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)

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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

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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

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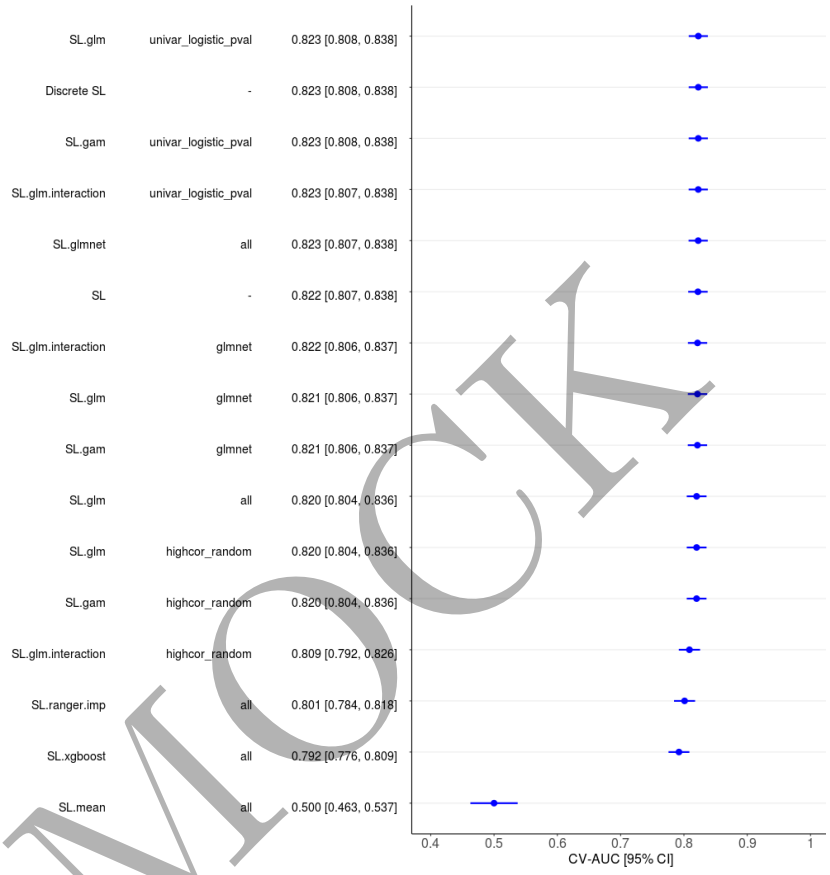

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Figure 1.1: Risk score analysis with EventIndPrimaryD57 as the outcome: Plot shows CV-AUC point estimates and 95% confidence intervals for the Super Learner and all models trained to classify cases in placebo group defined by EventIndPrimaryD57. Learners are sorted by their CV-AUC point estimates.

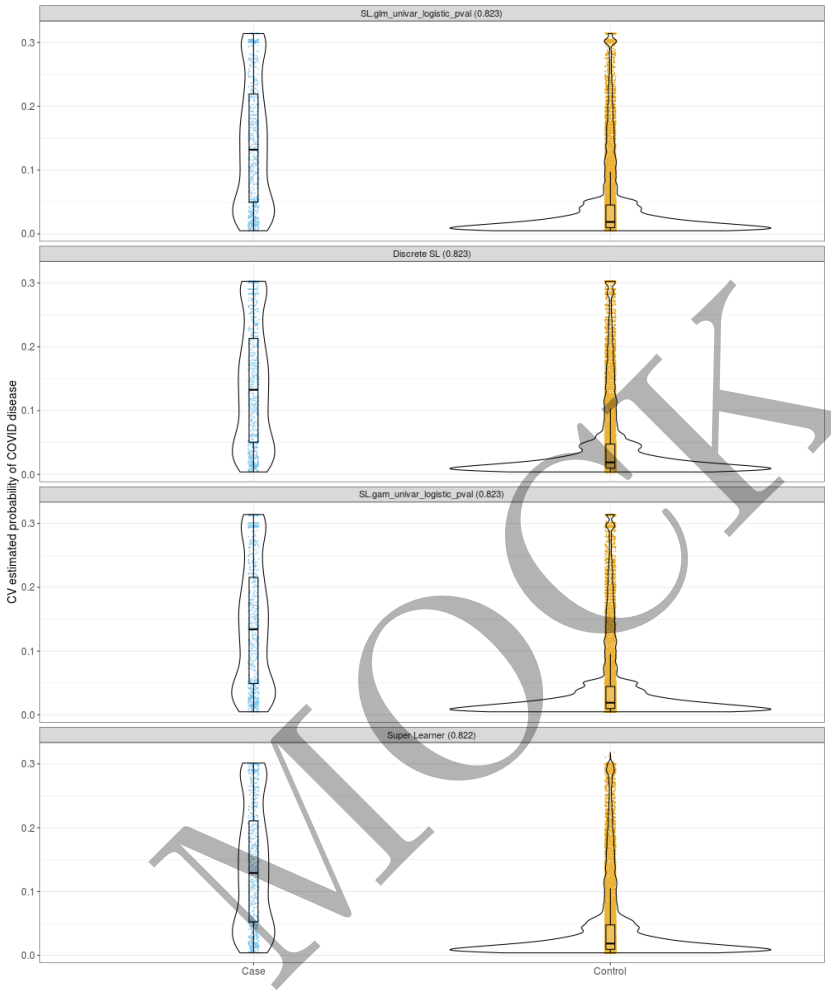

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Figure 1.2: Plots showing CV estimated probabilities of COVID disease split by cases and controls based off EventIndPrimaryD57 for the top 2 learners, SuperLearner and Discrete SL.

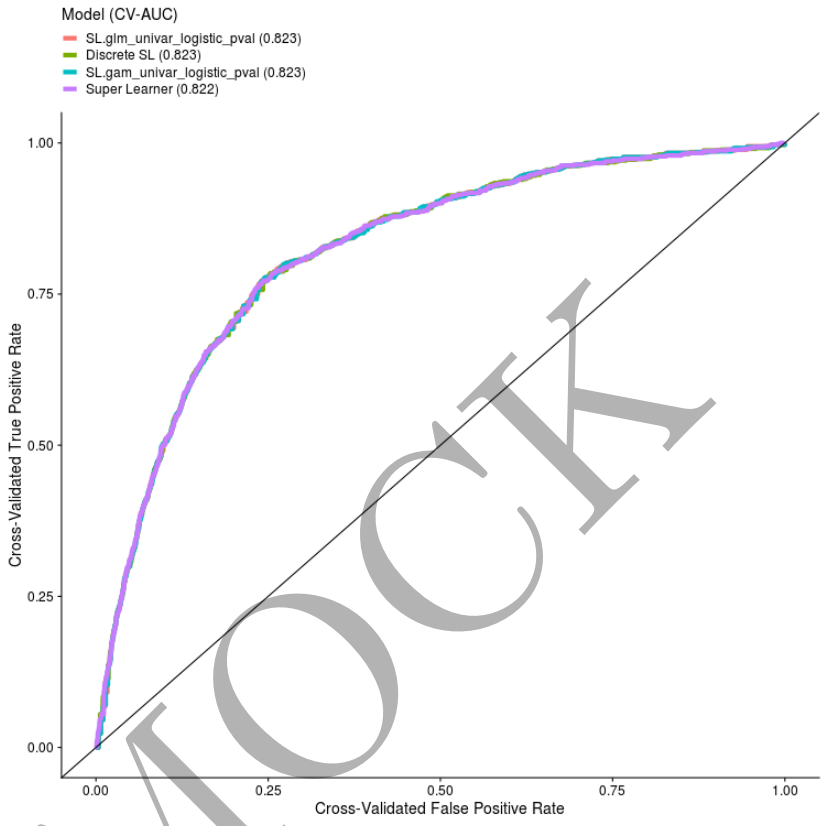

Figure 1.3: ROC curves for the top 2 learners, SuperLearner and Discrete SL.

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Table 1.3: Weights assigned by Superlearner (risk score analysis).

Learner	**Screen**	**SL.Weights**
SL.glmnet	screen_all	0.730
SL.glm	screen_univariate_logistic_pval	0.245
SL.glm.interaction	screen_highcor_random	0.024
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_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_univariate_logistic_pval	0.000
SL.gam	screen_highcor_random	0.000

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Table 1.4: Predictors in learners assigned weight > 0.5 by SuperLearner (risk score analysis).

Learner	Screen	SL.Weights	Predictors	Coefficient	Odds.Ratio
SL.glmnet	screen_all	0.73	(Intercept)	-3.262	0.038
SL.glmnet	screen_all	0.73	MinorityInd	0.000	1.000
SL.glmnet	screen_all	0.73	EthnicityHispanic	0.000	1.000
SL.glmnet	screen_all	0.73	EthnicityNotreported	0.000	1.000
SL.glmnet	screen_all	0.73	EthnicityUnknown	0.000	1.000
SL.glmnet	screen_all	0.73	Black	0.000	1.000
SL.glmnet	screen_all	0.73	Asian	0.000	1.000
SL.glmnet	screen_all	0.73	NatAmer	0.000	1.000
SL.glmnet	screen_all	0.73	PacIsl	0.000	1.000
SL.glmnet	screen_all	0.73	Multiracial	0.000	1.000
SL.glmnet	screen_all	0.73	Other	0.000	1.000
SL.glmnet	screen_all	0.73	Notreported	0.000	1.000
SL.glmnet	screen_all	0.73	Unknown	0.000	1.000
SL.glmnet	screen_all	0.73	HighRiskInd	0.652	1.920
SL.glmnet	screen_all	0.73	Sex	0.000	1.000
SL.glmnet	screen_all	0.73	Age	0.358	1.430
SL.glmnet	screen_all	0.73	BMI	0.000	1.000

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