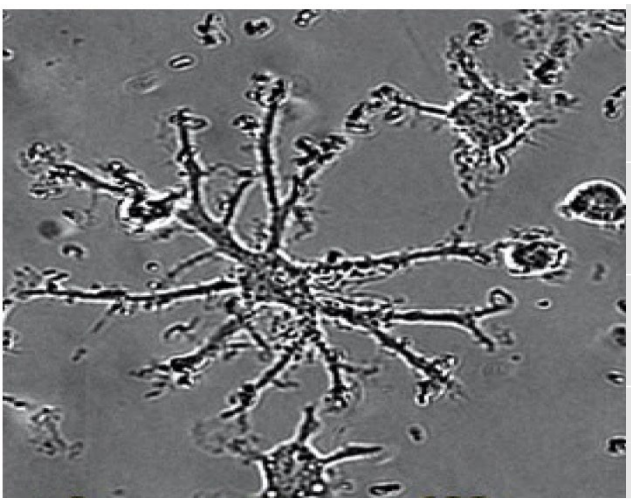
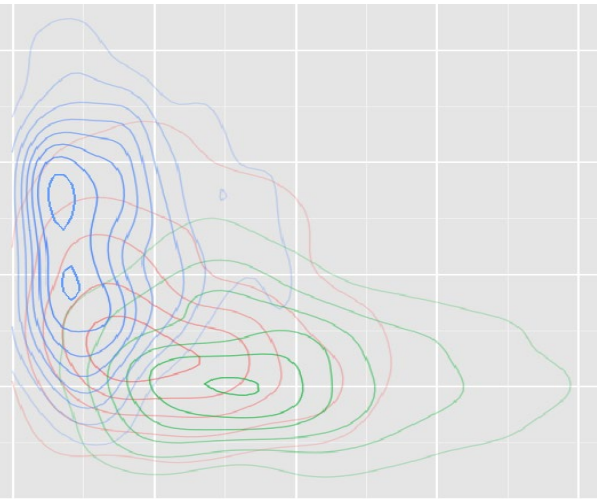
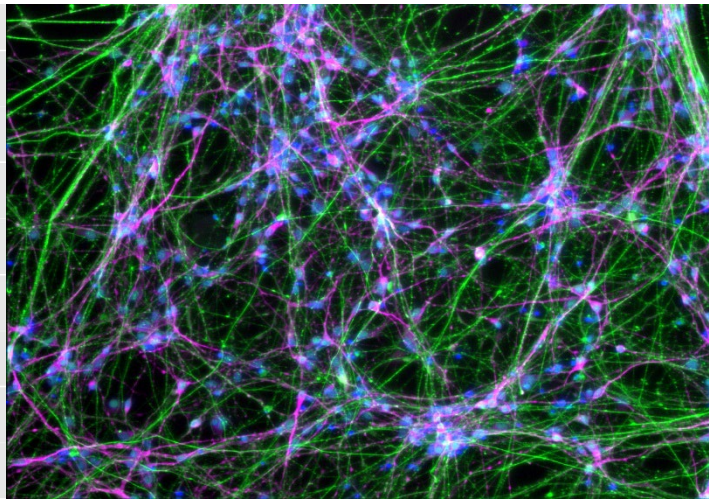
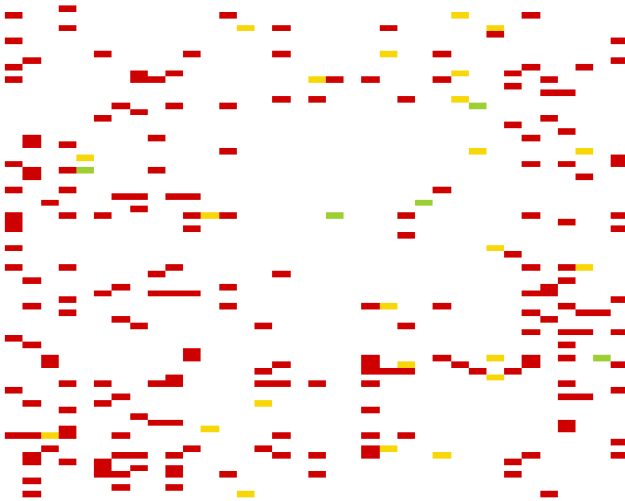
Long COVID, functional status, and well-being: a 50-state perspective

ROY PERLIS, MD MSC

MGH CENTER FOR QUANTITATIVE HEALTH

RPERLIS@MGH.HARVARD.EDU

CEDD CENTER FOR EXPERIMENTAL DRUGS & DIAGNOSTICS

CENTER FOR GENOMIC MEDICINE

MGH 1811 MASSACHUSETTS GENERAL HOSPITAL

HARVARD MEDICAL SCHOOL


THE COVID STATES PROJECT
About
Publications
Topics
Data
Media Coverage
Insights
Contact Us
Join Mailing List
THE STATE OF THE NATION:
A 50-STATE COVID-19 SURVEY
As covered by:
THE WALL STREET JOURNAL
The New York Times
The Atlantic
The Washington Post
USA TODAY
CBS NEWS
nature
npr
STAT
The Boston Globe
Latest report
REPORT #101
Mental Health Among Young Adults
Announcement
Did states with mask mandates have fewer deaths from Covid?
February 27, 2023
Recent media coverage
Long COVID symptoms keeping many Americans from returning to work
PBS April 18, 2023

The COVID States Project

- 50 states and the District of Columbia
- ~20k participants age 18+, every 6-8 weeks since April 2020
- Participants from online panels 'opt in' to a survey of opinions –

  -> NOT a COVID survey

- Nonprobabilistic, enriched design (i.e., quotas to oversample hard-to-reach groups), reweighting to ensure representativeness of US population as a whole
- Validated against other surveys, administrative data
- Wave 28 pending…!

Green PNAS Nexus 2023; Perlis JNO 2022

Simple pragmatic retrospective definition of long COVID

- positive COVID-19 test result (PCR or antigen)
- test at least 2 months before the survey month.
- self-report that acute symptoms have not completely resolved
- … then asked to complete a checklist of commonly reported symptoms

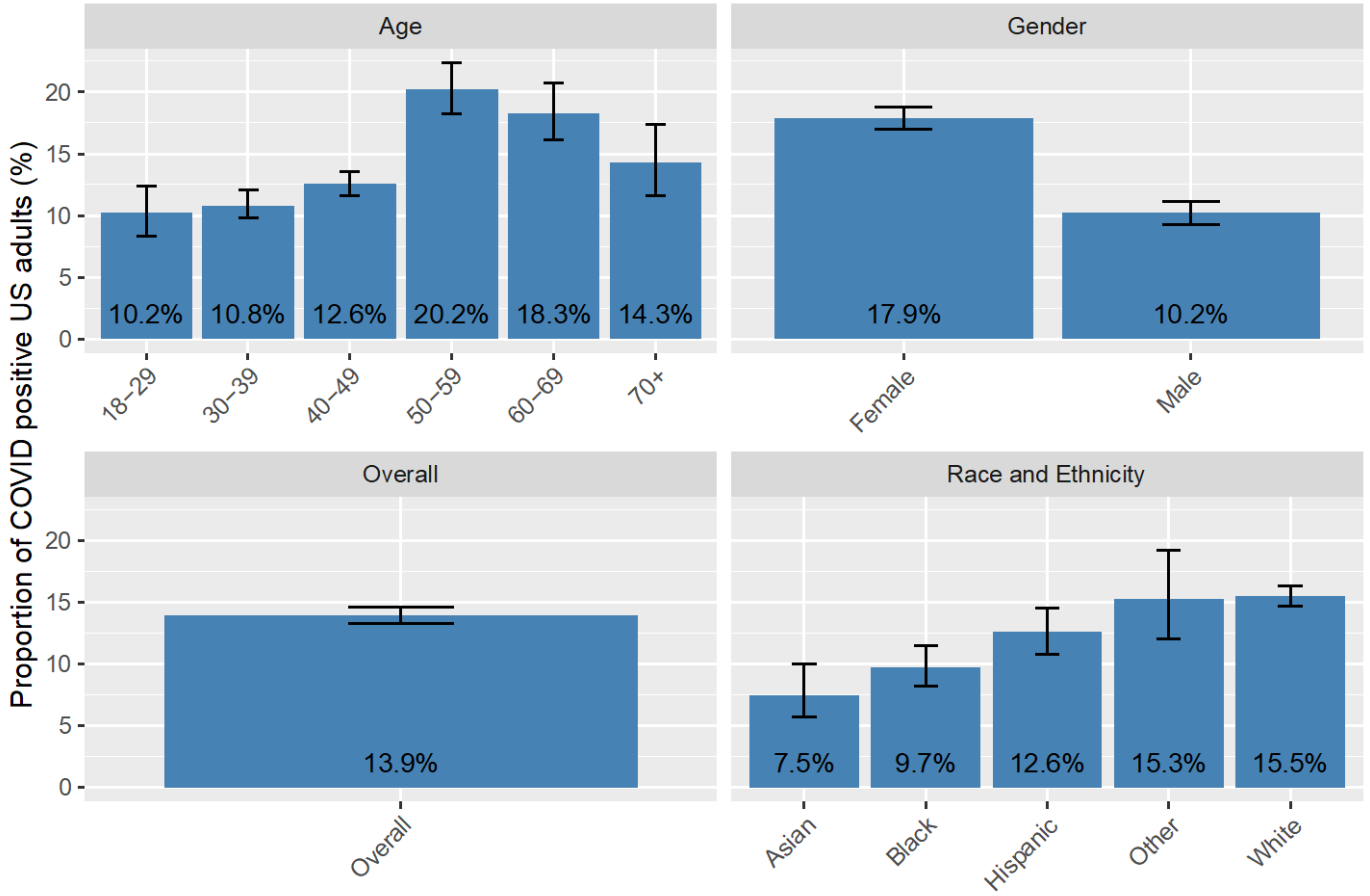
- (Results I will show are robust to varying definitions ….)

Estimating the average point prevalence of long COVID

- 8 waves of a 50-state non-probability internet survey conducted between February 2021 and July 2022
- N=16,091 with COVID test+ at least 2 months previously
- Proportion of individuals reporting continued symptoms?

Perlis JNO 2022

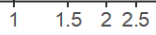
What proportion of people who tested positive for COVID 2+ months ago report continued symptoms?



Perlis JNO 2022

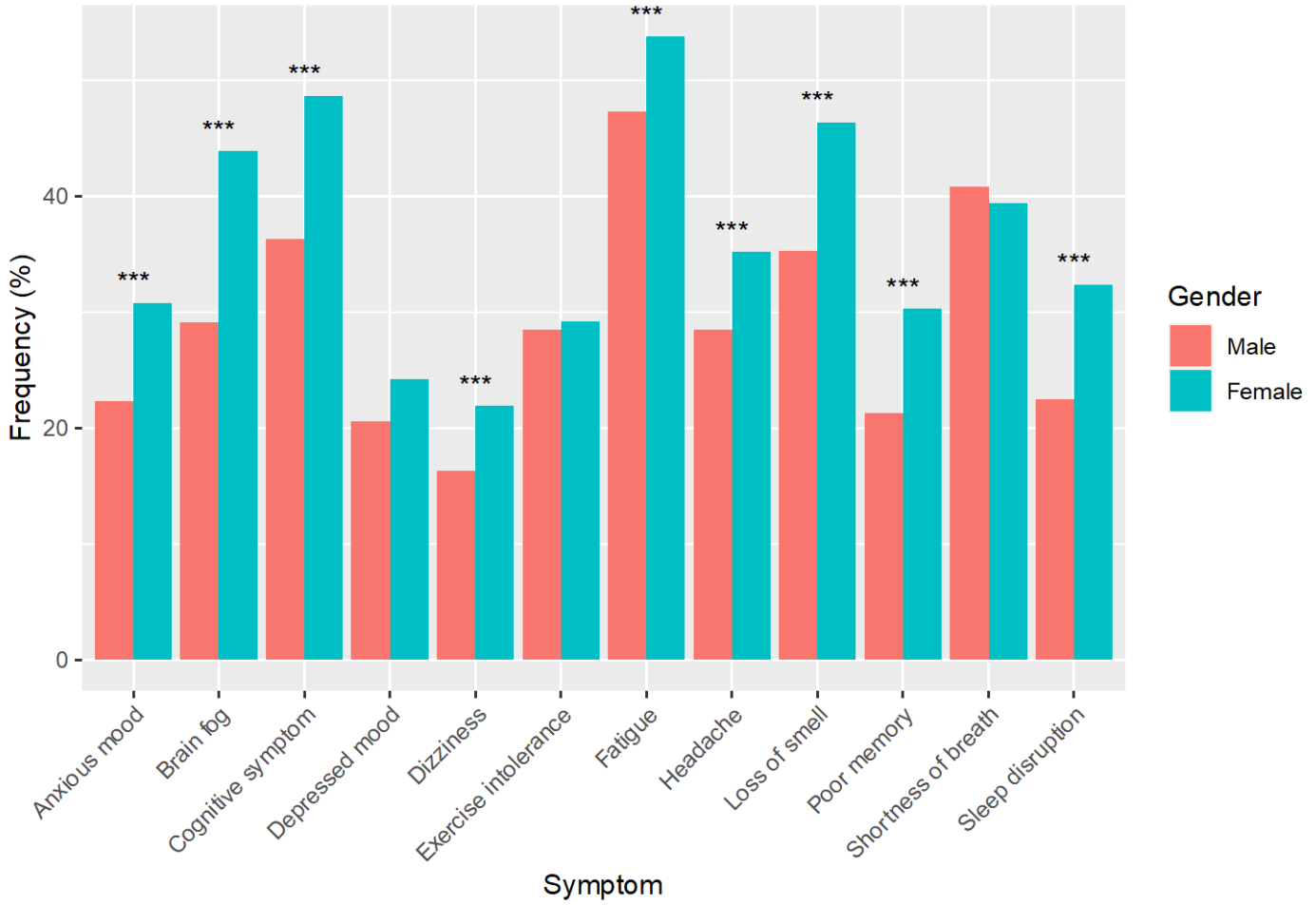
These estimates obscure huge sociodemographic variability…

Variable		N	Odds ratio		p
Age	18–29	1076		Reference	
	30–39	3629		1.12 (0.91, 1.40)	0.295
	40–49	7049		1.49 (1.22, 1.84)	<0.001
	50–59	2056		2.38 (1.92, 2.98)	<0.001
	60–69	1512		1.96 (1.55, 2.48)	<0.001
	70+	769		1.64 (1.24, 2.17)	<0.001
Gender	Male	6016		Reference	
	Female	10075		1.88 (1.70, 2.09)	<0.001
Race	Asian	817		Reference	
	Black	1546		1.06 (0.78, 1.44)	0.717
	Hispanic	1826		1.40 (1.06, 1.89)	0.022
	Other category	477		1.86 (1.31, 2.65)	<0.001
	White	11425		1.69 (1.31, 2.22)	<0.001
Income	Less than $25,000	3735		Reference	
	$25,000 to $74,999	6507		0.94 (0.84, 1.05)	0.270
	$75,000 to $149,999	4404		0.78 (0.68, 0.89)	<0.001
	$150,000 or more	1445		0.73 (0.59, 0.90)	0.003
Education	High School or Less	3969		Reference	
	Some College	5309		1.16 (1.04, 1.30)	0.009
	Bachelor's Degree	4100		0.87 (0.76, 1.00)	0.048
	Graduate Degree	2713		0.66 (0.56, 0.79)	<0.001
Urbanicity	Rural	2625		Reference	
	Suburban	9044		0.99 (0.88, 1.11)	0.834
	Urban	4422		0.75 (0.65, 0.87)	<0.001
Region	Northeast	2486		Reference	
	Midwest	4091		1.13 (0.98, 1.32)	0.100
	South	6287		1.11 (0.97, 1.28)	0.146
	West	3227		1.08 (0.92, 1.27)	0.321



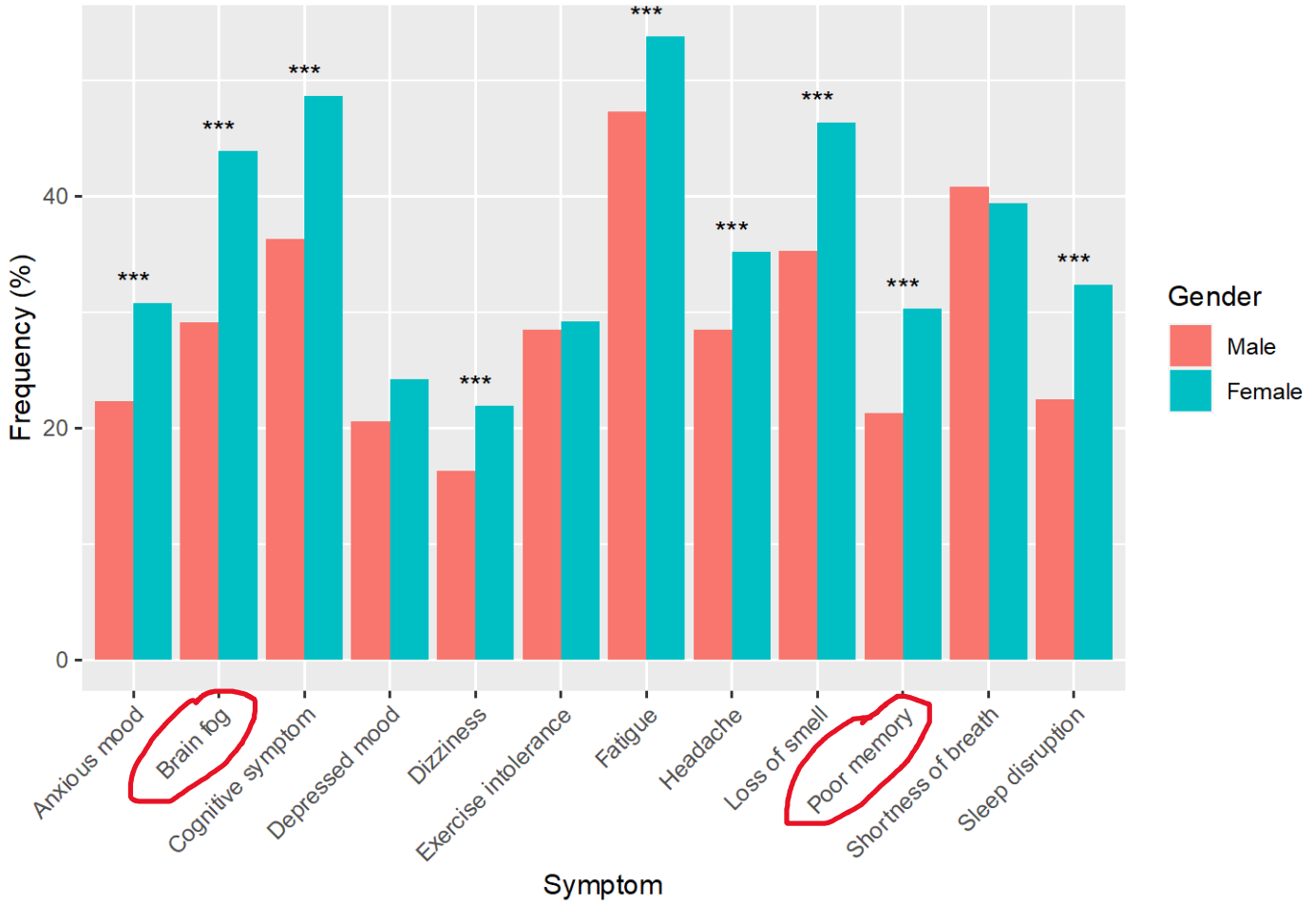
Perlis JNO 2022

… and major variability in prevalence of individual symptoms…



Perlis JNO 2022

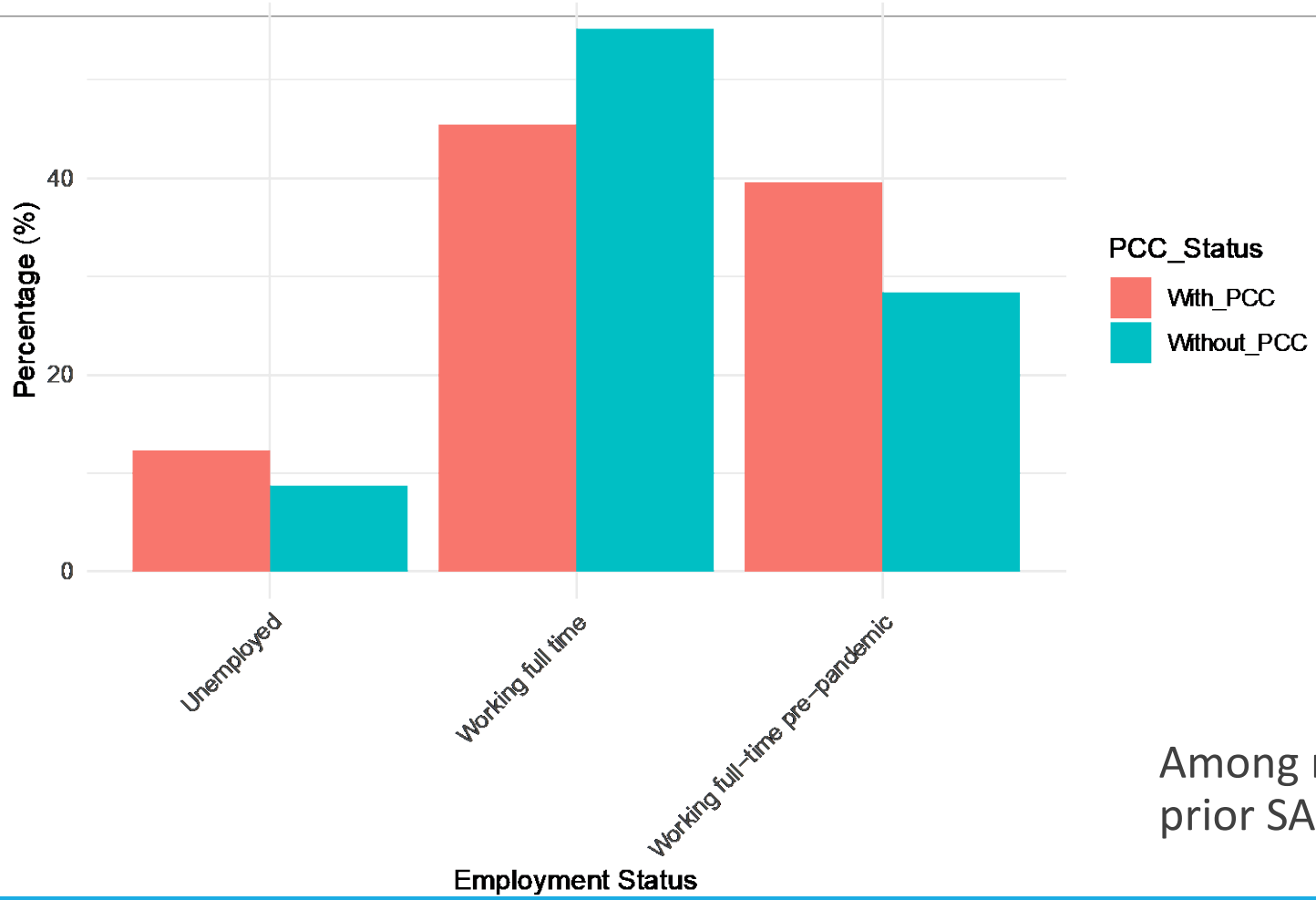
… and major variability in prevalence of individual symptoms…



Perlis JNO 2022

But… how do symptoms impact functioning?

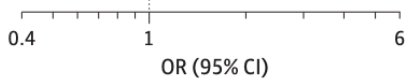
Long COVID and employment status



Among n=15,308 who reported prior SARS-CoV-2 infection

Figure 1. Association Between Post–COVID-19 Condition (PCC) and Likelihood of Working Full Time at Time of Survey in Logistic Regression Models Without and With Adjustment for Sociodemographic Features

Variable	No. of patients	OR (95% CI)	*P* value
PCC (unadjusted)	14149	0.71 (0.63-0.80)	<.001
PCC (adjusted)	14149	0.84 (0.74-0.96)	.01
Age, y			
18-29	1068	1 [Reference]	
30-39	3613	2.80 (2.29-3.42)	<.001
40-49	6951	4.41 (3.63-5.35)	<.001
50-59	1798	3.19 (2.56-3.98)	<.001
60-69	719	1.94 (1.48-2.53)	<.001
Sex			
Male	5201	1 [Reference]	
Female	8948	0.54 (0.49, 0.59)	<.001
Race			
Asian	784	1 [Reference]	
Black	1410	0.98 (0.77-1.24)	.85
Hispanic	1755	1.08 (0.86-1.36)	.49
Other category	427	0.95 (0.69-1.30)	.73
White	9773	1.18 (0.96-1.45)	.11
Education			
High school or less	3489	1 [Reference]	
Some college	4543	1.48 (1.32-1.65)	<.001
Bachelor's degree	3644	3.45 (3.04-3.91)	<.001
Graduate degree	2473	4.51 (3.86-5.25)	<.001
Urbanicity			
Rural	2271	1 [Reference]	
Suburban	7864	1.08 (0.95-1.23)	.26
Urban	4014	1.14 (0.98-1.32)	.10
Region			
Northeast	2215	1 [Reference]	
Midwest	3543	1.23 (1.06-1.42)	.007
South	5511	1.24 (1.08-1.42)	.003
West	2880	1.10 (0.94-1.29)	.23

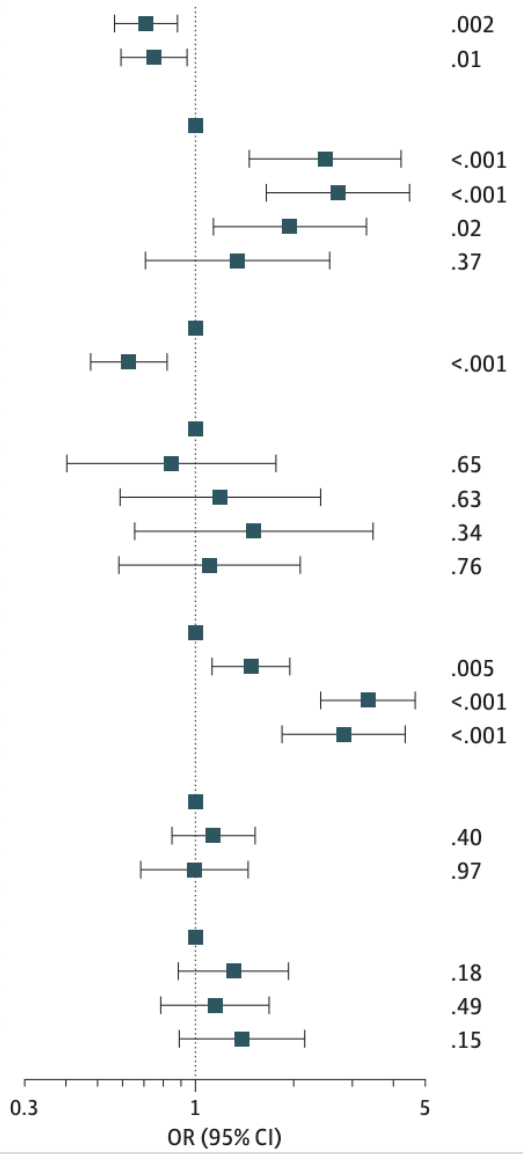


Odds of full-time employment are **~15% lower** among individuals with long COVID …

Perlis JNO 2023

Figure 2. Among Individuals With Post–COVID-19 Condition, Association Between Neurocognitive Symptoms and Likelihood of Working Full Time at Time of Survey in Logistic Regression Models Without and With Adjustment for Sociodemographic Features

Variable	No. of patients	OR (95% CI)	*P* value
Cognitive symptoms (unadjusted)	1993	0.70 (0.56-0.88)	.002
Cognitive symptoms (adjusted)	1993	0.75 (0.59-0.94)	.01
Age, y			
18-29	121	1 [Reference]	
30-39	425	2.50 (1.46-4.27)	<.001
40-49	909	2.73 (1.65-4.54)	<.001
50-59	403	1.95 (1.13-3.35)	.02
60-69	135	1.34 (0.70-2.58)	.37
Sex			
Male	433	1 [Reference]	
Female	1560	0.62 (0.48-0.82)	<.001
Race			
Asian	62	1 [Reference]	
Black	154	0.84 (0.40-1.76)	.65
Hispanic	218	1.19 (0.59-2.42)	.63
Other category	74	1.51 (0.65-3.51)	.34
White	1485	1.10 (0.58-2.10	.76
Education			
High school or less	542	1 [Reference]	
Some college	813	1.48 (1.12-1.95)	.005
Bachelor's degree	438	3.38 (2.42-4.72)	<.001
Graduate degree	200	2.85 (1.84-4.40)	<.001
Urbanicity			
Rural	390	1 [Reference]	
Suburban	1204	1.13 (0.85-1.52)	.40
Urban	399	0.99 (0.68-1.45)	.97
Region			
Northeast	266	1 [Reference]	
Midwest	552	1.31 (0.88-1.93)	.18
South	802	1.15 (0.78-1.68)	.49
West	373	1.39 (0.89-2.16)	.15

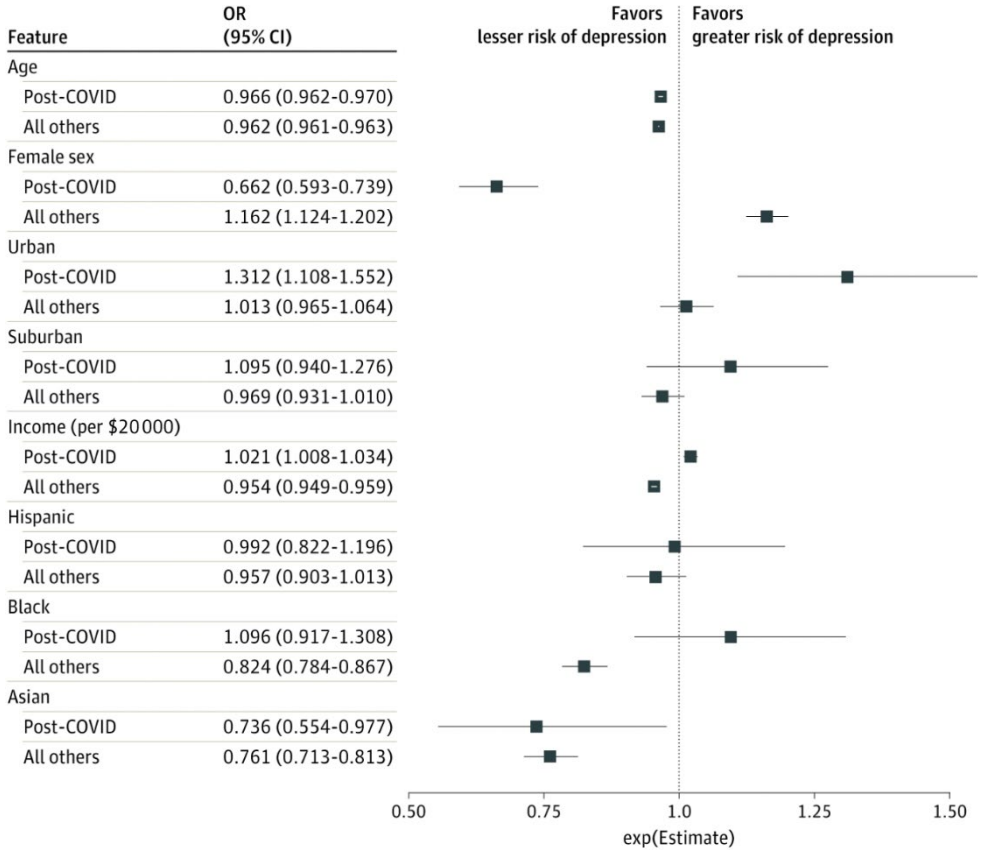


Odds of full-time employment are ~**25%** **lower** among individuals with long COVID and cognitive symptoms

Perlis JNO 2023

Other CNS symptoms in long COVID

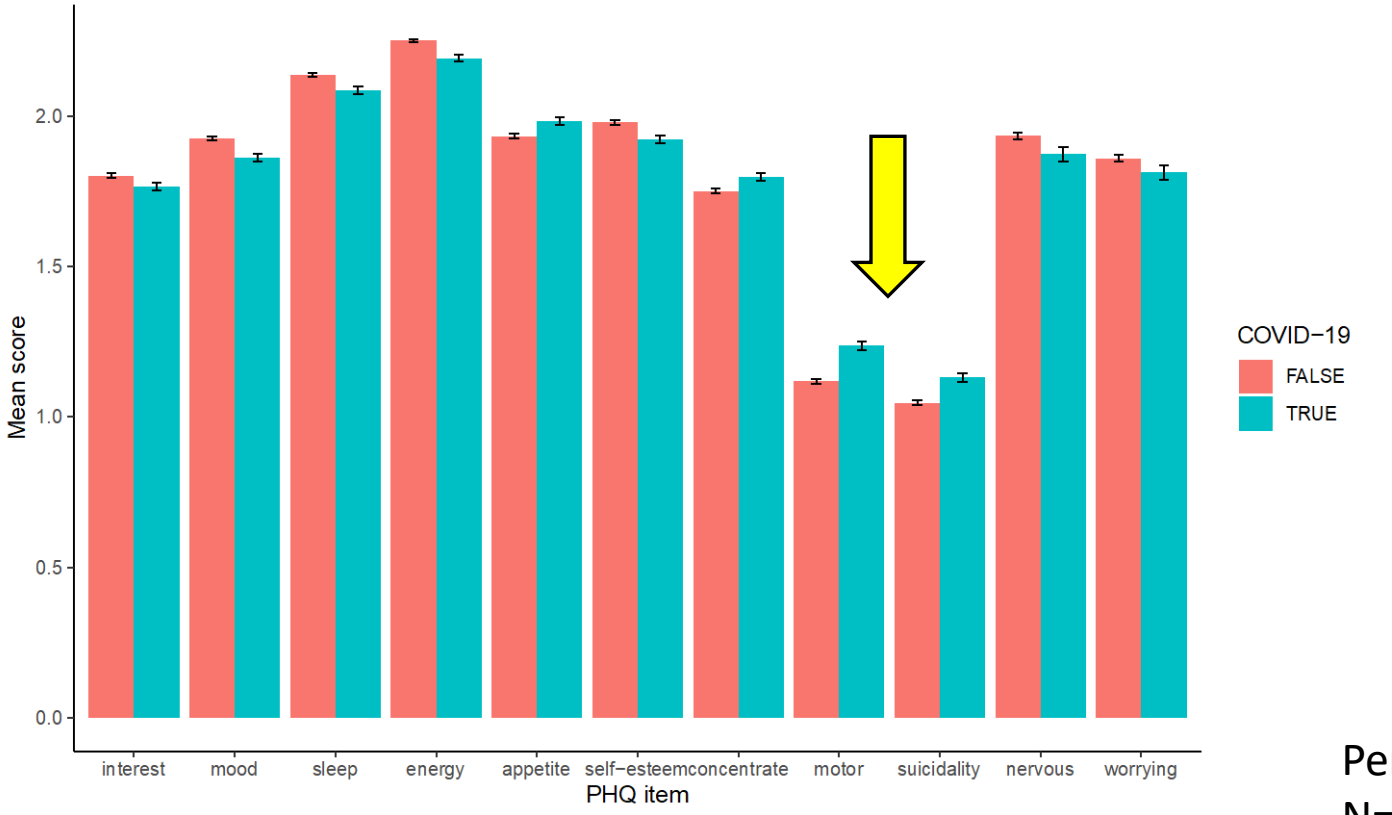
Post-COVID-19 depression risk factors are somewhat different from all-cause depression



N=91,791 respondents; comparing depression +/- prior COVID

Perlis JAMA Open June 2021

Symptom profiles are somewhat different for post-COVID-19 depression (April 2021-July 2022)



Perlis, JNO 2021 and unpublished
N=22,823 with
moderate or greater symptoms

So…

Substantial functional (and economic) impact of long COVID

Cognitive symptoms are prominent and associated with employment status

Understanding well-being means understanding *all* CNS symptoms

We can learn a lot from low-cost large-scale population-based survey data

Thank you!

National Institute of Mental Health

National Science Foundation

Dozoretz Family

Blyth Family

Barnett Family

CEDD Center for Experimental Drugs & Diagnostics

Center for Genomic Medicine

MGH 1811 Massachusetts General Hospital

Harvard Medical School