

COVID-19 Baseline Risk Score Analysis Report

mock Study

USG COVID-19 Response Biostatistics Team

May 24, 2021

Contents

1	Baseline Risk Score (Proxy for SARS-CoV-2 Exposure)	9
2	Appendix	25

List of Tables

- 1.1 Variables considered for risk score analysis. 10
- 1.2 All learner-screen combinations (28 in total) used as input to the
Superlearner. 11
- 1.3 Weights assigned by Superlearner. 15
- 1.4 Predictors in learners assigned weight > 0.0 by Superlearner. . . 16

List of Figures

1.1	Cross-validated AUC (95% CI) of algorithms for predicting COVID-19 disease status starting 7 days after Day 57.	12
1.2	CV-estimated predicted probabilities of COVID-19 disease 7 days after Day 57 by case/control status for top 2 learners, Super-Learner and Discrete SL.	13
1.3	ROC curves based off CV-estimated predicted probabilities for the top 2 learners, Superlearner and Discrete SL.	14
1.4	Superlearner predicted probabilities of COVID-19 disease in vaccinees 7 days after Day 57 by case/control status.	23
1.5	ROC curve based off Superlearner predicted probabilities in vaccinees.	24

MOCK

Chapter 1

Baseline Risk Score (Proxy for SARS-CoV-2 Exposure)

Table 1.1: Variables considered for risk score analysis.

Variable.Name	Definition	Total.missing.values	Comments
MinorityInd	Baseline covariate underrepresented minority status (1=minority, 0=non-minority)	0/30000 (0.0%)	NA
EthnicityHispanic	Indicator ethnicity = Hispanic (0 = Non-Hispanic)	0/30000 (0.0%)	NA
EthnicityNotreported	Indicator ethnicity = Not reported (0 = Non-Hispanic)	0/30000 (0.0%)	NA
EthnicityUnknown	Indicator ethnicity = Unknown (0 = Non-Hispanic)	0/30000 (0.0%)	NA
Black	Indicator race = Black (0 = White)	0/30000 (0.0%)	NA
Asian	Indicator race = Asian (0 = White)	0/30000 (0.0%)	NA
NatAmer	Indicator race = American Indian or Alaska Native (0 = White)	0/30000 (0.0%)	NA
PacIsl	Indicator race = Native Hawaiian or Other Pacific Islander (0 = White)	0/30000 (0.0%)	NA
Multiracial	Indicator race = Multiracial (0 = White)	0/30000 (0.0%)	NA
Other	Indicator race = Other (0 = White)	0/30000 (0.0%)	NA
Notreported	Indicator race = Not reported (0 = White)	0/30000 (0.0%)	NA
Unknown	Indicator race = unknown (0 = White)	0/30000 (0.0%)	NA
HighRiskInd	Baseline covariate high risk pre-existing condition (1=yes, 0=no)	0/30000 (0.0%)	NA
Sex	Sex assigned at birth (1=female, 0=male)	0/30000 (0.0%)	NA
Age	Age at enrollment in years, between 18 and 85	0/30000 (0.0%)	NA
BMI	BMI at enrollment (kg/m ²)	0/30000 (0.0%)	NA

Table 1.2: All learner-screen combinations (28 in total) used as input to the Superlearner.

Learner	Screen*
SL.mean	all
SL.glm	all glmnet univar_logistic_pval highcor_random
SL.glm.interaction	glmnet univar_logistic_pval highcor_random
SL.glmnet	all
SL.gam	glmnet univar_logistic_pval highcor_random
SL.xgboost	all
SL.ranger.imp	all

Note:

*Screen details:

all: includes all variables

glmnet: includes variables with non-zero coefficients in the standard implementation of SL.glmnet that optimizes the lasso tuning parameter via cross-validation

univar_logistic_pval: Wald test 2-sided p-value in a logistic regression model < 0.10

highcor_random: if pairs of quantitative variables with Spearman rank correlation > 0.90 , select one of the variables at random

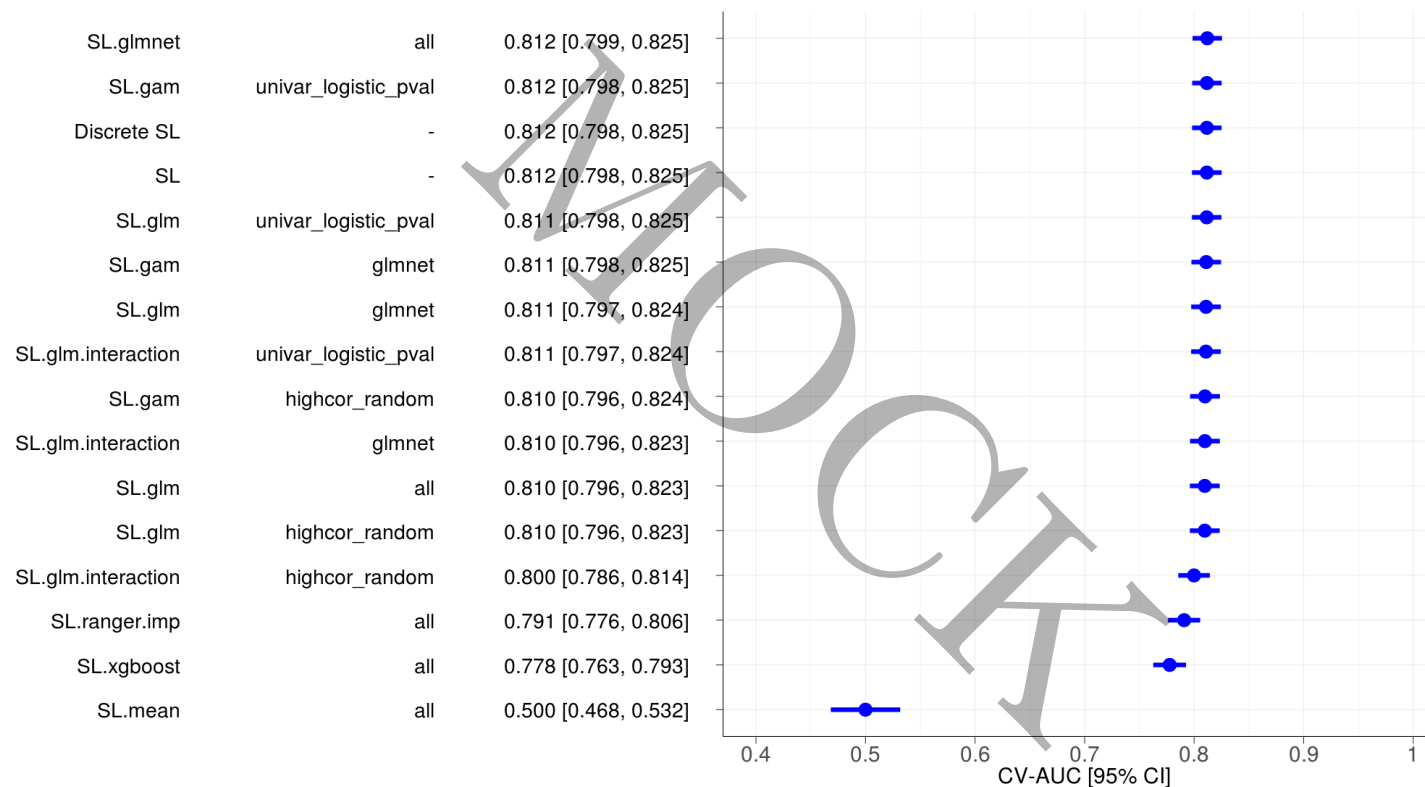


Figure 1.1: Cross-validated AUC (95% CI) of algorithms for predicting COVID-19 disease status starting 7 days after Day 57.

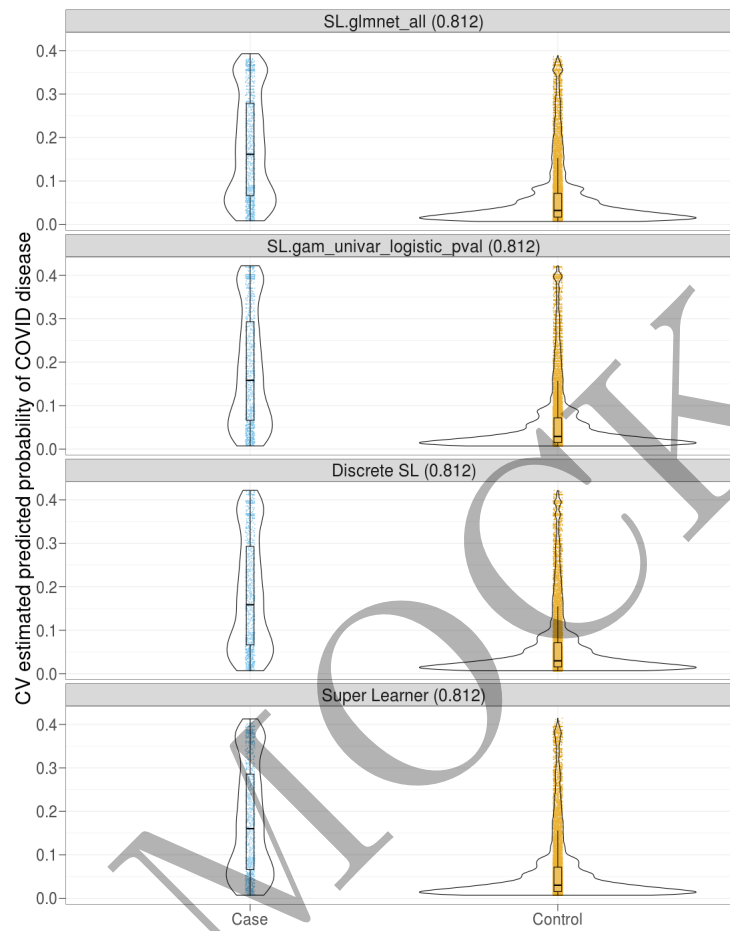


Figure 1.2: CV-estimated predicted probabilities of COVID-19 disease 7 days after Day 57 by case/control status for top 2 learners, SuperLearner and Discrete SL.

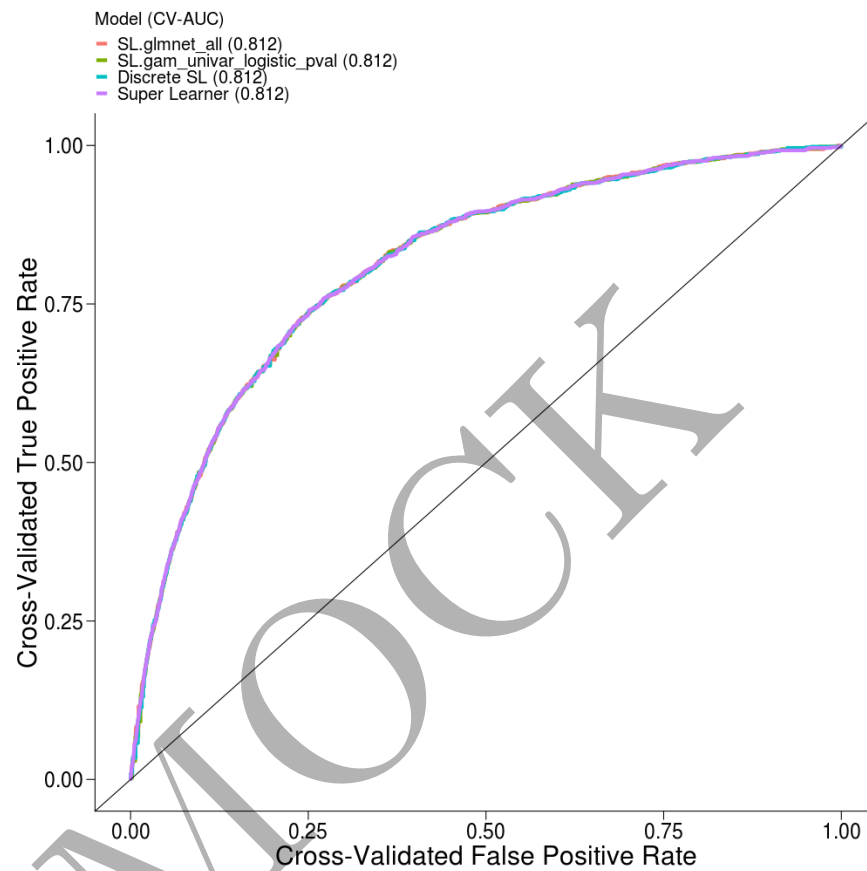


Figure 1.3: ROC curves based off CV-estimated predicted probabilities for the top 2 learners, Superlearner and Discrete SL.

Table 1.3: Weights assigned by Superlearner.

Learner	Screen	Weight
SL.gam	screen_univariate_logistic_pval	0.531
SL.glmnet	screen_all	0.444
SL.glm.interaction	screen_highcor_random	0.025
SL.mean	screen_all	0.000
SL.glm	screen_all	0.000
SL.xgboost	screen_all	0.000
SL.ranger.imp	screen_all	0.000
SL.glm	screen_glmnet	0.000
SL.glm	screen_univariate_logistic_pval	0.000
SL.glm	screen_highcor_random	0.000
SL.glm.interaction	screen_glmnet	0.000
SL.glm.interaction	screen_univariate_logistic_pval	0.000
SL.gam	screen_glmnet	0.000
SL.gam	screen_highcor_random	0.000

Table 1.4: Predictors in learners assigned weight > 0.0 by Superlearner.

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.gam	screen_univariate_logistic_pval	0.531	(Intercept)	-3.202	0.041
SL.gam	screen_univariate_logistic_pval	0.531	s(Age,2)	0.743	2.103
SL.gam	screen_univariate_logistic_pval	0.531	HighRiskInd	0.842	2.322
SL.glmnet	screen_all	0.444	(Intercept)	-2.881	0.056
SL.glmnet	screen_all	0.444	MinorityInd	0.000	1.000
SL.glmnet	screen_all	0.444	EthnicityHispanic	0.000	1.000
SL.glmnet	screen_all	0.444	EthnicityNotreported	0.000	1.000
SL.glmnet	screen_all	0.444	EthnicityUnknown	0.000	1.000
SL.glmnet	screen_all	0.444	Black	0.000	1.000
SL.glmnet	screen_all	0.444	Asian	0.000	1.000
SL.glmnet	screen_all	0.444	NatAmer	0.000	1.000
SL.glmnet	screen_all	0.444	PacIsl	0.000	1.000
SL.glmnet	screen_all	0.444	Multiracial	0.000	1.000
SL.glmnet	screen_all	0.444	Other	0.000	1.000
SL.glmnet	screen_all	0.444	Notreported	0.000	1.000
SL.glmnet	screen_all	0.444	Unknown	0.000	1.000
SL.glmnet	screen_all	0.444	HighRiskInd	0.624	1.867
SL.glmnet	screen_all	0.444	Sex	0.000	1.000
SL.glmnet	screen_all	0.444	Age	0.444	1.560
SL.glmnet	screen_all	0.444	BMI	0.000	1.000
SL.glm.interaction	screen_highcor_random	0.025	(Intercept)	-3.388	0.034
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd	-0.267	0.765
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic	-0.022	0.978
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported	-0.401	0.670
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown	-0.090	0.914
SL.glm.interaction	screen_highcor_random	0.025	Black	0.254	1.289
SL.glm.interaction	screen_highcor_random	0.025	Asian	0.060	1.061
SL.glm.interaction	screen_highcor_random	0.025	NatAmer	-0.012	0.988
SL.glm.interaction	screen_highcor_random	0.025	PacIsl	-0.085	0.918
SL.glm.interaction	screen_highcor_random	0.025	Multiracial	-0.117	0.889
SL.glm.interaction	screen_highcor_random	0.025	Other	-0.073	0.929
SL.glm.interaction	screen_highcor_random	0.025	Notreported	0.018	1.018
SL.glm.interaction	screen_highcor_random	0.025	Unknown	-0.073	0.929
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd	0.880	2.412
SL.glm.interaction	screen_highcor_random	0.025	Sex	0.069	1.071
SL.glm.interaction	screen_highcor_random	0.025	Age	0.806	2.239
SL.glm.interaction	screen_highcor_random	0.025	BMI	-0.024	0.976
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:EthnicityHispanic	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:EthnicityNotreported	-1.351	0.259
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:EthnicityUnknown	0.106	1.112
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Black	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Asian	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Multiracial	NA	NA

Table 1.4: Predictors in learners assigned weight > 0.0 by Superlearner. (continued)

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Notreported	0.054	1.055
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Unknown	0.045	1.046
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:HighRiskInd	0.196	1.217
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Sex	0.181	1.199
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Age	-0.201	0.818
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:BMI	0.087	1.091
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:EthnicityNotreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:EthnicityUnknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Black	-0.018	0.982
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Asian	-0.096	0.908
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:NatAmer	0.028	1.029
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:PacIsl	0.279	1.321
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Multiracial	0.049	1.050
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:HighRiskInd	-0.081	0.923
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Sex	-0.073	0.929
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Age	0.118	1.125
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:BMI	-0.085	0.919
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:EthnicityUnknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Black	0.972	2.643
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Asian	0.643	1.902
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:NatAmer	-0.011	0.989
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:PacIsl	0.369	1.446
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Multiracial	0.046	1.047
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Notreported	0.000	1.000
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Unknown	0.023	1.024
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:HighRiskInd	0.035	1.035
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Sex	-0.117	0.889
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Age	0.011	1.011
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:BMI	-0.020	0.981
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Black	-0.059	0.942
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Asian	-0.075	0.928
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:NatAmer	-0.026	0.974
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:PacIsl	-0.309	0.734
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Multiracial	-0.013	0.987
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Notreported	0.008	1.008
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Unknown	0.029	1.029
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:HighRiskInd	0.044	1.045
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Sex	-0.010	0.990
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Age	0.009	1.009

Table 1.4: Predictors in learners assigned weight > 0.0 by Superlearner. (continued)

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:BMI	-0.106	0.900
SL.glm.interaction	screen_highcor_random	0.025	Black:Asian	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:HighRiskInd	-0.183	0.832
SL.glm.interaction	screen_highcor_random	0.025	Black:Sex	-0.132	0.876
SL.glm.interaction	screen_highcor_random	0.025	Black:Age	0.181	1.199
SL.glm.interaction	screen_highcor_random	0.025	Black:BMI	-0.058	0.944
SL.glm.interaction	screen_highcor_random	0.025	Asian:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:HighRiskInd	-0.061	0.941
SL.glm.interaction	screen_highcor_random	0.025	Asian:Sex	-0.104	0.901
SL.glm.interaction	screen_highcor_random	0.025	Asian:Age	0.153	1.165
SL.glm.interaction	screen_highcor_random	0.025	Asian:BMI	-0.078	0.925
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:HighRiskInd	-0.086	0.918
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Sex	-0.097	0.907
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Age	-0.011	0.989
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:BMI	-0.060	0.941
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:HighRiskInd	-0.052	0.949
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Sex	-0.098	0.907
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Age	0.221	1.247
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:BMI	-0.011	0.989
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:HighRiskInd	-0.053	0.948
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Sex	-0.051	0.950
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Age	0.006	1.006

Table 1.4: Predictors in learners assigned weight > 0.0 by Superlearner. (continued)

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:BMI	-0.077	0.926
SL.glm.interaction	screen_highcor_random	0.025	Other:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Other:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Other:HighRiskInd	-0.007	0.993
SL.glm.interaction	screen_highcor_random	0.025	Other:Sex	-0.008	0.992
SL.glm.interaction	screen_highcor_random	0.025	Other:Age	0.027	1.027
SL.glm.interaction	screen_highcor_random	0.025	Other:BMI	-0.066	0.936
SL.glm.interaction	screen_highcor_random	0.025	Notreported:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Notreported:HighRiskInd	0.021	1.021
SL.glm.interaction	screen_highcor_random	0.025	Notreported:Sex	-0.043	0.958
SL.glm.interaction	screen_highcor_random	0.025	Notreported:Age	0.009	1.009
SL.glm.interaction	screen_highcor_random	0.025	Notreported:BMI	-0.004	0.996
SL.glm.interaction	screen_highcor_random	0.025	Unknown:HighRiskInd	0.051	1.052
SL.glm.interaction	screen_highcor_random	0.025	Unknown:Sex	-0.058	0.944
SL.glm.interaction	screen_highcor_random	0.025	Unknown:Age	0.027	1.028
SL.glm.interaction	screen_highcor_random	0.025	Unknown:BMI	0.010	1.010
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd:Sex	0.002	1.002
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd:Age	-0.045	0.956
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd:BMI	-0.017	0.983
SL.glm.interaction	screen_highcor_random	0.025	Sex:Age	-0.026	0.974
SL.glm.interaction	screen_highcor_random	0.025	Sex:BMI	-0.012	0.988
SL.glm.interaction	screen_highcor_random	0.025	Age:BMI	-0.007	0.993
SL.glm.interaction	screen_highcor_random	0.025	(Intercept)	-3.388	0.034
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd	-0.267	0.765
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic	-0.022	0.978
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported	-0.401	0.670
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown	-0.090	0.914
SL.glm.interaction	screen_highcor_random	0.025	Black	0.254	1.289
SL.glm.interaction	screen_highcor_random	0.025	Asian	0.060	1.061
SL.glm.interaction	screen_highcor_random	0.025	NatAmer	-0.012	0.988
SL.glm.interaction	screen_highcor_random	0.025	PacIsl	-0.085	0.918
SL.glm.interaction	screen_highcor_random	0.025	Multiracial	-0.117	0.889
SL.glm.interaction	screen_highcor_random	0.025	Other	-0.073	0.929
SL.glm.interaction	screen_highcor_random	0.025	Notreported	0.018	1.018
SL.glm.interaction	screen_highcor_random	0.025	Unknown	-0.073	0.929
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd	0.880	2.412
SL.glm.interaction	screen_highcor_random	0.025	Sex	0.069	1.071
SL.glm.interaction	screen_highcor_random	0.025	Age	0.806	2.239
SL.glm.interaction	screen_highcor_random	0.025	BMI	-0.024	0.976
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:EthnicityHispanic	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:EthnicityNotreported	-1.351	0.259
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:EthnicityUnknown	0.106	1.112
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Black	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Asian	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:NatAmer	NA	NA

Table 1.4: Predictors in learners assigned weight > 0.0 by Superlearner. (continued)

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Notreported	0.054	1.055
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Unknown	0.045	1.046
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:HighRiskInd	0.196	1.217
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Sex	0.181	1.199
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:Age	-0.201	0.818
SL.glm.interaction	screen_highcor_random	0.025	MinorityInd:BMI	0.087	1.091
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:EthnicityNotreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:EthnicityUnknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Black	-0.018	0.982
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Asian	-0.096	0.908
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:NatAmer	0.028	1.029
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:PacIsl	0.279	1.321
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Multiracial	0.049	1.050
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:HighRiskInd	-0.081	0.923
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Sex	-0.073	0.929
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:Age	0.118	1.125
SL.glm.interaction	screen_highcor_random	0.025	EthnicityHispanic:BMI	-0.085	0.919
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:EthnicityUnknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Black	0.972	2.643
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Asian	0.643	1.902
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:NatAmer	-0.011	0.989
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:PacIsl	0.369	1.446
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Multiracial	0.046	1.047
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Notreported	0.000	1.000
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Unknown	0.023	1.024
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:HighRiskInd	0.035	1.035
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Sex	-0.117	0.889
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:Age	0.011	1.011
SL.glm.interaction	screen_highcor_random	0.025	EthnicityNotreported:BMI	-0.020	0.981
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Black	-0.059	0.942
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Asian	-0.075	0.928
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:NatAmer	-0.026	0.974
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:PacIsl	-0.309	0.734
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Multiracial	-0.013	0.987
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Notreported	0.008	1.008
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Unknown	0.029	1.029
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:HighRiskInd	0.044	1.045

Table 1.4: Predictors in learners assigned weight > 0.0 by Superlearner. (continued)

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Sex	-0.010	0.990
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Age	0.009	1.009
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:BMI	-0.106	0.900
SL.glm.interaction	screen_highcor_random	0.025	Black:Asian	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Black:HighRiskInd	-0.183	0.832
SL.glm.interaction	screen_highcor_random	0.025	Black:Sex	-0.132	0.876
SL.glm.interaction	screen_highcor_random	0.025	Black:Age	0.181	1.199
SL.glm.interaction	screen_highcor_random	0.025	Black:BMI	-0.058	0.944
SL.glm.interaction	screen_highcor_random	0.025	Asian:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Asian:HighRiskInd	-0.061	0.941
SL.glm.interaction	screen_highcor_random	0.025	Asian:Sex	-0.104	0.901
SL.glm.interaction	screen_highcor_random	0.025	Asian:Age	0.153	1.165
SL.glm.interaction	screen_highcor_random	0.025	Asian:BMI	-0.078	0.925
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:HighRiskInd	-0.086	0.918
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Sex	-0.097	0.907
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Age	-0.011	0.989
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:BMI	-0.060	0.941
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:HighRiskInd	-0.052	0.949
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Sex	-0.098	0.907
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:Age	0.221	1.247
SL.glm.interaction	screen_highcor_random	0.025	PacIsl:BMI	-0.011	0.989
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:HighRiskInd	-0.053	0.948

Table 1.4: Predictors in learners assigned weight > 0.0 by Superlearner. (continued)

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Sex	-0.051	0.950
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:Age	0.006	1.006
SL.glm.interaction	screen_highcor_random	0.025	Multiracial:BMI	-0.077	0.926
SL.glm.interaction	screen_highcor_random	0.025	Other:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Other:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Other:HighRiskInd	-0.007	0.993
SL.glm.interaction	screen_highcor_random	0.025	Other:Sex	-0.008	0.992
SL.glm.interaction	screen_highcor_random	0.025	Other:Age	0.027	1.027
SL.glm.interaction	screen_highcor_random	0.025	Other:BMI	-0.066	0.936
SL.glm.interaction	screen_highcor_random	0.025	Notreported:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.025	Notreported:HighRiskInd	0.021	1.021
SL.glm.interaction	screen_highcor_random	0.025	Notreported:Sex	-0.043	0.958
SL.glm.interaction	screen_highcor_random	0.025	Notreported:Age	0.009	1.009
SL.glm.interaction	screen_highcor_random	0.025	Notreported:BMI	-0.004	0.996
SL.glm.interaction	screen_highcor_random	0.025	Unknown:HighRiskInd	0.051	1.052
SL.glm.interaction	screen_highcor_random	0.025	Unknown:Sex	-0.058	0.944
SL.glm.interaction	screen_highcor_random	0.025	Unknown:Age	0.027	1.028
SL.glm.interaction	screen_highcor_random	0.025	Unknown:BMI	0.010	1.010
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd:Sex	0.002	1.002
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd:Age	-0.045	0.956
SL.glm.interaction	screen_highcor_random	0.025	HighRiskInd:BMI	-0.017	0.983
SL.glm.interaction	screen_highcor_random	0.025	Sex:Age	-0.026	0.974
SL.glm.interaction	screen_highcor_random	0.025	Sex:BMI	-0.012	0.988
SL.glm.interaction	screen_highcor_random	0.025	Age:BMI	-0.007	0.993

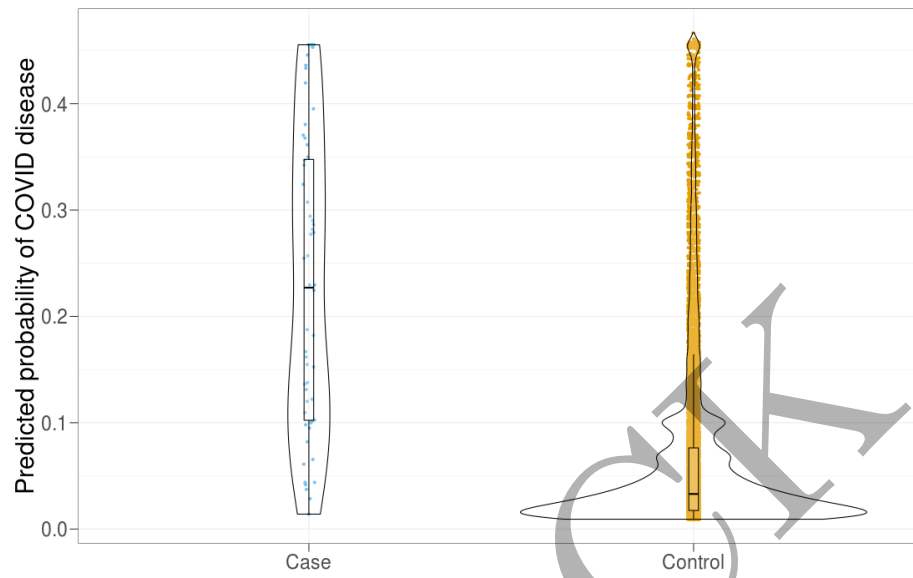


Figure 1.4: Superlearner predicted probabilities of COVID-19 disease in vaccinees 7 days after Day 57 by case/control status.

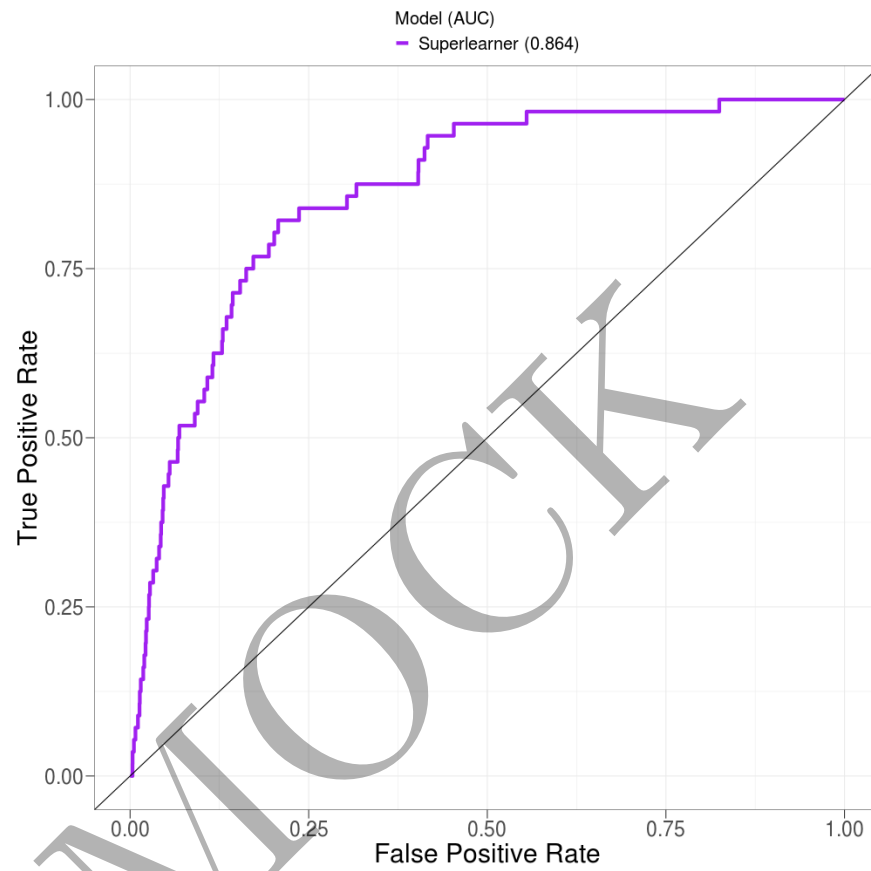


Figure 1.5: ROC curve based off Superlearner predicted probabilities in vaccinees.

Chapter 2

Appendix

- This report was built from the [CoVPN/correlates_reporting](https://github.com/CoVPN/correlates_reporting) repository with commit hash 37645e4b736fa0bff3696ed9468d546c4b6f1c3c. A diff of the changes introduced by that commit may be viewed at https://github.com/CoVPN/correlates_reporting/commit/37645e4b736fa0bff3696ed9468d546c4b6f1c3c
- The sha256 hash sum of the raw input file, “COVID_VEtrial_practicedata_primarystage1.csv”: 9093a3d1fd6eb4b5523bfa7df143e1bc6e1f3ee0f6b340eaf60d3859e07a1023
- The sha256 hash sum of the processed file, “practice_data.csv”: b3eb4a4bc4134968cce332b14e8bbd891517cf559f9a3459409f644db65a1810