



THE LONG SHADOW OF LONG COVID



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LONG COVID: PREVALENCE

Major Recent Studies on Prevalence of Long Covid.

- FAIR Health study (N size=2M): US private health insurance claims selected randomly for Americans testing positive between Feb and Nov of 2020. Lungs/Respiratory. Results: 23% of positives saw a provider for a Covid-related condition > 30 days after test.
 - For hospitalized positives (5% of total), 50% saw a provider.
 - For symptomatic positives (40% of total), 27% saw a provider.
 - For asymptomatic positives (55% of total), 19% saw a provider.
- Washington University study of VHA patients (N size=73K): Compared positives at > 30 days over 6-month period to demographically identical control group of non-positives. Results: Positives were 20% more likely to require outpatient care at any time and had 47% more outpatient visits in any 30-day period.
- Helix California and Nevada study (N size=357). Follow-up survey study of positives. Results: 42% reported at least one Long Covid symptom after 30 days and 24% after 90 days.
- WHO issued a Long Covid summary report in Feb 2021 that estimated Long Covid prevalence at only 10% after 12 weeks, but WHO conceded that the studies it cites varied hugely in their estimates and that their N sizes were mostly small.

LONG COVID: PREVALENCE

Table 1 Summary of selected studies on the prevalence of Long COVID in nonhospitalized patients^a

COUNTRY	STUDY	SAMPLE	NUMBER OF CASES INCLUDED	RESULTS
United Kingdom	Office for National Statistics (2020)	Population representative	8 193	<ul style="list-style-type: none"> • 21% had symptoms 5 weeks after infection • 10% had symptoms 12 weeks after infection
	Sudre et al. (2020)	COVID Symptom App users (out of which 14% were hospitalized)	4 182	<ul style="list-style-type: none"> • 13% of cases had symptoms lasting 28 days after symptom onset • 5% of cases had symptoms for over 8 weeks and 2% for over 12 weeks after symptom onset
	Townsend et al. (2020)	Hospital outpatients (out of which 56% were hospitalized)	127	<ul style="list-style-type: none"> • 52% reported persistent fatigue at 10 weeks after symptom onset
USA	Tenforde et al. (2020)	Hospital outpatients (out of which 7% were hospitalized)	292	<ul style="list-style-type: none"> • 35% had symptoms after a median of 16 days after testing positively for SARS-CoV-2 infection
Switzerland	Nehme et al. (2020)	Hospital outpatients	669	<ul style="list-style-type: none"> • About 33% of cases had symptoms 30–45 days after diagnosis
The Netherlands and Belgium	Goërtz et al. (2020) ^b	Facebook group for coronavirus patients with persistent complaints (out of which 5% were hospitalized)	2 113	<ul style="list-style-type: none"> • Over 99% infected individuals did not fully recover within 12 weeks after symptom onset

^aSome of the studies reported in this table included hospitalized patients

^bIncluded suspected cases

Source: Authors

LONG COVID: SYMPTOMS AND DURATION

○ What are the symptoms of Long Covid?

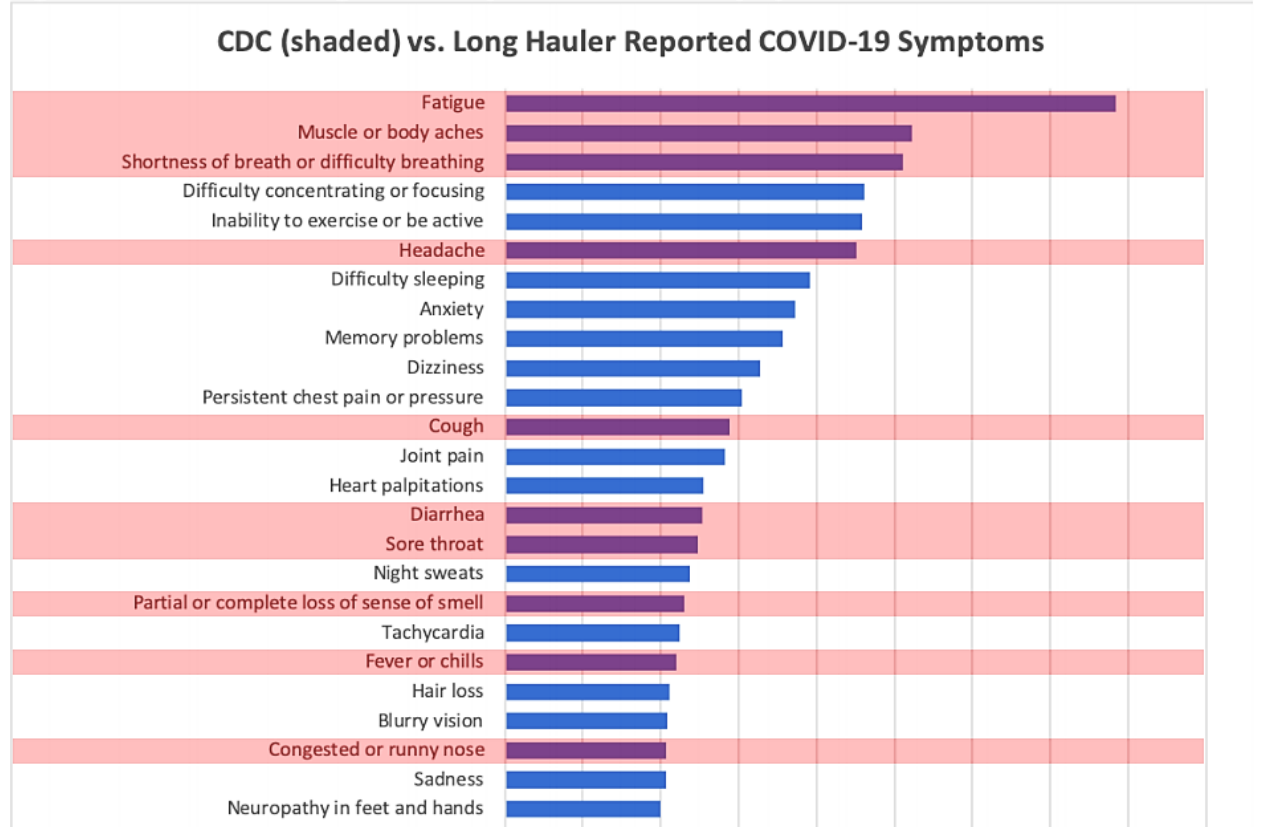
- respiratory problems (difficulty breathing, reduced lung capacity, reduced O2 diffusion)
- metabolic disorders (insulin resistance, high blood lipids, anemia, liver and kidney damage)
- cardiovascular issues (hypertension, rapid heartbeat, cardiac inflammation, clotting)
- digestive complaints (abdominal pain, nausea, gastric issues)
- nervous system disorders (severe headache, body aches, "brain fog")
- overall emotional and physical distress (chronic fatigue, anxiety, depression)

○ How long does Long Covid last?

- Due to the bewildering multitude of symptoms--and to the fact that some symptoms may get worse even while others get better--no one yet has a clear idea. General consensus is that symptom prevalence declines steadily from 30 days to 90 days, but much more slowly thereafter.
- Most exhaustive symptom study is from UK (Intl, N size = 3,762): Survey of Long Covid patients. Major result is that afflicted fall into two groups: (1) those who recover or improve within 3 months; and (2) those with a distinct mix of "moderate symptoms" (fatigue, breathing issues, cognitive dysfunction) whose symptoms showed little improvement even after 3 months.

LONG COVID: SYMPTOMS AND DURATION

Figure 4. CDC Verses Long Hauler Reported COVID-19 Symptoms



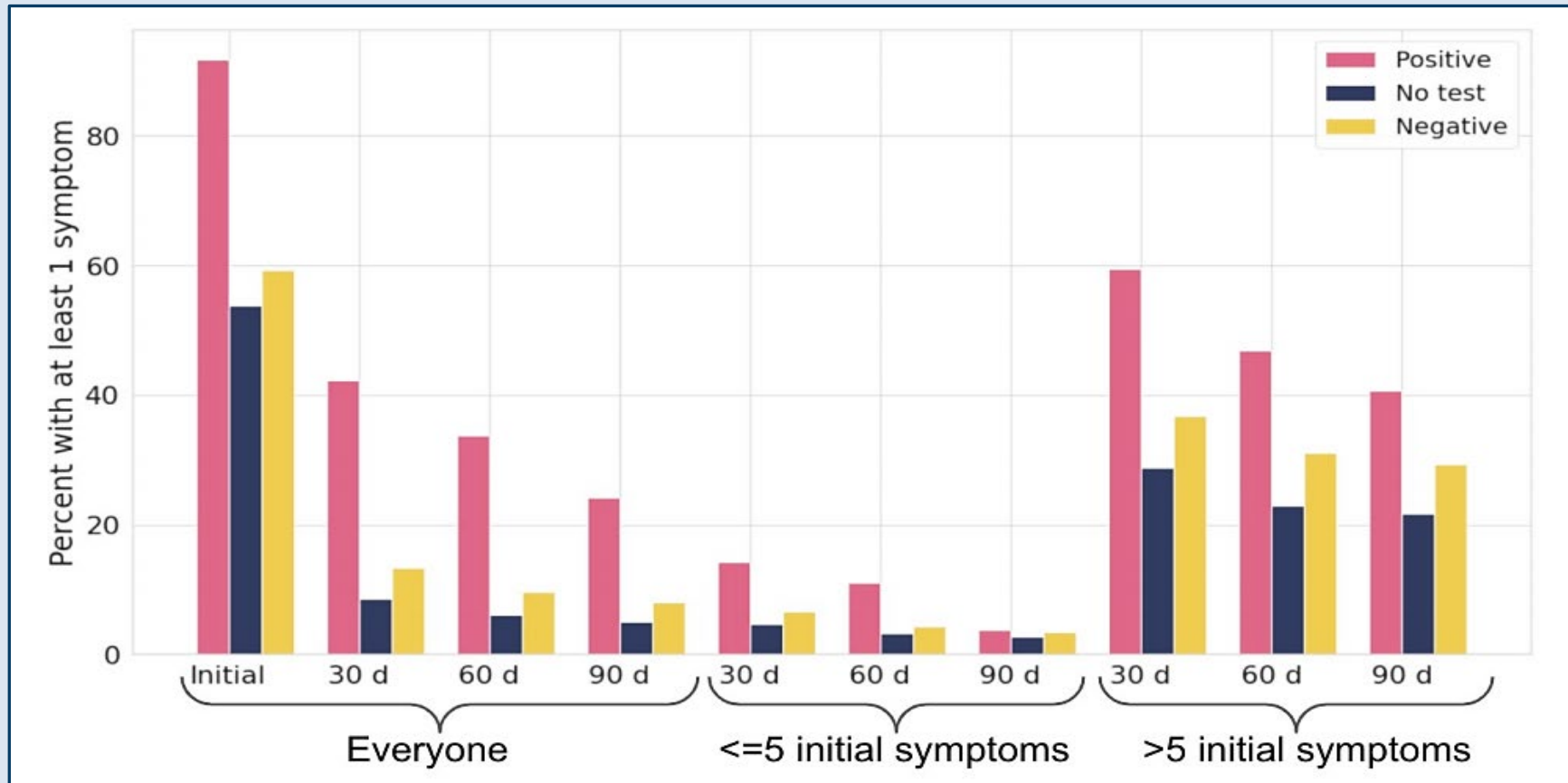
LONG COVID: WHO IS LIKELY TO GET IT?

- Who is most likely to experience Long Covid?
 - Those who had the most serious symptoms while still infected
 - Those who experience multiple (5 or more) initial symptoms before 30 days
 - Women (more than men)
 - Whites (more than nonwhites)

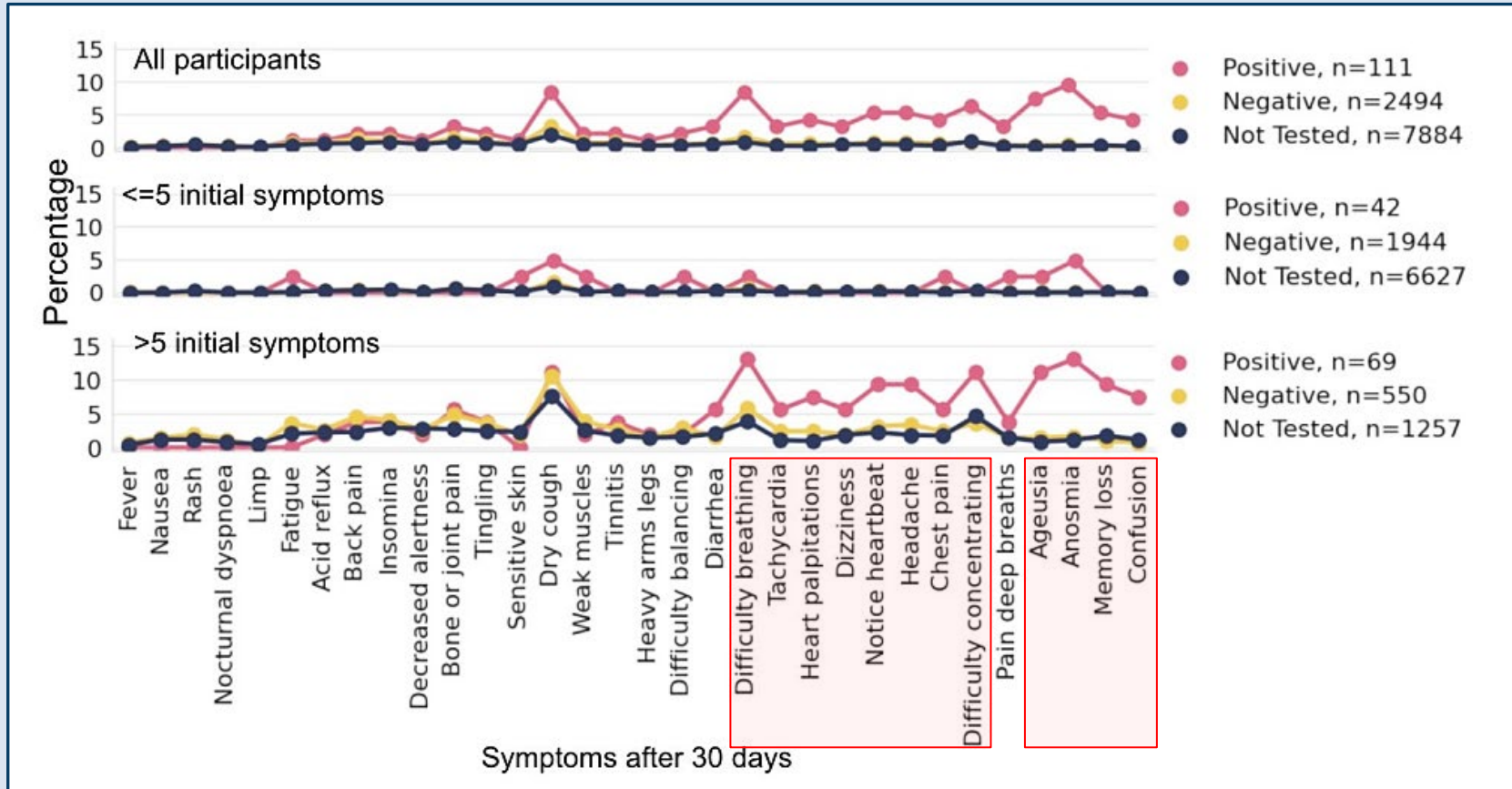
- What about Long Covid prevalence by age?
 - It is very clear that youth does not protect you from Long Covid. In fact, the risk may go down slightly at older ages.
 - Most researchers say the most at-risk age range is 35 to 49, and positives in their late teens and 20s are probably more at risk than positives in their 70s and 80s.

- Why does the age profile for severe chronic Covid differ so much from the age profile for severe acute Covid?
 - Possibility One: Survivor effect.
 - Possibility Two: Long Covid is triggered by overactive immune response—that is, it is a post-viral autoimmune disorder similar to ME/CFS in post-influenza patients.

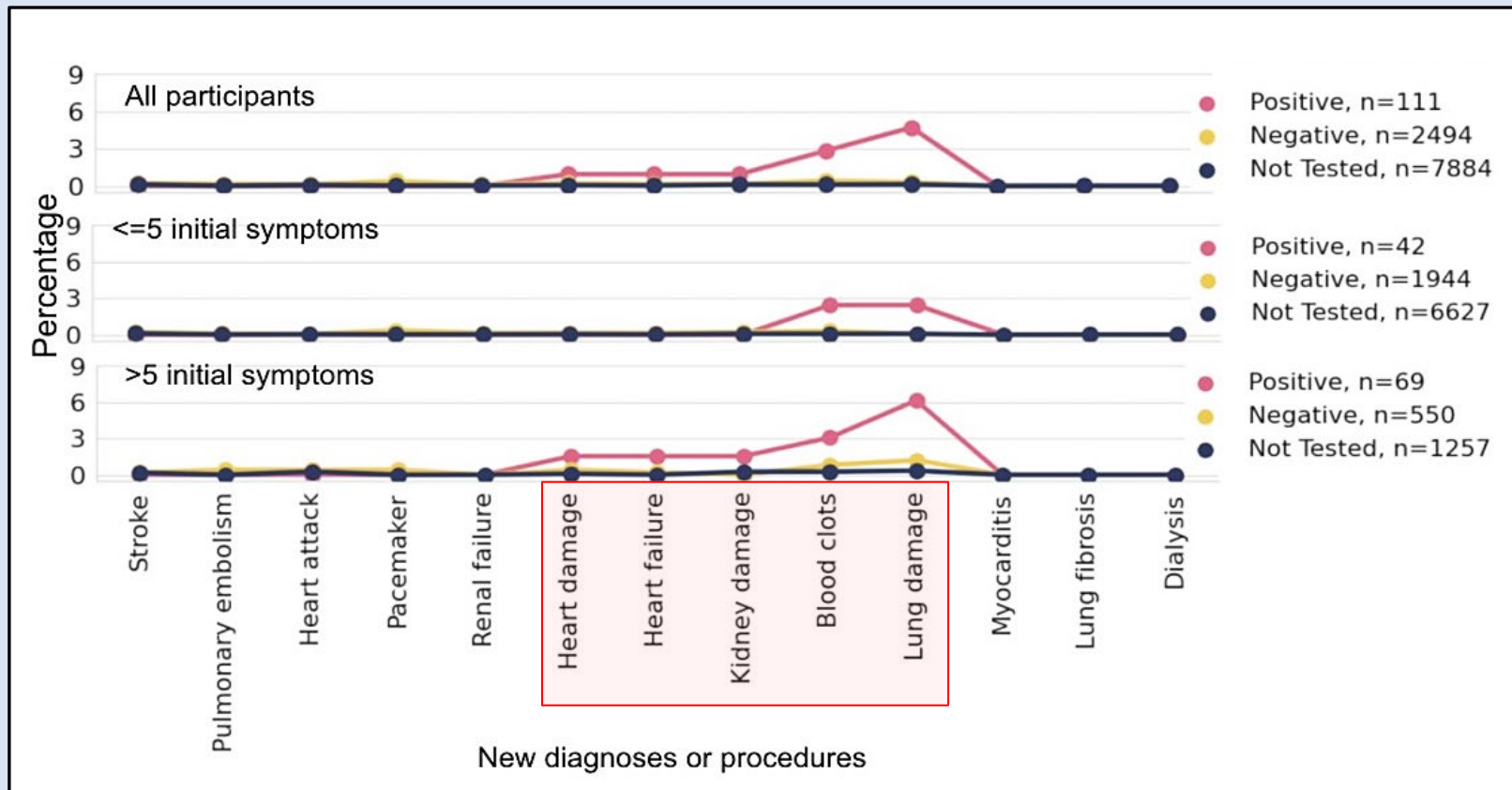
LONG COVID: WHO IS LIKELY TO GET IT?



LONG COVID: SYMPTOMS AND DURATION



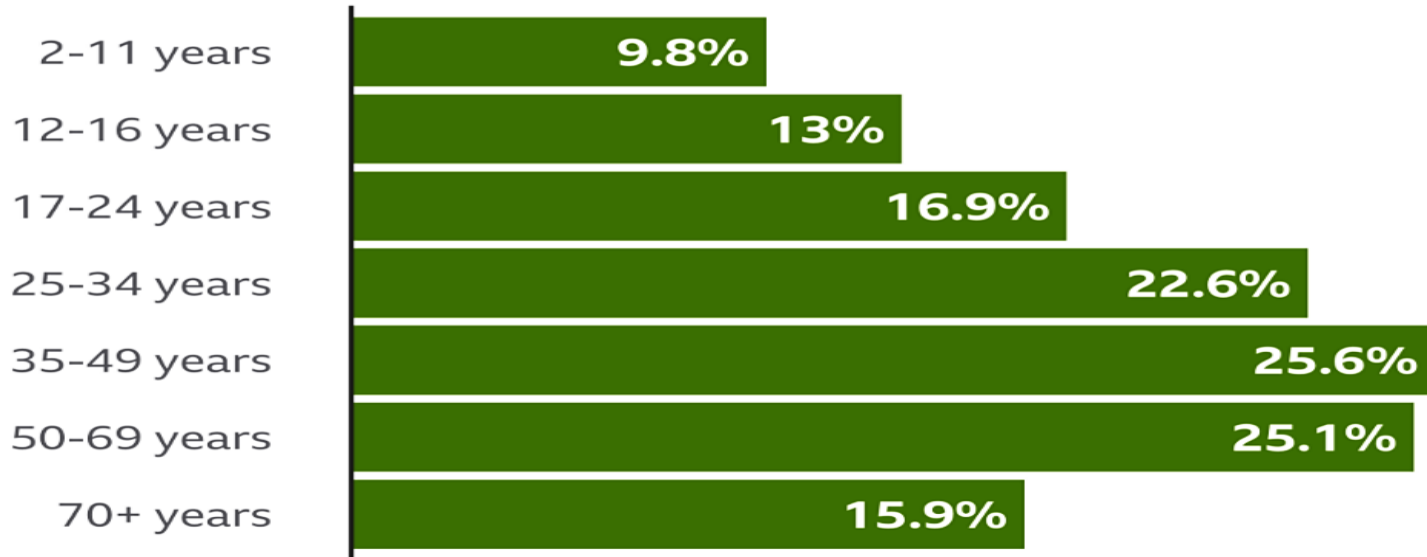
LONG COVID: WHO IS LIKELY TO GET IT?



LONG COVID: WHO IS LIKELY TO GET IT?

People aged 35-49 most likely to report symptoms of long Covid

Percentage of people reporting a symptom at least five weeks from assumed date of infection



ONS Coronavirus Infection Survey, 26 April 2020 to 6 March 2021

BBC

LONG COVID AND YOUNG ADULTS

According to surveys, the primary reason young adults avoid getting vaccinated is that they believe the risk of vaccination is or may be higher than the risk of Covid-19.

- This is not true for short-term risk of an extreme outcome.
 - The risk of dying from the vaccine is statistically indistinguishable from zero.
 - The risk of dying from acute Covid, while very small for young adults, is above zero.
- Yet once we consider longer-term outcomes, the relative risk of Covid for young adult is vastly larger.
 - The risk of a long-term vaccine side effect is 2 or 20 or (at the outside) 200 in a MILLION.
 - The risk of a long-term side effect from Covid is on the order of 2 or 3 in TEN.
 - That makes the vaccine roughly 100,000X to (at worst) 1,000X less risky than Covid-19.
- In fact, young adults are disproportionately likely to be affected by two common types of symptoms they most fear as side effects of the vaccine. These affect 80-90% of all Long Covid sufferers. These are:
 - cognitive dysfunction
 - heart inflammation (myocarditis or pericarditis) and rapid heartbeat

LONG COVID AND YOUNG ADULTS

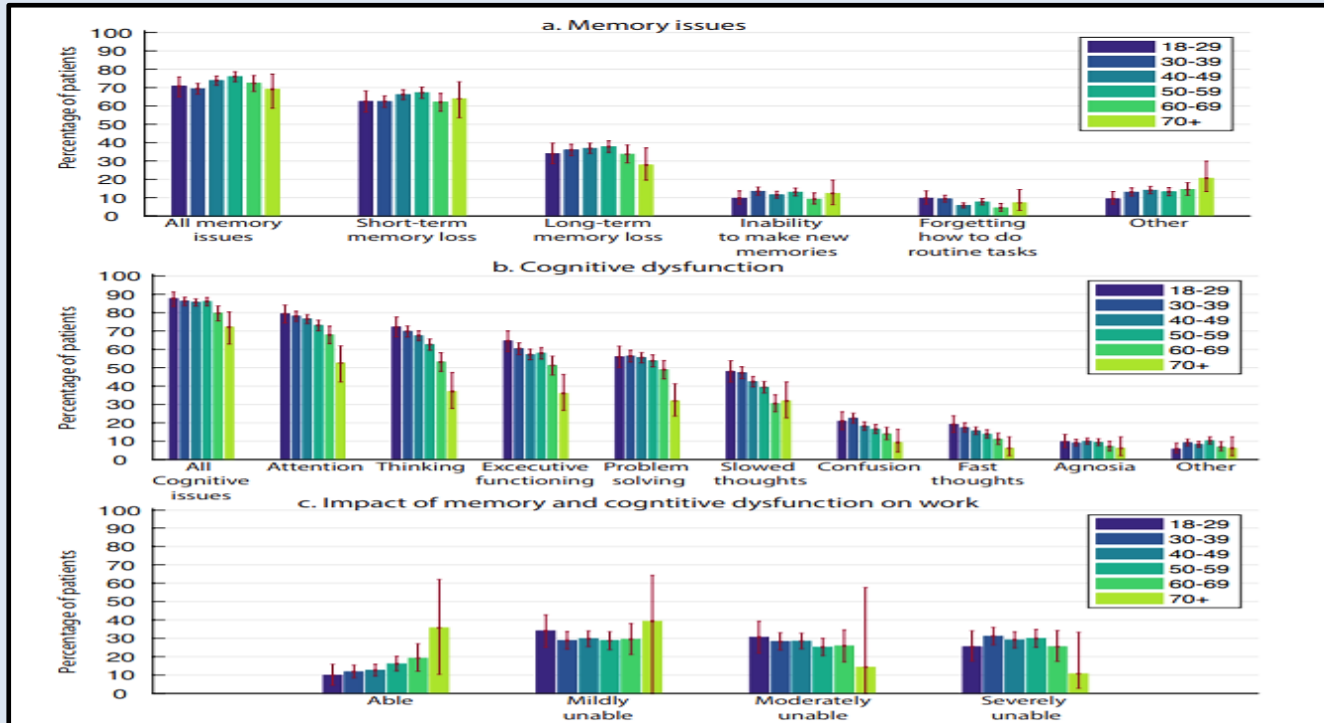
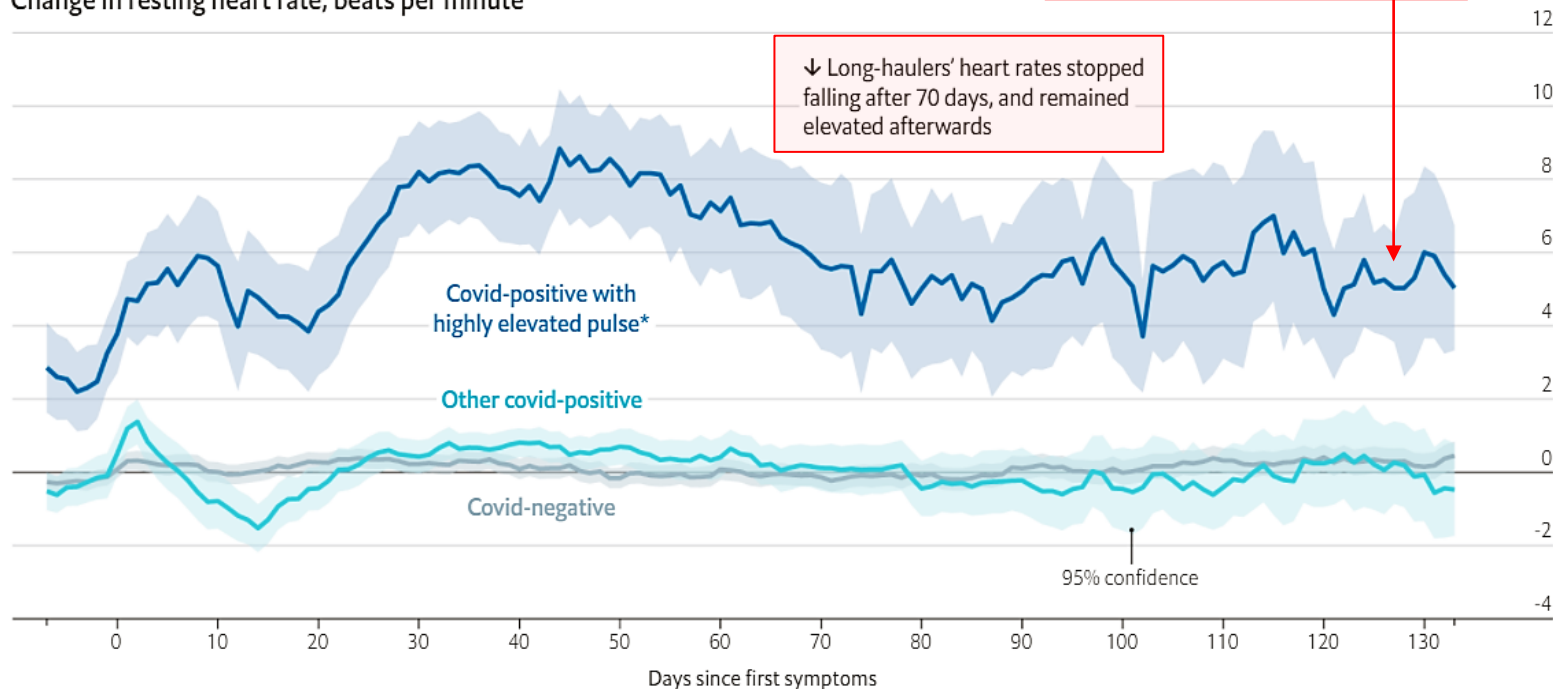


Figure 8. Memory and cognitive dysfunction. a) Percentage of respondents in six age groups who experienced different types of memory impairments. b) Same as (a) for cognitive dysfunction. c) Impact of memory and cognitive dysfunction on work (for those who work), for different age groups. Participants were asked to rate the impact by choosing one of the four options "Able, Mildly unable, Moderately unable, and Severely unable". d) Overall impact of memory and cognitive dysfunction on daily life. Participants to whom the question was not applicable were excluded. Error bars show 95% confidence intervals.

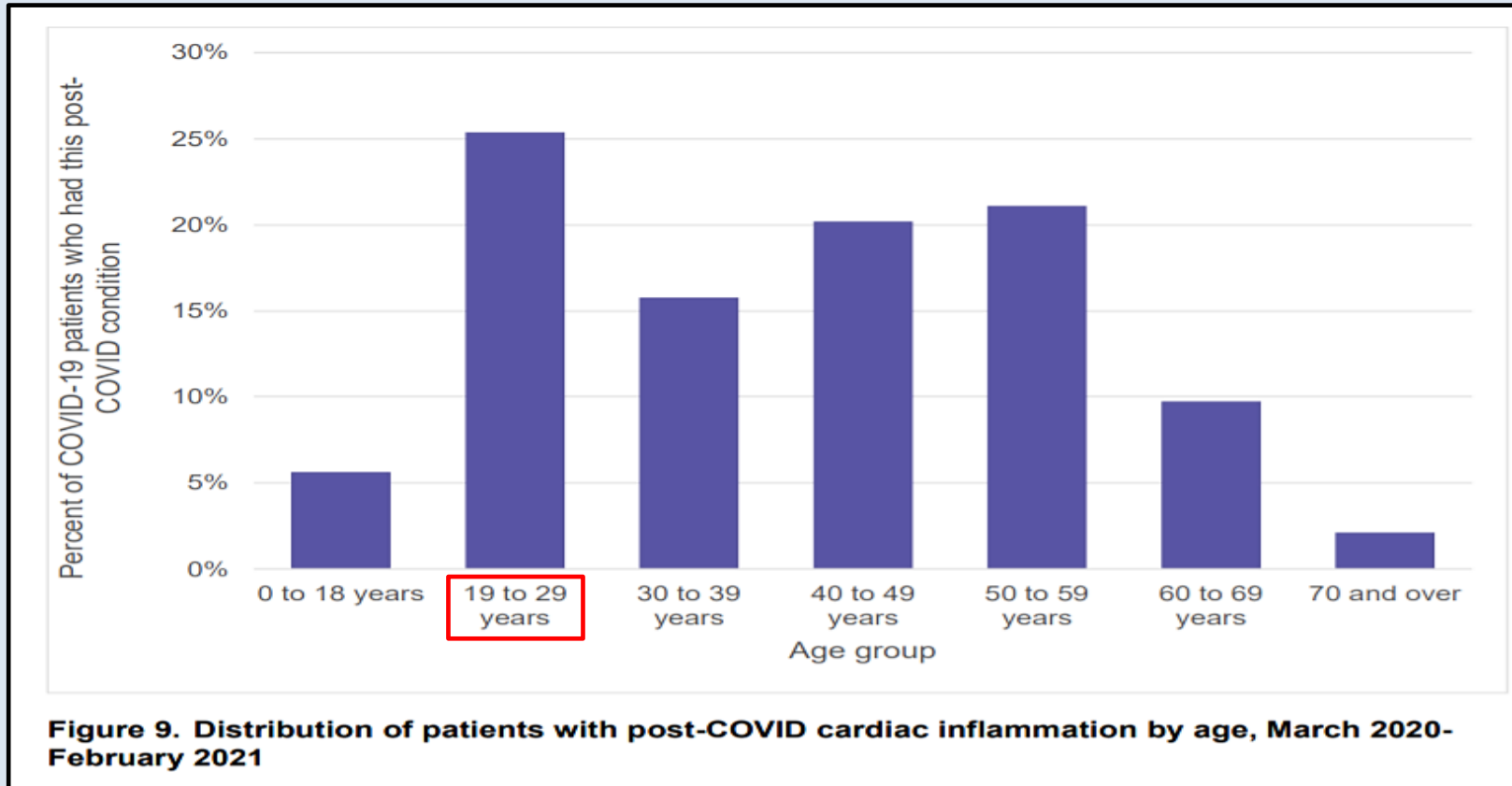
LONG COVID AND YOUNG ADULTS

875 people who reported a respiratory illness and were tested for covid-19
United States, March 25th 2020-January 24th 2021

Change in resting heart rate, beats per minute



LONG COVID AND YOUNG ADULTS



LONG COVID: TOTAL IMPACT

- Enough about the young. Let's pan out at this point and look at the broader question. What's the magnitude of Long Covid's impact on all Americans?
- Let's assume that 20% of all positives eventually encounter Long Covid. Based on CDC estimates, let's also assume that 130M Americans have by now been infected. That translates into about 26M Long Covid sufferers.
- Over time, we can assume (a) that some of this group will get better, yet also (b) that more of the unvaccinated and vaccinated will get infected.
 - We used to assume that few of the vaccinated would become infected or, if infected, get Long Covid.
 - Now we are revising both of these last assumptions... upwards.
- Now, the consequences:
 - Healthcare provider visits per month: Take number of visits for 26M people and increase it by 47%.
 - Labor force participation:
 - Take pre-pandemic LFP (63.4%), and multiply it by 26M people = 16.5M in 2019 LF.
 - Then multiply that by 22% = 3.6M once in LF and now with Long Covid. The 22% is based on intl study showing that 22% of sufferers are unable to work at all (and 73% report working at reduced schedule).
 - Do we have a major explanation of our "missing 4M" in the LF? I think we do.

LONG COVID: TOTAL IMPACT



Shaded areas indicate U.S. recessions.

Source: U.S. Bureau of Labor Statistics

fred.stlouisfed.org



LONG COVID: TOTAL IMPACT

Long Covid doesn't just make you feel bad. It can kill you--though the proximate cause of death will never be identified as Covid-19.

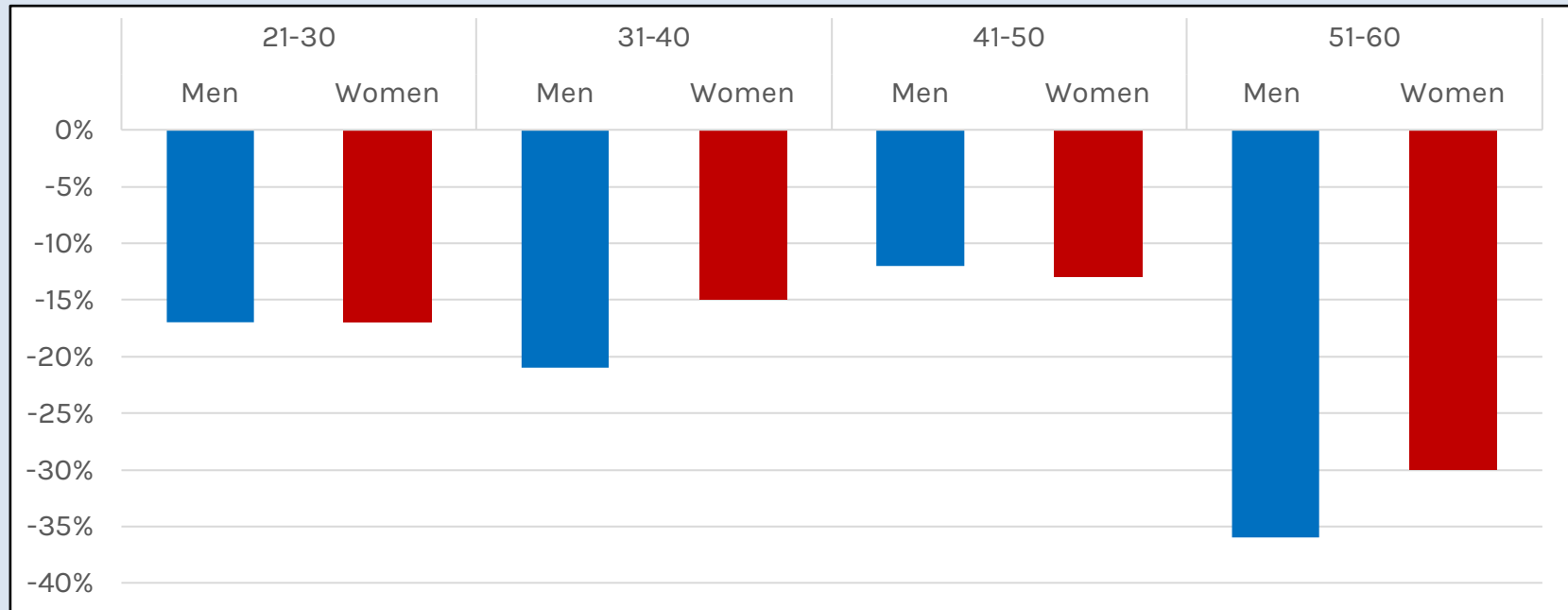
- Per Washington University study, mortality rate among all Covid-19 positive patients during the 6 months after their recovery from infection (that is, after 30 days) is 59% higher than among a demographically identical group of non-positives. This is the extra risk for all Covid positives--not just those with Long Covid.
- Research on SARS (2003) has also found a high rate of chronic illness ("Long SARS") among survivors. According to one study of SARS survivors, average walking speed (good surrogate indicator of expected mortality) remained far below normal two years after infection.
- In fact, Long Covid may not be all that different from the CFS/ME and related disabilities that are often noted after most severe viral outbreaks—and were widely observed for many years following the Russian Flu of 1889 and 1892 and the Spanish Flu of 1918-19.

Final note. Studies of historical pandemic events, even excluding catastrophes like the Black Death, find that they regularly inaugurate eras of less investment and lower real rates. E.g., recent papers by SF Fed ("Longer-Run Economic Consequences of Pandemics" in 2020) and by IMF ("A Vicious Cycle: How Pandemics Lead to Economic Despair and Social Unrest").

Did post-viral "long shadow" of those earlier outbreaks cast a similar shadow over post-viral economy? It's possible.

LONG COVID: THE SARS (2003) RECORD

Meters Walked in 6 Minutes: Hong Kong SARS Survivors Minus Control Group, at 24 Months After Illness



LONG COVID: THE SARS (2003) RECORD

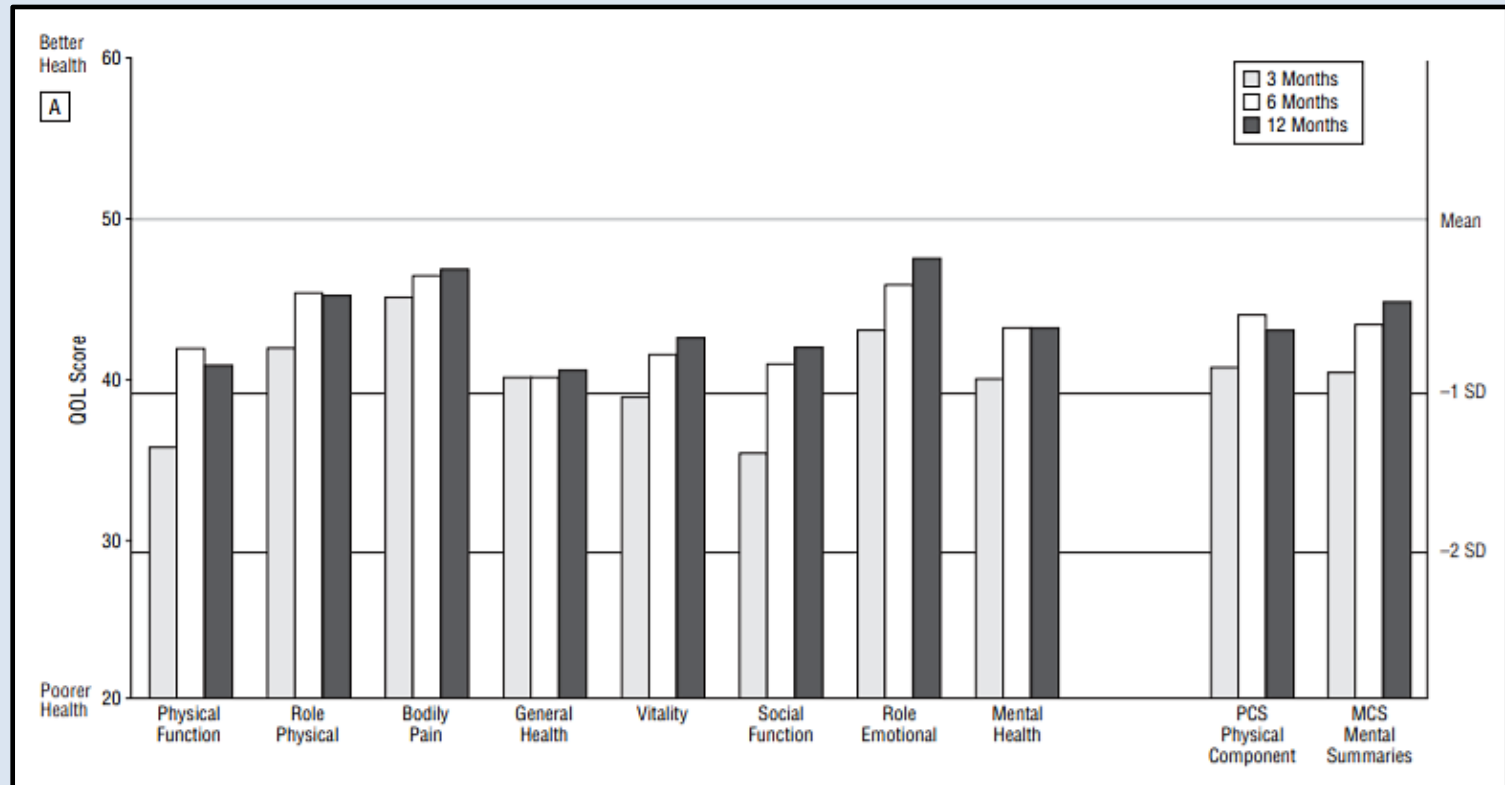


Figure 2. Mean health-related quality of life (QOL) scores among patients with severe acute respiratory syndrome (SARS) in the 12 months following hospital discharge (A) and their caregivers just after quarantine (B). MCS indicates mental component summary score; PCS, physical component summary score.

LONG COVID: THE SARS (2003) RECORD

Table 3. Ability to Exercise, Pulmonary Function, Return to Work, and QOL as Reported on the SGRQ in Patients With SARS During the 12 Months Following Discharge From Hospital*

Variable	Follow-up Visit		
	3 mo (n = 84)	6 mo (n = 100)	12 mo (n = 107)
Distance walked in 6 min Median (IQR), m	(n = 75)† 483 (396-552)	(n = 94)‡ 487 (447-553)	(n = 98)† 488 (448-555)
% of Predicted value§	81	81	83
Pulmonary function testing, % of predicted value	(n = 83)¶	(n = 97)¶	(n = 103)#
Forced vital capacity	98 (89-113)	103 (91-115)	103 (92-115)
Forced expiratory volume in 1 s	107 (94-120)	110 (100-122)	109 (96-122)
Total lung capacity	98 (88-111)	101 (93-112)	102 (92-112)
Residual volume**	101 (75-112)	98 (82-115)	96 (83-113)
Carbon monoxide diffusion capacity***††	87 (77-93)	86 (80-93)	85 (81-93)
Maximum inspiratory pressure***	68 (49-89)	74 (59-105)	78 (65-110)
Maximum expiratory pressure***	48 (40-61)	54 (43-67)	56 (45-73)
Return to work	(n = 84)	(n = 100)	(n = 107)
Full-time work	25 (30)	53 (53)	71 (66)
Pre-SARS level of work	35 (42)	63 (63)	79 (74)
Not returned to work	41 (49)	17 (17)	18 (17)
SGRQ‡‡	(n = 75)	(n = 83)	(n = 89)
Total score (normal = 6)	24 (8-36)	17 (6-34)	18 (5-34)
Symptoms score (normal = 12§§)	20 (8-35)	15 (4-36)	18 (5-40)
Activity score (normal = 9§§)	36 (12-60)	31 (6-60)	29 (3-54)
Impacts score (normal = 2§§)	14 (2-29)	9 (2-25)	10 (2-25)

VACCINES FOR LONG-COVID PATIENTS?

Figure 1: Symptoms at 8-month follow up with change following vaccination (or matched timepoint in unvaccinated group)

