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

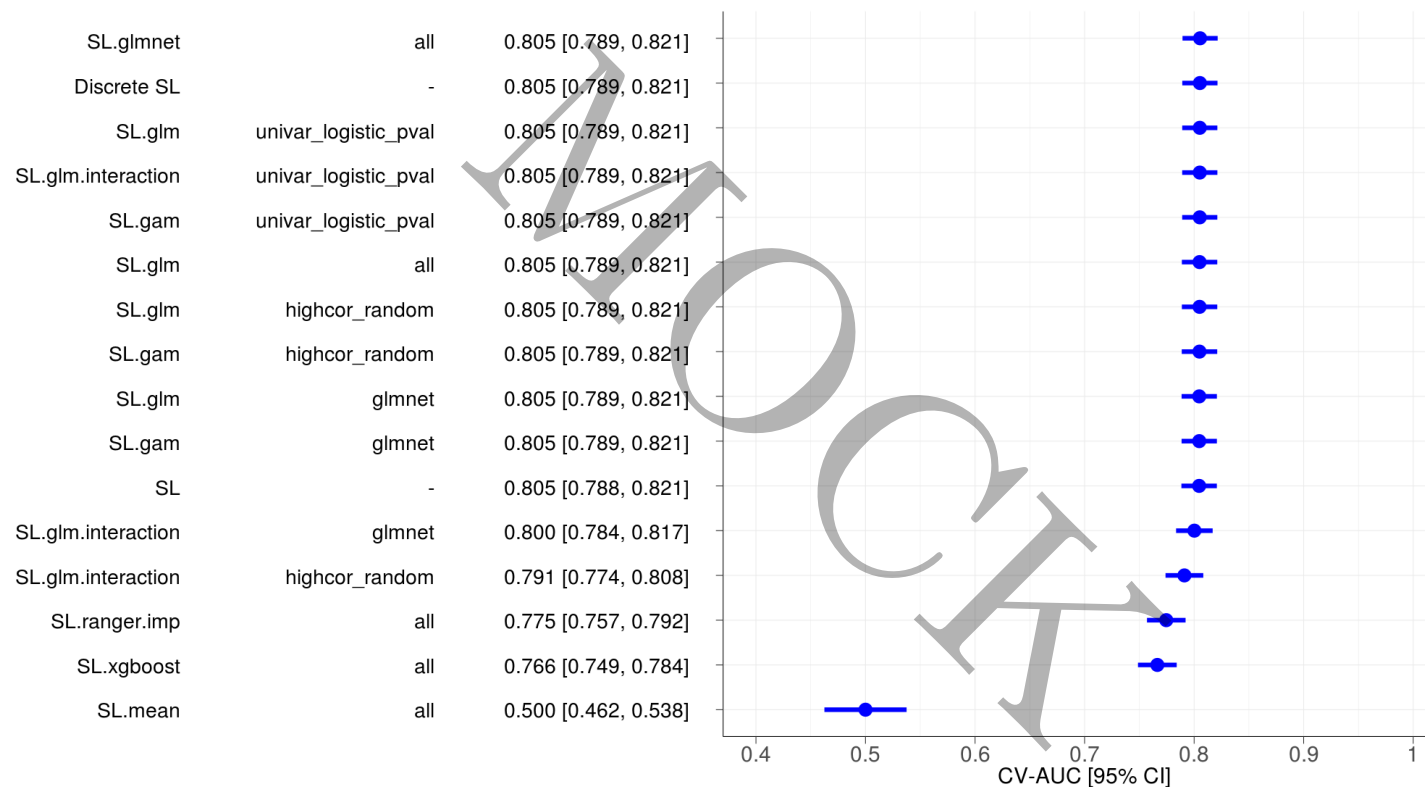|			
SL.glmnet	all	0.805 [0.789, 0.821]	
Discrete SL	-	0.805 [0.789, 0.821]	
SL.glm	univar_logistic_pval	0.805 [0.789, 0.821]	
SL.glm.interaction	univar_logistic_pval	0.805 [0.789, 0.821]	
SL.gam	univar_logistic_pval	0.805 [0.789, 0.821]	
SL.glm	all	0.805 [0.789, 0.821]	
SL.glm	highcor_random	0.805 [0.789, 0.821]	
SL.gam	highcor_random	0.805 [0.789, 0.821]	
SL.glm	glmnet	0.805 [0.789, 0.821]	
SL.gam	glmnet	0.805 [0.789, 0.821]	
SL	-	0.805 [0.788, 0.821]	
SL.glm.interaction	glmnet	0.800 [0.784, 0.817]	
SL.glm.interaction	highcor_random	0.791 [0.774, 0.808]	
SL.ranger.imp	all	0.775 [0.757, 0.792]	
SL.xgboost	all	0.766 [0.749, 0.784]	
SL.mean	all	0.500 [0.462, 0.538]	

CV-AUC [95% CI]

Figure 1.1: Cross-validated AUC (95% CI) of algorithms for predicting COVID-19 disease status starting 7 days after Day 57.
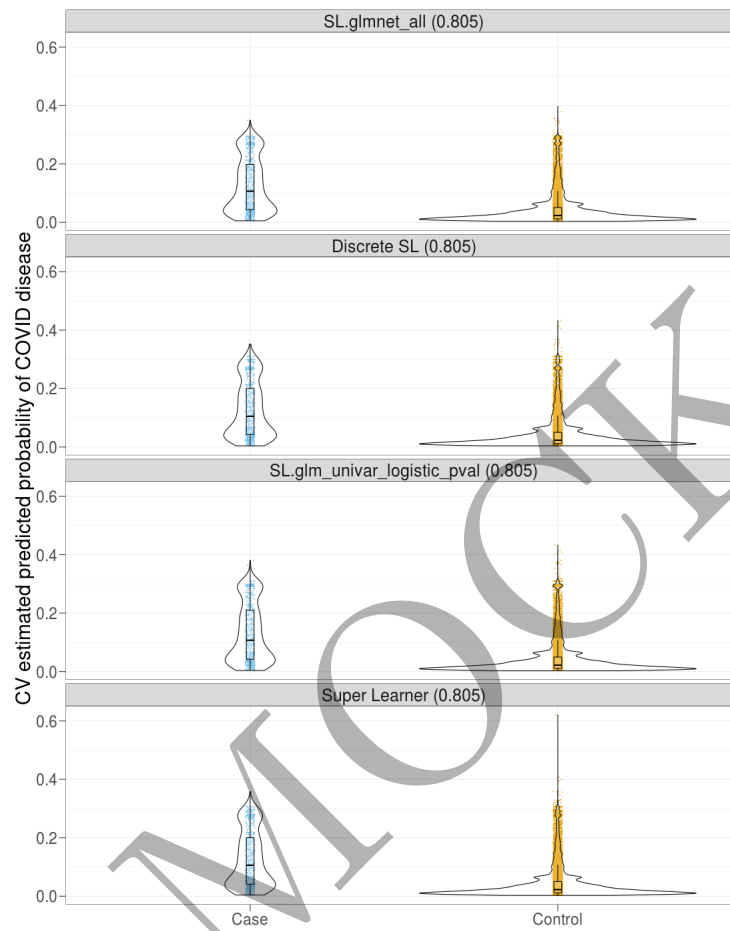
Figure 1.2: CV-estimated predicted probabilities of COVID-19 disease 7 days after Day 57 by case/control status for top 2 learners, SuperLearner and Discrete SL.
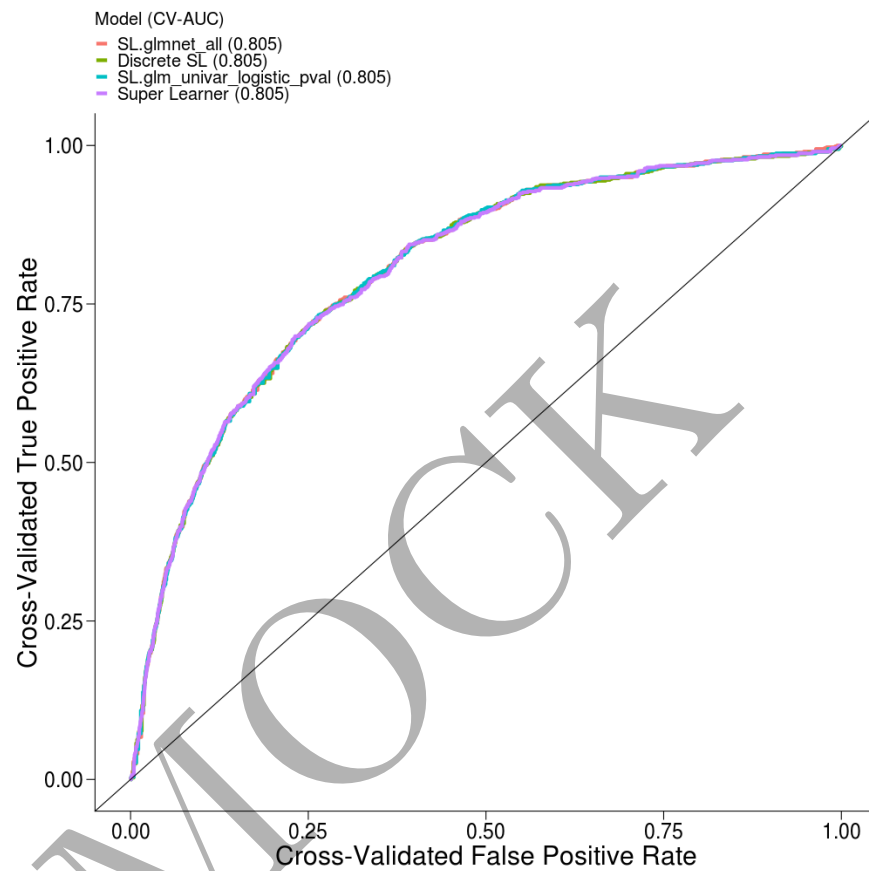
Figure 1.3: ROC curves based off CV-estimated predicted probabilities for the top 2 learners, Superlearner and Discrete SL.

Table 1.3: Weights assigned by Superlearner.

Learner	Screen	Weight
SL.glmnet	screen_all	0.382
SL.glm	screen_all	0.321
SL.glm.interaction	screen_univariate_logistic_pval	0.263
SL.glm	screen_univariate_logistic_pval	0.027
SL.glm.interaction	screen_highcor_random	0.007
SL.mean	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.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.glmnet	screen_all	0.382	(Intercept)	-3.222	0.040
SL.glmnet	screen_all	0.382	MinorityInd	0.000	1.000
SL.glmnet	screen_all	0.382	EthnicityHispanic	0.000	1.000
SL.glmnet	screen_all	0.382	EthnicityNotreported	0.000	1.000
SL.glmnet	screen_all	0.382	EthnicityUnknown	0.000	1.000
SL.glmnet	screen_all	0.382	Black	0.000	1.000
SL.glmnet	screen_all	0.382	Asian	0.000	1.000
SL.glmnet	screen_all	0.382	NatAmer	0.000	1.000
SL.glmnet	screen_all	0.382	PacIsl	0.000	1.000
SL.glmnet	screen_all	0.382	Multiracial	0.000	1.000
SL.glmnet	screen_all	0.382	Other	0.000	1.000
SL.glmnet	screen_all	0.382	Notreported	0.000	1.000
SL.glmnet	screen_all	0.382	Unknown	0.000	1.000
SL.glmnet	screen_all	0.382	HighRiskInd	0.553	1.739
SL.glmnet	screen_all	0.382	Sex	0.000	1.000
SL.glmnet	screen_all	0.382	Age	0.416	1.516
SL.glmnet	screen_all	0.382	BMI	0.000	1.000
SL.glm	screen_all	0.321	(Intercept)	-3.588	0.028
SL.glm	screen_all	0.321	MinorityInd	-0.082	0.922
SL.glm	screen_all	0.321	EthnicityHispanic	-0.032	0.968
SL.glm	screen_all	0.321	EthnicityNotreported	-0.035	0.965
SL.glm	screen_all	0.321	EthnicityUnknown	0.031	1.032
SL.glm	screen_all	0.321	Black	0.084	1.088
SL.glm	screen_all	0.321	Asian	0.100	1.105
SL.glm	screen_all	0.321	NatAmer	0.072	1.075
SL.glm	screen_all	0.321	PacIsl	-0.030	0.970
SL.glm	screen_all	0.321	Multiracial	0.015	1.015
SL.glm	screen_all	0.321	Other	-0.044	0.957
SL.glm	screen_all	0.321	Notreported	0.007	1.008
SL.glm	screen_all	0.321	Unknown	0.007	1.007
SL.glm	screen_all	0.321	HighRiskInd	0.786	2.194
SL.glm	screen_all	0.321	Sex	0.013	1.013
SL.glm	screen_all	0.321	Age	0.749	2.114
SL.glm	screen_all	0.321	BMI	0.001	1.001
SL.glm.interaction	screen_univariate_logistic_pval	0.263	(Intercept)	-3.610	0.027
SL.glm.interaction	screen_univariate_logistic_pval	0.263	EthnicityHispanic	-0.076	0.926
SL.glm.interaction	screen_univariate_logistic_pval	0.263	NatAmer	0.037	1.037
SL.glm.interaction	screen_univariate_logistic_pval	0.263	HighRiskInd	0.813	2.255
SL.glm.interaction	screen_univariate_logistic_pval	0.263	Age	0.791	2.205
SL.glm.interaction	screen_univariate_logistic_pval	0.263	EthnicityHispanic:NatAmer	0.036	1.037
SL.glm.interaction	screen_univariate_logistic_pval	0.263	EthnicityHispanic:HighRiskInd	-0.022	0.978
SL.glm.interaction	screen_univariate_logistic_pval	0.263	EthnicityHispanic:Age	0.021	1.021
SL.glm.interaction	screen_univariate_logistic_pval	0.263	NatAmer:HighRiskInd	0.050	1.051
SL.glm.interaction	screen_univariate_logistic_pval	0.263	NatAmer:Age	-0.061	0.941
SL.glm.interaction	screen_univariate_logistic_pval	0.263	HighRiskInd:Age	-0.045	0.956

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

Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm	screen_univariate_logistic_pval	0.027	(Intercept)	-3.581	0.028
SL.glm	screen_univariate_logistic_pval	0.027	EthnicityHispanic	-0.079	0.924
SL.glm	screen_univariate_logistic_pval	0.027	NatAmer	0.050	1.051
SL.glm	screen_univariate_logistic_pval	0.027	HighRiskInd	0.785	2.193
SL.glm	screen_univariate_logistic_pval	0.027	Age	0.748	2.112
SL.glm.interaction	screen_highcor_random	0.007	(Intercept)	-4.170	0.015
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd	-1.038	0.354
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic	-0.075	0.928
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported	-0.593	0.553
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown	-0.410	0.663
SL.glm.interaction	screen_highcor_random	0.007	Black	0.567	1.762
SL.glm.interaction	screen_highcor_random	0.007	Asian	0.357	1.429
SL.glm.interaction	screen_highcor_random	0.007	NatAmer	0.037	1.038
SL.glm.interaction	screen_highcor_random	0.007	PacIsl	-0.380	0.684
SL.glm.interaction	screen_highcor_random	0.007	Multiracial	-0.185	0.831
SL.glm.interaction	screen_highcor_random	0.007	Other	-0.132	0.876
SL.glm.interaction	screen_highcor_random	0.007	Notreported	-0.976	0.377
SL.glm.interaction	screen_highcor_random	0.007	Unknown	-0.123	0.884
SL.glm.interaction	screen_highcor_random	0.007	HighRiskInd	0.836	2.307
SL.glm.interaction	screen_highcor_random	0.007	Sex	0.019	1.019
SL.glm.interaction	screen_highcor_random	0.007	Age	0.823	2.278
SL.glm.interaction	screen_highcor_random	0.007	BMI	0.123	1.131
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:EthnicityHispanic	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:EthnicityNotreported	-1.379	0.252
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:EthnicityUnknown	-1.399	0.247
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Black	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Asian	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Notreported	-1.376	0.253
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Unknown	0.084	1.088
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:HighRiskInd	-0.087	0.916
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Sex	-0.099	0.905
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Age	0.136	1.146
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:BMI	0.127	1.136
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:EthnicityNotreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:EthnicityUnknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Black	0.021	1.021
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Asian	-0.091	0.913
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:NatAmer	0.035	1.035
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:PacIsl	-0.425	0.654
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Multiracial	0.044	1.044
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Other	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	0.007	EthnicityHispanic:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:HighRiskInd	-0.003	0.997
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Sex	0.079	1.082
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Age	-0.072	0.930
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:BMI	-0.136	0.873
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:EthnicityUnknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Black	1.042	2.836
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Asian	0.600	1.822
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:NatAmer	-0.063	0.939
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:PacIsl	0.053	1.054
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Multiracial	-0.041	0.960
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Notreported	-0.022	0.978
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Unknown	-0.426	0.653
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:HighRiskInd	0.091	1.095
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Sex	-0.022	0.978
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:Age	0.013	1.013
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported:BMI	-0.005	0.995
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Black	1.018	2.767
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Asian	0.645	1.907
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:NatAmer	-0.021	0.979
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:PacIsl	-0.030	0.971
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Multiracial	0.075	1.078
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Notreported	-0.085	0.918
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Unknown	-0.411	0.663
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:HighRiskInd	0.024	1.024
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Sex	0.035	1.036
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:Age	-0.033	0.967
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown:BMI	-0.018	0.982
SL.glm.interaction	screen_highcor_random	0.007	Black:Asian	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Black:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Black:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Black:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Black:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Black:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Black:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Black:HighRiskInd	0.045	1.046
SL.glm.interaction	screen_highcor_random	0.007	Black:Sex	0.041	1.042
SL.glm.interaction	screen_highcor_random	0.007	Black:Age	-0.085	0.919
SL.glm.interaction	screen_highcor_random	0.007	Black:BMI	-0.060	0.942
SL.glm.interaction	screen_highcor_random	0.007	Asian:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Asian:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Asian: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	0.007	Asian:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Asian:Notreported	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Asian:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Asian:HighRiskInd	0.039	1.040
SL.glm.interaction	screen__highcor__random	0.007	Asian:Sex	0.005	1.005
SL.glm.interaction	screen__highcor__random	0.007	Asian:Age	-0.023	0.977
SL.glm.interaction	screen__highcor__random	0.007	Asian:BMI	-0.129	0.879
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:PacIsl	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:Multiracial	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:Notreported	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:HighRiskInd	0.078	1.081
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:Sex	-0.010	0.990
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:Age	-0.098	0.907
SL.glm.interaction	screen__highcor__random	0.007	NatAmer:BMI	-0.045	0.956
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:Multiracial	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:Notreported	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:HighRiskInd	0.070	1.073
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:Sex	-0.044	0.957
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:Age	0.120	1.128
SL.glm.interaction	screen__highcor__random	0.007	PacIsl:BMI	-0.075	0.928
SL.glm.interaction	screen__highcor__random	0.007	Multiracial:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Multiracial:Notreported	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Multiracial:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Multiracial:HighRiskInd	0.079	1.083
SL.glm.interaction	screen__highcor__random	0.007	Multiracial:Sex	0.001	1.001
SL.glm.interaction	screen__highcor__random	0.007	Multiracial:Age	0.029	1.030
SL.glm.interaction	screen__highcor__random	0.007	Multiracial:BMI	0.111	1.118
SL.glm.interaction	screen__highcor__random	0.007	Other:Notreported	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Other:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Other:HighRiskInd	0.031	1.032
SL.glm.interaction	screen__highcor__random	0.007	Other:Sex	-0.035	0.966
SL.glm.interaction	screen__highcor__random	0.007	Other:Age	0.055	1.056
SL.glm.interaction	screen__highcor__random	0.007	Other:BMI	-0.026	0.975
SL.glm.interaction	screen__highcor__random	0.007	Notreported:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Notreported:HighRiskInd	0.028	1.028
SL.glm.interaction	screen__highcor__random	0.007	Notreported:Sex	0.011	1.011
SL.glm.interaction	screen__highcor__random	0.007	Notreported:Age	0.014	1.014
SL.glm.interaction	screen__highcor__random	0.007	Notreported:BMI	0.033	1.034
SL.glm.interaction	screen__highcor__random	0.007	Unknown:HighRiskInd	-0.033	0.967
SL.glm.interaction	screen__highcor__random	0.007	Unknown:Sex	-0.058	0.944
SL.glm.interaction	screen__highcor__random	0.007	Unknown:Age	-0.008	0.992

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	0.007	Unknown:BMI	0.043	1.044
SL.glm.interaction	screen_highcor_random	0.007	HighRiskInd:Sex	-0.031	0.969
SL.glm.interaction	screen_highcor_random	0.007	HighRiskInd:Age	-0.052	0.949
SL.glm.interaction	screen_highcor_random	0.007	HighRiskInd:BMI	-0.096	0.909
SL.glm.interaction	screen_highcor_random	0.007	Sex:Age	0.037	1.037
SL.glm.interaction	screen_highcor_random	0.007	Sex:BMI	0.001	1.001
SL.glm.interaction	screen_highcor_random	0.007	Age:BMI	-0.049	0.952
SL.glm.interaction	screen_highcor_random	0.007	(Intercept)	-4.170	0.015
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd	-1.038	0.354
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic	-0.075	0.928
SL.glm.interaction	screen_highcor_random	0.007	EthnicityNotreported	-0.593	0.553
SL.glm.interaction	screen_highcor_random	0.007	EthnicityUnknown	-0.410	0.663
SL.glm.interaction	screen_highcor_random	0.007	Black	0.567	1.762
SL.glm.interaction	screen_highcor_random	0.007	Asian	0.357	1.429
SL.glm.interaction	screen_highcor_random	0.007	NatAmer	0.037	1.038
SL.glm.interaction	screen_highcor_random	0.007	PacIsl	-0.380	0.684
SL.glm.interaction	screen_highcor_random	0.007	Multiracial	-0.185	0.831
SL.glm.interaction	screen_highcor_random	0.007	Other	-0.132	0.876
SL.glm.interaction	screen_highcor_random	0.007	Notreported	-0.976	0.377
SL.glm.interaction	screen_highcor_random	0.007	Unknown	-0.123	0.884
SL.glm.interaction	screen_highcor_random	0.007	HighRiskInd	0.836	2.307
SL.glm.interaction	screen_highcor_random	0.007	Sex	0.019	1.019
SL.glm.interaction	screen_highcor_random	0.007	Age	0.823	2.278
SL.glm.interaction	screen_highcor_random	0.007	BMI	0.123	1.131
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:EthnicityHispanic	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:EthnicityNotreported	-1.379	0.252
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:EthnicityUnknown	-1.399	0.247
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Black	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Asian	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:NatAmer	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Notreported	-1.376	0.253
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Unknown	0.084	1.088
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:HighRiskInd	-0.087	0.916
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Sex	-0.099	0.905
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:Age	0.136	1.146
SL.glm.interaction	screen_highcor_random	0.007	MinorityInd:BMI	0.127	1.136
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:EthnicityNotreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:EthnicityUnknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Black	0.021	1.021
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:Asian	-0.091	0.913
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:NatAmer	0.035	1.035
SL.glm.interaction	screen_highcor_random	0.007	EthnicityHispanic:PacIsl	-0.425	0.654

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	0.007	EthnicityHispanic:Multiracial	0.044	1.044
SL.glm.interaction	screen__highcor__random	0.007	EthnicityHispanic:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	EthnicityHispanic:Notreported	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	EthnicityHispanic:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	EthnicityHispanic:HighRiskInd	-0.003	0.997
SL.glm.interaction	screen__highcor__random	0.007	EthnicityHispanic:Sex	0.079	1.082
SL.glm.interaction	screen__highcor__random	0.007	EthnicityHispanic:Age	-0.072	0.930
SL.glm.interaction	screen__highcor__random	0.007	EthnicityHispanic:BMI	-0.136	0.873
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:EthnicityUnknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Black	1.042	2.836
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Asian	0.600	1.822
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:NatAmer	-0.063	0.939
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:PacIsl	0.053	1.054
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Multiracial	-0.041	0.960
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Notreported	-0.022	0.978
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Unknown	-0.426	0.653
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:HighRiskInd	0.091	1.095
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Sex	-0.022	0.978
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:Age	0.013	1.013
SL.glm.interaction	screen__highcor__random	0.007	EthnicityNotreported:BMI	-0.005	0.995
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Black	1.018	2.767
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Asian	0.645	1.907
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:NatAmer	-0.021	0.979
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:PacIsl	-0.030	0.971
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Multiracial	0.075	1.078
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Notreported	-0.085	0.918
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Unknown	-0.411	0.663
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:HighRiskInd	0.024	1.024
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Sex	0.035	1.036
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:Age	-0.033	0.967
SL.glm.interaction	screen__highcor__random	0.007	EthnicityUnknown:BMI	-0.018	0.982
SL.glm.interaction	screen__highcor__random	0.007	Black:Asian	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Black:NatAmer	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Black:PacIsl	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Black:Multiracial	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Black:Other	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Black:Notreported	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Black:Unknown	NA	NA
SL.glm.interaction	screen__highcor__random	0.007	Black:HighRiskInd	0.045	1.046
SL.glm.interaction	screen__highcor__random	0.007	Black:Sex	0.041	1.042
SL.glm.interaction	screen__highcor__random	0.007	Black:Age	-0.085	0.919
SL.glm.interaction	screen__highcor__random	0.007	Black:BMI	-0.060	0.942
SL.glm.interaction	screen__highcor__random	0.007	Asian: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	0.007	Asian:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Asian:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Asian:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Asian:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Asian:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Asian:HighRiskInd	0.039	1.040
SL.glm.interaction	screen_highcor_random	0.007	Asian:Sex	0.005	1.005
SL.glm.interaction	screen_highcor_random	0.007	Asian:Age	-0.023	0.977
SL.glm.interaction	screen_highcor_random	0.007	Asian:BMI	-0.129	0.879
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:PacIsl	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:HighRiskInd	0.078	1.081
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:Sex	-0.010	0.990
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:Age	-0.098	0.907
SL.glm.interaction	screen_highcor_random	0.007	NatAmer:BMI	-0.045	0.956
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:Multiracial	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:HighRiskInd	0.070	1.073
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:Sex	-0.044	0.957
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:Age	0.120	1.128
SL.glm.interaction	screen_highcor_random	0.007	PacIsl:BMI	-0.075	0.928
SL.glm.interaction	screen_highcor_random	0.007	Multiracial:Other	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Multiracial:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Multiracial:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Multiracial:HighRiskInd	0.079	1.083
SL.glm.interaction	screen_highcor_random	0.007	Multiracial:Sex	0.001	1.001
SL.glm.interaction	screen_highcor_random	0.007	Multiracial:Age	0.029	1.030
SL.glm.interaction	screen_highcor_random	0.007	Multiracial:BMI	0.111	1.118
SL.glm.interaction	screen_highcor_random	0.007	Other:Notreported	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Other:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Other:HighRiskInd	0.031	1.032
SL.glm.interaction	screen_highcor_random	0.007	Other:Sex	-0.035	0.966
SL.glm.interaction	screen_highcor_random	0.007	Other:Age	0.055	1.056
SL.glm.interaction	screen_highcor_random	0.007	Other:BMI	-0.026	0.975
SL.glm.interaction	screen_highcor_random	0.007	Notreported:Unknown	NA	NA
SL.glm.interaction	screen_highcor_random	0.007	Notreported:HighRiskInd	0.028	1.028
SL.glm.interaction	screen_highcor_random	0.007	Notreported:Sex	0.011	1.011
SL.glm.interaction	screen_highcor_random	0.007	Notreported:Age	0.014	1.014
SL.glm.interaction	screen_highcor_random	0.007	Notreported:BMI	0.033	1.034
SL.glm.interaction	screen_highcor_random	0.007	Unknown:HighRiskInd	-0.033	0.967

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

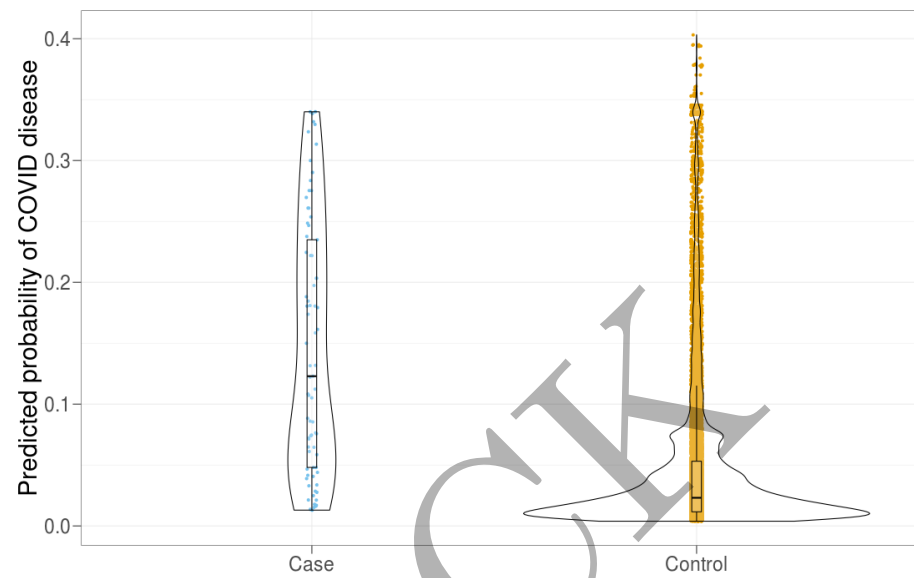| Learner	Screen	Weight	Predictors	Coefficient	Odds.Ratio
SL.glm.interaction	screen__highcor__random	0.007	Unknown:Sex	-0.058	0.944
SL.glm.interaction	screen__highcor__random	0.007	Unknown:Age	-0.008	0.992
SL.glm.interaction	screen__highcor__random	0.007	Unknown:BMI	0.043	1.044
SL.glm.interaction	screen__highcor__random	0.007	HighRiskInd:Sex	-0.031	0.969
SL.glm.interaction	screen__highcor__random	0.007	HighRiskInd:Age	-0.052	0.949
SL.glm.interaction	screen__highcor__random	0.007	HighRiskInd:BMI	-0.096	0.909
SL.glm.interaction	screen__highcor__random	0.007	Sex:Age	0.037	1.037
SL.glm.interaction	screen__highcor__random	0.007	Sex:BMI	0.001	1.001
SL.glm.interaction	screen__highcor__random	0.007	Age:BMI	-0.049	0.952

Figure 1.4: Superlearner predicted probabilities of COVID-19 disease in vaccinees 7 days after Day 57 by case/control status.
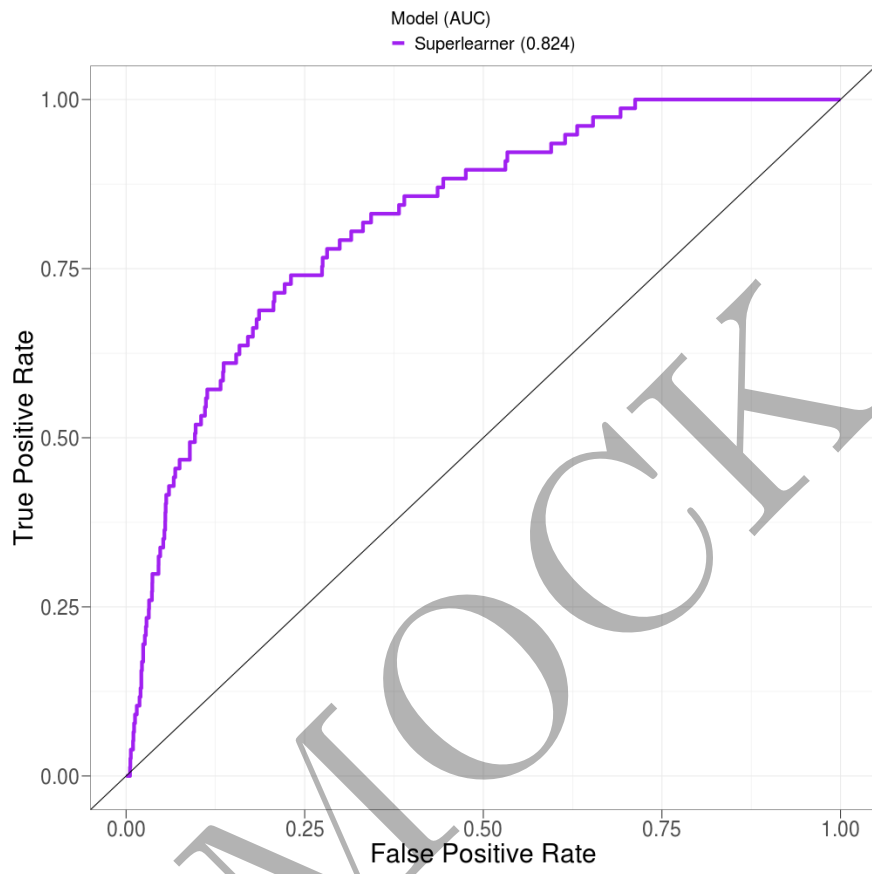
Figure 1.5: ROC curve based off Superlearner predicted probabilities in vaccinees.

Chapter 2

Appendix

- This report was built from the `CoVPN/correlates_reporting` repository with commit hash d51839a54febb687b3b008e54838b14637b59083. A diff of the changes introduced by that commit may be viewed at https://github.com/CoVPN/correlates_reporting/commit/d51839a54febb687b3b008e54838b14637b59083

- The sha256 hash sum of the raw input file, "COVID_VEtrial_practicedata_primarystage1.csv": b91bb45a990c435d4630dea29b63b768f7edb40d9306f6bc108486a780166fd4

- The sha256 hash sum of the processed file, "practice_data.csv": a126c3e4dff376bcf15f6ac4476fd7048b35219934bb0b837a86699c80832d46