

NOTE: Some of the slides in this presentation have changed since the original presentation on March 21, 2022. The researchers reran the analyses because an adjustment in the data was required and they have updated the results as follows:

- Updated model results figures (slides 6-8)
- Updated proportions table at 3, 6, and 12 months after acute episode (slide 9)
- Updated results figures of U.S. long COVID cases (at 3 months after symptom onset) by sex and coarse age group for 2020-2021 and overlap of symptom clusters (slide 10)
- Updated results of long COVID case numbers at 3 months and 12 months after symptom onset (slides 11 and 13)



IHME

Measuring what matters

# Long COVID in 2020 and 2021, USA

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# Content

- Introduction
- Brief overview methods
- Results
- Implications

# Introduction

1. Focus has, understandably, been on managing acute infections of SARS-CoV-2
  - a) Spread of infections
  - b) Severe disease: management in hospital wards and ICUs
  - c) Deaths
2. Middle of 2020, reports emerged on longer-term symptoms in a proportion of infected cases akin to other post-infection syndromes e.g. after dengue or Lyme disease
3. A range of publications and systematic review/meta-analyses have followed
4. Limitations:
  - a) Large heterogeneity in symptom questions, scales and selection of cases (...and often no controls)
  - b) Concentrated on a (long) list of symptoms and largely presented symptom by symptom or as symptom counts
  - c) No systematic measurement of severity

## Introduction (2)

- Our motivation was to add 'long COVID' as an outcome to the Global Burden of Disease estimates as we aim to comprehensively estimate health loss in the world
- We concentrated on three symptom clusters that affect a large proportion of patients
- We did not include added risk of diseases that are measured separately in GBD, such as cardiovascular diseases, acute/chronic kidney disease ...but will present today a 'back of the envelope' calculation of CVD outcomes based on analysis of VA data (Ziyad Al-Aly, Nature Medicine)
- We started with a traditional systematic review but quickly realized limitations of what can be derived from publications
- Actively sought out collaboration with ongoing cohort study authors

# Methods

## 1. Data sources

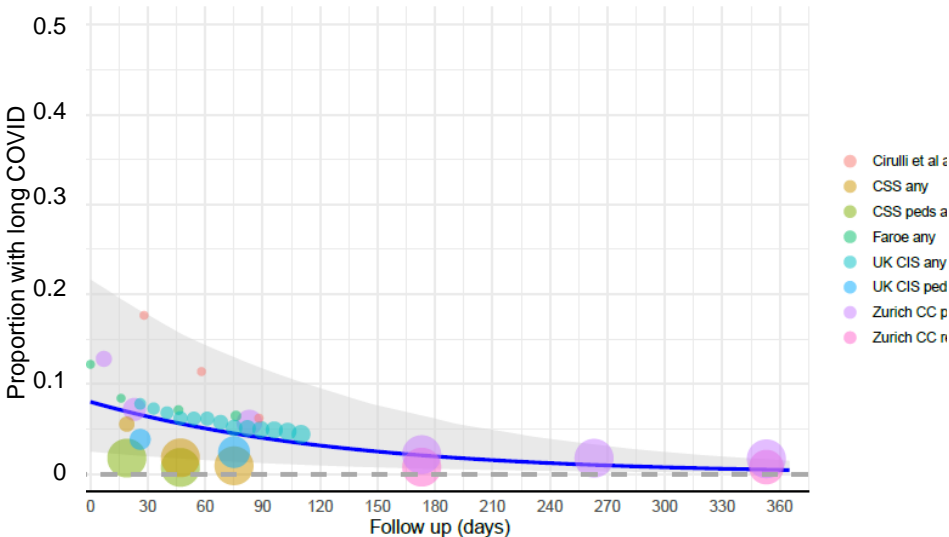
- a) Analyses based on access to individual records of 10 collaborating cohorts (RUS, IRN, USA, ITA, NED, SWE, CHE, AUT, DEU, Faroe Isl)
- b) Bespoke analyses of two large US medical claims data sources: VA and PRA
- c) Supplemented with data from 40 published sources

## 2. Case definitions

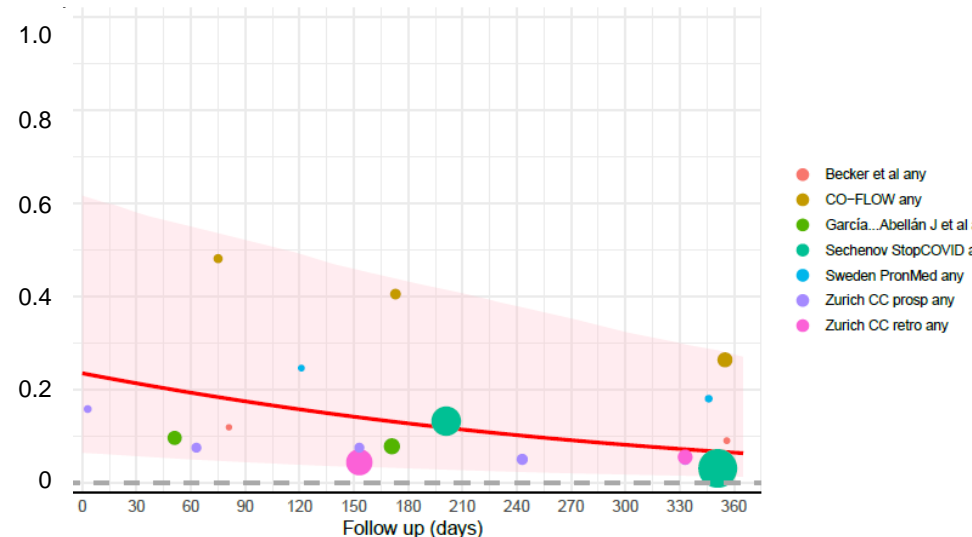
- a) Three symptom clusters
  - o **Fatigue**, bodily pain and depression/anxiety symptoms
  - o **Cognitive** problems (inability to concentrate, remember); 2 levels of severity
  - o Ongoing **respiratory** problems (shortness of breath, cough, chest pain); 3 levels of severity
- b) Here we present cases who have any of these symptom clusters lasting at least **3 months** post-infection as well as those with continuing problems at 12 months
- c) Separate estimates of the risk of 'long COVID' in those with milder infections and those hospitalised (ward or ICU)
- d) Assumption that asymptomatic infection does not lead to long COVID
- e) Data extractions using algorithms to make as comparable estimates as possible from heterogeneous Qs/scales

# Nonfatal COVID: derivation of duration

Median duration mild infections: 121.5 days

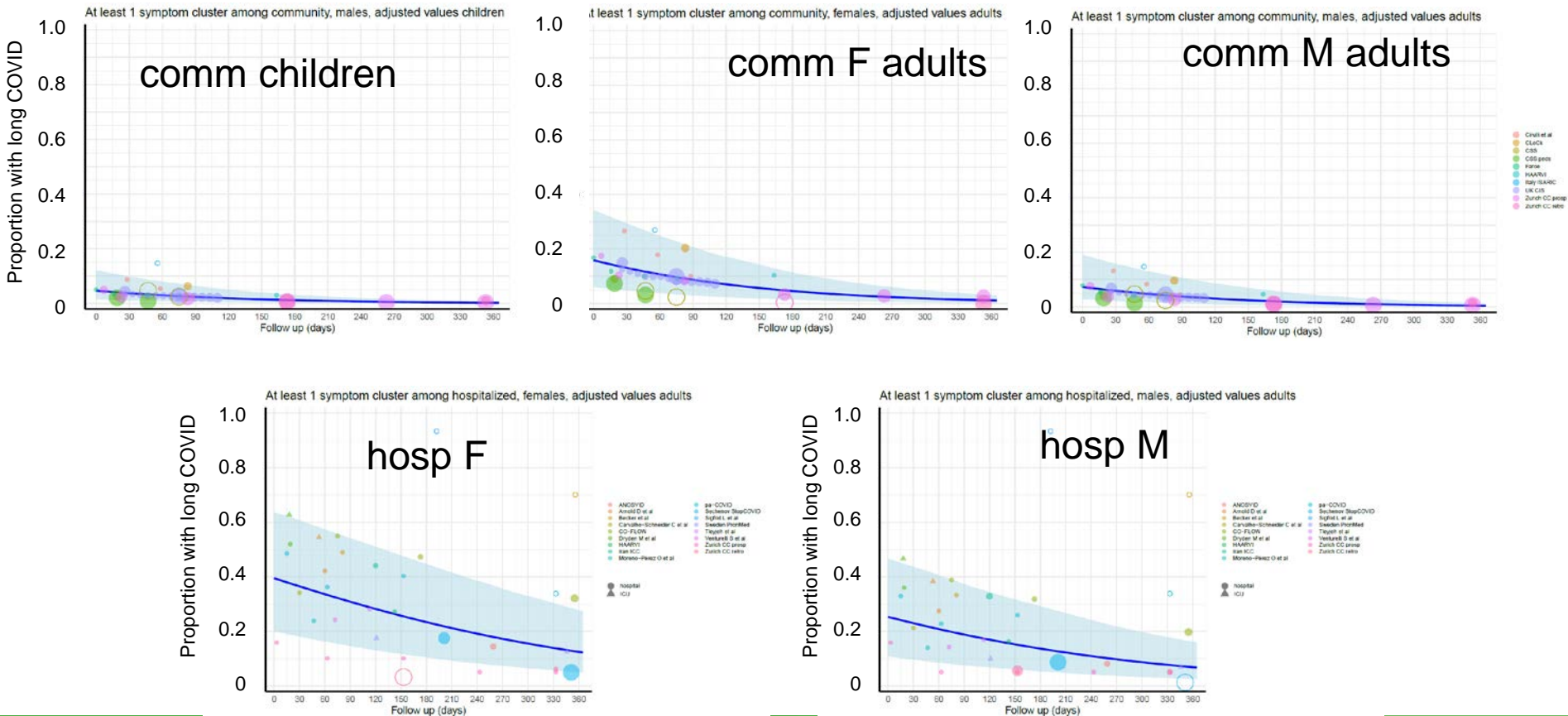


Median duration hospitalized cases: 268.9 days



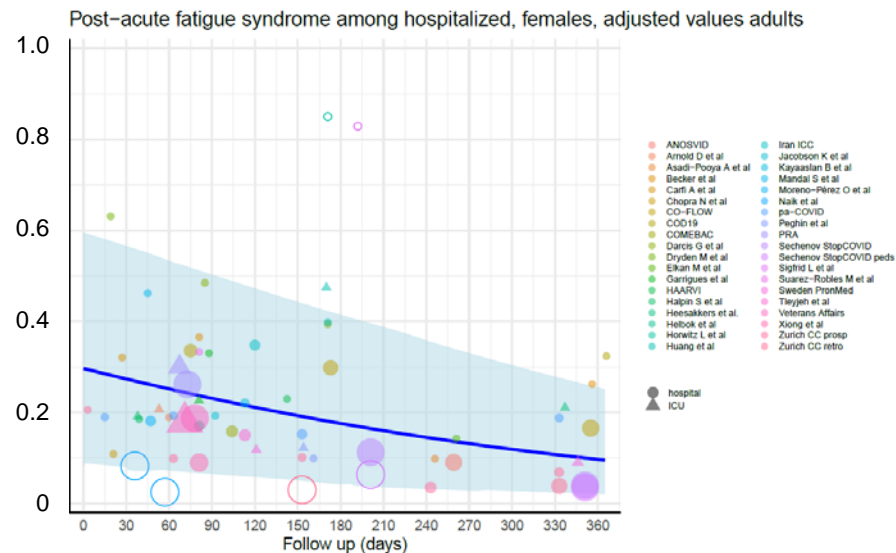
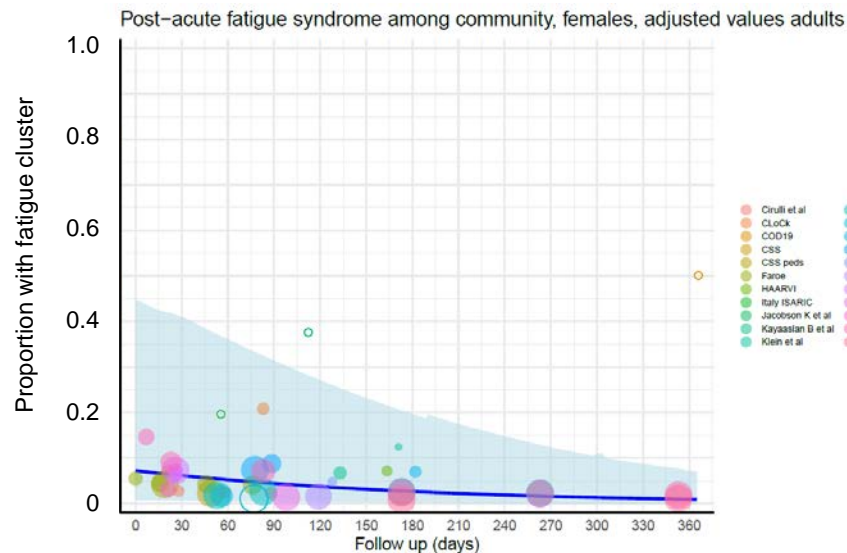
Note: durations estimated from minimum 3 months period post-infection; for this analysis data from studies with multiple follow-up points

# Any of three clusters in cohort studies





# All data including published studies



Example: Fatigue symptom cluster in females

# Probability of ongoing symptoms at 3, 6, and 12 months after acute episode

		months since end of acute episode		
<b>FEMALES</b>		<b>3 mo</b>	<b>6 mo</b>	<b>12 mo</b>
community*	children <20	2.55%	1.26%	0.26%
community	adults >=20	9.26%	4.88%	1.24%
hospital	all ages	33.64%	25.74%	13.94%
icu	all ages	51.49%	42.08%	25.37%

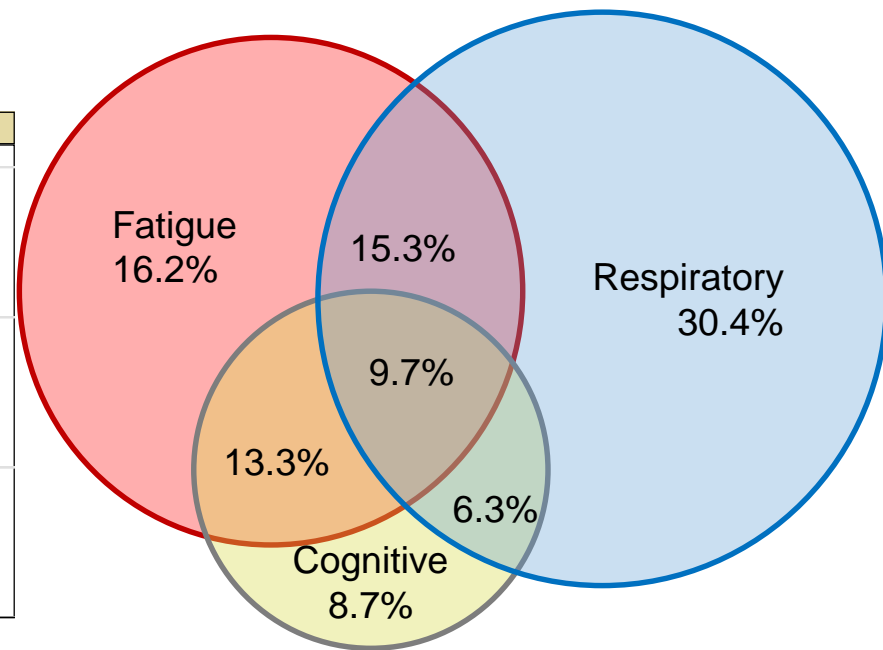
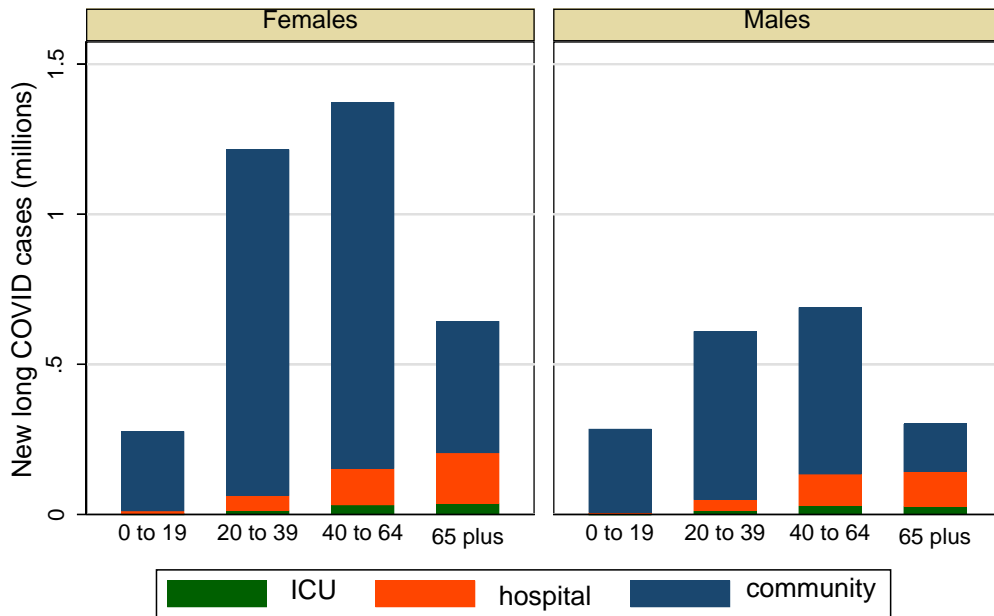
<b>MALES</b>				
community*	children <20	2.55%	1.26%	0.26%
community	adults >=20	4.05%	2.05%	0.47%
hospital	all ages	20.84%	15.25%	7.73%
icu	all ages	35.56%	27.41%	15.00%

\* Estimates for community cases among children are assumed the same for males and females

<b>ALL SURVIVING CASES</b>				
Females		7.42%	4.05%	1.16%
Males		3.93%	2.10%	0.58%
<b>Both sexes</b>		<b>5.68%</b>	<b>3.07%</b>	<b>0.87%</b>

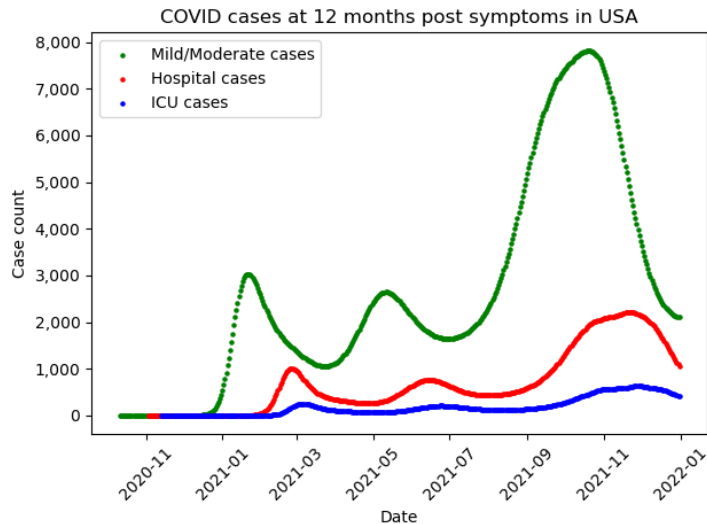
# Nonfatal COVID: 2020 Results

New long COVID cases, USA, 2020-2021  
at 3 months after symptom onset



# Nonfatal COVID: 2020/21 USA Results

- 4.6 million new cases of long COVID (3-month duration threshold) in 2020 and 2021
  - 86% from community cases, 11% from hospitalized cases, 3% from ICU cases
  - 66% were female
  - Average disability weight among long COVID cases = 0.21 (equivalent to DWs for complete hearing loss and severe traumatic brain injury)
- 1.35 million 'incidence' of long COVID in 2021 and 2022 having lasted at least one year
  - 73% from community cases, 20% from hospitalized cases, 7% from ICU cases
  - 66% were female
  - 70% in those aged between 20 and 64



# Limitations

- Sparse, heterogeneous data
- Incomplete follow-up to determine ‘tail’ of duration, particularly in hospitalized cases; so far, three cohorts with 12-month follow-up
- Relatively few studies from low/middle-income countries
  - But long COVID is present where studied (e.g. published studies from India, Brazil, Bangladesh, South Africa)

# Implications

- Considerable risk of on-going symptoms after acute SARS-COV2 infection
- Age pattern shows highest risk in young adults and females → very different from age pattern of severe acute COVID-19
- Majority of cases in people of working age
- Around 24% of those qualifying for long COVID at 3 months are still a case at 12 months
- In the USA in 2021 720,000 people aged 20 and older hit the 1-year duration mark and we estimate this number to be 520,000 for the current 2022 year
- The average severity of long COVID is pretty severe
- Recovery for the vast majority of long COVID cases within a year
- Considerable support (rehab, income) required as well as help to transition back into the workforce (or education) when symptoms start to wane