COVID-19 Baseline Risk Score Analysis Report $_{\rm mock\ Study}$

USG COVID-19 Response Biostatistics Team

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Contents

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

4 CONTENTS

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

8 LIST OF FIGURES



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
${\bf Ethnicity Not reported}$	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:

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 ${\bf r}$

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

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

^{*}Screen details:

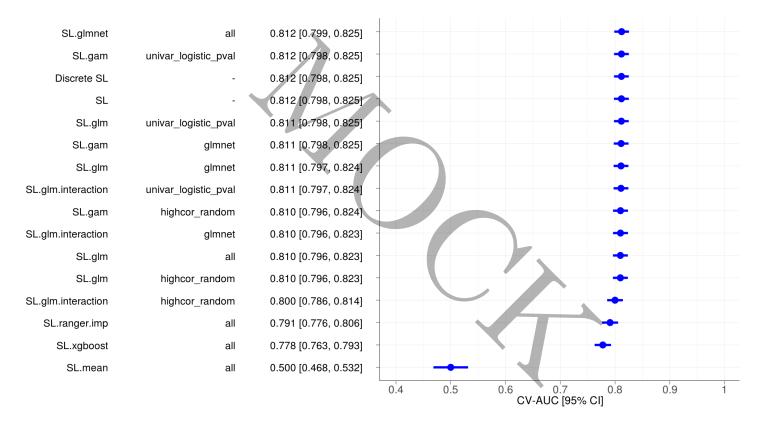


Figure 1.1: Cross-validated AUC (95% CI) of algorithms for predicting COVID-19 disease status starting 7 days after Day 57.

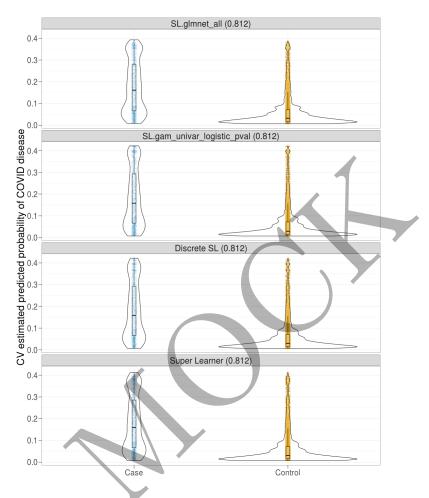


Figure 1.2: CV-estimated predicted probabilities of COVID-19 disease 7 days after Day 57 by case/control status for top 2 learners, SuperLearner and Discrete $^{\rm CI}$

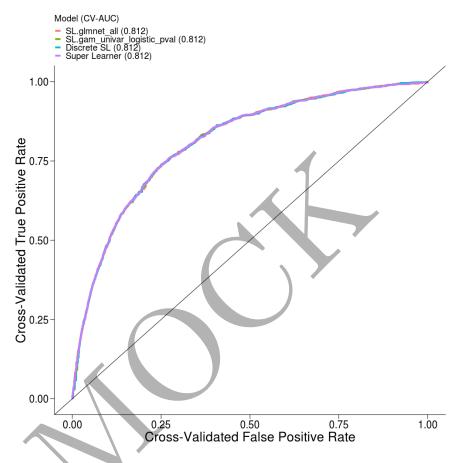


Figure 1.3: ROC curves based off CV-estimated predicted probabilities for the top 2 learners, Superlearner and Discrete SL.

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

Weight Predictors Coefficient Odds.Ratio Learner Screen SL.gam screen univariate logistic pval 0.531(Intercept) -3.202 0.041SL.gam screen_univariate_logistic_pval 0.531s(Age,2) 0.7432.103 0.531 HighRiskInd 2.322 SL.gam screen_univariate_logistic_pval 0.842SL.glmnet 0.056 $screen_all$ 0.444(Intercept) -2.881SL.glmnet 0.444MinorityInd 0.000 1.000 screen_all SL.glmnet screen all 0.444 EthnicityHispanic 0.000 1.000 SL.glmnet $screen_all$ 0.444 EthnicityNotreported 0.000 1.000 SL.glmnet 0.444EthnicityUnknown 0.0001.000 screen all SL.glmnet $screen_all$ 0.444 Black 0.000 1.000 SL.glmnet screen_all 0.444 Asian 0.0001.000 SL.glmnet0.444 NatAmer $screen_all$ 0.000 1.000 SL.glmnet 0.444PacIsl 0.000 1.000 $screen_all$ SL.glmnet screen all 0.444Multiracial 0.000 1.000 SL.glmnet $screen_all$ 0.444Other 0.000 1.000 SL.glmnet 0.444 Notreported 0.000 1.000 screen all 1.000 SL.glmnet screen_all 0.4444Unknow 0.000 SL.glmnet $screen_all$ 0.444HighRiskInd 0.6241.867SL.glmnet 1.000 $screen_all$ 0.4440.000 Sex SL.glmnet screen_all 0.444Age 0.4441.560 SL.glmnet $screen_all$ 0.444 $_{\rm BMI}$ 0.000 1.000 SL.glm.interaction screen_highcor_random 0.025(Intercept -3.3880.034SL.glm.interaction screen_highcor_random 0.025MinorityInd -0.2670.765 ${\bf Ethnicity Hispanic}$ ${\rm SL.glm.interaction}$ 0.025-0.022 0.978 screen highcor random SL.glm.interaction screen_highcor_random 0.025EthnicityNotreported -0.401 0.670 SL.glm.interaction 0.025EthnicityUnknown -0.090 0.914 screen highcor random ${\rm SL.glm.interaction}$ $screen_highcor_random$ 0.025Black0.2541.289 SL.glm.interaction 0.025Asian 0.060 1.061 screen highcor random SL.glm.interaction $screen_highcor_random$ 0.025NatAmer -0.012 0.988 SL.glm.interaction 0.025 PacIsl -0.085 0.918 screen_highcor_random SL.glm.interaction screen_highcor_random 0.025Multiracial -0.1170.889 SL.glm.interaction screen_highcor_random 0.025Other -0.073 0.9290.0250.018 1.018 SL.glm.interaction screen_highcor_random Notreported ${\rm SL.glm.interaction}$ $screen_highcor_random$ 0.025Unknown -0.0730.929 SL.glm.interaction screen_highcor_random 0.025HighRiskInd 0.8802.412SL.glm.interaction $screen_highcor_random$ 0.025Sex 0.069 1.071 ${\rm SL.glm.interaction}$ $screen_highcor_random$ 0.025Age 0.8062.239 0.025вмі -0.024 0.976 SL.glm.interaction screen highcor random SL.glm.interaction $screen_highcor_random$ 0.025MinorityInd:EthnicityHispanic NANASL.glm.interaction 0.025MinorityInd:EthnicityNotreported -1.351 0.259 screen highcor random 0.0251.112 SL.glm.interaction screen_highcor_random MinorityInd:EthnicityUnknown 0.106 SL.glm.interaction screen_highcor_random 0.025MinorityInd:Black NANASL.glm.interaction 0.025MinorityInd:Asian NA NA screen_highcor_random

0.025

0.025

0.025

MinorityInd:NatAmer

MinorityInd:Multiracial

MinorityInd:PacIsl

NA

NΑ

NA

NA

NΑ

NA

 ${\rm SL.glm.interaction}$

SL.glm.interaction

SL.glm.interaction

 $screen_highcor_random$

screen highcor random

screen_highcor_random

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

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	Ethnicity Notreported: 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	0.025	1.035
SL.glm.interaction	screen highcor random	0.025	EthnicityNotreported:Sex	-0.117	0.889
SL.glm.interaction	screen_nighcor_random screen highcor random	0.025	EthnicityNotreported:Age EthnicityNotreported:Age	0.011	1.011
SL.glm.interaction	screen_highcor_random screen_highcor_random	0.025	EthnicityNotreported:Age EthnicityNotreported:BMI	-0.020	0.981
SL.glm.interaction	screen_highcor_random	0.025	EthnicityUnknown:Black	-0.020	0.942
_			Ethnicity Unknown: Asian	-0.039	
SL.glm.interaction	screen_highcor_random	0.025			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

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)

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	-0.012	0.918
SL.glm.interaction	screen_highcor_random	0.025	Multiracial	-0.117	0.889
SL.glm.interaction	screen_nighcor_random screen highcor random	0.025	Other	-0.117	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_nighcor_random screen highcor random	0.025	Sex	0.069	1.071
_	_ 0 _				
SL.glm.interaction	screen_highcor_random	0.025	Age BMI	0.806	2.239
SL.glm.interaction	screen_highcor_random	0.025		-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

Odds.Ratio Coefficient Learner Screen Predictors Weight SL.glm.interaction screen_highcor_random 0.025 MinorityInd:PacIsl NA NA SL.glm.interaction screen_highcor_random 0.025MinorityInd:Multiracial NANASL.glm.interaction 0.025MinorityInd:Other screen highcor random NANA ${\rm SL.glm.interaction}$ $screen_highcor_random$ 0.025 ${\bf Minority Ind: Not reported}$ 0.054 1.055 0.025 SL.glm.interaction screen_highcor_random MinorityInd:Unknown 0.045 1.046 MinorityInd:HighRiskInd SL.glm.interaction screen highcor random 0.025 0.1961.217 ${\it SL.glm.interaction}$ screen_highcor_random 0.025MinorityInd:Sex 0.1811.199 0.025SL.glm.interaction screen highcor random MinorityInd:Age -0.2010.818 SL.glm.interaction screen_highcor_random 0.025MinorityInd:BMI 0.087 1.091 SL.glm.interaction 0.025 EthnicityHispanic:EthnicityNotreported screen highcor random NANA0.025 ${\rm SL.glm.interaction}$ $screen_highcor_random$ EthnicityHispanic:EthnicityUnknown NA NA0.025 EthnicityHispanic:Black 0.982 ${\rm SL.glm.interaction}$ $screen_highcor_random$ -0.018 0.025 EthnicityHispanic:Asian SL.glm.interaction screen highcor random -0.0960.908 SL.glm.interaction $screen_highcor_random$ 0.025EthnicityHispanic:NatAmer 0.028 1.029 SL.glm.interaction 0.025 EthnicityHispanic:PacIsl 0.279 1.321 screen highcor random SL.glm.interaction screen_highcor_random 0.025EthnicityHispanic:Multiracial 0.0491.050 SL.glm.interaction screen_highcor_random 0.025EthnicityHispanic:Other NANA0.025 EthnicityHispanic:Notreported SL.glm.interaction screen_highcor_random NA NA SL.glm.interaction screen_highcor_random 0.025EthnicityHispanic:Unknown NANA0.025 EthnicityHispanic:HighRiskInd SL.glm.interaction -0.0810.923screen highcor random SL.glm.interaction screen_highcor_random 0.025EthnicityHispanic:Sex -0.073 0.929SL.glm.interaction screen_highcor_random 0.025EthnicityHispanic:Age 0.1181.125 EthnicityHispanic:BMI SL.glm.interaction screen_highcor_random 0.025-0.0850.919 EthnicityNotreported:EthnicityUnknown SL.glm.interaction screen_highcor_random 0.025NANASL.glm.interaction EthnicityNotreported:Black 0.025 0.972 2.643 screen_highcor_random ${\it SL.glm.interaction}$ 0.025EthnicityNotreported:Asian 1.902 screen_highcor_random 0.643 0.025EthnicityNotreported:NatAmer SL.glm.interaction screen highcor random -0.0110.989 ${\rm SL.glm.interaction}$ $screen_highcor_random$ 0.025EthnicityNotreported:PacIsl 0.369 1.446 SL.glm.interaction screen highcor random 0.025EthnicityNotreported:Multiracial 0.046 1.047 SL.glm.interaction screen highcor random 0.025EthnicityNotreported:Other NANAEthnicityNotreported:Notreported SL.glm.interaction screen_highcor_random 0.0250.000 1.000 SL.glm.interaction screen_highcor_random 0.025 EthnicityNotreported:Unknown 0.023 1.024 SL.glm.interaction screen_highcor_random 0.025EthnicityNotreported:HighRiskInd 0.0351.035 0.025 EthnicityNotreported:Sex SL.glm.interaction -0.1170.889 screen highcor random ${\rm SL.glm.interaction}$ $screen_highcor_random$ 0.025EthnicityNotreported:Age 0.011 1.011 SL.glm.interaction screen_highcor_random 0.025EthnicityNotreported:BMI -0.020 0.981SL.glm.interaction screen_highcor_random 0.025EthnicityUnknown:Black -0.0590.942SL.glm.interaction screen_highcor_random 0.025EthnicityUnknown:Asian -0.075 0.928SL.glm.interaction 0.025 EthnicityUnknown:NatAmer -0.026 0.974 $screen_highcor_random$ SL.glm.interaction screen_highcor_random 0.025EthnicityUnknown:PacIsl -0.309 0.734SL.glm.interaction 0.025 EthnicityUnknown:Multiracial -0.013 0.987 screen highcor random 0.025 EthnicityUnknown:Other SL.glm.interaction screen_highcor_random NA NA SL.glm.interaction screen_highcor_random 0.025EthnicityUnknown:Notreported 0.008 1.008

0.025

0.025

EthnicityUnknown:Unknown

EthnicityUnknown:HighRiskInd

0.029

0.044

1.029

1.045

SL.glm.interaction

SL.glm.interaction

screen highcor random

screen_highcor_random

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

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
L.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
L.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
L.glm.interaction	screen_highcor_random	0.025	NatAmer:Other	NA	NA
SL.glm.interaction	screen_nighcor_random screen highcor random	0.025	NatAmer:Notreported	NA NA	NA NA
SL.glm.interaction	screen_highcor_random	0.025	NatAmer:Unknown	NA NA	NA
SL.glm.interaction	screen_nighcor_random screen highcor random	0.025	NatAmer:HighRiskInd	-0.086	0.918
SL.glm.interaction	screen_highcor_random screen_highcor_random	0.025	NatAmer:Sex	-0.086	0.917
SL.glm.interaction	screen_nightor_random screen highcor random	0.025	NatAmer:Age	-0.097	0.989
L.glm.interaction	screen_nighcor_random screen highcor random	0.025	NatAmer:Age NatAmer:BMI	-0.011	0.989
9	screen_highcor_random screen_highcor_random	0.025	NatAmer:BMI PacIsl:Multiracial	-0.060 NA	0.941 NA
L.glm.interaction			PacIsl:Multiracial PacIsl:Other	NA NA	NA NA
L.glm.interaction	screen_highcor_random	0.025		NA NA	NA NA
L.glm.interaction	screen_highcor_random	0.025	PacIsl:Notreported		
L.glm.interaction	screen_highcor_random	0.025	PacIsl:Unknown	NA	NA
L.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

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	1	-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

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

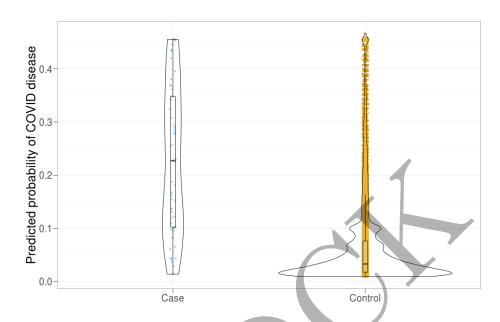


Figure 1.4: Superlearner predicted probabilities of COVID-19 disease in vaccinees 7 days after Day 57 by case/control status.

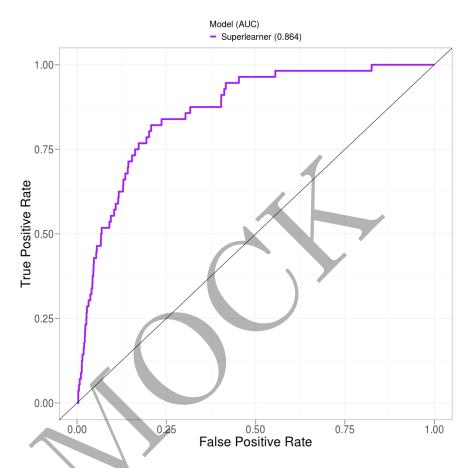


Figure 1.5: ROC curve based off Superlearner predicted probabilities in vaccinees.

Chapter 2

Appendix

- This report was built from the CoVPN/correlates_reporting repository with commit hash 9a77e2bb0adc4f09f7dec918fef73d49d849ad8b. A diff of the changes introduced by that commit may be viewed at https://github.com/CoVPN/correlates_reporting/commit/9a77e2bb0adc4f09f7dec918fef73d49d849ad8b
- The sha256 hash sum of the raw input file, "COVID_VEtrial_practicedata_primarystage1.csv": 9093a3d1fd6eb4b5523bfa7df143e1bc6e1f3ee0f6b340eaf60d3859e07a1023
- \bullet The sha256 hash sum of the processed file, "practice_data.csv": b3eb4a4bc4134968cce332b14e8bbd891517cf559f9a3459409f644db65a1810