COVID-19 Correlates of Protection Analysis Report

mock Study

USG COVID-19 Response Biostatistics Team

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Contents

List of Tables

List of Figures

Chapter 1

CoP: Correlates of Vaccine Efficacy

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Chapter 2

CoP: Controlled Vaccine Efficacy

TO FILL IN

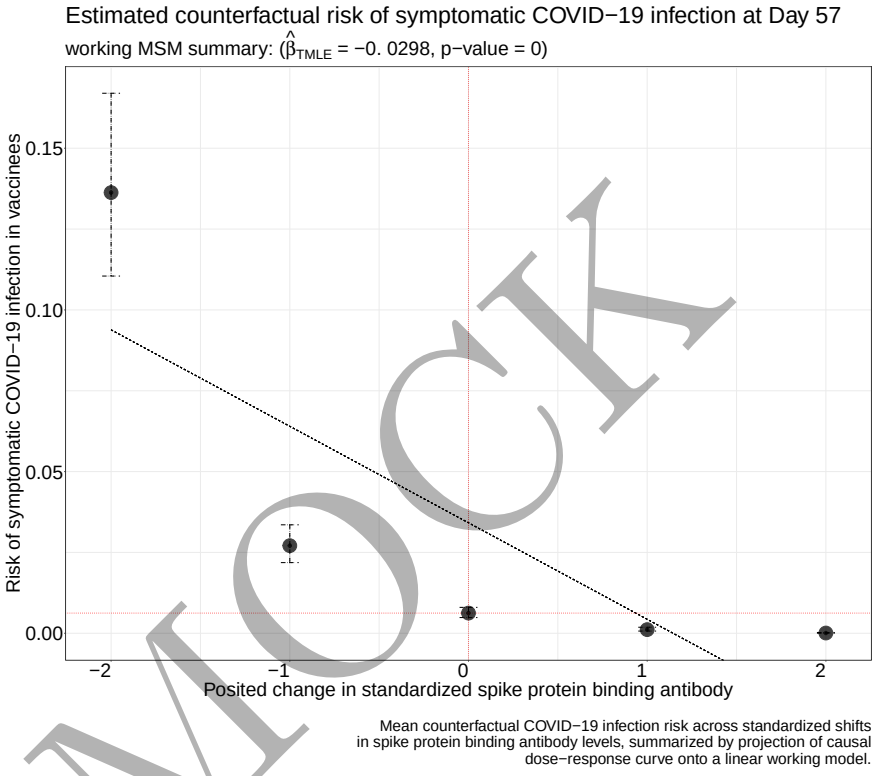
Chapter 3

Stochastic Interventional Risk and Vaccine Efficacy Effects

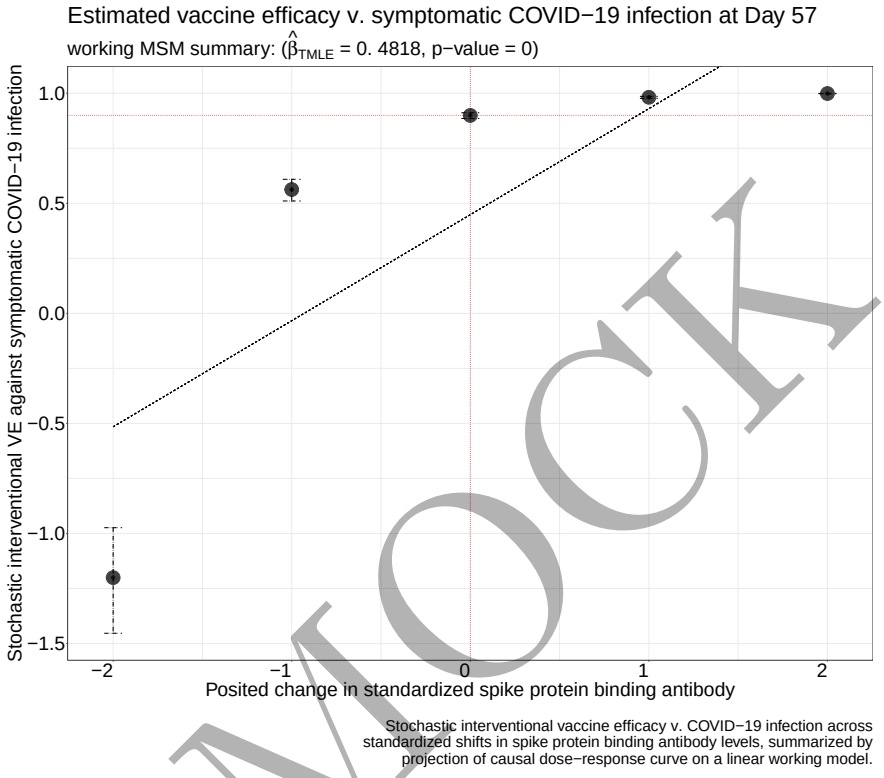
We estimate the counterfactual mean of symptomatic COVID-19 infection under posited shifts in the measured activity levels of each of 4 *candidate* mechanistic correlates of protection (mCoP) biomarkers. By shifting the *standardized* biomarker activity levels by standard unit shifts along the grid {-2, -1, 0, 1, 2}, we can assess the degree to which vaccines that modulate mCoP biomarker activity to these levels could mitigate symptomatic COVID-19 infection in terms of counterfactual stochastic interventional risk and vaccine efficacy (VE).

3.1 Figures with estimates and confidence intervals for Day 57

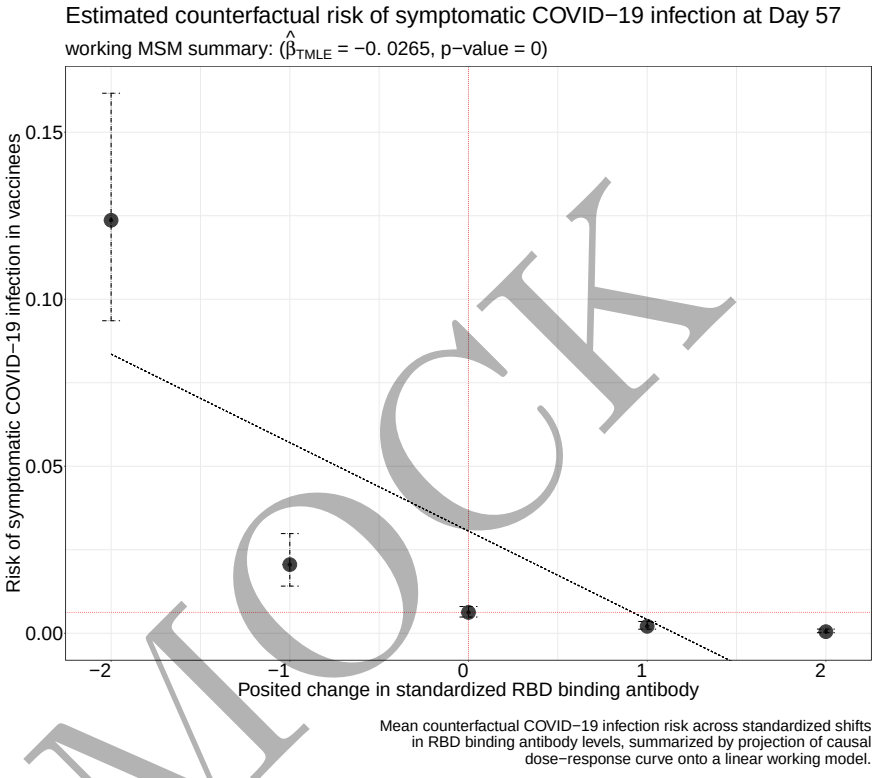
3.1.1 Stochastic interventional risk: spike protein binding antibody



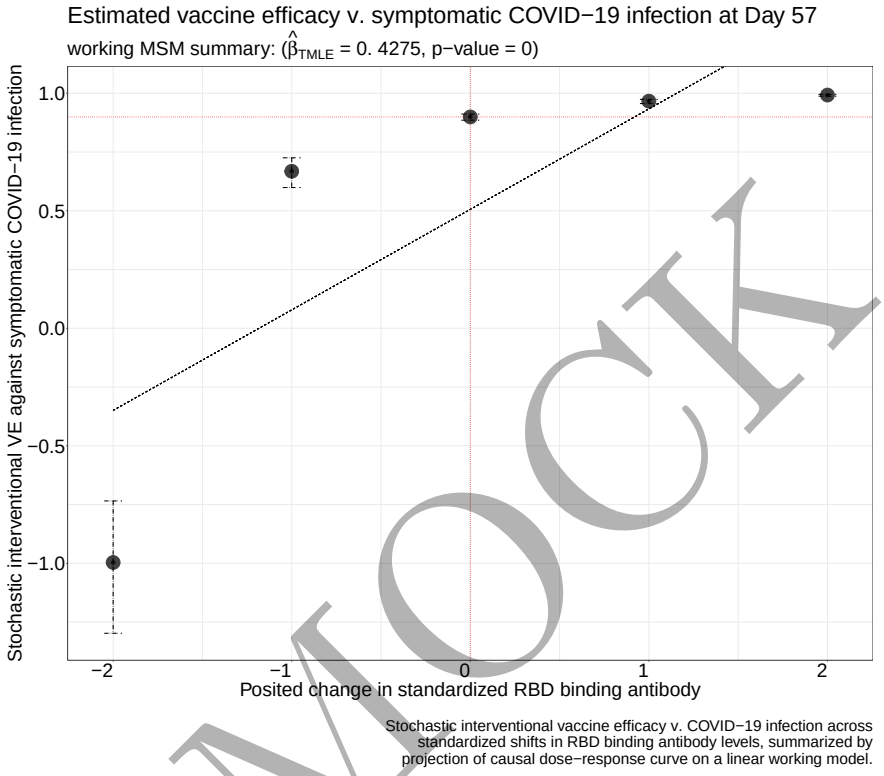
3.1.2 Stochastic interventional VE: spike protein binding antibody



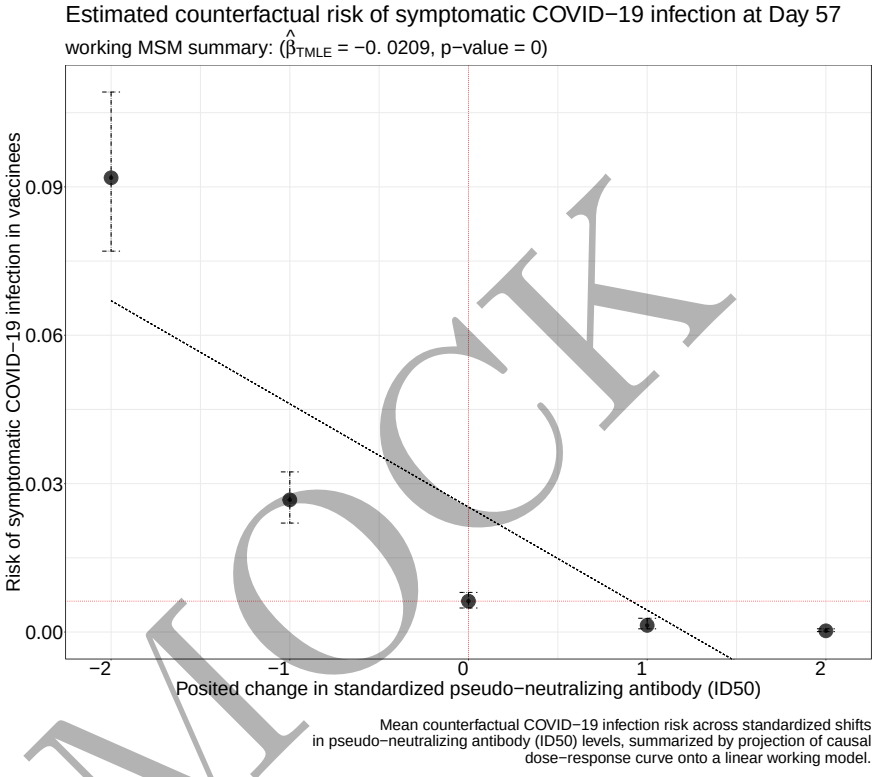
3.1.3 Stochastic interventional risk: RBD binding antibody



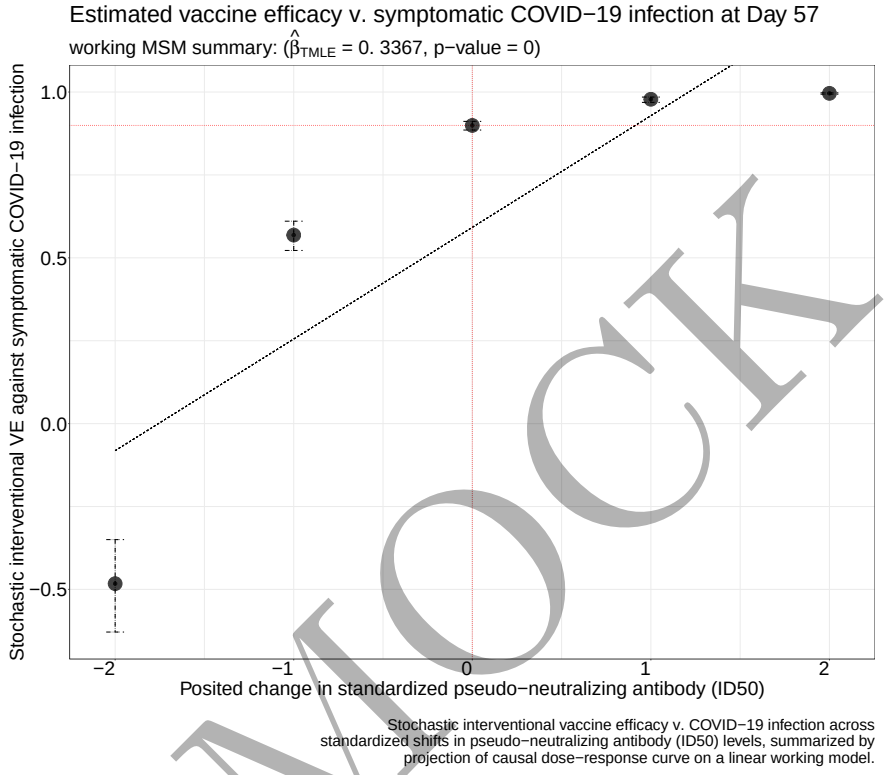
3.1.4 Stochastic interventional VE: RBD binding antibody



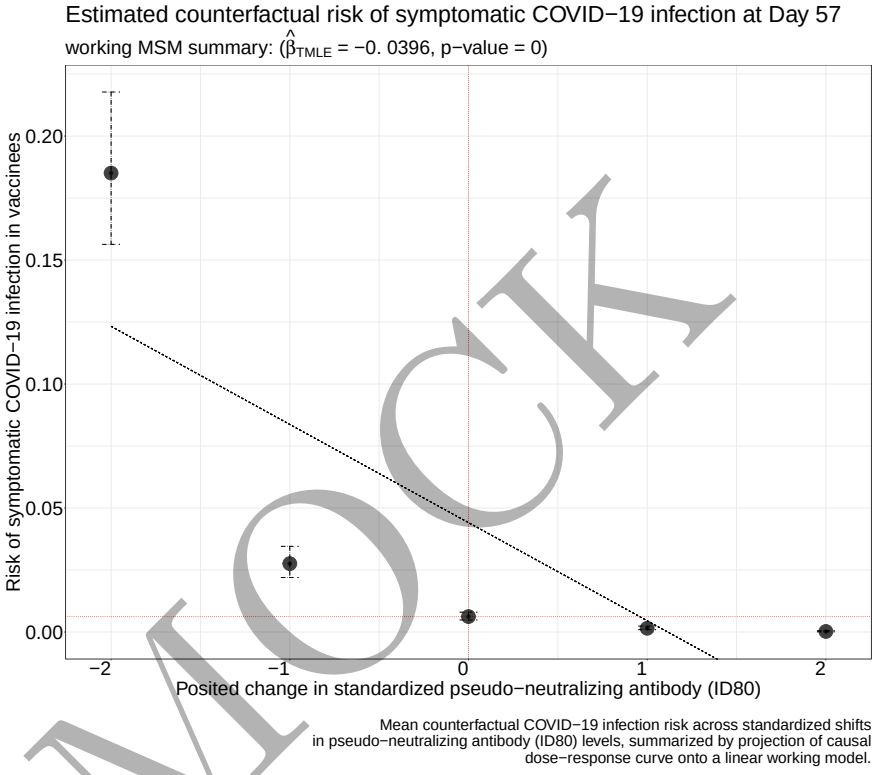
3.1.5 Stochastic interventional risk: pseudo-neutralizing antibody (ID50)



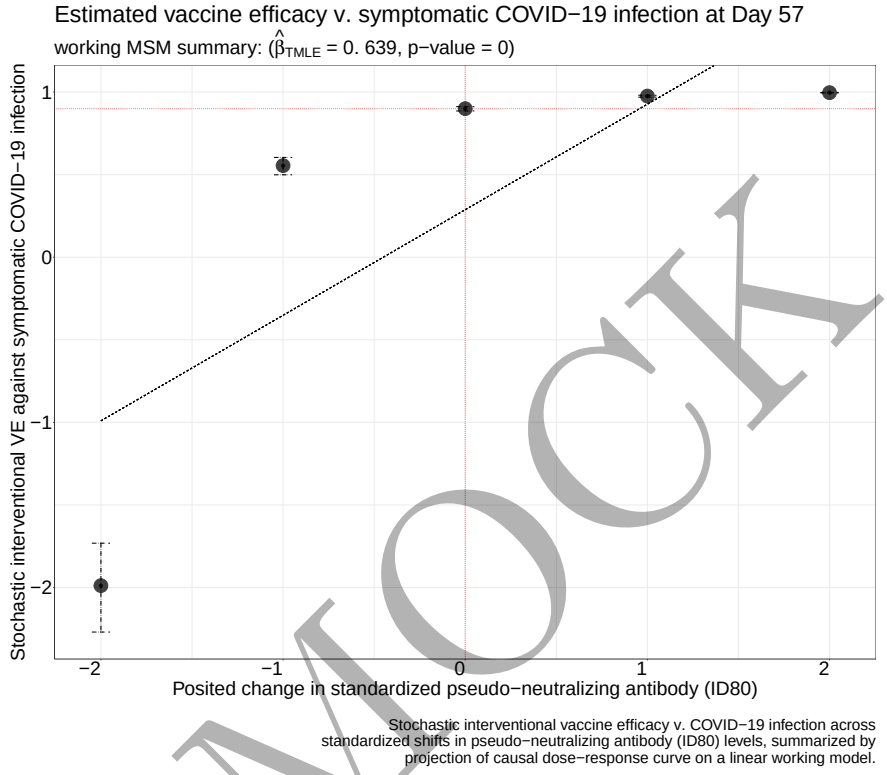
3.1.6 Stochastic interventional VE: pseudo-neutralizing antibody (ID50)



3.1.7 Stochastic interventional risk: pseudo-neutralizing antibody (ID80)

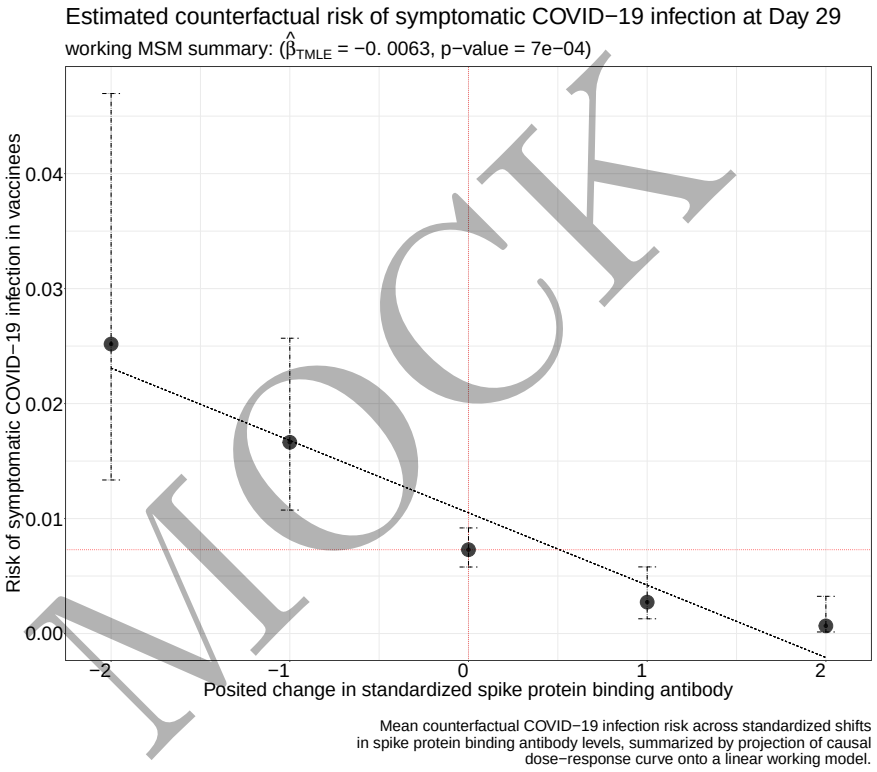


3.1.8 Stochastic interventional VE: pseudo-neutralizing antibody (ID80)

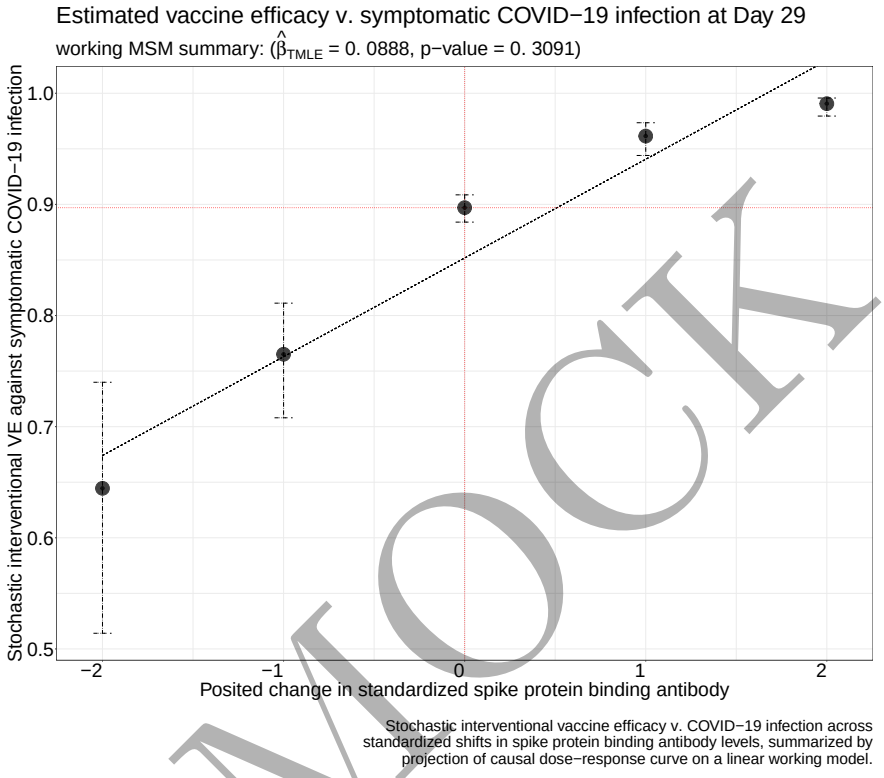


3.2 Figures with estimates and confidence intervals for Day 29

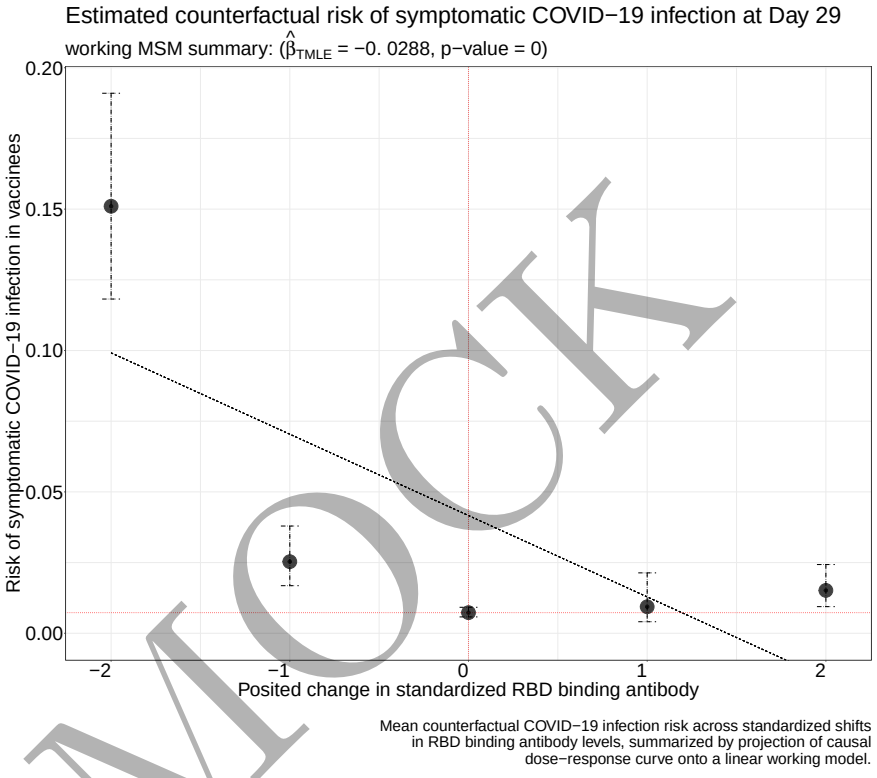
3.2.1 Stochastic interventional risk: spike protein binding antibody



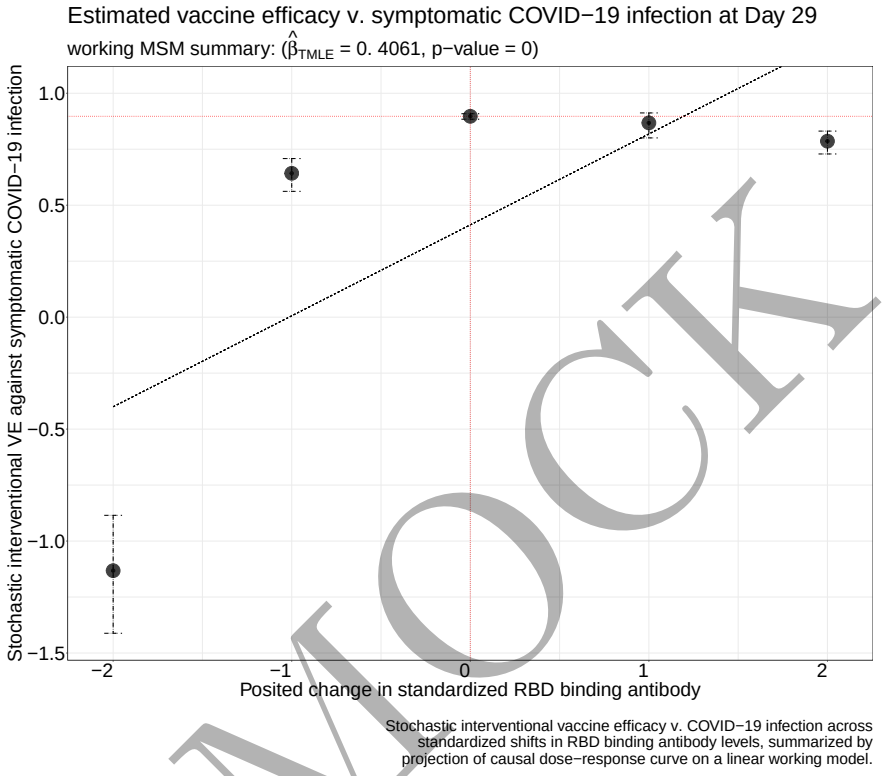
3.2.2 Stochastic interventional VE: spike protein binding antibody



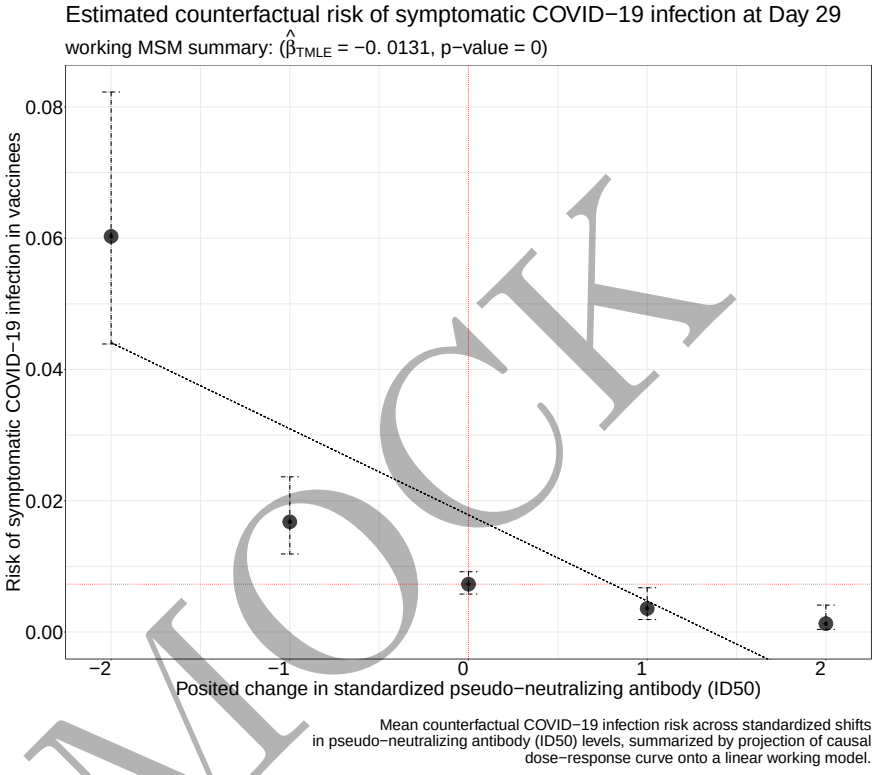
3.2.3 Stochastic interventional risk: RBD binding antibody



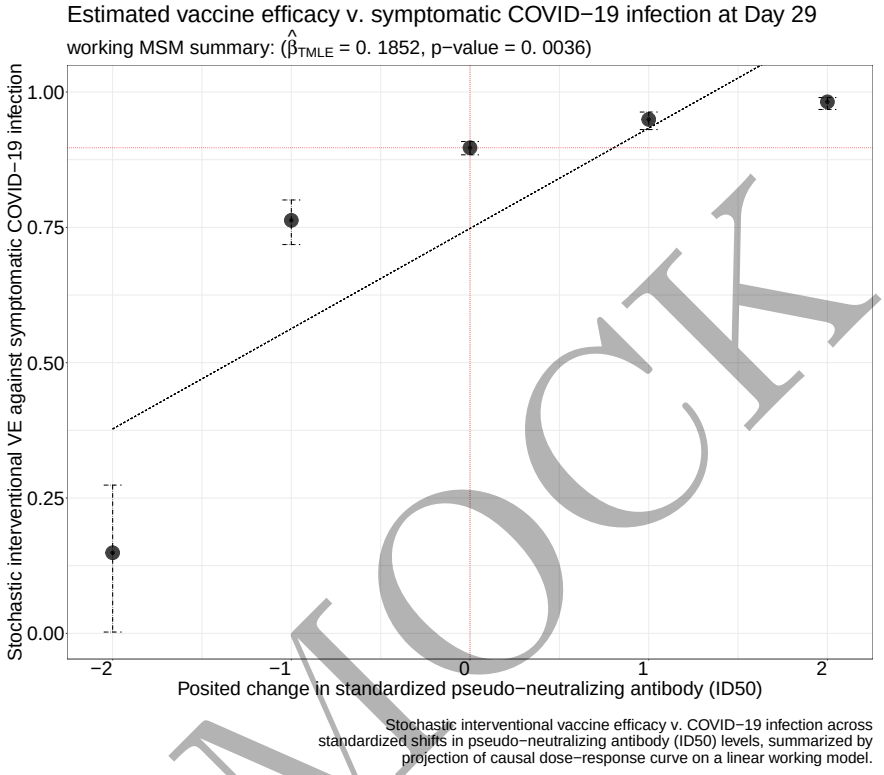
3.2.4 Stochastic interventional VE: RBD binding antibody



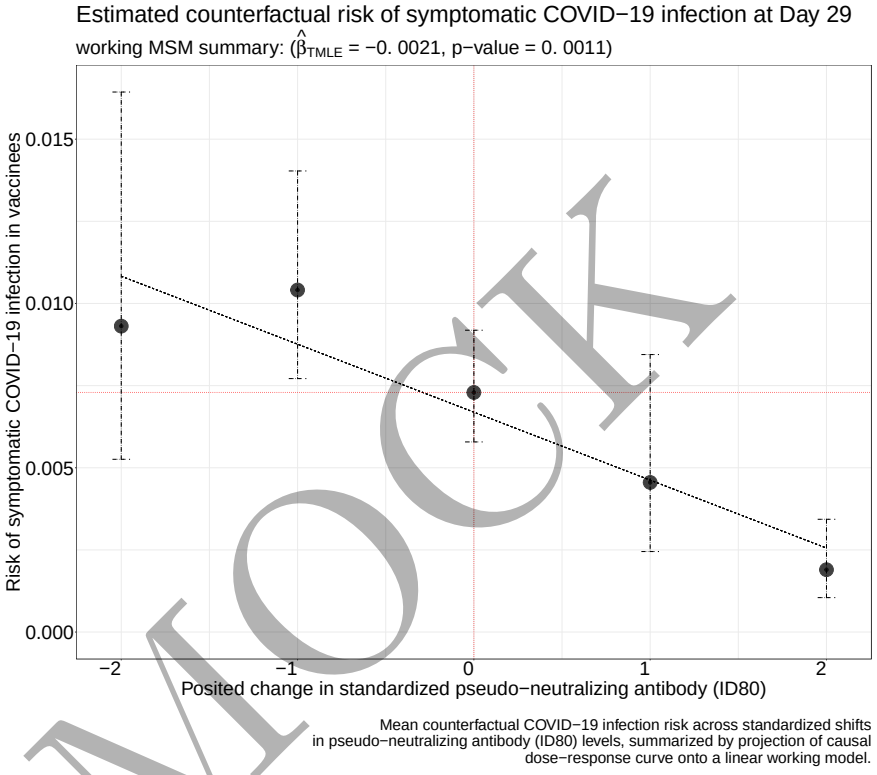
3.2.5 Stochastic interventional risk: pseudo-neutralizing antibody (ID50)



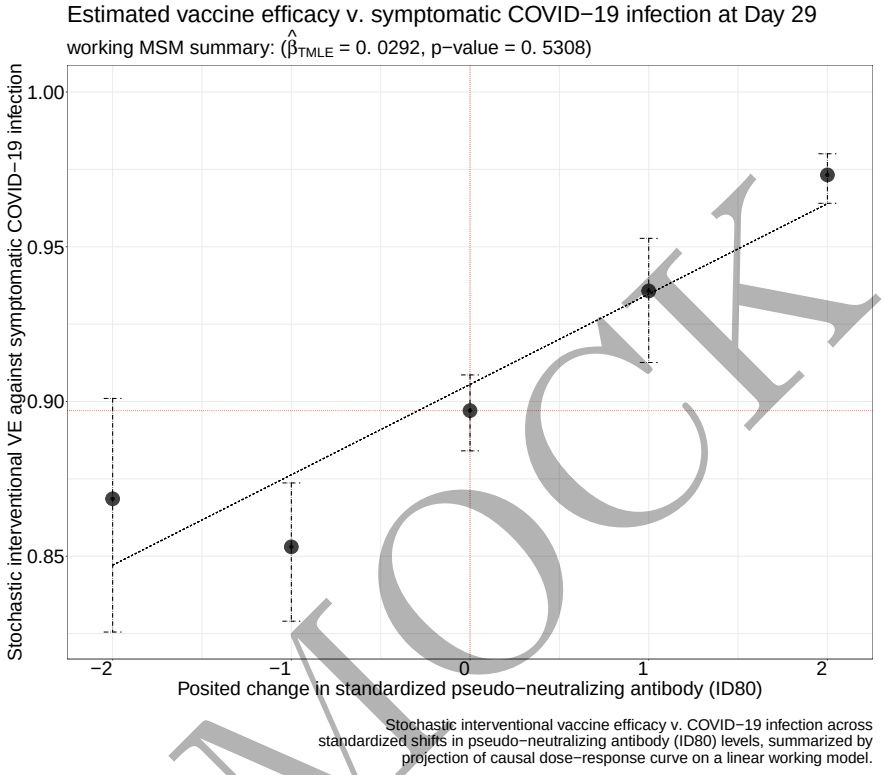
3.2.6 Stochastic interventional VE: pseudo-neutralizing antibody (ID50)



3.2.7 Stochastic interventional risk: pseudo-neutralizing antibody (ID80)



3.2.8 Stochastic interventional VE: pseudo-neutralizing antibody (ID80)



Chapter 4

Mediators of Vaccine Efficacy

Table 4.1: Table of mediation effect estimates for quantitative markers with 95% confidence intervals.
Direct VE = VE comparing vaccine vs. placebo with marker set to distribution in placebo.
Indirect VE = VE in vaccinated comparing observed marker vs. hypothetical marker under placebo.
Prop. mediated = fraction of total risk reduction from vaccine attributed to antibody response.

Time	Assay	Direct VE	Indirect VE	Prop. mediated
Day 57	Binding Antibody to Spike	NA	NA	NA
Day 57	Binding Antibody to RBD	NA	NA	NA
Day 57	PsV Neutralization 50% Titer	NA	NA	NA
Day 57	PsV Neutralization 80% Titer	NA	NA	NA
Day 29	Binding Antibody to Spike	NA	NA	NA
Day 29	Binding Antibody to RBD	NA	NA	NA
Day 29	PsV Neutralization 50% Titer	0.205 (0.142, 0.262)	0.856 (0.823, 0.883)	0.894 (0.927, 0.861)
Day 29	PsV Neutralization 80% Titer	0.823 (0.729, 0.884)	0.352 (-0.032, 0.593)	0.200 (0.408, -0.007)

[a] NA denotes insufficient overlap in antibody response between vaccinated and control participants.

Table 4.2: Table of mediation effect estimates for tertile markers with 95% confidence intervals.
Direct VE = VE comparing vaccine vs. placebo with marker set to distribution in placebo.
Indirect VE = VE in vaccinated comparing observed marker vs. hypothetical marker under placebo.
Prop. mediated = fraction of total risk reduction from vaccine attributed to antibody response.

Time	Assay	Direct VE	Indirect VE	Prop. mediated
Day 57	Binding Antibody to Spike	0.865 (0.723, 0.934)	0.157 (-0.577, 0.549)	0.078 (0.369, -0.212)
Day 57	Binding Antibody to RBD	0.777 (0.677, 0.846)	0.487 (0.305, 0.622)	0.308 (0.450, 0.166)
Day 57	PsV Neutralization 50% Titer	0.736 (0.643, 0.805)	0.568 (0.485, 0.637)	0.386 (0.480, 0.293)
Day 57	PsV Neutralization 80% Titer	0.742 (0.646, 0.812)	0.557 (0.460, 0.637)	0.375 (0.479, 0.272)
Day 29	Binding Antibody to Spike	0.890 (0.784, 0.944)	-0.047 (-0.927, 0.431)	-0.021 (0.260, -0.303)
Day 29	Binding Antibody to RBD	0.940 (0.701, 0.988)	-0.909 (-7.917, 0.591)	-0.299 (0.407, -1.004)
Day 29	PsV Neutralization 50% Titer	0.917 (0.700, 0.977)	-0.388 (-3.702, 0.590)	-0.151 (0.409, -0.712)
Day 29	PsV Neutralization 80% Titer	0.905 (0.809, 0.953)	-0.208 (-1.262, 0.355)	-0.087 (0.201, -0.376)

Chapter 5

Appendix

- This report was built from the `CoVPN/correlates_reporting` repository with commit hash a6650c62ba971b13ba484300063447e3737ff1cb. A diff of the changes introduced by that commit may be viewed at https://github.com/CoVPN/correlates_reporting/commit/a6650c62ba971b13ba484300063447e3737ff1cb
- The sha256 hash sum of the raw input file, "COVID_VEtrial_practicedata_primarystage1.csv": 2353971c2e14399ede55ef6ba0d4e624626433dc15ec507c2482bb886210019a
- The sha256 hash sum of the processed file, "practice_data.csv": 6250066f886245b78f7aa29fefc615ba5d10118448f298c39ec2b601b2a5049f