Point Prevalence Estimates of Activity-Limiting Long-Term Symptoms among U.S. Adults ≥1 Month After Reported SARS-CoV-2 Infection, November 1, 2021

Short title: Prevalence of post-COVID conditions

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Abstract

Background: Although most adults infected with SARS-CoV-2 fully recover, a proportion have ongoing symptoms, or post-COVID conditions (PCC), after infection. The objective of this analysis was to estimate the number of US adults with activity-limiting PCC on November 1, 2021.

Methods: We modeled the prevalence of PCC using reported infections occurring from February 1, 2020 – September 30, 2021, and population-based, household survey data on new activity-limiting symptoms ≥1 month following SARS-CoV-2 infection. From these data sources, we estimated the number and proportion of US adults with activity-limiting PCC on November 1, 2021, as 95% uncertainty intervals, stratified by sex and age. Sensitivity analyses adjusted for under-ascertainment of infections and uncertainty about symptom duration.

Results: On November 1, 2021, at least 3.0–5.0 million US adults were estimated to have activity-limiting PCC of ≥1 month duration, or 1.2%–1.9% of US adults. Population prevalence was higher in females (1.4%–2.2%) than males. The estimated prevalence after adjusting for under-ascertainment of infections was 1.7%–3.8%.

Conclusion: Millions of US adults were estimated to have activity-limiting PCC. These estimates can support future efforts to address the impact of PCC on the U.S. population.

Key words: Post-COVID conditions; long COVID; disability; COVID-19; modeling; prevalence

Introduction

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome associated coronavirus 2 (SARS-CoV-2), has had a devastating global impact. In the United States, almost 1 million COVID-19-related deaths were reported through April 2022 [1]. Although most individuals infected with SARS-CoV-2 survive, a proportion experience post-acute sequelae that may last for weeks or longer [2, 3]. Various post-COVID conditions (PCC), often referred to as long COVID, have been described. Common among them are fatigue and body aches, respiratory symptoms, and neurocognitive dysfunction, although a variety of additional sequelae are observed [4-7].

Understanding the prevalence of PCC is important for enumerating the full impact of the COVID-19 pandemic, allocating resources and developing evidence-based prevention and management strategies, and planning for and mobilizing healthcare and social support services. Although several clinical case definitions for PCC have been developed [8, 9], a universally agreed definition does not exist [10-12]. Challenges in defining PCC and evaluating its prevalence include non-specific signs and symptoms that may have other causes; knowledge gaps in pathophysiology [13, 14]; limited duration of follow-up leading to incomplete understanding of its natural history; and heterogeneity in design, outcomes, and populations evaluated across published studies [15].

We developed a model-based approach to provide estimates of the point prevalence of activity-limiting PCC among US adults on November 1, 2021. These estimates are intended to provide a foundation for future research focused on estimating the prevalence of PCC over time as the COVID-19 pandemic evolves and definitions of and instruments for assessing PCC continue to mature.

Methods

Data sources

Our objective was to estimate the number of adults (aged ≥18 years) residing in the US on November 1, 2021 experiencing PCC that adversely affected their daily activities at least 1 month following infection with SARS-CoV-2. In developing the estimates, we chose reported activity-limiting symptoms attributed to prior SARS-CoV-2 infection as our primary outcome to capture PCC associated with significant functional impairment. Other PCC-related outcomes reported in published studies [15], such as ≥1 persistent symptom of any severity or new clinical diagnoses, were not evaluated and might lead to different estimates of PCC prevalence. The period of at least 1 month post-infection corresponds with Centers for Disease Control and Prevention (CDC) definitions of PCC [16].

We developed PCC point prevalence estimates using two primary data sources. First, to estimate the number of adults in the general US population who were at risk of having PCC on November 1,2021, we used the total number of infections reported to CDC through the Nationally Notifiable Disease Surveillance System (NNDSS) between February 1, 2020 and September 30, 2021 [17]. We used data through September 30, 2021, to predate the effects of the Omicron variant and its sublineages (because the probability of PCC after Omicron may be different from the probability of PCC after previous variants), and of reinfections with SARS-CoV-2, which have been reported with increasing frequency subsequently [18]. November 1, 2021 was selected for estimating the point prevalence of PCC to allow at least a 1-month interval between time of infection, for those most recently infected, and initiation of PCC.

The second primary data source was the household Coronavirus Infection Survey (CIS) conducted by the Office for National Statistics in the United Kingdom (UK) [19]. This data source employs population-based sampling including non-hospitalized adults with primarily mild or

asymptomatic acute SARS-CoV-2 infection, to represent most SARS-CoV-2 infections. In the CIS, persons with PCR-confirmed SARS-CoV-2 infection were asked the following questions, “Would you describe yourself as having ‘long COVID’, that is, you are still experiencing symptoms more than 4 weeks after you first had COVID-19, that are not explained by something else?” If yes: “Does this reduce your ability to carry-out day-to-day activities compared with the time before you had COVID-19?”

Summary CIS data on responses to these questions were available from participants recruited April 2020 through August 2021 within strata defined by days since positive test (range 42 to 168 days), sex, age group (18-49, 50-64, ≥65 years), and severity of acute infection (asymptomatic or symptomatic) [20]. All CIS participants are regularly tested for SARS-CoV-2, irrespective of symptoms, so the data include both symptomatic and asymptomatic infections. However, the CIS is a household survey and does not include people in communal establishments such as hospitals or care homes. In order to estimate PCC for persons from inpatient settings who were included in NNDSS counts, we assumed their probability of PCC was 1.5 to 3.5 times greater than the PCC probability among those who were symptomatic but not hospitalized. These estimates were based on evidence demonstrating that various symptoms and other post-COVID-19 sequelae correlate with the severity of acute SARS-CoV-2 infection [4, 21, 22].

CDC receives reports of SARS-CoV-2 infections from US states and other jurisdictions in two primary ways (1). For a portion of infections, line listed (LL) data are reported. These reported cases (including asymptomatic infections identified by laboratory testing results) include information on date of testing, age, sex, hospitalization status on date of testing, and acute COVID-19-related symptoms experienced when the SARS-CoV-2 test was administered. CDC also receives aggregate counts of SARS-CoV-2 infections in which only the total numbers of cases are reported over time (i.e., no additional information beyond date of report is provided). Given the lack of identifying information in either data source, it is not possible to determine the precise extent of overlap in counts of reported infections in

the LL and aggregate data. More than 26 million non-fatal SARS-Cov-2 infections among persons aged ≥ 18 years were reported in LL format between February 2020 and September 2021. However, LL data underestimates the total number of reported infections. During the same period, approximately 36 million non-fatal SARS-CoV-2 infections were reported among those aged ≥18 years in aggregate form. To develop a more complete estimate of reported cases, we added the difference between the number of non-fatal infections reported in aggregate and the number reported in LL format.

The prevalence of PCC among the US adult population on November 1, 2021, was estimated through a series of steps with associated uncertainty assumptions (Table 1). The general steps in the estimation process were: 1) assignment of both the LL and aggregate counts of adult non-fatal infections to two-month time intervals corresponding to dates of case reports ranging from February-March 2020 through August-September 2021; 2) imputation of data on age group, sex, and severity of SARS-CoV-2 acute infection when missing in the LL data and for the entire collection of aggregate data; 3) estimation of excess reported infections in the aggregate data, with excess infection counts added to the appropriate strata of the LL data; 4) application of stratum-specific PCC probability estimates from the CIS to corresponding strata of US adults at risk for PCC; and 5) summation of estimates across time-since-infection intervals.

The modeled measures of PCC prevalence are summarized using 95% uncertainty intervals (UI) derived from 10,000 Monte Carlo realizations of the model outputs. Variation across these Monte Carlo samples reflects repeated sampling from the assumed uncertainty distributions for model input parameters (Supplementary Appendix Table A2, Supplementary Appendix equations [1] – [5]). The lower and upper limits of the UIs are defined by the 2.5^{th} and 97.5^{th} percentiles of the of 10,000 Monte Carlo realizations.

We expect our estimates of the number of US adults at risk for PCC to be underestimated, because of undiagnosed SARS-CoV-2 infections and under-reporting of diagnosed infections [1, 23]. We used a modified version of our modeling approach to evaluate the potential impact of this likely under-estimation on the PCC prevalence estimates. This sensitivity analysis was conducted by inflating the reported number of infections in the combined LL and aggregate data by a multiplier based on the ratio of the estimated seroprevalence of SARS-CoV-2 in the US to the corresponding time-specific reported number of infections [1, 23].

Estimates of the probability of having a PCC with time since infection were available from the CIS for time periods ranging from 42 to 168 days after testing, corresponding to intervals of approximately 1 to 6 months after infection. Using the combined LL and aggregate data, however, we were able to estimate the number of persons at risk for PCC ranging from 1–2 months (August-September 2021) to 19–20 months (February-March 2020) prior to the prevalence estimation target date of November 1, 2021. As a result, it was necessary to assume trends in probability of PCC for time-since-infection periods greater than 6 months. Based on trends observed in the CIS, the probability of PCC was assumed to be constant beyond 6 months in the base model. To investigate the impact of violations of this assumption, we considered an alternative model in which the probability of having a PCC decreased for times since infection greater than 6 months at a rate similar to that observed among symptomatic CIS participants during the first 6 months post-infection. Details on the modeling steps and assumptions used to conduct both sensitivity assessments are presented in the Supplementary Appendix. Analyses were conducted using R Version 4.0.3 (Vienna, Austria). The project was determined to be a non-research, public health surveillance activity by CDC. We performed secondary data analysis on de-identified cases reports and survey responses; written informed consent was not obtained.

Results

Model Estimates

Through September 30, 2021, approximately 36.3 million SARS-CoV-2 infections were reported in US adults (Table 2), including 19.2 million (53%) in females and 23.1 million in adults 18-49-years old (64%) [Table 2]. Of these reported infections, we estimated that approximately 24 million (66%) were symptomatic but not hospitalized for acute infection, 10 million (28%) were asymptomatic and not hospitalized, and 2 million (6%) were hospitalized for acute infection. The number of reported infections peaked at 10 million in the December 2020 – January 2021 time interval with an upward trajectory in cases by September 30, 2021, when the Delta variant predominated in the US (Figure 1). The time between infection and November 1, 2021, was 1–6 months for 22% of persons, 7-12 months for 44%, and >12 months for 34%, with a median period of 10 months.

Survey response rate in the CIS survey ranged from 51% during the initial pilot phase in April 2020, when eligible households included respondents to prior ONS surveys, to 12% in August 2021 after enrollment was expanded to include households randomly selected from address lists [24]. Among those who enrolled, loss to follow-up rates were low. Defining loss to follow-up as formal withdrawal from the study or non-attendance at the three mostly recently scheduled follow-up visits (loss of contact), the average monthly attrition rate was <1% through 2021. From the CIS household survey data, among adults who were generally not hospitalized for acute SARS-CoV-2 infection, the estimated probability of having PCC was higher among those with symptomatic compared to asymptomatic acute infection and in females compared to males (Figure 2). The estimated percent of persons with confirmed SARS-CoV-2 infection who were not hospitalized due to infection during the acute phase and reported new activity-limiting symptoms 42 days post infection ranged from 22.7% among symptomatic females aged 50-64 years to 3.3% among asymptomatic males aged ≥65 years old. At 168 days post infection,

the percentage who reported PCC ranged from 16.8 % among symptomatic females aged 50-64 years to 3.0% among 18-49-year-old asymptomatic males.

Overall, 3.0–5.0 million US adults with documented SARS-CoV-2 infection were estimated to be living with activity-limiting PCC on November 1, 2021, representing approximately 1.2%–1.9% of the US adult population (Table 2). An estimated 0.4–1.3 million cases of activity-limiting PCC were estimated among adults hospitalized during acute infection, corresponding with 13%–25% of all PCC cases. The prevalence was higher in females (1.4%–2.2%) than males (0.9%–1.7%). Adults aged 50-64 years had the highest prevalence of activity-limiting PCC, with an estimated 1.5%–2.5% prevalence, and lower estimates for adults 18-49 and ≥65 years old.

Sensitivity analyses

In a model incorporating seroprevalence estimates to account for under-ascertainment of infections [23], we estimate that 61.3-90.6 million SARS-CoV-2 infections occurred in US adults through September 30, 2021 (Table 3). With adjustment for under-ascertainment of infections, 4.3–9.7 million US adults with any SARS-CoV-2 infection were estimated to be living with activity-limiting PCC, representing 1.7%–3.8% of the US adult population. A second sensitivity analysis, assuming a decrease in the probability of having PCC beyond 6 months and holding other parameters from the primary model constant, resulted in lower PCC prevalence compared to the primary model, with an estimated 2.2–4.2 million US adults living with PCC on November 1, 2021, representing approximately 0.9%–1.6% of the US adult population.

Discussion

Using a model-based approach, we estimated that at least 3.0 to 5.0 million US adults were living with activity-limiting symptoms of PCC on November 1, 2021. Accounting for underdiagnosis or underreporting of SARS-CoV-2 infections, we estimated that 4.3–9.7 million adults were living with

activity-limiting PCC at this time. These are pre-Omicron period estimates, which relied on reported infections and used activity-limiting symptoms as criteria for PCC, so they are conservative estimates. Estimates further accounted for uncertainty due to limitations of data sources and an incomplete understanding of the natural history of PCC. The prevalence of PCC is expected to be dynamic and influenced by temporal changes in the incidence of infections with circulating SARS-CoV-2 variants and the distribution of time since infection [25, 26]. As the COVID-19 pandemic continues, population-level immunity has increased, with a growing proportion of infections occurring in those with prior infection and those who received COVID-19 vaccinations. This accumulated immunity may further affect the risk of PCC [24, 27-30]. Notably, even our conservative estimates suggest a substantial prevalence of activity-limiting symptoms lasting for weeks to months after SARS-CoV-2 infection. This foundational study highlights an urgent need for basic science, epidemiological and clinical research to understand the pathophysiology of and risk factors for PCC, and an evidence base to guide medical management, as well as to assist with planning for and mobilizing healthcare and social support services [31].

A strength of this analysis is the use of data from national surveillance system of SARS-CoV-2 cases and hospitalizations combined with data from a population-based, longitudinal household survey of individuals after acute infection, most of whom experience mild infection not requiring hospitalization or asymptomatic infection [32, 33]. In contrast, other PCC studies have generally focused on the severe end of the spectrum of acute illness [15], and have often cross-sectionally measured heterogeneous outcomes that may not correlate with functional impairment. A recent systematic review found that a majority of published studies report at least 1 post-acute sequelae of COVID-19 in more than 50% of survivors, including at follow-up periods of >6 months [15]. Compared to a baseline (reference) period predating infection, the CIS captures new onset of activity-limiting symptoms of 4 weeks or longer with longitudinal evaluations. Although the survey relied on self-reporting and did not include a SARS-CoV-2-negative comparator population, new onset of impairment evaluated in the survey is likely to reflect

ongoing illness correlating with need for clinical or other support services. Multipliers were used to estimate the probability of having PCC in adults after hospitalization for acute infection because of the limitations of household survey data. These individuals may experience long-term sequelae of COVID-19 from pathophysiological mechanisms and underlying sequelae that follow less severe acute infection, as well as through additional mechanisms associated with severe disease [34]. Uncertainty in the estimates of probability of having PCC in adults after hospitalization for acute infection is unlikely to have a large impact on prevalence estimates, even though the probability of PCC is higher for those who were hospitalized, as a minority of SARS-CoV-2 infections result in hospitalization [35].

The estimated prevalence of PCC was higher in females than males, reflective of higher reporting of activity-limiting symptoms among females participating in the household survey. Similar findings have been observed across studies that assessed a variety of PCC-related outcomes [36-38]. Although mechanisms are unclear, differences by sex have been observed in other chronic syndromes that have overlapping characteristics with PCC, including myalgic encephalitis/chronic fatigue syndrome (ME/CFS) [39]. Estimates stratified by age suggest that PCC prevalence is distributed across age groups, with highest prevalence among adults aged 50-64 years. Notably, the estimated risk was lower both in younger (18-49-years of age) and older (≥65-years of age) adults. This finding may reflect a higher risk of death in older adults [40] or higher vaccine coverage (and associated lower PCC risk) in older compared to younger adults sampled in the CIS. Limitations of data sources precluded the application of our model to generate estimates of the prevalence of PCC by race or ethnicity among US adults.

These estimates are subject to several limitations. Multipliers were used to scale the probability of having PCC in adults hospitalized for acute SARS-CoV-2 infections due to the absence of direct sampling in the UK household surveys. We did not account for differential PCC risk in those experiencing reinfection or with prior COVID-19 vaccination due to limitations of survey data. Because the majority of SARS-CoV-2-positive CIS participants were unvaccinated at the time of infection over the study period

[30], sample size was insufficient to include activity-limiting PCC by vaccination status cross-stratified by age, sex, and severity of acute illness. This analysis predated circulation of the Omicron variant and its sublineages, which is associated with less severe COVID-19 compared to previously circulating SARS-CoV-2 variants, and potentially differential risk of PCC [25, 27]. Several key parameters had a large degree of uncertainty. To account for these uncertainties, sensitivity analyses were performed to provide a broader range of prevalence estimates.

UK household survey data were used to estimate the probability of having PCC over time in a US population. Models did not account for differences between populations, such as differences in certain sociodemographic characteristics, vaccine coverage and products, underlying health conditions, and access and availability of health services that may influence the probability of experiencing PCC and reporting activity-limiting PCC. COVID-19 vaccination before, as well as after, incident SARS-CoV-2 infection may modify the risk of PCC and risk of continuing to experience persistent symptoms in those who already have symptoms when vaccinated [24, 30]. Differences in COVID-19 vaccination coverage over time between the UK and US may therefore contribute to differences in the risk of activity-limiting PCC between settings, although infections among individuals fully vaccinated against COVID-19 were relatively uncommon during the study period. A recent systematic review and meta-analysis also found differences in PCC risk across geographic regions, but some of these differences may be attributable to differences in sociodemographic characteristics, follow-up time, and COVID-19 study populations including severity of infections, among other factors [41]. Our analysis included longitudinal follow-up and results were stratified into meaningful groups, including age, sex, and severity of acute illness, likely to correlate with risk of activity-limiting PCC across different settings. Modeling methods, including use of US case data, may address some of the differences in the underlying SARS-CoV-2-infected population between the US and UK.

Finally, in the absence of a universally accepted definition of PCC, we used a primary outcome measure intended to capture self-reported PCC that interfered with daily activities. Self-reported outcomes may be subject to bias and other definitions of PCC likely would have resulted in different estimates. Respondents may also define activity-limiting symptoms differently and the survey does not capture the severity of activity-limiting symptoms. Use of existing functional scales that grade severity might provide more granularity on degree of disability associated with PCC.

Our findings conservatively suggest that millions of US adults were living with activity-limiting symptoms of PCC on November 1, 2021. The modeling framework used for this analysis is intended to serve as a foundation for future research estimating and monitoring the prevalence of PCC. Further analyses will need to consider growing population immunity through natural infection and vaccination, differences in risks of PCC with Omicron or other emerging variants, and changing probabilities of having PCC with longer times since infection. Ideally, estimates should be stratified by race and ethnicity, age groups that include children, and other sociodemographic characteristics. These estimates provide an initial framework to understand the prevalence of PCC in the adult US population and highlight the importance of continued prevention efforts to reduce the incidence of SARS-CoV-2 infections and mitigate not only acute COVID-19 but also the subsequent impact of long-term, activity-limiting symptoms among adults.

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Table 1. Steps and key underlying assumptions used to model estimates of prevalence of activity-limiting post-COVID conditions among US adults on November 1, 2021

Step in Estimation Process	**Key Assumptions**
Use 26,606,924 LL records for survivors of SARS-CoV-2 infection among those ≥ 18 years of age into strata defined by date of infection in 2-month intervals, sex, age group, and severity of acute infection (i.e., hospitalization/symptom status).	Those classified as hospitalized and asymptomatic were not hospitalized for SARS-CoV-2 infection.
	Missing information on hospitalization and symptom status can be imputed based on LL data for which these data are available.
	Persons with LL records missing hospitalization status are more likely not to have been hospitalized than those with records in which hospitalization status is documented.
	Persons with LL records missing symptom status (asymptomatic/symptomatic) are more likely to be asymptomatic that those with records in which symptom status is documented.
	Reinfections comprise a negligible proportion of infections reported in the LL data.
Add estimated excess number of survivors[†] of infection reported to CDC in aggregate[§] form to LL stratum-specific infection counts to obtain total confirmed SARS-CoV-2 infections reported to CDC from February 2020 through September 2021 in strata of 2-month date of infection	Excess numbers of survivors of confirmed SARS-CoV-2 infections reported to CDC can be estimated as the difference in counts of survivors of infection between the aggregate and LL data in jurisdictions where both LL and aggregate data are reported.
	Sex, age group, and hospitalization/symptom status

interval, sex, age group, and severity of acute infection (i.e., hospitalized, non-hospitalized symptomatic, and non-hospitalized asymptomatic).	for additional survivors of infection reported in aggregate data can be imputed using the distribution of infections across these strata observed in the LL data.
	Reinfections comprise a negligible proportion of infections reported in the aggregate data.
Apply stratum-specific probabilities of reporting PCC that limits daily activities from the UK Coronavirus Infection Survey (CIS) data to the appropriate stratum-specific infection counts reported to CDC.	Responses from UK CIS participants are representative of responses that would be expected if the survey was conducted among US residents with confirmed SARS-CoV-2 infection who were infected between February 2020 and September 2021. Those who were hospitalized for COVID have a probability of having PCC that is 1.5 to 3.5 times greater [4], regardless of time since infection, than the risk for those with an infection that was symptomatic but did not require hospitalization.

* Line listed data are comprised of an individual record for each reported infection. Date of testing, age group, and hospitalization and symptom status are either recorded or reported as missing on each record.

† Sum of aggregate reported infections minus reported aggregate deaths within 2-month time of infection intervals.

§ Reported to CDC as aggregate counts of infections and deaths, by date.

Table 2. Estimated point prevalence of the number of adults in the United States with activity-limiting post-COVID conditions (PCC), November 1, 2021

	Cumulative reported SARS-CoV-2 infections that occurred through 9/30/21	**PCC Cases**		
	N, millions	N, millions (95% UI)	% of infected (95% UI)	% of adult population (95% UI)*
Total	36.3	3.0 – 5.0	8.3 – 13.8	1.2 – 1.9
Sex				
Male	17.1	1.2 – 2.1	6.8 – 12.4	0.9 – 1.7
Female	19.2	1.8 – 2.9	9.5 – 15.3	1.4 – 2.2
Age, years				
18-49	23.1	1.5 – 2.4	6.5 – 10.3	1.1 – 1.7
50-64	8.3	1.0 – 1.6	11.8 – 19.7	1.5 – 2.5
≥65	5.0	0.5 – 1.1	9.6 – 21.7	0.9 – 2.0

Abbreviations: UI = uncertainty interval

* https://www.census.gov/data/tables/2020/demo/popest/2020-demographic-analysis-tables.html

Table 3. Estimated number of adults in the United States with activity-limiting post-COVID conditions (PCC) under sensitivity analyses, November 1, 2021

	Cumulative reported SARS-CoV-2 infections that occurred through 9/30/21	**PCC Cases**		
	N, millions	N, millions (95% UI)	% of infected (95% UI)	% of adult population (95% UI) [†]
Sensitivity analysis 1. Adjusting for under-ascertainment of infections				
Total	61.3 – 90.6*	4.3 – 9.7	6.4 – 11.5	1.7 – 3.8
Sex				
Male	28.9 – 42.6	1.7 – 4.0	5.2 – 10.1	1.3 – 3.2
Female	32.4- 48.0	2.7 – 5.7	7.4 – 12.7	2.0 – 4.4
Age, years				
18-49	38.5 – 57.8	2.2 – 4.9	5.1 – 9.0	1.6 – 3.5
50-64	13.9 – 21.3	1.4 – 3.1	9.1 – 16.3	2.3 – 4.9
≥65	8.3 – 12.6	0.7 – 1.7	7.0 – 16.3	1.3 – 3.2
Sensitivity analysis 2. Assuming decrease in risk of PCC >6 months post-infection				
Total	36.3	2.2 – 4.2	6.2 – 11.6	0.9 – 1.6
Sex				
Male	17.1	0.9 – 1.8	5.1 – 10.3	0.7 – 1.4

Female	19.2	1.4 – 2.4	7.1 – 12.8	1.0 -– 1.9
Age, years				
18-49	23.1	1.1 – 2.0	5.0 – 8.7	0.8 – 1.4
50-64	8.3	0.7 – 1.3	8.7 – 16.2	1.1 – 2.1
≥65	5.0	0.4 – 0.9	7.1 – 17.7	0.7 – 1.6

Abbreviations: UI = uncertainty interval

* Uncertainty intervals are presented for the reported SARS-CoV-2 infection counts in sensitivity analysis 1 to reflect estimation of these values under assumed under-ascertainment of the true number of infections.

† https://www.census.gov/data/tables/2020/demo/popest/2020-demographic-analysis-tables.html

Figure 1. Number of SARS-CoV-2 infections among adults reported to CDC from February 2020 – September 2021*, by two-month intervals of time of infection† and infection severity

* 95% uncertainty intervals for number of infections within severity strata reflect imputation performed due to missing data.

† The date of SARS-CoV-2 clinical testing was assumed to be equivalent to the date of infection.

Figure 2. Percent of CIS participants with confirmed SARS-CoV-2 infection reporting long-term COVID-19 symptoms that limit daily activities; by age, days since infection, and infection severity status*

Abbreviations: CIS = UK Coronavirus Infection Survey; NH = non-hospitalized

* Estimates do not include the probability of having activity-limiting PCC among adults hospitalized for acute SARS-CoV-2 infection, which was generated using multipliers estimating a 1.5-3.5 relative risk of activity-limiting symptoms in hospitalized adults compared to symptomatic adults who were not hospitalized.

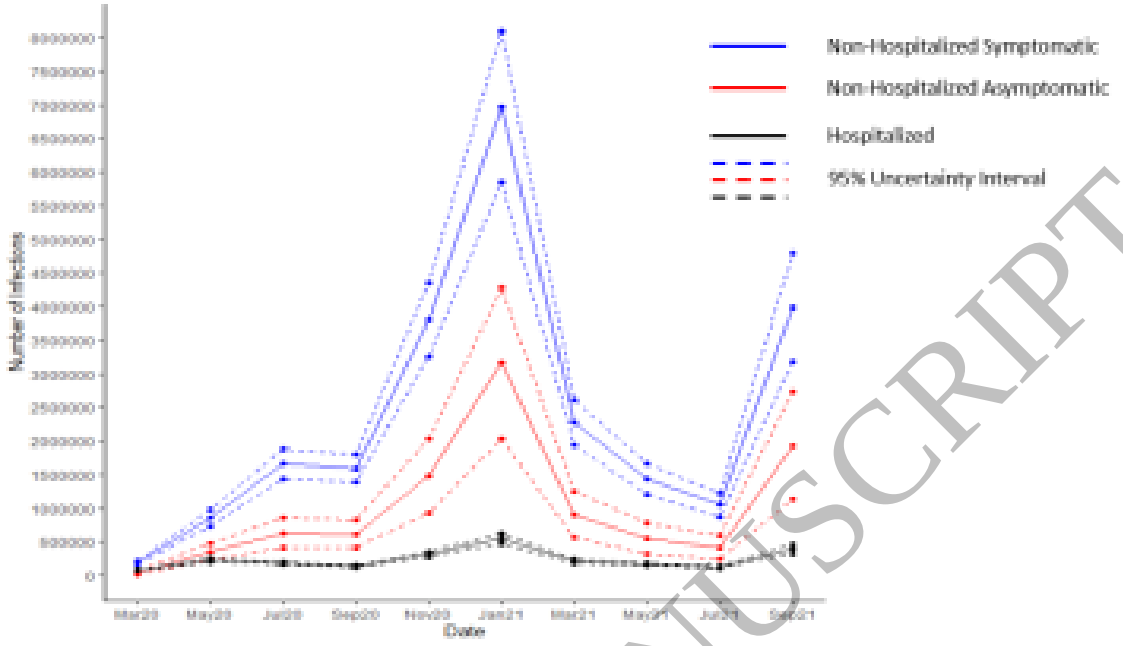

Figure 1
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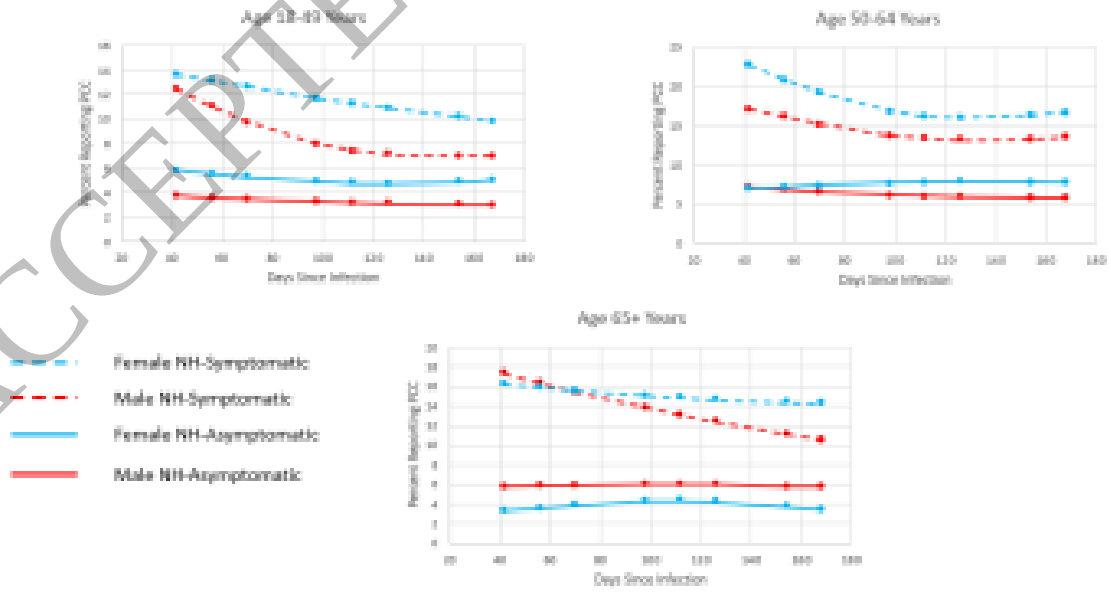

Figure 2
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