COVID-19 Baseline Risk Score Analysis Report

mock Study

USG COVID-19 Response Biostatistics Team

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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

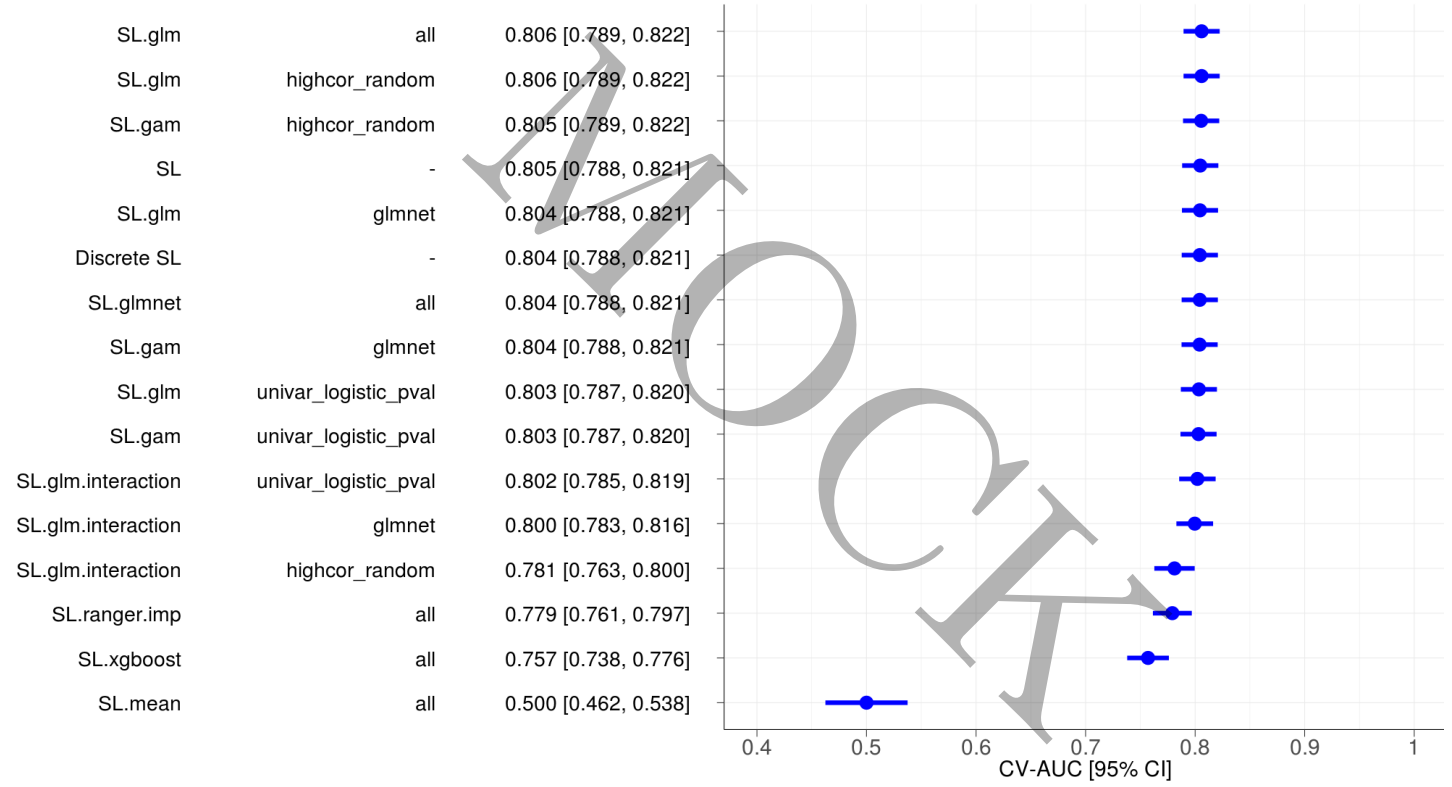

Figure 1.1: Cross-validated AUC (95% CI) of algorithms for predicting COVID-19 disease status starting 7 days after Day 57.

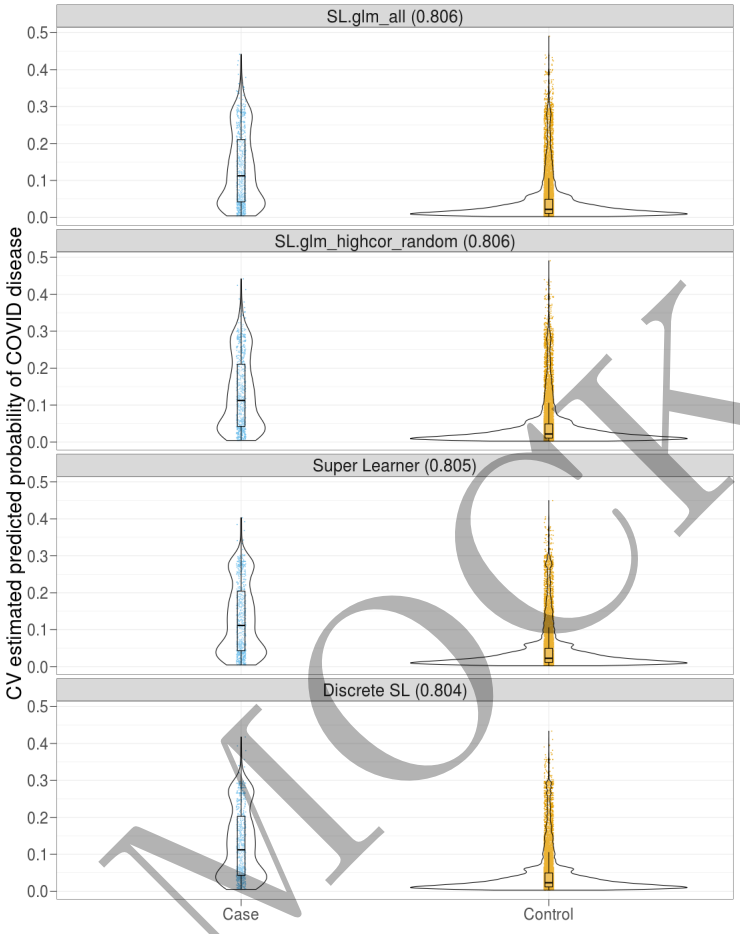

Figure 1.2: CV-estimated predicted probabilities of COVID-19 disease 7 days after Day 57 by case/control status for top 2 learners, SuperLearner and Discrete SL.

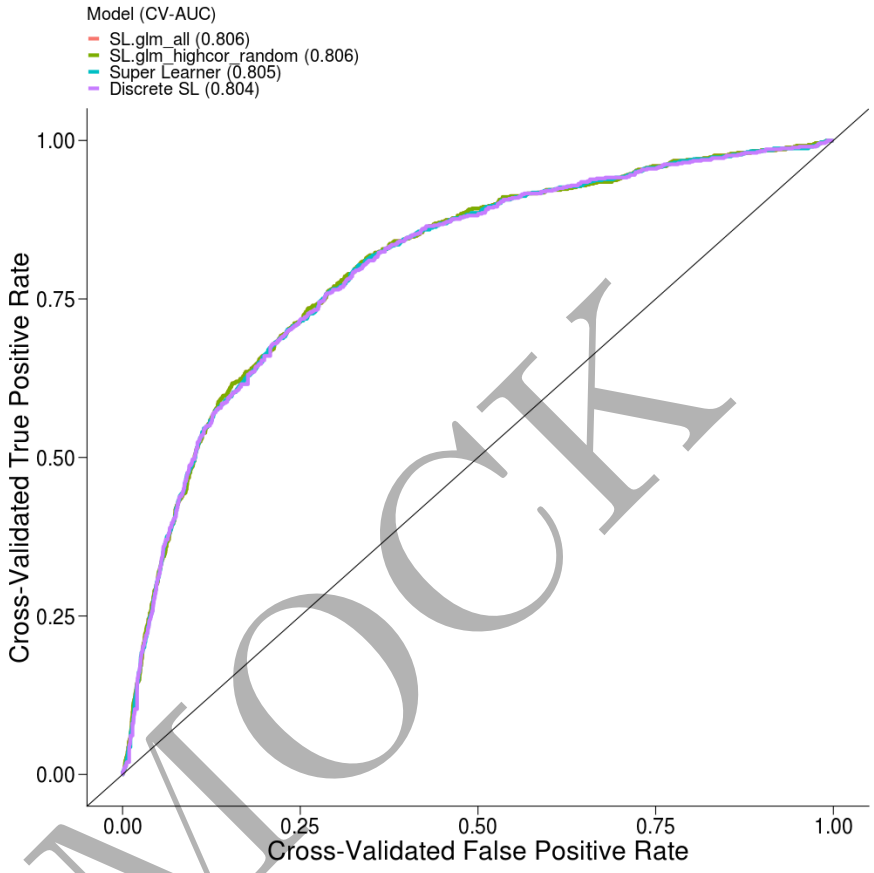

Figure 1.3: ROC curves based off CV-estimated predicted probabilities for the top 2 learners, Superlearner and Discrete SL.

Table 1.3: Weights assigned by Superlearner.

Learner	**Screen**	**Weight**
SL.glm	screen_all	0.714
SL.glm.interaction	screen_univariate_logistic_pval	0.271
SL.mean	screen_all	0.016
SL.glmnet	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_highcor_random	0.000
SL.gam	screen_glmnet	0.000
SL.gam	screen_univariate_logistic_pval	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.glm	screen_all	0.714	(Intercept)	-3.592	0.028
SL.glm	screen_all	0.714	MinorityInd	0.109	1.115
SL.glm	screen_all	0.714	EthnicityHispanic	0.016	1.017
SL.glm	screen_all	0.714	EthnicityNotreported	0.064	1.066
SL.glm	screen_all	0.714	EthnicityUnknown	0.055	1.057
SL.glm	screen_all	0.714	Black	-0.127	0.881
SL.glm	screen_all	0.714	Asian	-0.051	0.950
SL.glm	screen_all	0.714	NatAmer	-0.022	0.978
SL.glm	screen_all	0.714	PacIsl	0.014	1.014
SL.glm	screen_all	0.714	Multiracial	-0.106	0.900
SL.glm	screen_all	0.714	Other	0.049	1.051
SL.glm	screen_all	0.714	Notreported	0.064	1.066
SL.glm	screen_all	0.714	Unknown	0.056	1.058
SL.glm	screen_all	0.714	HighRiskInd	0.793	2.210
SL.glm	screen_all	0.714	Sex	-0.033	0.967
SL.glm	screen_all	0.714	Age	0.743	2.102
SL.glm	screen_all	0.714	BMI	-0.001	0.999
SL.glm.interaction	screen_univariate_logistic_pval	0.271	(Intercept)	-3.604	0.027
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl	0.060	1.062
SL.glm.interaction	screen_univariate_logistic_pval	0.271	Other	0.112	1.119
SL.glm.interaction	screen_univariate_logistic_pval	0.271	HighRiskInd	0.806	2.239
SL.glm.interaction	screen_univariate_logistic_pval	0.271	Age	0.767	2.154
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl:Other	NA	NA
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl:HighRiskInd	0.020	1.020
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl:Age	-0.083	0.921
SL.glm.interaction	screen_univariate_logistic_pval	0.271	Other:HighRiskInd	-0.015	0.985
SL.glm.interaction	screen_univariate_logistic_pval	0.271	Other:Age	-0.050	0.952
SL.glm.interaction	screen_univariate_logistic_pval	0.271	HighRiskInd:Age	-0.021	0.979
SL.glm.interaction	screen_univariate_logistic_pval	0.271	(Intercept)	-3.604	0.027
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl	0.060	1.062
SL.glm.interaction	screen_univariate_logistic_pval	0.271	Other	0.112	1.119
SL.glm.interaction	screen_univariate_logistic_pval	0.271	HighRiskInd	0.806	2.239
SL.glm.interaction	screen_univariate_logistic_pval	0.271	Age	0.767	2.154
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl:Other	NA	NA
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl:HighRiskInd	0.020	1.020
SL.glm.interaction	screen_univariate_logistic_pval	0.271	PacIsl:Age	-0.083	0.921
SL.glm.interaction	screen_univariate_logistic_pval	0.271	Other:HighRiskInd	-0.015	0.985
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SL.glm.interaction	screen_univariate_logistic_pval	0.271	HighRiskInd:Age	-0.021	0.979

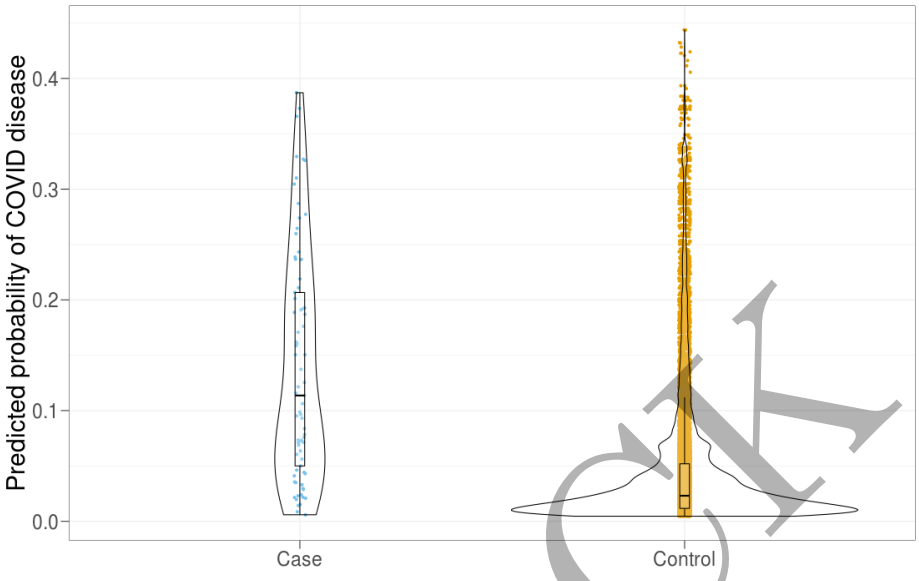

Figure 1.4: Superlearner predicted probabilities of COVID-19 disease in vaccinees 7 days after Day 57 by case/control status.

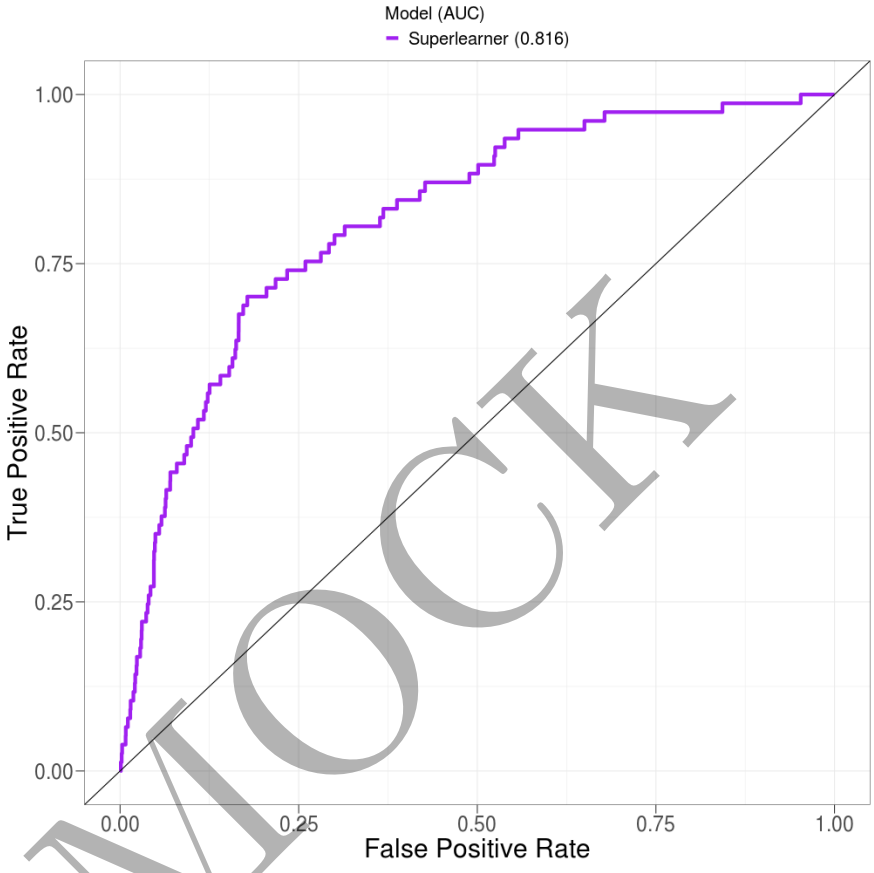

Figure 1.5: ROC curve based off Superlearner predicted probabilities in vaccinees.

Chapter 2

Appendix

- This report was built from the `CoVPN/correlates_reporting` repository with commit hash dd6777c742d1d1c8a4bc6dd4b107f7ec7254fcbd. A diff of the changes introduced by that commit may be viewed at https://github.com/CoVPN/correlates_reporting/commit/dd6777c742d1d1c8a4bc6dd4b107f7ec7254fcbd
- 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