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ASSISTANT SECRETARY FOR PLANNING AND EVALUATION

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Long COVID among Essential Workers, Non-Essential Workers, and Not Working Persons in the United States, 2022-2023: a Cross-Sectional Study

Key Points

- We examined the prevalence of current Long COVID, overall and stratified by worker type (essential, non-essential, and not working) using the U.S. Census Household Pulse Survey (HPS).
- According to the HPS, approximately 5.5-7.0% of adults (34,928-45,715 persons in this sample) reported currently experiencing Long COVID from 2022 to 2023.
- There were few differences in workers experiencing Long COVID across multiple employment categories, though essential healthcare workers were less likely to experience Long COVID.

Background

Long COVID (LC) is an infection-associated chronic condition that occurs after SARS-CoV-2 infection and is present for at least 3 months as a continuous, relapsing and remitting, or progressive disease state that affects one or more organ systems (*National Academies of Sciences, Engineering, and Medicine definition, 2024*).[1] Long COVID can impede someone from returning to work, however the impact of Long COVID on the workforce and the labor economy has been difficult to quantify. A 2024 rapid review of Long COVID and the workforce from the Clearinghouse for Labor Evaluation and Review (CLEAR) found that there is evidence that those with Long COVID are less likely to be employed, and, if employed, work fewer hours than those without Long COVID.[2] Furthermore, while it has been hard to pinpoint the exact amount of lost wages due to Long COVID, Mirin (2022) has estimated lost income between $101 to $430 billion annually among all U.S. workers.[3] Additionally, a Brookings Paper on Economic Activity (Abraham & Rendell, 2023), has estimated that Long COVID may have reduced the participation rate of labor by 0.3 percentage points, or 700,000 people.[4]

A number of gaps remain in our understanding of the impact of LC on the work force, including the prevalence of LC among different types of workers (for example, essential vs. non-essential workers) and among individuals who were not working. Workers in different occupations face different risks of COVID infection, and, potentially, LC, depending on the nature of their work. This study sought to fill that gap by using the Census Household Pulse Survey to describe the prevalence of current LC among essential healthcare, essential non-healthcare, non-essential workers, and persons not currently working at four different time points.

Data and Methods

This project used the Census Household Pulse Survey (HPS), phases 3.6-3.9 (September 26th, 2022-August 7th, 2023) to estimate the prevalence of LC in each phase, stratified by type of worker.[5] We

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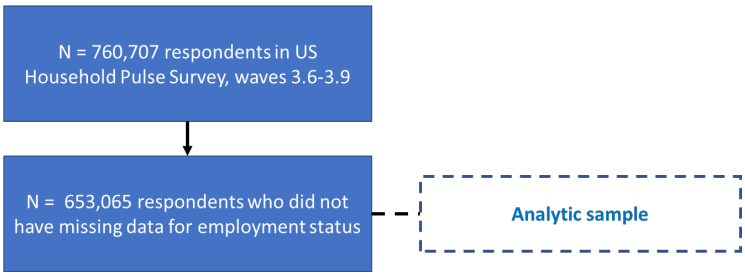
defined LC as "current Long Covid" at the time of the survey. To obtain this prevalence we took the number of survey respondents who said that they: 1) had Covid-19 symptoms lasting 3 months or longer AND 2) currently had Covid-19 symptoms (i.e., on the day of the survey) and divided it by the number of respondents to the survey in each phase. We decided to use "current Long COVID" instead of "any Long COVID" to more accurately capture temporal trends of people who were actively experiencing LC symptoms. The questions as they were asked in HPS are provided in **Appendix A**.

Figure 1. Participant Flow Diagram



We conducted a cross-sectional study among participants in the Census Household Pulse Survey who responded in waves 3.6-3.9 (**Box 1**, September 26th, 2022-August 7th, 2023) and did not have missing data for employment (**Figure 1**). Notably, the employment setting category question was not asked in waves after 3.9. We defined worker type as a categorical variable by using the "setting" and "anywork" variables within the Census HPS (**Appendix A**). We defined those who reported working in a hospital, pharmacy, ambulatory healthcare, or in nursing as "essential healthcare"; we defined those who reported working in death care, social service, preschool, K-12 schooling, other schools, a correctional facility, a food/grocery store, the agriculture sector, food manufacturing, non-food manufacturing, or public transit, or as a first responder, for the US Postal Service, or in other essential work as "essential non-healthcare"; we defined those persons employed but in neither of the two prior categories as "non-essential"; lastly, we defined those who reported they had not worked in the prior seven days (as of the date of the survey) as "not currently working" (**Table 1**).

Box 1: Census Household Pulse Phases

In this analysis, we used the following four phases:

1. **Phase 3.6** (September 26th, 2022-November 2nd, 2022)
2. **Phase 3.7** (December 9th, 2022-February 13th, 2023)
3. **Phase 3.8** (March 1st, 2023-May 8th, 2023)
4. **Phase 3.9** (June 7th, 2023-August 7th, 2023)

Table 1. Type of worker and associated professions

Type of worker	Professions	
Essential healthcare	• Hospital professions • Pharmacy professions • Ambulatory healthcare professions • Nursing	
Essential non-healthcare	• Death care • Social services • Preschools • K-12 schools • Other schools • First responder • Correctional facility workers • Food/grocery store	• Agriculture work • Food manufacturing • Non-food manufacturing • Public transit • US Postal Service • Other essential work
Non-essential	• Any job type or sector that isn't essential healthcare or essential non-healthcare	
Not currently working	• Anyone who reported not working (e.g., unemployed, retired, student, etc.) in the last 7 days from the day of the survey	

We report descriptive statistics of participant demographics in addition to calculating the overall prevalence of current LC over time among all participants and stratified by type of worker. Specifically, we report proportions for non-continuous variables and means and standard deviations for continuous measures. We also examine prevalence of LC overall and stratified by worker type over time. We use sample weights from the Census Bureau to generate nationally representative estimates for all results.[6] We used R version 2023.06.0 for all analyses and visualizations (R Team).

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Results

In our study, 653,065 participants were eligible for analysis. In this sample, 35,250 (5.4%) reported they were essential healthcare, 330,041 (50.5%) as essential non-healthcare, 12,796 (2.0%) as non-essential, and 274,978 (42.1%) as not having worked within the last seven days of the survey time (henceforth, not working). Mean age was 49 (SD: 17), 50% were female-identifying, and 76% identified as White race alone. Approximately 87% identified as straight, 41% reported having a household income of $75,000 or less, and 50% as having a high school diploma or some college education. In this sample, 83% reported as having been vaccinated against COVID-19. When stratifying by worker type (i.e., essential healthcare, essential non-healthcare, non-essential, and not currently working), those in the essential healthcare work, compared to essential non-healthcare, non-essential, and not currently working individuals (respectively), were more likely to be male-identifying (77% vs. 49%, 50%, and 55%) and identify as White race alone (84% vs. 75%, 80%, 75%), but were less likely to report that they were vaccinated against COVID-19 (68% vs. 85%, 90%, and 83%). Additionally, those who were not currently working were over 10 years older than any of the other worker types on average. All descriptive statistics and comparisons between worker groups are presented in **Table 2**.

In the time span assessed (September 26th, 2022-August 7th, 2023), current LC overall was highest during phase 3.6 (6.8%) compared to subsequent phases (3.7: 5.6%; 3.8: 5.7%; 3.9: 5.7%) (**Figure 2**). When stratified by worker type, all groups had a higher prevalence of LC during phase 3.6 compared to phases 3.7-3.9. In phases 3.6 and 3.7, respectively, non-essential workers had the highest prevalence of LC (7.8%; 6.5%), followed by essential non-healthcare workers (7.4%; 6.0%), non-working persons (6.6%; 5.8%), and essential healthcare workers (6.4%; 4.3%). In phase 3.8, essential non-healthcare workers had the highest LC prevalence (6.6%), followed by non-working persons (5.6%), non-essential workers (5.6%), and essential healthcare workers (5.2%). In phase 3.9, trends shifted again, with non-working persons having the highest prevalence of LC (5.9%), followed by essential non-healthcare (5.8%), non-essential (5.6%), and essential healthcare (5.2%). It is also notable that differences *between groups* were lowest in phase 3.9 (LC prevalence range: 5.2%-5.9%; 0.7% difference) and highest in phase 3.7 (LC prevalence range: 4.3%-6.5%; 2.2% difference) (**Figure 3**).

Figure 2. Current Long Covid Prevalence Overall, by Phase (N = 653,065)

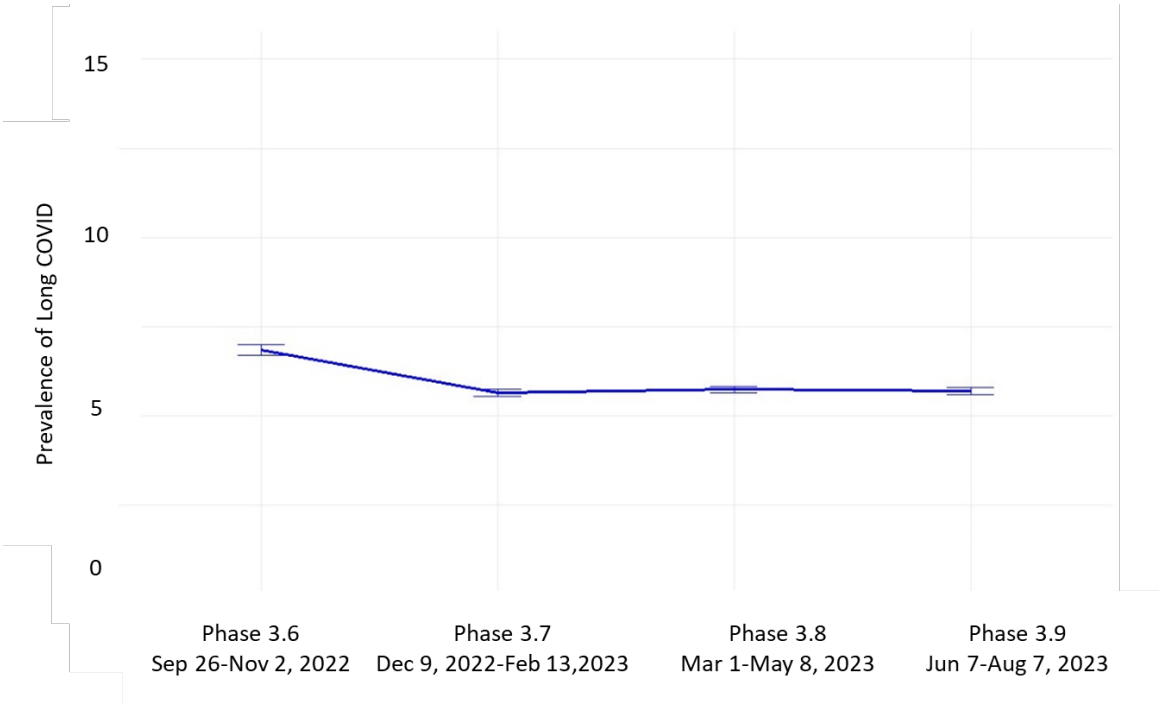
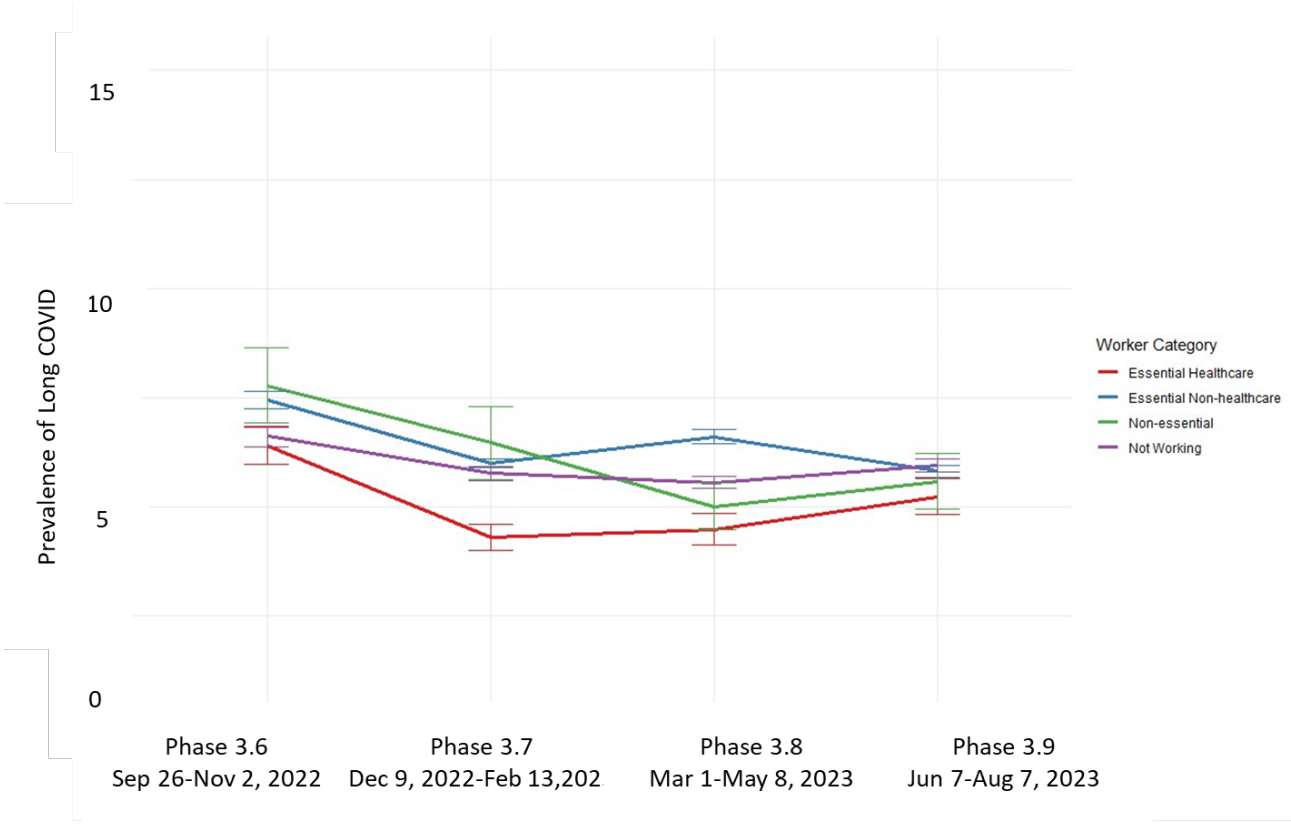


Figure 3. Current Long Covid Prevalence, by Worker Type and Phase (N = 653,065)



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Discussion

We examined the prevalence of current LC in a sample of U.S. adults at four periods of time within a one-year time span. Our analysis indicated that there are differences in sociodemographic and other characteristics between worker type groups, particularly in the distribution of age, sex, race, and COVID vaccination status. Our analyses also indicated that current LC was higher at the beginning of the study (Phase 3.6, September 2022) at almost 7.0%, decreased in Phase 3.7 to around 5.5% and remained essentially constant for the remaining phases (Phases 3.8-3.9). These estimates are higher than the current LC estimates for 2022 in a National Center for Health Statistics (NCHS) data brief of current LC at around 3.5% and ever LC at around 7.0%, though both were from cross-sectional surveys of the US population.[6] Our estimates show that even with a decrease in current LC burden over time that around 1 in 20 adults have been affected by current LC at any given time.

In addition to examining overall LC, we stratified our prevalence estimates by worker type. We found that all worker types followed the same overall trend of a higher burden of LC at the beginning of the study (September 2022) compared to the end (August 2023), although the trends differed slightly by group, and no one group consistently had the highest prevalence of Long COVID. Essential healthcare workers consistently had the lowest prevalence of current LC. One explanation for this finding about essential healthcare workers is they may have had a decreased risk of COVID infection and exercised a higher level of behavior to protect themselves from COVID compared to other occupations. Healthcare settings, more so than non-healthcare settings were more likely to have institutional infection-prevention controls (e.g., masks, other personal protective equipment), even if workers in essential healthcare settings had greater odds of exposure to the virus.[7] COVID vaccination, which prevents COVID infection and, therefore, LC, also typically has higher rates among essential healthcare workers, though, notably, healthcare workers in our study had a lower COVID vaccination rate.[8] It is important to note that we did not find any studies that compared risk of COVID infection or risk of LC between occupational categories during the same period as our study (i.e., 2022-2023), although studies conducted in 2020 and 2021 certainly show that essential healthcare workers had higher rates of COVID infection compared to other occupational categories.[9–12]

Other possible explanations of the finding of lower risk of Long COVID in essential health care workers may not have to do with the risk of COVID; although COVID infection is a necessary component cause in the development of LC, the risk of COVID infection is not the same as the risk of LC. For example, unmeasured differences in the prevalence of chronic diseases among these groups may affect their risk of Long COVID.[13–15]

Strengths & Limitations

The main strength of this this study was that our analyses were novel, as no studies to-date have used national (US) data to understand differences and similarities in worker groups and current LC. This is important, as recent economic evidence shows lost wages and shorter hours among those with Long COVID, and potential labor shortages during the COVID pandemic, some of which might be due to Long COVID.[2,4,16,17]

There were also limitations. This study was cross-sectional, so we were unable to monitor trends within-subject over time.[18] Additionally, the Census Household Pulse Survey has had a response rate of less than 10% for each Phase, meaning that the sample is likely not representative of the US population at-

large.[19] Because of this, our results may not be generalizable to the broader U.S. population and should be interpreted with caution. We also conducted a complete-case analysis and excluded approximately 100,000 (~14.6%) of observations due to missing data for employment; these persons may be systematically different than those who responded to the employment questions, thus potentially biasing our estimates. Lastly, we were unable to consider repeated cases of COVID within a person, as the data were de-identified and cross-sectional.

Conclusions

We found that current LC continues to make an impact on the US adult population. We also found that LC prevalence by type of employment was similar among major occupational groups, though it is possible type of employment may still play a role in risk of LC. More research is needed to understand the impact of Long COVID on all segments of the work force and the US economy. Future work should strive to use data from longitudinal studies and/or surveys with broader representativeness to establish temporality and causality of Long COVID with various occupations to better understand risks for LC, in addition to trends in disability claims due to LC and inability to work due to LC

Table 2. Household Pulse Participant Characteristics, Overall & by Worker Type (Phases 3.6-3.9) (N=653,065) *

Characteristic (N(%) or mean (SD))	Overall, N = 653,065	Essential Healthcare, N = 35,250	Essential Non-healthcare, N = 330,041	Non-essential, N = 12,796	Not working, N = 274,978
Age (years)	49 (17)	45 (14)	44 (14)	41 (15)	57 (18)
Gender Identity					
Female	49.7%	20.3%	49.0%	44.4%	54.9%
Male	47.2%	76.8%	48.6%	49.8%	41.2%
Transgender and other gender identity	2.0%	1.5%	1.7%	5.5%	2.2%
Missing/Unknown	1.2%	1.3%	0.6%	<0.1%	1.7%
Sexual Orientation					
Gay/lesbian	3.3%	1.6%	3.8%	7.3%	2.5%
Other sexual orientation	6.8%	5.1%	7.6%	16.2%	5.9%
Straight	87.0%	90.6%	86.5%	74.0%	87.5%
Unsure	1.8%	1.6%	1.4%	2.1%	2.2%
Missing/Unknown	1.2%	1.0%	1.0%	<0.1%	1.9%
Income					
$25-50K	28.2%	20.1%	19.7%	24.7%	38.1%
$50-75K	13.5%	13.7%	13.8%	14.3%	13.1%
$75 - $100K	10.7%	13.4%	12.3%	11.2%	8.6%
$100K+	26.8%	31.5%	37.4%	31.5%	15.1%
Missing/Unknown	20.9%	21.2%	16.8%	18.3%	25.2%
Race					
Asian, Alone	5.8%	3.0%	7.1%	5.9%	5.0%
Black, Alone	12.1%	6.5%	12.1%	6.5%	13.3%
Other/muti-race	6.1%	6.8%	5.8%	7.4%	6.3%
White, Alone	76.0%	83.7%	75.0%	80.2%	75.4%
Ethnicity					
Hispanic/Latino	16.8%	21.9%	15.4%	14.6%	17.6%
Not Hispanic/Latino	83.2%	78.1%	84.6%	85.4%	82.4%

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Education Level					
High School or less	7.4%	9.7%	3.2%	4.2%	11.4%
High School or some college	49.8%	61.1%	41.7%	39.0%	56.8%
Associates/Bachelor's	27.5%	22.8%	33.5%	42.5%	21.4%
Graduate degree or higher	15.3%	6.4%	21.5%	14.3%	10.4%
COVID-19 Vaccination Status					
Not vaccinated	16.3%	31.0%	14.2%	9.8%	16.5%
Vaccinated	83.3%	68.3%	85.4%	90.1%	83.0%
Missing/Unknown	<0.1%	0.1%	<0.1%	<0.1%	1.0%
US Region					
Midwest	20.7%	20.4%	21.9%	15.2%	19.8%
Northeast	17.3%	13.9%	18.1%	19.7%	16.8%
South	38.2%	41.0%	37.1%	32.1%	39.1%
West	23.9%	24.7%	22.9%	33.0%	24.3%

*All presented results are weighted.

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Appendix A: HPS Questions – Long COVID and Occupational Categories

Long COVID Questions:

Instrument Question Number	Variable Name in Data	Question Seen by Participants
PASC2	LONGCOVID	COVID-19 or coronavirus symptoms lasting 3 months or longer 1) Yes 2) No
PASC3	SYMPTMNOW	Currently have COVID-19 or coronavirus symptoms 1) Yes 2) No

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Occupation/Occupational Categories Questions:

Instrument Question Number	Variable Name in Data	Question Seen by Participants
EMP2	ANYWORK	Employment status for last 7 days 1) Yes 2) No
EMP6	SETTING	Business or organization type 1) Agriculture, Forestry, Fishing and Hunting 2) Mining, Quarrying, and Oil and Gas Extraction 3) Utilities 4) Construction 5) Manufacturing 6) Wholesale Trade 7) Retail Trade 8) Transportation and Warehousing 9) Information Technology 10) Finance and Insurance 11) Real Estate and Rental and Leasing 12) Professional, Scientific, and Technical Services 13) Management of Companies and Enterprises 14) Administrative and Support Services 15) Waste Management and Remediation Services 16) Educational Services 17) Health Care 18) Social Assistance 19) Arts, Entertainment, and Recreation 20) Accommodation and Food Services 21) Public Administration 22) Other Services (except Public Administration)

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