testing positive for COVID-19, UK, 26 April 2020 to 6 March 2021
(Source: ONS)



B. What are the most significant socioeconomic impacts of long COVID (incl. staff absences for businesses and personal impact on inability to work)?

5. Emerging evidence suggests long COVID is likely to have an important social and economic impact through its disproportionate effects on certain groups of people, its impact on output and productivity due to sickness and absence from work, and its mental health impact. However, limited evidence so far prevents drawing any robust conclusions.

6. Evidence from ONS and academic literature indicates long COVID is likely to have disproportionate effects on certain groups of people. Groups that were previously considered at 'low risk' from COVID-19 are being affected by long COVID, including children, younger and middle aged adults, those with no pre-existing health conditions, and those who experienced mild disease and were not hospitalised with COVID-19.[8,9,10]

7. In addition to disproportionately higher case rates, ethnic minority groups face greater risk of experiencing post-discharge complications compared to white groups, and may disproportionately experience long COVID.[11] Ethnic minority groups also have poorer access to healthcare services and commonly cite poor past experiences of care and medical treatment.[13] ONS estimates of long COVID prevalence rates was higher amongst those living in deprived areas.[12] **Long COVID, therefore, has the potential to exacerbate pre-existing health and societal inequalities in the long term.**

8. In a post-pandemic context, long COVID has the potential to become a chronic condition that could both affect output and productivity due to absence from work, and worsen existing socioeconomic inequalities. In an international web-based survey (3,762 respondents of suspected and confirmed COVID-19 cases with illness lasting over 28 days and onset prior to June 2020), nearly half of respondents reported having to work reduced hours as a result of long COVID, and almost a quarter were not working at all. Many had to take months of leave before going back to work and often required phased returns and/or other workplace arrangements, like flexible hours and the ability to work from home.[14] **This is likely to disproportionately impact those on lower wages and in low income groups** who are less likely to be able to bargain for such arrangements, and for whom taking an extended period of leave or working fewer hours may make it more difficult to pay bills and other outgoings.

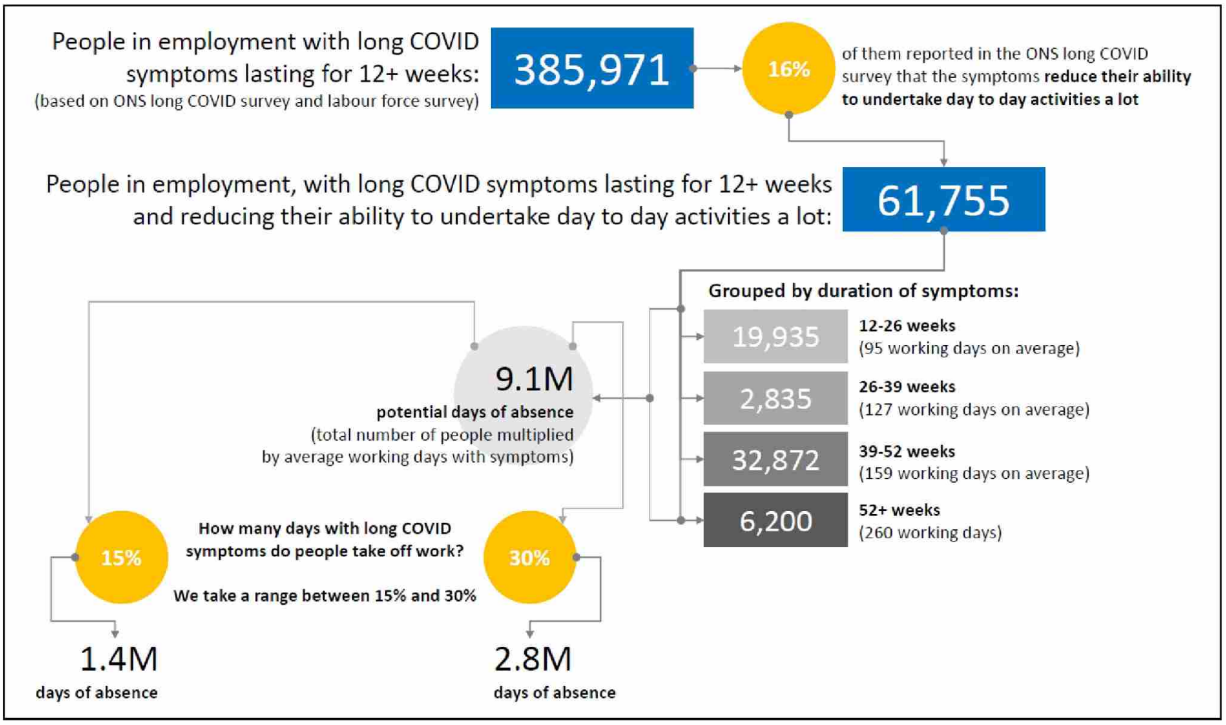
9. Given the paucity of data on long COVID and lack of an agreed definition, it is difficult to estimate the economic impact of this new condition. However, using the ONS long COVID survey published on 1 April 2021 and experimental data, we have attempted to give an indication of the cost of sickness absence due to long COVID.[3] This analysis is based on experimental data and should be used as a guide. It was not possible to determine the number of days of absence as a result of long COVID, therefore, we calculated the average number of days with symptoms that significantly affect an individual's ability to perform day-to-day tasks (ONS long COVID survey) and assumed that a worker suffering with these symptoms might take 15%-30% of that time off

work. This range could be an under/over estimate depending on a person's type of occupation and their ability to work from home. We do not account for demographic variables or pre-existing conditions in these analyses. We cannot estimate the cost per symptom or co-morbidity due to a lack of data.

10. Based on the latest ONS survey on long COVID symptoms and the ONS Labour market survey, 385,971 people in employment are reporting long COVID symptoms of varying duration and severity.[15] In the survey, 16% of working age respondents report that long COVID symptoms reduce their ability to undertake day-to-day activities a lot. This means that around **61,755 people in employment, report symptoms that have a significant impact on their day to day life**.

11. The ONS long COVID symptoms survey asks respondents to report on the duration of their symptoms and answers are grouped in the following way: from 12 to <26 weeks, from 26 to <39 weeks, from 39 to <52 weeks and for 52+ weeks. We took the median value of these ranges (for working days only) and multiplied by our estimates of the population in employment that fall under each range before making the assumption that people would take 15%-30% of that time off work. These calculations place **the number of work days lost because of long COVID symptoms in the range of 1.4M - 2.8M days** in a year. To put these numbers into perspective, the total number of days lost in 2020 through all sickness absence was 118.6M.[16] As a percentage of the total number of days worked in a year, this range of working days lost is estimated to be between 0.02% and 0.04% of all working days in England.

Figure 2: Estimated number of days of absence due to long COVID based on population in employment
(Source: Analysis and Data Directorate, C-19 Taskforce)



12. To calculate an indicative cost of the above days of absence, we used the ONS annual survey of hours and earnings (April 2020) from which we took the weekly average for England: £564.96.[17] The above range of days potentially lost to long COVID if valued based on the average weekly earnings, gives us a **cost of absenteeism due to long COVID from £158M to £316M**. This is only the cost of wages lost and is used as a proxy, given the lack of data to calculate lost output which would most probably be higher. Other analyses examining total productivity loss estimate the cost to be over £2bn. Assumptions underpinning those analyses will need to be examined rigorously and revised as new evidence develops.

13. For every person that suffers from **long COVID with symptoms that significantly affect their ability to perform day-to-day tasks, the cost of absenteeism is from £2,558 to £5,116 per person**. For every person infected with COVID-19 regardless of the symptoms they develop, **the cost of absenteeism from those developing long COVID is from £14.93 to £29.86 per person**. This is purely the cost calculated as wages lost but further analysis needs to be conducted to understand the true cost to the individuals (taking into account that a substantial proportion of the population have sick pay or receive SSP).

14. To understand the cost of long COVID in QALYs lost we need to split the infected population in two: those hospitalised and those not hospitalised but suffering from chronic respiratory disease, cardiovascular diseases, musculoskeletal disorders, mental disorders and other health issues as a result of infection. Based on a study released by the Scientific Advisory Group for Emergencies (SAGE) each hospitalisation for COVID-19 has a long-COVID QALY loss for a 1-year time horizon from infection of 0.35 QALYs.[18] Our analysis of infections by age estimates that 137,387 working age people infected with COVID-19 have been hospitalised from the start of the pandemic. Based on this, **the total QALYs lost to long COVID for the working age population (hospitalised) is 48,085**. For non-hospitalised populations the estimate is not as clear. Based on a scenario from the same study, the **total QALYs lost for those not hospitalised can be as high as 1.3 million** but this is not for long COVID specifically and it is not possible at the moment to refine this number for the working age population only.

C. What is the impact of long COVID on the health system?

15. **Long COVID is likely to increase demand for healthcare services.** Although pressures on the NHS are currently being felt most acutely in hospitals, it is likely that the burden of long-term illness would fall mostly on primary, mental health, and community care services.

    - **Long COVID is likely to worsen mental health in those affected**. In a study by the International Severe Acute Respiratory and emerging Infections Consortium (ISARIC),based on self-reported data of 325 people who survived hospital admission, participants reported a drop in quality of life including greater difficulty doing day-to-day activities and increases in anxiety, depression, and pain.[19] Moreover, some of the groups listed above (for example, females, young people, and ethnic minority groups), who are more likely to experience long COVID symptoms, have already reported deteriorated mental health and wellbeing during the pandemic.[20] This could potentially lead to increased demand for mental health services, however, further research is needed to better understand the full impacts.

    - A study led by ONS and the University of Leicester found that **readmission rates in hospitalised COVID-19 patients were 3 times higher than in control groups**, as were new onset cardiovascular (3 times), respiratory (27 times), and diabetic (1.5 times) events (Figure 3), with the greatest risks observed among those over the age of 70 and in ethnic minorities.[21] The study found that a third of COVID patients were readmitted to hospital after 140 days, a similar rate to other patients with acute respiratory disease.[22] More information is needed to understand the the implication of readmission among long COVID patients.

    - A large study published in the Lancet found evidence for **substantial neurological and psychiatric morbidity in the 6 months after COVID-19 infection**. Of 236,379 patients diagnosed with COVID-19, c.34% received a neurological or psychiatric diagnosis in the following 6 months, with c.13% receiving their first such diagnosis. Diagnoses were more common in patients who had COVID-19 than in those who had influenza or other respiratory tract infections. Risks were greatest in, but not limited to, patients who had severe COVID-19.[23]

    - According to a survey by the Royal College of GPs conducted in September 2020, **67% of GPs were looking after patients with COVID-19 symptoms lasting longer than 12 weeks.**[24] The same survey found that 76% of GPs described long COVID patients reporting sleep disorders or mood changes, suggesting an impact on mental health services. More information on the proportion of GP patients suffering from long COVID and the care needed is required to assess the pressures in the primary care sector.

    - Electronic health record data from 69 million individuals in the USA also showed that a diagnosis of **COVID-19 was associated with an increased incidence of a first psychiatric diagnosis** between 14 and 90 days after diagnosis, with the greatest risk observed for anxiety disorders, but also depression, insomnia, and dementia. At 90 days, the estimated

probability of having been diagnosed with a new onset psychiatric illness following COVID-19 was 5.8%, significantly higher than for six other health events (influenza, other respiratory tract infections, skin infection, cholelithiasis, urolithiasis, and fracture of a large bone).[25]

- Preliminary data from an ongoing study of hospitalised COVID patients at 31 UK hospitals suggests that there may be further health impacts for which hospitalised patients may need specialist care. **24% of the 318 participants reported a new disability.** New disabilities included significant deterioration in sight, walking, memory, self-care, and communication.[26]

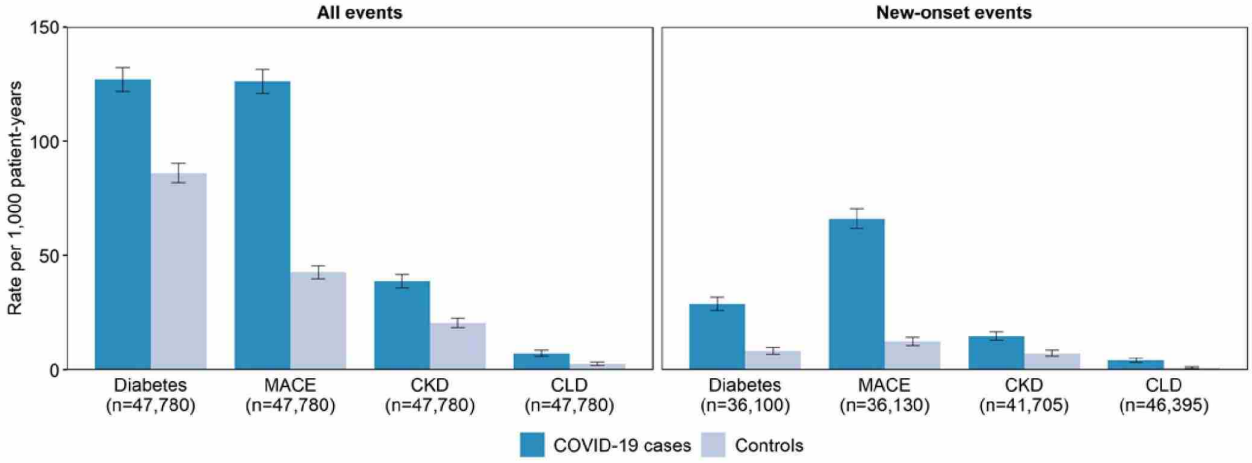
- A UK observational study of 1,077 adults discharged from hospital with a clinical diagnosis of COVID-19 reported that five months after discharge, only 29% felt fully recovered, 20% had a new disability, and 19% experienced a health-related change in occupation. More than a quarter also had clinically significant symptoms of anxiety and depression, and 12% had symptoms of post-traumatic stress disorder (PTSD).[27]

- **The type of services required to treat long COVID might change the skill mix and demand for specific healthcare services**. Early evidence suggests that long COVID patients might need rehabilitation care.[28] The current system may not have enough capacity to provide rehabilitation care to meet this increasing demand.

16. **Long COVID risks reducing workforce availability.** Many healthcare workers were exposed to the virus and consequently became infected. ONS estimates that COVID prevalence among those in patient-facing roles is almost double that of non-patient facing roles during peak periods, around 3-3.5% compared to 1.5-2.5% respectively in January 2020.[29] **Health and social care workers also experienced the highest prevalence rates of self-reported long COVID** (3.6% and 3.1% respectively compared to 2.08% in other employment sectors).[3] Staff absence related to COVID reached a high of 4.3% for all staff, 5.5% among nurses, and 2.3% among doctors on 14 January.[30] Evidence also suggests that in the first wave, **in comparison to non-essential workers, healthcare workers had a more than sevenfold greater risk of severe COVID-19.**[31] In the long run, there are increased risks of long COVID-related staff absence among healthcare workers.

Figure 3: Rates of adverse events in discharged COVID-19 patients in England compared with matched controls

(Sources: Hospital Episode Statistics to Aug 2020, General Practice Extraction Service data to Sep 2020, death registrations to Sep 2020[19])



- Diabetes includes both type 1 and type 2, MACE: major adverse cardiovascular event (a composite of heart failure, myocardial infarction, stroke and arrhythmia), CKD: chronic kidney disease stages 3-5, including dialysis and kidney transplant, CLD: chronic liver disease
- Matching variables: age, sex, ethnicity, region, IMD quintile, smoking status, pre-existing conditions (hypertension, MACE, respiratory disease, CKD, CLD, diabetes, cancer)

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[4] Sudre et al., Attributes and predictors of Long-COVID: analysis of COVID cases and their symptoms collected by the COVID Symptoms Study App, 21 October 2020

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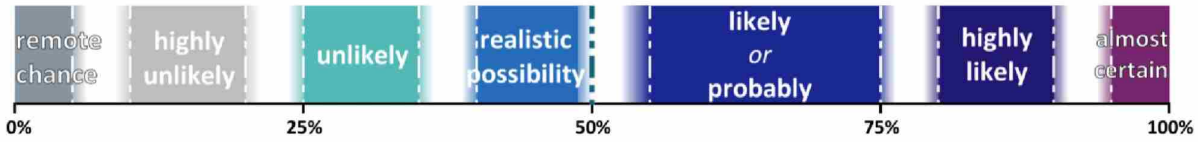
[29] ONS, Modelled daily rates of the percentage of the population testing positive for COVID-19 by patient-facing role and age, England, 27 January 2021

[30] NHS England data, unpublished

[31] Mutambudzi et al., Occupation and risk of severe COVID-19: prospective cohort study of 120 075 UK Biobank participants, 9 December 2020

Probabilistic language



Confidence Statement

There remains much uncertainty around the clinical presentation of long COVID including the mechanism through which COVID-19 leads to complications following discharge and the frequency of severe post-COVID-19 complications. As such, it is too soon to determine the potential impact on health care. Similarly, whilst it is highly likely that long COVID will have economic impacts, the magnitude will remain uncertain until we have better data on the relationship between long COVID and time off work, and the effectiveness of therapeutics in treating symptoms. The estimate of human capital costs is based on experimental data which does not fully capture the severity of symptoms of long COVID and time taken off work as a result. Furthermore, we have not been able to disaggregate this estimate by sector, or disproportionately impacted groups, and the data does not shed light on co-morbidity and the associated costs.	**Low**