

Age-related functional impairment after COVID-19: An analysis of the U.S. *All of Us* Research Program data.

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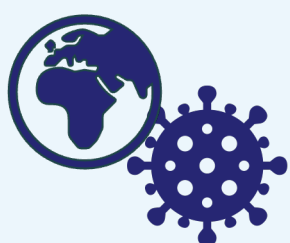
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- Long COVID can cause disability and loss of health-promoting roles and routines.

- Older adults' risk of long COVID is higher.



- We don't have evidence from large-scale studies about the associations between risk factors and functional outcomes in older adults.

Hypothesis:

Age, pre-infection functioning and symptoms, and long COVID status would significantly affect functional status changes after COVID-19 infection

Methods:



Design: Retrospective cohort study

- Data through July 2022 (Controlled tier v. 7).
- ~413,000 U.S. adults enrolled in *All of Us* Research Program.

Analysis:



Ordinal probit regression model



Had COVID-19:
N=104,993



Grouped by:

At least one long COVID symptom, 28+ days post-COVID:

- ✓ Yes **n=52,349**
- ✓ No **n=31,437**

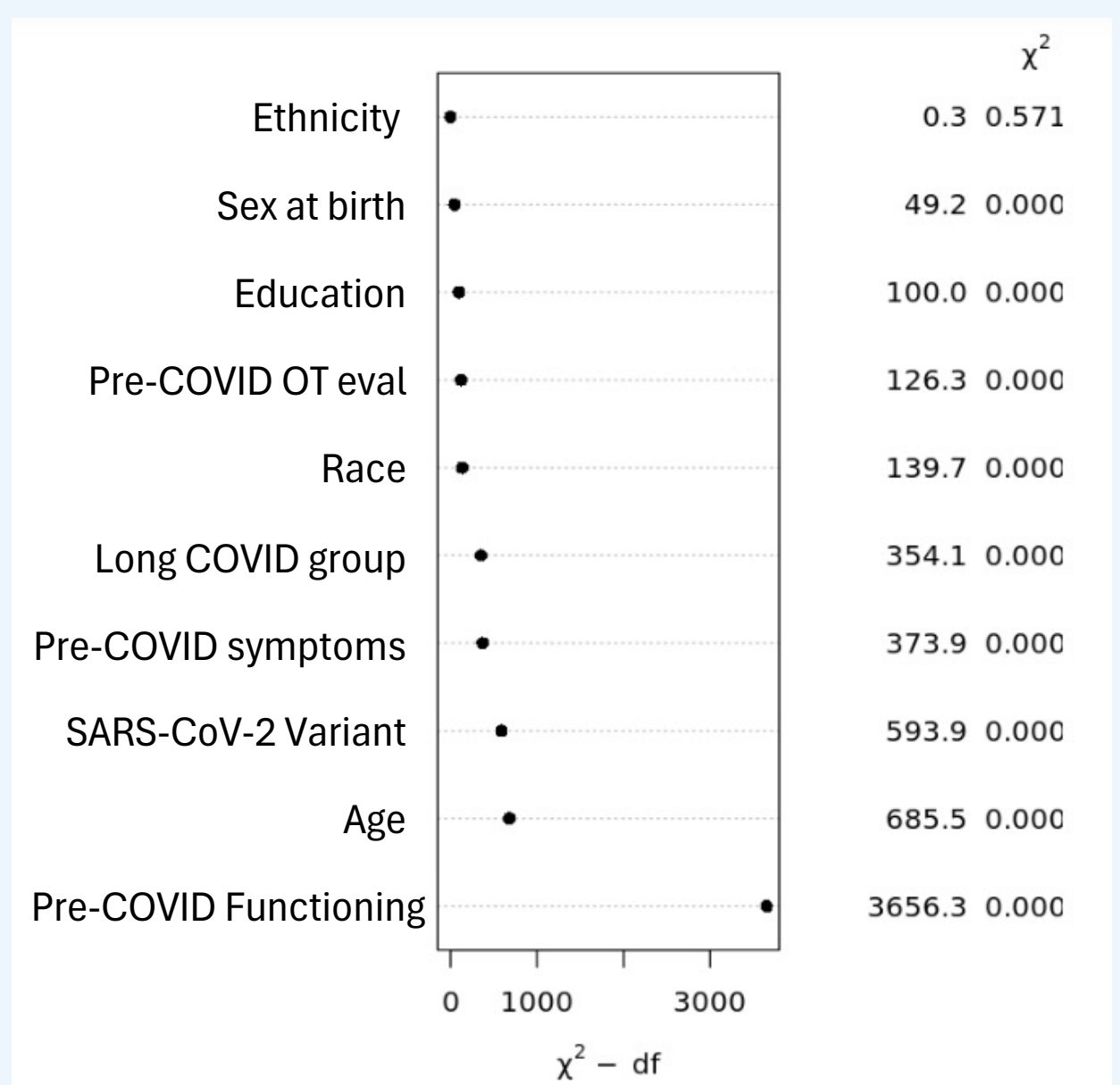
Outcome:

OT evaluation complexity + EHR functional status code =
0-4 impairment score

Results

	Recovered (control) (n=31,437)		Long COVID (case) (n=52,349)		
Age (mean, SD)	57.53	28	60.51	24	p < 2.2e-16
Total number of long COVID symptoms occurring prior to infection (mean, SD)	2.30	2.86	5.83	3.98	p < 2.2e-16
SARS-CoV-2 Variant (n, %)					p < 2.2e-16
Pre VOC	9694	30.8	27123	51.8	
Pre VOC, alpha, beta	7904	25.1	13057	24.9	
Alpha, beta, delta	2580	8.2	4352	8.3	
Delta	3890	12.4	4365	8.3	
Omicron BA1-BA2	4319	13.7	3028	5.8	
Omicron BA2-BA5	3050	9.7	424	0.8	
Sex at birth (n, %)					p < 2.2e-16
Female or intersex	19360	61.6	33945	64.8	
Male	12077	38.4	18404	35.2	
Race (n, %)					p < 2.2e-16
Asian	1241	3.9	1239	2.4	
Black or African American	5508	17.5	10574	20.2	
Middle Eastern or North African	246	0.8	367	0.7	
More than one population	692	2.2	1066	2	
White	23750	75.5	39103	74.7	
Ethnicity = Not Hispanic or Latino(1) (n, %)	30548	97.2	51069	97.6	p = 0.0007922
Note: VOC = Variant of concern					

Main Effects:
Pre-infection functioning was the strongest predictor of post-infection functioning, followed by age, variant, number of pre-infection symptoms, and long COVID status



Results

- Age modified the effect of prior impairment. ($X^2 = 3656.3$)

Fig. 2. Probability of impairment, by prior functioning

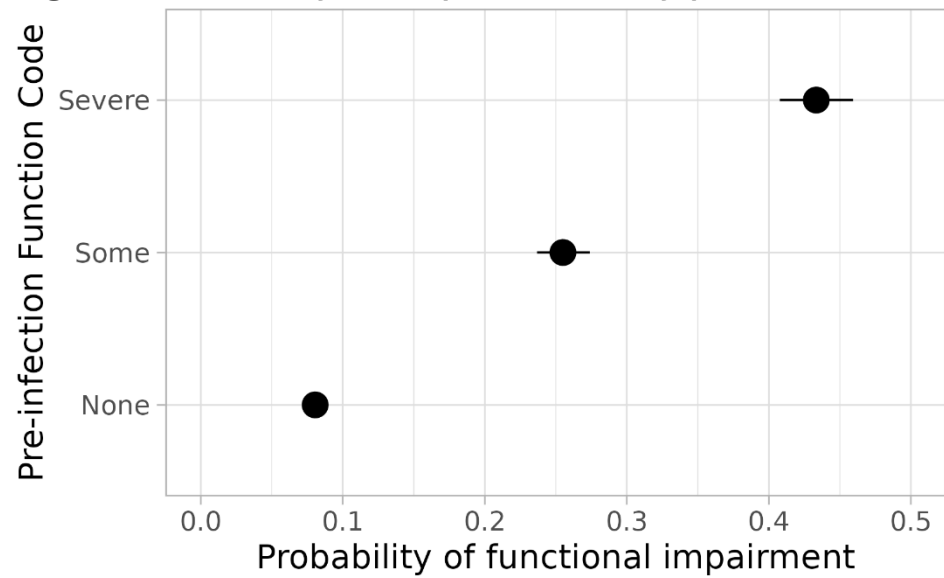
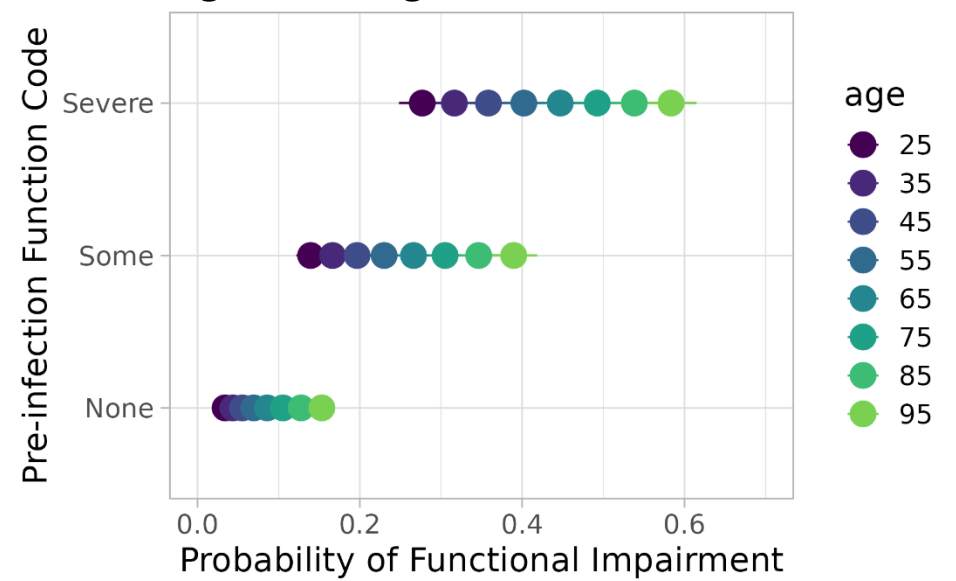


Fig. 3. Probability of impairment, by prior functioning at each age

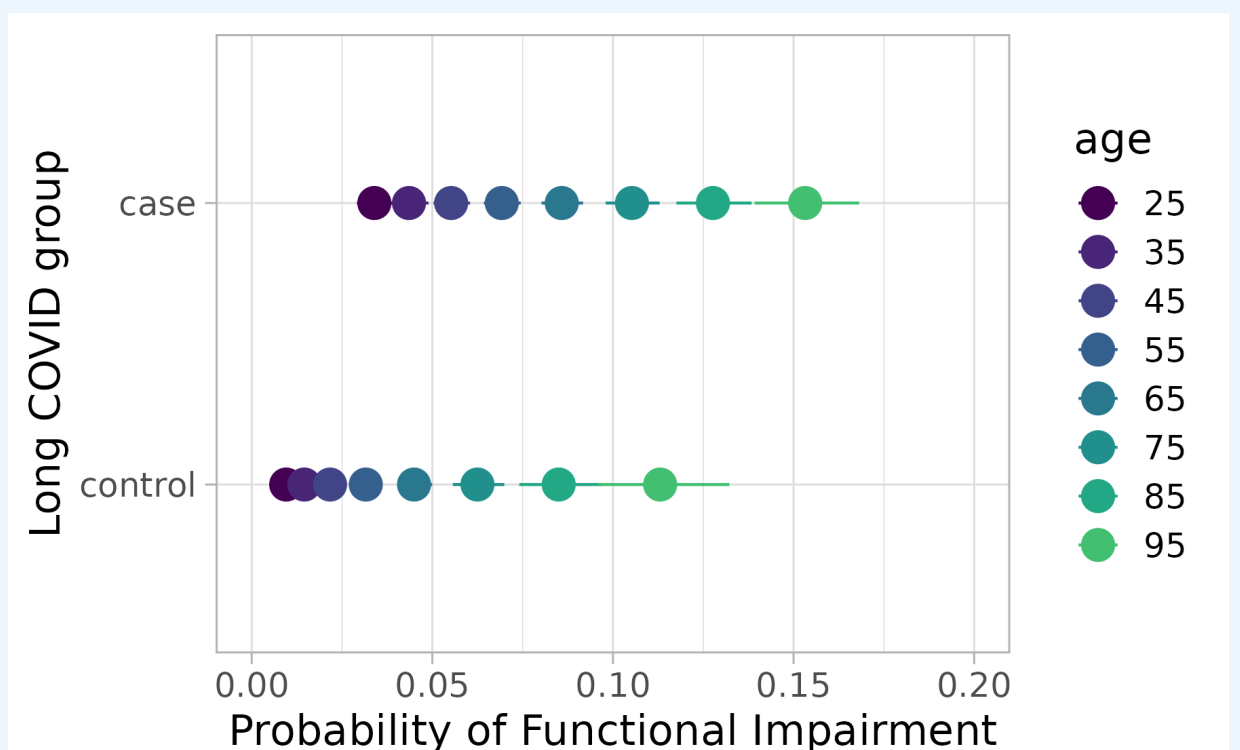


- Cases had greater mean post-infection functional impairment than controls (SMD = 0.34 (99% CI = 0.31, 0.38) $p < 0.000$).
- This was also modified by age: younger-aged cases had greater decreases from prior functioning than older-aged cases.

Table 2. Standard mean differences in functioning by age

Age	Cases (compared to controls)		
	SMD	Std. Error	Interval
25	0.52	0.05	(0.39, 0.65)
35	0.47	0.04	(0.37, 0.57)
45	0.42	0.03	(0.35, 0.50)
55	0.38	0.02	(0.32, 0.43)
65	0.33	0.02	(0.28, 0.38)
75	0.28	0.02	(0.23, 0.34)
85	0.23	0.03	(0.16, 0.31)

Fig. 4. Probability of impairment, by long COVID status at each age



Conclusions:

- Older adults had higher odds of functional impairment even when controlling for other risk factors.
- The post-COVID infection assessment and care of older adults should include measurement of functional change from pre-infection baseline using instruments that are able to detect functional status changes in older people.
- Based on the probability of functional loss, occupational therapy interventions have the potential to improve post-COVID function and enhance occupational performance in older adults.