Wellness Hub: Immunogenicity Sub-Study

AB-Protect

Ontario, Canada

Public Health Agency of Canada

Agence de la santé publique du Canada

Antibody responses to vaccine and protection from COVID-19 in residents of long term care homes.

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COVID-19 IMMUNITY TASK FORCE / GROUPE DE TRAVAIL SUR L'IMMUNITÉ FACE À LA COVID-19

MICHAEL GARRON HOSPITAL
TORONTO EAST HEALTH NETWORK

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Immunogenicity Sub-Study Objectives

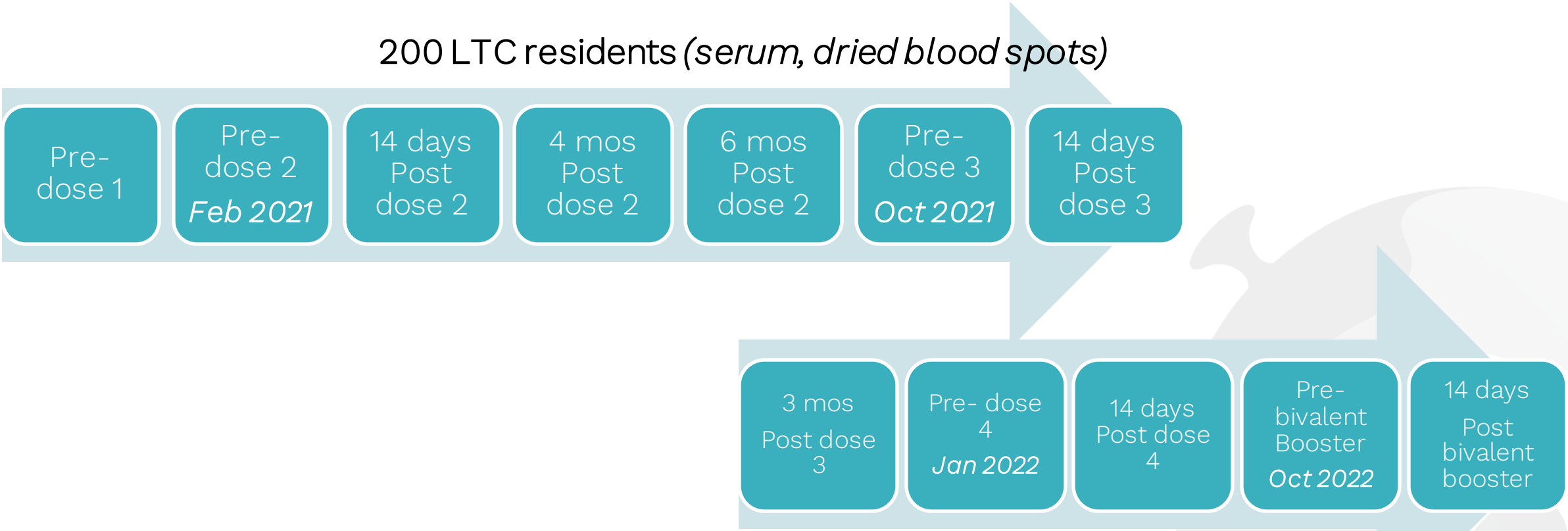
- Primary objective:
  - To compare antibodies to COVID-19 after vaccination in residents and staff of long term care homes (LTCHs).
- Exploratory objectives:
  - Compare the nature of antibodies to COVID-19 after infection to those after vaccination in residents of LTCHs
  - Assess the decline in antibodies to COVID-19 over time in vaccinated and infected residents and staff of LTCHs
  - Assess impact of doses of mRNA vaccines on antibody levels
  - *Contribute to data assessing antibody correlates of protection*

Resident participants

- Participants:
  - Median age 88 yr (range 53-105); 137 (69%) female
  - Median Charlson index 2 (range 0-8), median BMI 26 (range 15-45)
  - 8 (4%) immunosuppressed
  - 25 residents with prior laboratory-confirmed COVID-19
- Homes/vaccines
  - Three homes (29, 26, 60 residents) – all vaccines mRNA-1273
  - One home (88 residents) – first 3 doses BNT162b2

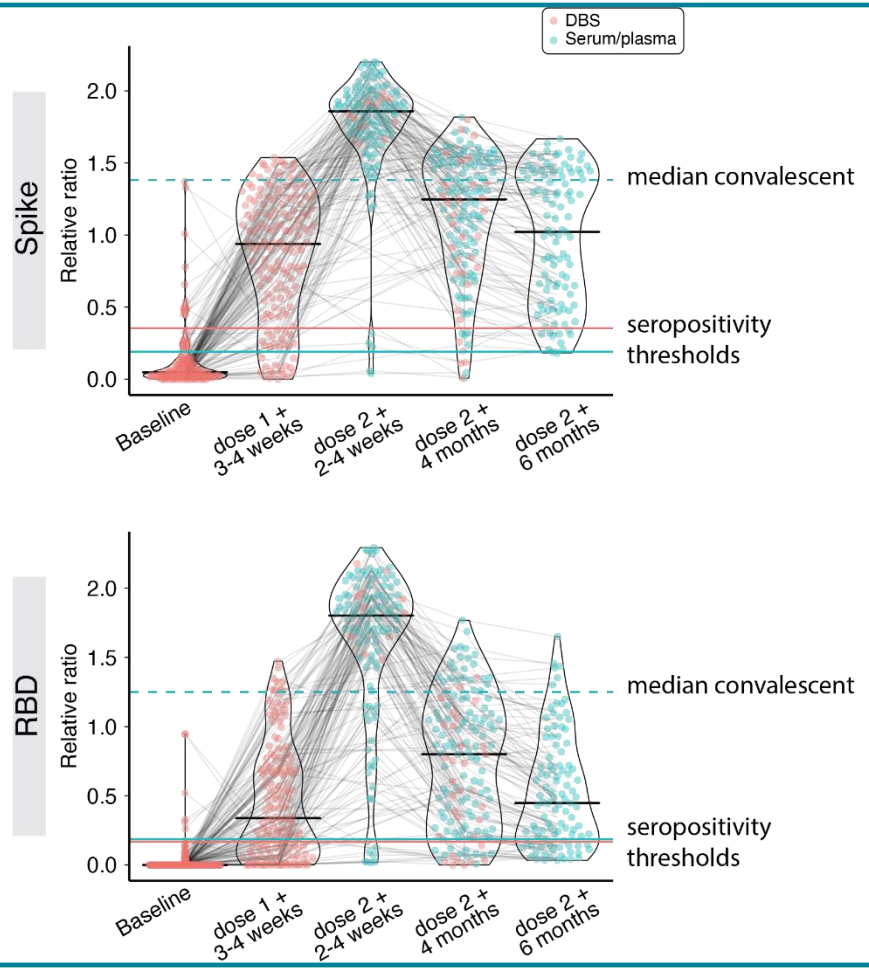
Sampling time points

200 LTC residents *(serum, dried blood spots)*



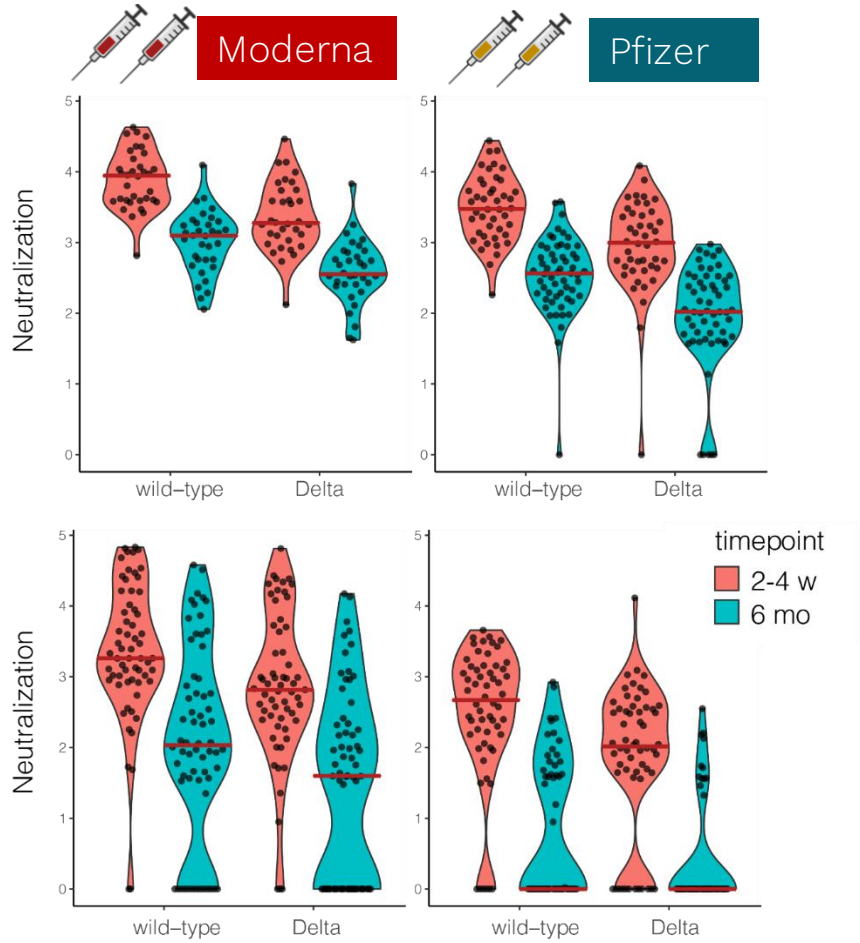
Ongoing monitoring of COVID-19 infection; Serum/DBS 4 weeks post-infection

Initial high levels of anti-Spike and anti-RBD decline more quickly than expected



- 3–4 weeks post dose 1:
  - Seroconversion in **67%** of residents
  - 7% had higher anti-RBD IgG than median convalescents
- 2–4 weeks post dose 2 (apex):
  - Seroconversion in **92%** of residents
  - 80% had higher anti-RBD IgG than median convalescents
- 4 months post dose 2:
  - Seroconversion in **88%** of residents
  - 23% had higher anti-RBD than median convalescents
- 6 months post dose 2:
  - Seroconversion in **72%** of residents
  - 12% had higher anti-RBD than median convalescents

Multiple factors affect antibody titres

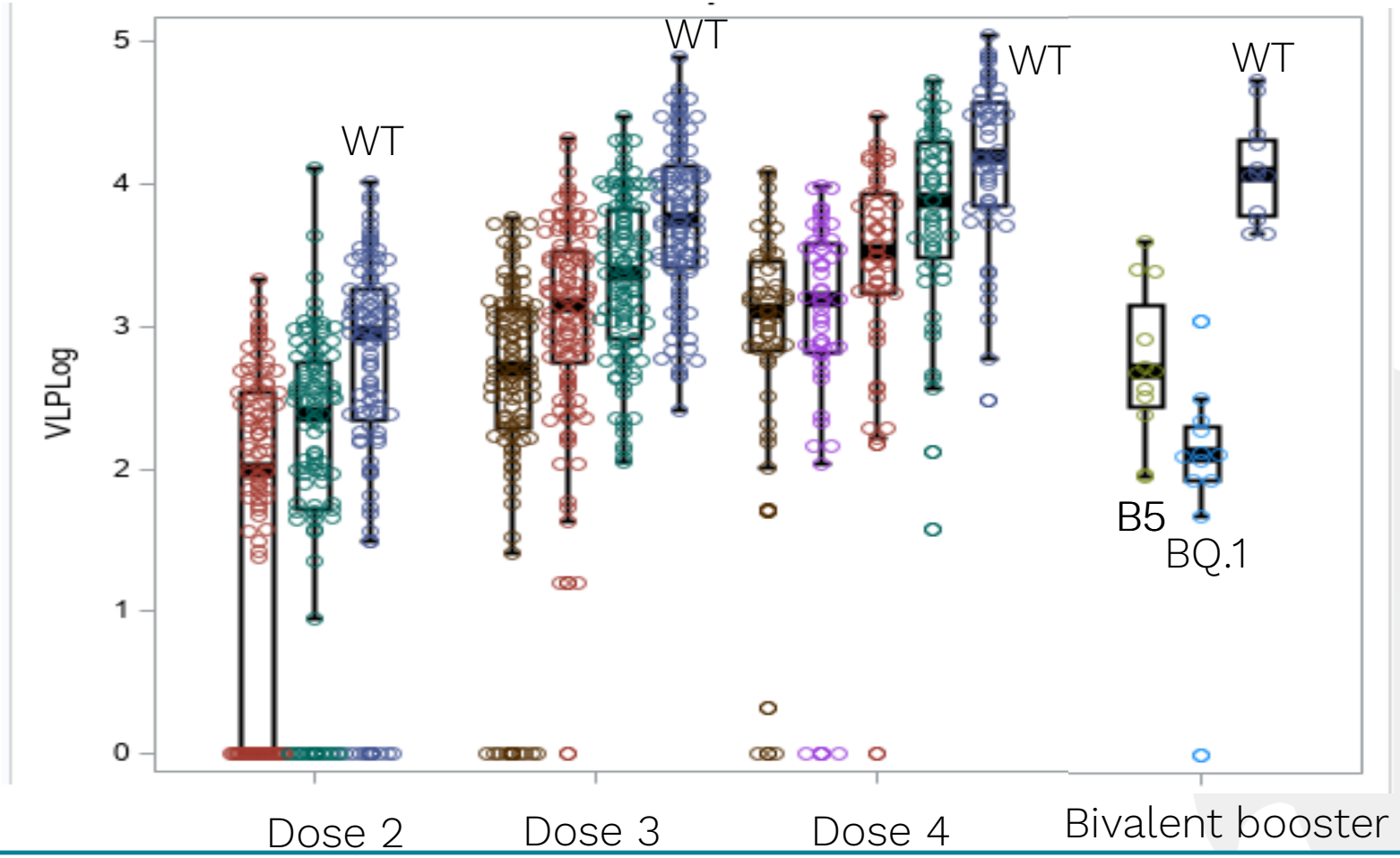


Staff

LTCH residents

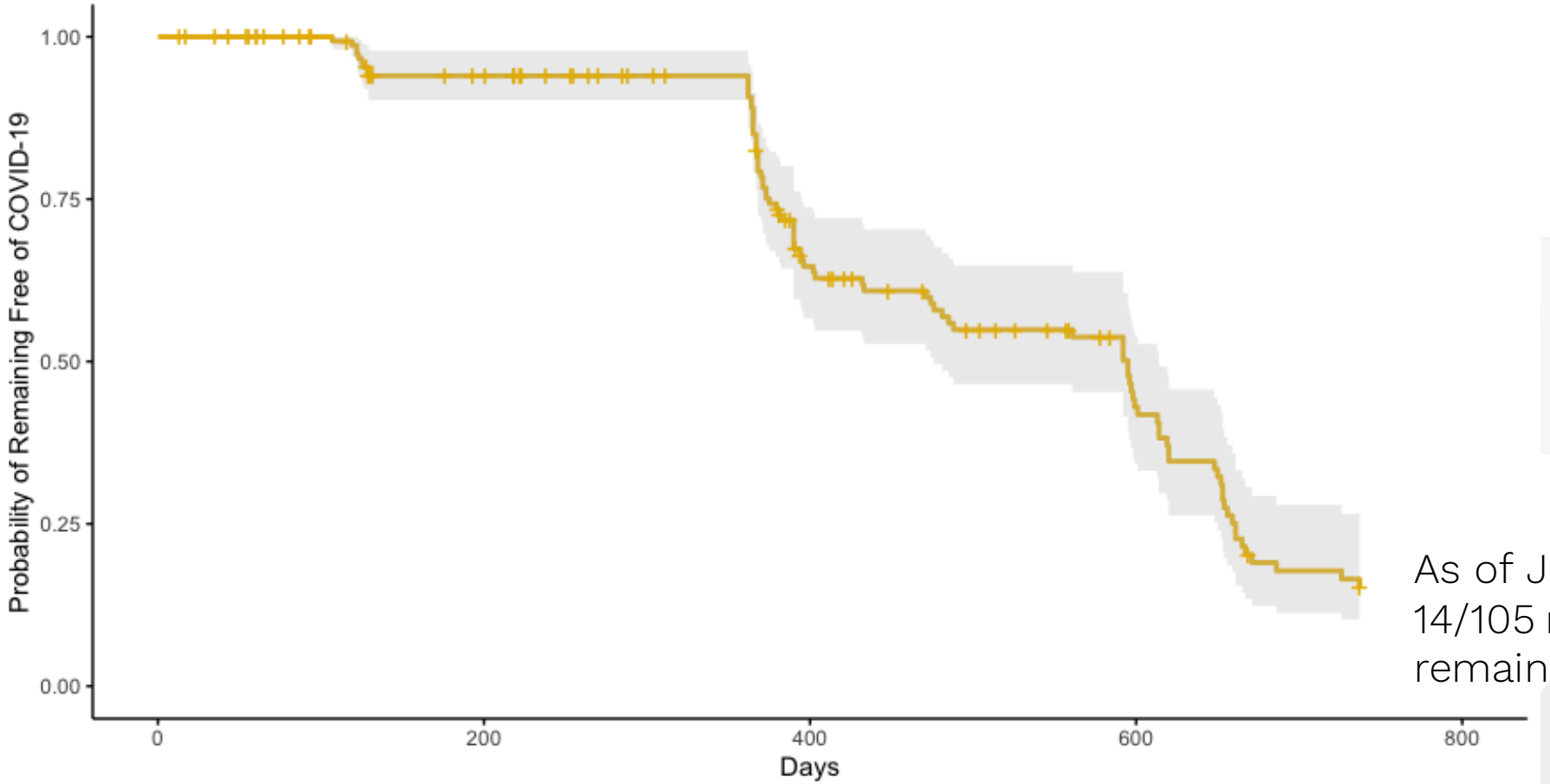
- Vaccine:
  - Moderna > Pfizer (~3.6 fold)
- Population:
  - Staff > resident (~6.3 fold)
- Virus variant:
  - Wild-type > Delta (~2.9 fold)
- Time post dose 2:
  - 2-4 weeks > 6 months (~7.3 fold)
- Cumulative drop in neutralization
  - 480 fold (*from top left to bottom right*)

Pseudo-neutralization titers (uninfected residents)



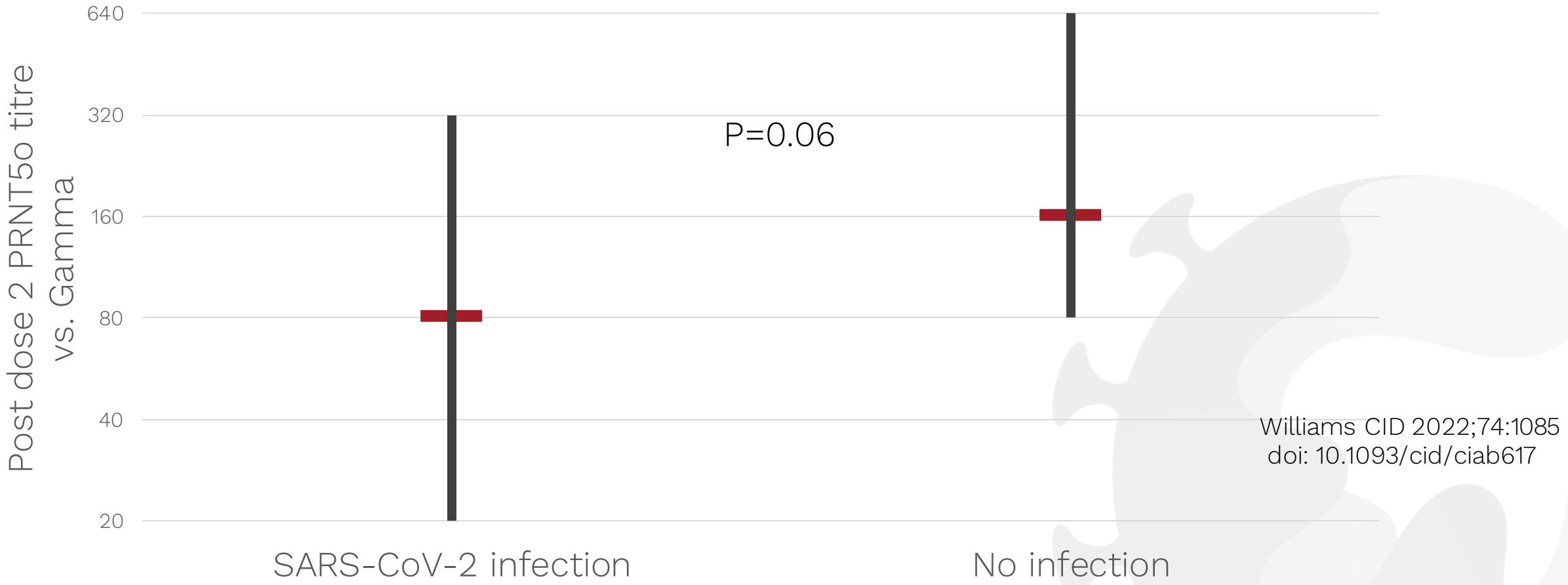
Probability of resident participants who were uninfected at study start remaining infection free over time

25 residents (13%) Infected prior to study start



As of Jan 2023, 14/105 residents remain uninfected

Gamma (P.1) outbreak, April/May 2021

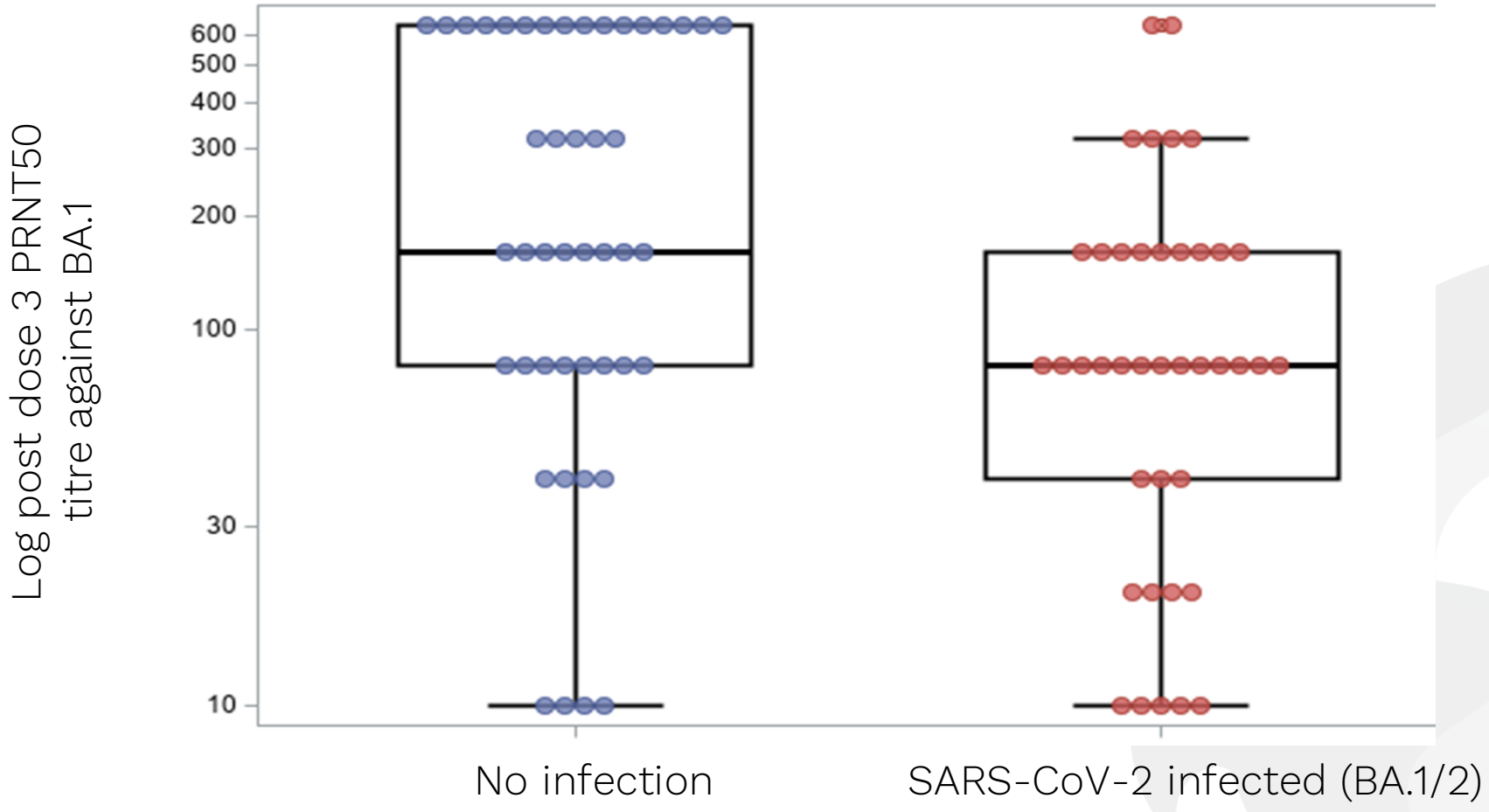


Williams CID 2022;74:1085
doi: 10.1093/cid/ciab617

Correlation between antibody titres and protection against Omicron (only significant correlations shown)

Timing	Antibody measure	Against infection with which variant	OR MV analysis (95% CI)	P value
Post dose 2	WT PRNT-50	BA.1/2	1.003 (1.000-1.006)	0.03
Post dose 3	Delta PRNT-90 BA.1 PRNT-50 WT Pseudoneut	Any omicron	1.004 (1.001-1.007) 1.003 (1.000-1.005) 4.4 (1.0-19)	0.01 0.05 0.05
Post dose 3	Beta PRNT-90 Delta PRNT-90 BA.1 PRNT-50	BA.1/2	1.004 (1.001-1.006) 1.002 (1.000-1.004) 1.016 (1.003-1.029)	0.05 0.04 0.005

Correlation between post-dose 3 PRNT50 titre against BA.1 and BA.1/2 infection



Lessons learned

- Vaccines:
  - Amount of antigen matters
  - Frail older adults need greater stimulus to achieve same concentrations as younger adults
- Correlates of protection
  - Neutralizing antibody correlation > pseudoneutralization > EIA
  - Correlation between antibody titres and protection from infection appears to be variant specific
  - Even with PRNT titres and matched variants, correlation imperfect
  - Assessment limited by differential risk exposure

Study Team

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Staff, residents, caregivers at study homes

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