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Long COVID

Longevity 17

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SEPTEMBER 13, 2022

Agenda

1. **Introduction**
2. What is Long COVID?
3. What are the symptoms?
4. Who is more at risk?
5. How prevalent is Long COVID?
6. Treatments
7. Final thoughts/learnings on Long COVID
8. Implications for life insurance, annuities, and pensions
9. Resources

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Introduction to Long COVID

Also known as Post-acute Sequelae of SARS-CoV-2 Infection (PASC) and other terms

- **Issues**

  There is still much to learn, but if one studies the information available some conclusions can be drawn.

  Some studies may be more valuable than others because of the way they were conducted.

- **Caveats**

  I am an actuary and researcher, not a medical professional.

  This presentation is based on my research and opinions and does necessarily reflect the opinions of my employer or the Longevity 17 planning committee.

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What is Long COVID?

There are different definitions

- **Long COVID is a wide range of new, returning or ongoing physical and mental health problems people can experience four or more weeks after first getting infected with SARS-CoV-2.**

  CDC (Centers for Disease Control)

- **Long COVID occurs usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis. Conditions are characterized by symptoms affecting everyday life, such as fatigue, shortness of breath, and cognitive dysfunction, which occur after a history of probable or confirmed SARS-CoV-2 infection.**

  WHO (World Health Organization)

What is Long COVID?

There are different definitions

- **Long COVID in children and young people is a condition in which a child or young person has symptoms (at least one of which is a physical symptom) that:**
  - **Have continued or developed after a diagnosis of COVID-19 (confirmed with one or more positive COVID tests),**
  - **Impact their physical, mental or social wellbeing,**
  - **Are interfering with some aspect of daily living (e.g., school, work, home or relationships), and**
  - **Persist for a minimum duration of 12 weeks after initial testing for COVID-19 (even if symptoms have waxed and waned over that period).**

  Created by consensus through a Delphi study, published in the British Medical Journal

  Created by starting with World Health Organization (WHO) adult definition

Diagnosing Long COVID

A few additional thoughts

- **Symptoms usually last for at least 2 months, were not present before COVID, and cannot be explained by an alternative diagnosis.**
- **Some use clinical medical records or electronic health records to determine past histories.**
- **There is no laboratory test that can definitively distinguish Long COVID – The reason, in my opinion, is because "Long COVID" is more than one disease.**

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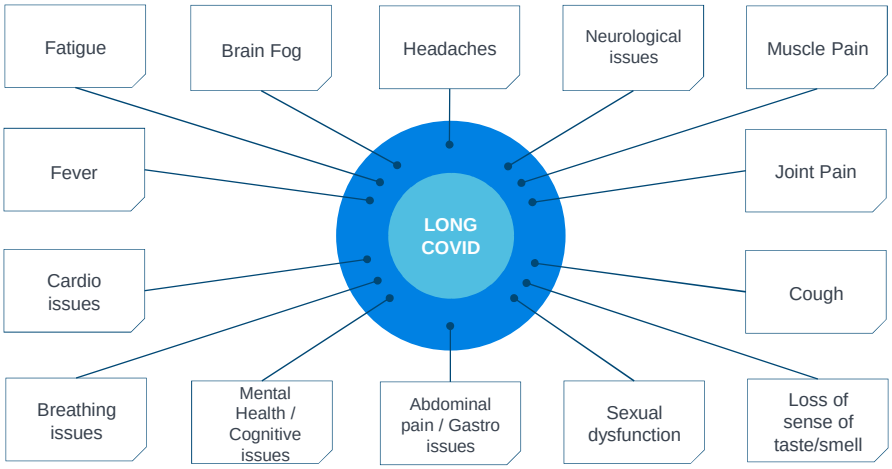
Long COVID Symptoms

Any of the symptoms shown (or more) can indicate Long COVID

These are just some of the many potential Long COVID symptoms.

Other symptoms not shown in the graph include hair loss, headache, diarrhea, dizziness, vertigo, metabolic disorders, malaise, nausea, and vomiting.

Symptoms typically appear several months after "recovering" from COVID and can last for an unknown length of time.



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Long COVID Symptoms (cont'd)

Other findings

- **According to JAMA (Journal of the American Medical Association), an average of 32% of patients still have one to two symptoms and 55% have three or more symptoms 60 days after first onset of COVID.**
- **Note that the symptoms can vary between hospitalized vs. non-hospitalized, reported vs. observed, the population involved, preexisting conditions, and more.**

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Long COVID Risk Factors

From several studies

- **Female, ethnic minority, socioeconomic deprivation, smoking, obesity, multiple comorbidities, treated with mechanical ventilation, and inflammation (most important?).**

  62 symptoms significantly associated with SARS-CoV-2 infection after 12 weeks

- **Researchers from University of Washington, Institute for Systems Biology, and Swedish Medical Center in Seattle followed 309 patients, aged 18-89 for two to three months following COVID-19 diagnosis, 71% were hospitalized.**

  Asked about 20 Long COVID symptoms, grouped into four categories (respiratory, gastrointestinal, neurological, and anosmia/dysgeusia).

  Compared to a group of 100 patients with mild initial infections and 457 healthy people.

  Study found four factors associated with future Long COVID symptoms:

  (1) Level of coronavirus RNA in person's blood,

  (2) presence of certain autoantibodies, i.e., antibodies that attack the body,

  (3) reactivation of Epstein-Barr virus, and

  (4) Having type 2 diabetes.

  Multiple early factors anticipate post-acute COVID19 sequelae, Cell

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Long COVID Risk Factors

From several studies

- **215 people from Mount Sinai Hospital in New York City and Yale New Haven Hospital in Connecticut studied.**

  Divided individuals into four groups – Healthy without previous COVID infection, healthy unvaccinated people who had COVID, healthy vaccinated people who had COVID with no lingering symptoms, individuals who had persistent symptoms following COVID infection.

  Using immune profiling, study found people with Long COVID had increased antibody responses to other viruses, like Epstein-Barr Virus, and significantly lowered cortisol (the main stress hormone) levels.

  Study of Immune System Differences of Long COVID Patients

Long COVID Risk Factors

From several studies

- **Noticed that months after mild COVID infections, children still were short of breath, had crushing fatigue, and other symptoms. He thinks this is due to cells and tissues that control blood flow being damaged and blood's ability to clot is amplified. These tiny blood clots might be gumming up the body's circulation and in some patients, where specific areas had reduced or no blood flow.**

  Italy – Pediatric infectious disease doctor Danilo Buonsenso from Gemelli University Hospital

- **Noticed that the coronavirus endured in the body, even after the acute infection passed.**

  U.S.- Microbiologist Amy Proal, from PolyBio Research Foundation

- **Discovered that the blood of Long COVID patients shows an immune system gone haywire, even 8 months after first testing positive. He would have assumed that the immune cells that galvanized to fight off infection would have calmed down over that time span.**

  Australia - Immunologist Chansavath Phetsouphanh from the University of New South Wales

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Prevalence of Long COVID (of those who have had COVID)

Information from two studies

- **Data source was Household Pulse Survey with recently added questions on COVID-19.**
  Conducted July 27 to August 8 in 2022.
  Covered 46,190 individuals from U.S. population.
  CDC
- **Data source was 50 studies including 1,680,003 people.**
  Conducted review on July 5, 2021.
  Covered Asia, Europe, North America, and the U.S separately.
  University of Michigan .

Prevalence of Long COVID

Percentage of those who have had COVID

CATEGORY	CDC (JULY 27 – AUGUST 8)	UNIVERSITY OF MICHIGAN
Overall	33.2%	43% (9% - 81%)
Female	38.6%	49%
Male	26.8%	37%
U.S.	33.2%	31%

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Prevalence of Long COVID (Data Unique to CDC)

Percentage of those who have had COVID

AGE	CDC	RACE	CDC
18 – 29	30.3%	Hispanic or Latino	38.5%
30 – 39	34.0%	Non-Hispanic, Asian	20.5%
40 – 49	36.3%	Non-Hispanic, Black	33.5%
50 – 59	37.6%	Non-Hispanic, White	31.8%
60 – 69	31.1%	Non-Hispanic, Other/Mix	42.5%
70 – 79	23.9%	EDUCATION	
80+	25.0%	Less than High School	45.1%
STATE (RANGE)		High School Diploma	34.9%
Pennsylvania	21.7%	Some College	37.0%
Alabama	45.2%	Bachelor's Degree +	25.2%

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Prevalence of Long COVID (Data Unique to U. of Michigan)

Percentage of those who have had COVID

MONTHS AFTER INITIAL DIAGNOSIS	UNIVERSITY OF MICHIGAN	HOSPITALIZATION	UNIVERSITY OF MICHIGAN
1	37%	Hospitalized	54%
2	25%	Outpatient	34%
3	32%	SYMPTOMS	
4	49%	Fatigue	23%
REGION		Memory Problems	14%
Asia	51%	Shortness of Breath	13%
Europe	44%	Sleep Problems	11%
North America	31%	Joint Pain	10%
U.S.	31%		

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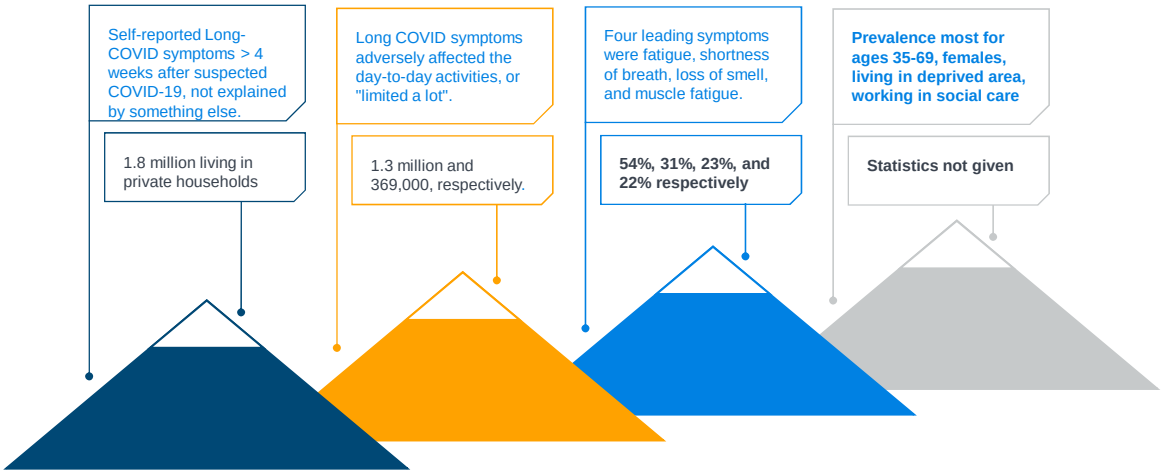
Prevalence of Long COVID in the UK

As of 4 August 2022



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Treatments for Long COVID

No standard treatment yet, but probably never will one treatment because of diversity of issues

- **Caveat:**

  I am not a medical professional, nor recommending any of the potential treatments below.

  Do your own research and/or consult a medical professional.

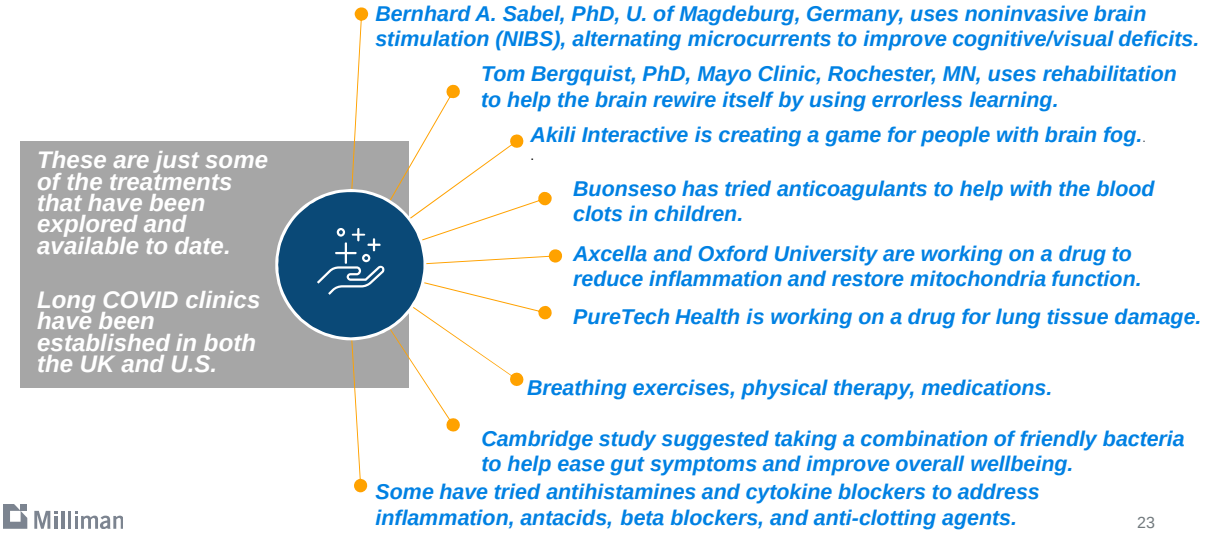
- **A couple of thoughts up-front:**

  There is not a "one-size fits all" treatment as the problems associated with "Long COVID" vary person to person, e.g., some have blood clots and a suppressed immune system while others have an out-of-control immune system.

  Although this has not been tried yet, one suggestion was to use antivirals to try to remove the RNA virus that remains in the gut of those with Long COVID.

Treatments for Long COVID (cont'd)

Some treatments that have been done



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Final Thoughts/Learnings on Long COVID

- While much is still unknown, much has been learned.
- Long COVID is complex and not one disease.
- Long COVID mostly affects ages 30-59, females, and those with multiple comorbidities.
- Need to look beyond outward symptoms to find underlying cause to be able to treat it.
  - Someone with Long COVID should have a doctor determine what is causing their symptoms, e.g., blood clots or an out-of-control immune system.
  - These involve a completely different approach to treatment.
- Long COVID, like COVID itself, is both undercounted and overcounted.
  - A study by Kaiser Permanente found that after they identified 25% of the patients as having "Long COVID," the symptoms were new rather than pre-existing for only 13%.

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How will Long COVID affect future longevity/mortality?

My opinions

QUESTION	MY THOUGHTS
How long will someone with Long COVID live relative to those without it?	Not as long, but it is still unclear how much shorter. Some will likely die within a few years and others, a long life (but maybe a few years earlier than expected).
	.
Will there be an increase in suicides?	Yes. I believe after some point, many will get tired of suffering every day.
How should mortality, longevity, and mortality improvement assumptions be adjusted?	My opinion is to be a little conservative (that is the actuary in me!), but mostly take a wait and see attitude while closely monitoring the latest information to be able to quickly react to the latest developments (good or bad).

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Resources

Used in presentation

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Resources (cont'd)

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Resources

Other

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Resources (cont'd)

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Resources (cont'd)

Other

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- WebMD. More Than 100 Million People Worldwide Have or Had Long COVID: Study. See https://www.webmd.com/lung/news/20211118/millions-worldwide-long-covid-study.
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- https://www.theguardian.com/world/2022/jun/01/two-million-people-in-uk-living-with-long-covid-say-studies.
- https://www.statnews.com/2022/07/06/understanding-long-covid-estimates/.

Resources

From Milliman

- **Milliman has written many articles on different aspects of COVID-19 that you can use for all types of insurance and pension work and more. Some that relate to Longevity include:**
  - 2021 Milliman Variable Annuity Mortality Study
  - Impact of the COVID-19 pandemic in Latin America
  - Modeling the pandemic risk
  - How does our experience with COVID-19 impact the life insurance industry going forward?
  - COVID-19 impact on long-term care insurance report: 2021 survey
  - Responses to the COVID-19 pandemic in South Africa: Impacts on life insurance and how insurers responded
  - Mortality and catastrophe risk reinsurance
  - Potential effects of the COVID-19 pandemic and other mortality trends on corporate defined benefit plans
  - Impact of COVID-19 on life insurance mortality and underwriting
- **The following is a link to all of the papers:**
  https://www.milliman.com/en/search#q=covid&sort=date%20descending&f:contentLabelFacet=[Insight]&f:articleYearFacet=[2022]

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Thank you

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