libname d "Y:\...\CovidFinalData";

**data** covid\_data;

set d.subset\_CovidGE15Covid;

**run**;

**proc** **sort** data=covid\_data;

by prov\_id;

**run**;

**data** wave1\_data;

set covid\_data;

if wave=**1**;**run**;

**data** wave2\_data;

set covid\_data;

if wave=**2**;

**run**;

**proc** **glimmix** data=covid\_data EMPIRICAL initglm scoring=**5**;

class prov\_id age\_cat5 gender race4 adm\_src2 adm\_type2 payor\_new acute\_resp\_fail\_poa hepatic\_fail\_poa

hematologic\_fail\_poa metabolic\_fail\_poa neurologic\_fail\_poa renal\_fail\_poa vaso\_02 remdesivir\_adm2 steroid\_adm azithro\_hydroxychl dnr\_poa cancer\_poa ckd\_stage3\_poa copd\_poa immunocomp\_poa obese\_overweight\_poa pregnant\_poa sickle\_cell\_poa diabetes\_poa asthma\_poa interstitial\_lung\_dx\_poa thalassemia\_poa cdc\_heartdx elix\_HTN elix\_NeuroOther cdc\_liverfail\_cirrhosis URBAN\_RURAL TEACHING BEDS\_GRP Tech\_Index\_v2 remdes\_hosp\_month

PROV\_REGION adm\_mon grade\_day02\_new covid\_surgeindex\_percent\_grps;

model death (event="1") = age\_cat5 gender race4 adm\_src2 adm\_type2 payor\_new acute\_resp\_fail\_poa hepatic\_fail\_poa

hematologic\_fail\_poa metabolic\_fail\_poa neurologic\_fail\_poa renal\_fail\_poa vaso\_02 remdesivir\_adm2 steroid\_adm azithro\_hydroxychl dnr\_poa cancer\_poa ckd\_stage3\_poa copd\_poa immunocomp\_poa obese\_overweight\_poa pregnant\_poa sickle\_cell\_poa diabetes\_poa asthma\_poa interstitial\_lung\_dx\_poa thalassemia\_poa cdc\_heartdx elix\_HTN elix\_NeuroOther cdc\_liverfail\_cirrhosis URBAN\_RURAL TEACHING BEDS\_GRP Tech\_Index\_v2 remdes\_hosp\_month pat\_per\_attend20 icuventprop\_covid icu02prop\_covid prop\_covidtest\_monthly ratio\_vent\_20v19 medicaid\_vol19 perc\_uninsured

PROV\_REGION adm\_mon grade\_day02\_new covid\_surgeindex\_percent\_grps /link=logit dist=binary or cl solution;

random intercept /subject=prov\_id type=VC solution;

estimate "50-75 vs 00-50" covid\_surgeindex\_percent\_grps -**1** **1** **0** **0** **0** **0** /exp cl;

estimate "75-90 vs 00-50" covid\_surgeindex\_percent\_grps -**1** **0** **1** **0** **0** **0** /exp cl;

estimate "90-95 vs 00-50" covid\_surgeindex\_percent\_grps -**1** **0** **0** **1** **0** **0** /exp cl;

estimate "95-99 vs 00-50" covid\_surgeindex\_percent\_grps -**1** **0** **0** **0** **1** **0** /exp cl;

estimate "99-100 vs 00-50" covid\_surgeindex\_percent\_grps -**1** **0** **0** **0** **0** **1** /exp cl;

/\* PATIENT LEVEL VARIABLES \*/

estimate "25-34 vs <25" age\_cat5 **1** **0** **0** **0** **0** **0** **0** -**1**/exp cl;

estimate "35-44 vs <25" age\_cat5 **0** **1** **0** **0** **0** **0** **0** -**1**/exp cl;

estimate "45-54 vs <25" age\_cat5 **0** **0** **1** **0** **0** **0** **0** -**1**/exp cl;

estimate "55-64 vs <25" age\_cat5 **0** **0** **0** **1** **0** **0** **0** -**1**/exp cl;

estimate "65-74 vs <25" age\_cat5 **0** **0** **0** **0** **1** **0** **0** -**1**/exp cl;

estimate "75-84 vs <25" age\_cat5 **0** **0** **0** **0** **0** **1** **0** -**1**/exp cl;

estimate "85+ vs <25" age\_cat5 **0** **0** **0** **0** **0** **0** **1** -**1**/exp cl;

estimate "Male vs Female" gender -**1** **1**/exp cl;

estimate "Hispanic vs Non-His White" race4 **1** **0** **0** **0** -**1** **0** /exp cl;

estimate "Non-His Asian vs Non-His White" race4 **0** **1** **0** **0** -**1** **0** /exp cl;

estimate "Non-His Black vs Non-His White" race4 **0** **0** **1** **0** -**1** **0** /exp cl;

estimate "Non-His Other vs Non-His White" race4 **0** **0** **0** **1** -**1** **0** /exp cl;

estimate "Unknown Race vs Non-His White" race4 **0** **0** **0** **0** -**1** **1** /exp cl;

estimate "Acute care vs Home" adm\_src2 **1** -**1** **0** **0** /exp cl;

estimate "Other vs Home" adm\_src2 **0** -**1** **1** **0** /exp cl;

estimate "Subacute Fac vs Home" adm\_src2 **0** -**1** **0** **1** /exp cl;

estimate "Emergency/Urgent vs Elective" adm\_type2 -**1** **1** **0** /exp cl;

estimate "Emergency/Urgent vs Other" adm\_type2 **0** **1** -**1** /exp cl;

estimate "Medicaid vs Private Ins" payor\_new **1** **0** **0** -**1** **0** /exp cl;

estimate "Medicare vs Private Ins" payor\_new **0** **1** **0** -**1** **0** /exp cl;

estimate "Other vs Private Ins" payor\_new **0** **0** **1** -**1** **0** /exp cl;

estimate "Uninsured vs Private Ins" payor\_new **0** **0** **0** -**1** **1** /exp cl;

estimate "acute\_resp\_fail\_poa=Y vs acute\_resp\_fail\_poa=N" acute\_resp\_fail\_poa -**1** **1** /exp cl;

estimate "hepatic\_fail\_poa=Y vs hepatic\_fail\_poa=N" hepatic\_fail\_poa -**1** **1** /exp cl;

estimate "hematologic\_fail\_poa=Y vs hematologic\_fail\_poa=N" hematologic\_fail\_poa -**1** **1** /exp cl;

estimate "metabolic\_fail\_poa=Y vs metabolic\_fail\_poa=N" metabolic\_fail\_poa -**1** **1** /exp cl;

estimate "neurologic\_fail\_poa=Y vs neurologic\_fail\_poa=N" neurologic\_fail\_poa -**1** **1** /exp cl;

estimate "renal\_fail\_poa=Y vs renal\_fail\_poa=N" renal\_fail\_poa -**1** **1** /exp cl;

estimate "vaso=Y vs vaso=N" vaso\_02 -**1** **1** /exp cl;

estimate "remdesivir=Y vs remdesivir=N" remdesivir\_adm2 -**1** **1**/exp cl;

estimate "steroid=Y vs steroid=N" steroid\_adm -**1** **1**/exp cl;

estimate "azithro\_adm=Y vs neither" azithro\_hydroxychl **1** **0** **0** -**1**/exp cl;

estimate "hydroxychl\_adm=Y vs neither" azithro\_hydroxychl **0** **1** **0** -**1**/exp cl;

estimate "hydroxychl\_azithro\_adm=Y vs neither" azithro\_hydroxychl **0** **0** **1** -**1**/exp cl;

estimate "dnr\_poa=Y vs dnr\_poa=N" dnr\_poa -**1** **1** /exp cl;

estimate "acute\_resp\_fail\_poa=Y vs None" grade\_day02\_new -**1** **1** **0** **0** /exp cl;

estimate "ICUorHRNIPPV vs None" grade\_day02\_new -**1** **0** **1** **0** /exp cl;

estimate "ICUandVENT vs None" grade\_day02\_new -**1** **0** **0** **1** /exp cl;

/\* HOSPITAL LEVEL VARIABLES\*/

estimate "urban vs rural" urban\_rural -**1** **1** /exp cl;

estimate "teaching=Y vs teaching=N" teaching -**1** **1** /exp cl;

estimate "100-199 vs 000-099" beds\_grp -**1** **1** **0** **0** **0** **0** /exp cl;

estimate "200-299 vs 000-099" beds\_grp -**1** **0** **1** **0** **0** **0** /exp cl;

estimate "300-399 vs 000-099" beds\_grp -**1** **0** **0** **1** **0** **0** /exp cl;

estimate "400-499 vs 000-099" beds\_grp -**1** **0** **0** **0** **1** **0** /exp cl;

estimate "500+ vs 000-099" beds\_grp -**1** **0** **0** **0** **0** **1** /exp cl;

estimate "northeast vs midwest" prov\_region -**1** **1** **0** **0** /exp cl;

estimate "south vs midwest" prov\_region -**1** **0** **1** **0** /exp cl;

estimate "west vs midwest" prov\_region -**1** **0** **0** **1** /exp cl;

estimate "MedLowTech vs LowTech" Tech\_index\_v2 **0** -**1** **0** **1** /exp cl;

estimate "MedHighTech vs LowTech" Tech\_index\_v2 **0** -**1** **1** **0** /exp cl;

estimate "HighTech vs LowTech" Tech\_index\_v2 **1** -**1** **0** **0** /exp cl;

estimate "remdes\_hosp\_month=Y vs remdes\_hosp\_month=N" remdes\_hosp\_month -**1** **1** /exp cl;

estimate "April vs March" adm\_mon -**1** **1** **0** **0** **0** **0** /exp cl;

estimate "May vs March" adm\_mon -**1** **0** **1** **0** **0** **0** /exp cl;

estimate "June vs March" adm\_mon -**1** **0** **0** **1** **0** **0** /exp cl;

estimate "July vs March" adm\_mon -**1** **0** **0** **0** **1** **0** /exp cl;

estimate "August vs March" adm\_mon -**1** **0** **0** **0** **0** **1** /exp cl;

estimate "icuventprop" icuventprop\_covid **1** / exp cl;

estimate "icu02prop" icu02prop\_covid **1** / exp cl;

estimate "ratio\_vent\_20v19" ratio\_vent\_20v19 **1** / exp cl;

estimate "medicaid\_vol19" medicaid\_vol19 **1** / exp cl;

estimate "pat\_per\_attend20" pat\_per\_attend20 **1** / exp cl;

estimate "prop\_covidtest\_monthly" prop\_covidtest\_monthly **1** / exp cl;

estimate "perc\_uninsured" perc\_uninsured **1** / exp cl;

/\*PATIENT LEVEL CDC COMORBIDITIES\*/

estimate "cancer\_poa=Y vs cancer\_poa=N" cancer\_poa -**1** **1**/exp cl;

estimate "ckd\_stage3\_poa=Y vs ckd\_stage3\_poa=N" ckd\_stage3\_poa -**1** **1**/exp cl;

estimate "copd\_poa=Y vs copd\_poa=N" copd\_poa -**1** **1**/exp cl;

estimate "immunocomp\_poa=Y vs immunocomp\_poa=N" immunocomp\_poa -**1** **1**/exp cl;

estimate "obese\_overweight\_poa=Y vs obese\_overweight\_poa=N" obese\_overweight\_poa -**1** **1**/exp cl;

estimate "pregnant\_poa=Y vs pregnant\_poa=N" pregnant\_poa -**1** **1**/exp cl;

estimate "sickle\_cell\_poa=Y vs sickle\_cell\_poa=N" sickle\_cell\_poa -**1** **1**/exp cl;

estimate "diabetes\_poa=Y vs diabetes\_poa=N" diabetes\_poa -**1** **1**/exp cl;

estimate "asthma\_poa=Y vs asthma\_poa=N" asthma\_poa -**1** **1**/exp cl;

estimate "interstitial\_lung\_dx\_poa=Y vs interstitial\_lung\_dx\_poa=N" interstitial\_lung\_dx\_poa -**1** **1**/exp cl;

estimate "thalassemia\_poa=Y vs thalassemia\_poa=N" thalassemia\_poa -**1** **1**/exp cl;

estimate "cdc\_heartdx=Y vs cdc\_heartdx=N" cdc\_heartdx -**1** **1**/exp cl;

estimate "elix\_HTN=Y vs elix\_HTN=N" elix\_HTN -**1** **1**/exp cl;

estimate "elix\_NeuroOther=Y vs elix\_NeuroOther=N" elix\_NeuroOther -**1** **1**/exp cl;

estimate "cdc\_liverfail\_cirrhosis=Y vs cdc\_liverfail\_cirrhosis=N" cdc\_liverfail\_cirrhosis -**1** **1**/exp cl;

output out=Glimmix\_Pred pred(blup ilink)=PredProb pred(noblup ilink)=fix\_predprob;

ods output ParameterEstimates=FixEffects;

ods output SolutionR=RandomHospEstim;

ods output Tests3=Type3FixEffects;

ods output Estimates=glimmix\_estim\_covid\_pat;

ods output CovParms=VCestim;

\*parms / pdata=VCestim;

run;

**proc** **export** data=FixEffects outfile="Y:\...\sasout\full4\FixEffects\FixEffects\_main\GLIMMIX\_model\_M1\_covid\_pat\_FixEffects.csv" dbms=csv replace;

**run**;

**proc** **export** data=Type3FixEffects outfile="Y:\...\sasout\full4\Type3FixEffects\Type3FixEffects\_main\GLIMMIX\_model\_M1\_covid\_pat\_Type3FixEffects.csv" dbms=csv replace;

**run**;

**proc** **export** data=RandomHospEstim outfile="Y:\...\sasout\full4\RandomHospEstim\RandomHospEstim\_main\GLIMMIX\_model\_M1\_covid\_pat\_RandomHospEstim.csv" dbms=csv replace;

**run**;

**proc** **export** data=glimmix\_estim\_covid\_pat outfile="Y:\...\sasout\full4\Estimates\Estimates\_main\GLIMMIX\_model\_M1\_covid\_pat\_estimates.csv" dbms=csv replace;

**run**;

**data** estim\_subset;

keep Label ExpEstimate ExpLower ExpUpper Probt;

retain Label ExpEstimate ExpLower ExpUpper Probt;

set glimmix\_estim\_covid\_pat;

**run**;

**proc** **export** data=estim\_subset outfile="Y:\...\sasout\full4\Estimates\_subset\Estimates\_subset\_main\GLIMMIX\_model\_M1\_covid\_pat\_estimates.csv" dbms=csv replace;

**run**;

**data** Glimmix\_Pred\_Subset;

set Glimmix\_Pred;

keep pat\_key medrec\_key prov\_id adm\_mon PredProb fix\_predprob;

**run**;

**proc** **export** data=Glimmix\_Pred\_Subset outfile="Y:\...\sasout\full4\Predicted\Predicted\_main\GLIMMIX\_model\_M1\_covid\_pat\_predicted.csv" dbms=csv replace;

**run**;

/\* ESTIMATE STATEMENTS FOR THE INTERACTION AND THE SUBCOHORT ANALYSES \*/

/\* Model 2: Continuous surge index

estimate "ln\_covid\_surgeindex" ln\_covid\_surgeindex 1 /exp cl;

\*/

/\* Model 3: ln\_surgeindex X wave interaction

estimate "ln\_surgeindex in wave1" ln\_covid\_surgeindex 1 wave\*ln\_covid\_surgeindex 1 0/exp cl;

estimate "ln\_surgeindex in wave2" ln\_covid\_surgeindex 1 wave\*ln\_covid\_surgeindex 0 1/exp cl;

estimate "Slope diff between wave1 vs wave2" wave\*ln\_covid\_surgeindex 1 -1/exp cl;

estimate "wave1 vs wave2 at 50% surge" wave 1 -1 wave\*ln\_covid\_surgeindex 0.26 -0.26/exp cl;

estimate "wave1 vs wave2 at 75% surge" wave 1 -1 wave\*ln\_covid\_surgeindex 1.09 -1.09/exp cl;

estimate "wave1 vs wave2 at 90% surge" wave 1 -1 wave\*ln\_covid\_surgeindex 1.80 -1.80/exp cl;

estimate "wave1 vs wave2 at 95% surge" wave 1 -1 wave\*ln\_covid\_surgeindex 2.24 -2.24/exp cl;

estimate "wave1 vs wave2 at 99% surge" wave 1 -1 wave\*ln\_covid\_surgeindex 3.05 -3.05/exp cl;

\*/

/\* model 4A-4B: ln\_surgeindex X PROV\_REGION interaction

estimate "ln\_covid\_surgeindex in Midwest" ln\_covid\_surgeindex 1 prov\_region\*ln\_covid\_surgeindex 1 0 0 0/exp cl;

estimate "ln\_covid\_surgeindex in Northeast" ln\_covid\_surgeindex 1 prov\_region\*ln\_covid\_surgeindex 0 1 0 0/exp cl;

estimate "ln\_covid\_surgeindex in South" ln\_covid\_surgeindex 1 prov\_region\*ln\_covid\_surgeindex 0 0 1 0/exp cl;

estimate "ln\_covid\_surgeindex in West" ln\_covid\_surgeindex 1 prov\_region\*ln\_covid\_surgeindex 0 0 0 1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex between Northeast vs Midwest" prov\_region\*ln\_covid\_surgeindex -1 1 0 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex between South vs Midwest" prov\_region\*ln\_covid\_surgeindex -1 0 1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex between West vs Midwest" prov\_region\*ln\_covid\_surgeindex -1 0 0 1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex between South vs Northeast" prov\_region\*ln\_covid\_surgeindex 0 -1 1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex between West vs Northeast" prov\_region\*ln\_covid\_surgeindex 0 -1 0 1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex between West vs South" prov\_region\*ln\_covid\_surgeindex 0 0 -1 1/exp cl;

estimate "Northeast vs Midwest; 50%" prov\_region -1 1 0 0 prov\_region\*ln\_covid\_surgeindex -0.26 0.26 0 0/exp cl;

estimate "South vs Midwest; 50%" prov\_region -1 0 1 0 prov\_region\*ln\_covid\_surgeindex -0.26 0 0.26 0/exp cl;

estimate "West vs Midwest; 50%" prov\_region -1 0 0 1 prov\_region\*ln\_covid\_surgeindex -0.26 0 0 0.26/exp cl;

estimate "South vs Northeast; 50%" prov\_region 0 -1 1 0 prov\_region\*ln\_covid\_surgeindex 0 -0.26 0.26 0/exp cl;

estimate "West vs Northeast; 50%" prov\_region 0 -1 0 1 prov\_region\*ln\_covid\_surgeindex 0 -0.26 0 0.26/exp cl;

estimate "West vs South; 50%" prov\_region 0 0 -1 1 prov\_region\*ln\_covid\_surgeindex 0 0 -0.26 0.26/exp cl;

estimate "Northeast vs Midwest; 99%" prov\_region -1 1 0 0 prov\_region\*ln\_covid\_surgeindex -3.05 3.05 0 0/exp cl;

estimate "South vs Midwest; 99%" prov\_region -1 0 1 0 prov\_region\*ln\_covid\_surgeindex -3.05 0 3.05 0/exp cl;

estimate "West vs Midwest; 99%" prov\_region -1 0 0 1 prov\_region\*ln\_covid\_surgeindex -3.05 0 0 3.05/exp cl;

estimate "South vs Northeast; 99%" prov\_region 0 -1 1 0 prov\_region\*ln\_covid\_surgeindex 0 -3.05 3.05 0/exp cl;

estimate "West vs Northeast; 99%" prov\_region 0 -1 0 1 prov\_region\*ln\_covid\_surgeindex 0 -3.05 0 3.05/exp cl;

estimate "West vs South; 99%" prov\_region 0 0 -1 1 prov\_region\*ln\_covid\_surgeindex 0 0 -3.05 3.05/exp cl;

\*/

/\* model 5: ln\_surgeindex X grade\_day02\_new interaction

estimate "ln\_covid\_surgeindex for Uncomp\_Covid" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 1 0 0 0/exp cl;

estimate "ln\_covid\_surgeindex for acute\_resp\_fail\_poa=Y" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 0 1 0 0/exp cl;

estimate "ln\_covid\_surgeindex for ICUorHRNIPPV" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 0 0 1 0/exp cl;

estimate "ln\_covid\_surgeindex for ICUandVENT" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 0 0 0 1/exp cl;

estimate "Slope diff between Uncomp\_covid vs acute\_resp\_fail\_poa=Y" grade\_day02\_new\*ln\_covid\_surgeindex 1 -1 0 0/exp cl;

estimate "Slope diff between Uncomp\_covid vs ICUorHRNIPPV" grade\_day02\_new\*ln\_covid\_surgeindex 1 0 -1 0/exp cl;

estimate "Slope diff between Uncomp\_covid vs ICUandVENT" grade\_day02\_new\*ln\_covid\_surgeindex 1 0 0 -1/exp cl;

estimate "Slope diff between acute\_resp\_fail\_poa=Y vs ICUorHRNIPPV" grade\_day02\_new\*ln\_covid\_surgeindex 0 1 -1 0/exp cl;

estimate "Slope diff between acute\_resp\_fail\_poa=Y vs ICUandVENT" grade\_day02\_new\*ln\_covid\_surgeindex 0 1 0 -1/exp cl;

estimate "Slope diff between ICUorHRNIPPV vs ICUandVENT" grade\_day02\_new\*ln\_covid\_surgeindex 0 0 1 -1/exp cl;

estimate "acute\_resp\_fail\_poa=Y vs Uncomp\_Covid; 50%" grade\_day02\_new -1 1 0 0 grade\_day02\_new\*ln\_covid\_surgeindex -0.26 0.26 0 0/exp cl;

estimate "ICUorHRNIPPV vs Uncomp\_Covid; 50%" grade\_day02\_new -1 0 1 0 grade\_day02\_new\*ln\_covid\_surgeindex -0.26 0 0.26 0/exp cl;

estimate "ICUandVENT vs Uncomp\_Covid; 50%" grade\_day02\_new -1 0 0 1 grade\_day02\_new\*ln\_covid\_surgeindex -0.26 0 0 0.26/exp cl;

estimate "acute\_resp\_fail\_poa=Y vs Uncomp\_Covid; 99%" grade\_day02\_new -1 1 0 0 grade\_day02\_new\*ln\_covid\_surgeindex -3.05 3.05 0 0/exp cl;

estimate "ICUorHRNIPPV vs Uncomp\_Covid; 99%" grade\_day02\_new -1 0 1 0 grade\_day02\_new\*ln\_covid\_surgeindex -3.05 0 3.05 0/exp cl;

estimate "ICUandVENT vs Uncomp\_Covid; 99%" grade\_day02\_new -1 0 0 1 grade\_day02\_new\*ln\_covid\_surgeindex -3.05 0 0 3.05/exp cl;

\*/

/\*

model 6: ln\_covid\_surgeinde X ln\_PM\_covid\_surgeindex: Interaction with the previous month

estimate "ln\_covid\_surgeindex" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ln\_PM\_covid\_surgeindex 1 /exp cl;

estimate "ln\_PM\_covid\_surgeindex" ln\_PM\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ln\_PM\_covid\_surgeindex 1 /exp cl;

\*/

/\*

model 7A: Interaction with the continuous noncovid 2019 vs 2020 ratio

estimate "ln\_covid\_surgeindex" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ln\_ratio\_noncovid\_19vs20\_imp 1 /exp cl;

estimate "ln\_ratio\_nonconvid\_19vs20" ln\_ratio\_noncovid\_19vs20\_imp 1 ln\_covid\_surgeindex\*ln\_ratio\_noncovid\_19vs20\_imp 1 /exp cl;

estimate "coefficient of ln\_covid\_surgeindex X ln\_ratio\_nonconvid\_19vs20" ln\_covid\_surgeindex\*ln\_ratio\_noncovid\_19vs20\_imp 1 /exp cl;

model 7B: Interaction with the categorical noncovid 2019 vs 2020 ratio

estimate "ln\_covid\_surgeindex; HIGH noncovid\_ratio" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 1 0 0/exp cl;

estimate "ln\_covid\_surgeindex; MEDIUM noncovid\_ratio" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 0 0 1/exp cl;

estimate "ln\_covid\_surgeindex; LOW noncovid\_ratio" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 0 1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH vs MEDIUM" ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 1 0 -1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH VS LOW" ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 1 -1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn MEDIUM VS LOW" ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 0 -1 1/exp cl;

\*/

/\* Model 8 A-B: ln\_covid\_surgeindex X grade\_day02\_new interaction (subcohort analysis; In wave1 and In wave2)

ln\_covid\_surgeindex grade\_day02\_new ln\_covid\_surgeindex\*grade\_day02\_new

estimate "ln\_covid\_surgeindex for Uncomp\_Covid" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 1 0 0 0/exp cl;

estimate "ln\_covid\_surgeindex for acute\_resp\_fail\_poa=Y" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 0 1 0 0/exp cl;

estimate "ln\_covid\_surgeindex for ICUorHRNIPPV" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 0 0 1 0/exp cl;

estimate "ln\_covid\_surgeindex for ICUandVENT" ln\_covid\_surgeindex 1 grade\_day02\_new\*ln\_covid\_surgeindex 0 0 0 1/exp cl;

estimate "Slope diff between Uncomp\_covid vs acute\_resp\_fail\_poa=Y" grade\_day02\_new\*ln\_covid\_surgeindex 1 -1 0 0/exp cl;

estimate "Slope diff between Uncomp\_covid vs ICUorHRNIPPV" grade\_day02\_new\*ln\_covid\_surgeindex 1 0 -1 0/exp cl;

estimate "Slope diff between Uncomp\_covid vs ICUandVENT" grade\_day02\_new\*ln\_covid\_surgeindex 1 0 0 -1/exp cl;

estimate "Slope diff between acute\_resp\_fail\_poa=Y vs ICUorHRNIPPV" grade\_day02\_new\*ln\_covid\_surgeindex 0 1 -1 0/exp cl;

estimate "Slope diff between acute\_resp\_fail\_poa=Y vs ICUandVENT" grade\_day02\_new\*ln\_covid\_surgeindex 0 1 0 -1/exp cl;

estimate "Slope diff between ICUorHRNIPPV vs ICUandVENT" grade\_day02\_new\*ln\_covid\_surgeindex 0 0 1 -1/exp cl;

estimate "acute\_resp\_fail\_poa=Y vs Uncomp\_Covid; 50%" grade\_day02\_new -1 1 0 0 grade\_day02\_new\*ln\_covid\_surgeindex -0.26 0.26 0 0/exp cl;

estimate "ICUorHRNIPPV vs Uncomp\_Covid; 50%" grade\_day02\_new -1 0 1 0 grade\_day02\_new\*ln\_covid\_surgeindex -0.26 0 0.26 0/exp cl;

estimate "ICUandVENT vs Uncomp\_Covid; 50%" grade\_day02\_new -1 0 0 1 grade\_day02\_new\*ln\_covid\_surgeindex -0.26 0 0 0.26/exp cl;

estimate "acute\_resp\_fail\_poa=Y vs Uncomp\_Covid; 99%" grade\_day02\_new -1 1 0 0 grade\_day02\_new\*ln\_covid\_surgeindex -3.05 3.05 0 0/exp cl;

estimate "ICUorHRNIPPV vs Uncomp\_Covid; 99%" grade\_day02\_new -1 0 1 0 grade\_day02\_new\*ln\_covid\_surgeindex -3.05 0 3.05 0/exp cl;

estimate "ICUandVENT vs Uncomp\_Covid; 99%" grade\_day02\_new -1 0 0 1 grade\_day02\_new\*ln\_covid\_surgeindex -3.05 0 0 3.05/exp cl;

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model 9 A-B: ln\_covid\_surgeinde X ln\_PM\_covid\_surgeindex: Interaction with the previous month (subcohort analysis; In wave1 and In wave2)

estimate "ln\_covid\_surgeindex" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ln\_PM\_covid\_surgeindex 1 /exp cl;

estimate "ln\_PM\_covid\_surgeindex" ln\_PM\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ln\_PM\_covid\_surgeindex 1 /exp cl;

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model 10 A-B: Interaction with the categorical noncovid 2019 vs 2020 ratio (subcohort analysis; In wave1 and In wave2)

estimate "ln\_covid\_surgeindex; HIGH noncovid\_ratio" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 1 0 0/exp cl;

estimate "ln\_covid\_surgeindex; MEDIUM noncovid\_ratio" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 0 0 1/exp cl;

estimate "ln\_covid\_surgeindex; LOW noncovid\_ratio" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 0 1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH vs MEDIUM" ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 1 0 -1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH VS LOW" ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 1 -1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn MEDIUM VS LOW" ln\_covid\_surgeindex\*ratio\_noncovid\_19vs20\_cat 0 -1 1/exp cl;

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model 11-A-B-C:

estimate "ln\_covid\_surgeindex when LOW PM SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_tert 0 1 0/exp cl;

estimate "ln\_covid\_surgeindex when MEDIUM PM SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_tert 0 0 1/exp cl;

estimate "ln\_covid\_surgeindex when HIGH PM SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_tert 1 0 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH vs MEDIUM" ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_tert 1 0 -1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH VS LOW" ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_tert 1 -1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn MEDIUM VS LOW" ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_tert 0 -1 1/exp cl;

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model 12-A-B-C:

estimate "ln\_covid\_surgeindex when PM surge 00-50%" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_grps 1 0 0/exp cl;

estimate "ln\_covid\_surgeindex when PM surge 50-75%" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_grps 0 1 0/exp cl;

estimate "ln\_covid\_surgeindex when PM surge 75-100%" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_grps 0 0 1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn 50-75 vs 00-50" ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_grps -1 1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn 75-100 vs 00-50" ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_grps -1 0 1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn 75-100 vs 50-75" ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_grps 0 -1 1/exp cl;

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model 13-A-B-C:

ln\_covid\_surgeindex noncovid\_surgeindex\_tert ln\_covid\_surgeindex\*noncovid\_surgeindex\_tert

estimate "ln\_covid\_surgeindex when LOW NONCOVID SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*noncovid\_surgeindex\_tert 0 1 0/exp cl;

estimate "ln\_covid\_surgeindex when MEDIUM NONCOVID SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*noncovid\_surgeindex\_tert 0 0 1/exp cl;

estimate "ln\_covid\_surgeindex when HIGH NONCOVID SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*noncovid\_surgeindex\_tert 1 0 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH vs MEDIUM" ln\_covid\_surgeindex\*noncovid\_surgeindex\_tert 1 0 -1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn HIGH VS LOW" ln\_covid\_surgeindex\*noncovid\_surgeindex\_tert 1 -1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn MEDIUM VS LOW" ln\_covid\_surgeindex\*noncovid\_surgeindex\_tert 0 -1 1/exp cl;

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model 14-A-B-C:

estimate "ln\_covid\_surgeindex when noncovid surge 00-50%" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*noncovid\_surgeindex\_grps 1 0 0/exp cl;

estimate "ln\_covid\_surgeindex when noncovid surge 50-75%" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*noncovid\_surgeindex\_grps 0 1 0/exp cl;

estimate "ln\_covid\_surgeindex when noncovid surge 75-100%" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*noncovid\_surgeindex\_grps 0 0 1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn 50-75 vs 00-50" ln\_covid\_surgeindex\*noncovid\_surgeindex\_grps -1 1 0/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn 75-100 vs 00-50" ln\_covid\_surgeindex\*noncovid\_surgeindex\_grps -1 0 1/exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn 75-100 vs 50-75" ln\_covid\_surgeindex\*noncovid\_surgeindex\_grps 0 -1 1/exp cl;

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model 15-A-B-C:

estimate "ln\_covid\_surgeindex when 00-50% PM SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_dict 1 0 /exp cl;

estimate "ln\_covid\_surgeindex when 50-100% PM SURGE" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_dict 0 1 /exp cl;

estimate "Slope diff of ln\_covid\_surgeindex btwn 00-50% vs 50-100% PM SURGE" ln\_covid\_surgeindex\*PM\_covid\_surgeindex\_dict 1 -1/exp cl;

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model 16 A-B-C:

estimate "ln\_covid\_surgeindex" ln\_covid\_surgeindex 1 ln\_covid\_surgeindex\*ln\_noncovid\_surge\_index 1 /exp cl;

estimate "ln\_noncovid\_surge\_index" ln\_noncovid\_surge\_index 1 ln\_covid\_surgeindex\*ln\_noncovid\_surge\_index 1 /exp cl;

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/\*ESTIMATE STATEMENTS USED IN THE SENSITIVITY ANALYSES\*/

/\* Analysis with deciles

estimate "50-60 vs 00-50" covid\_surgeindex\_deciles -1 1 0 0 0 0 /exp cl;

estimate "60-70 vs 00-50" covid\_surgeindex\_deciles -1 0 1 0 0 0 /exp cl;

estimate "70-80 vs 00-50" covid\_surgeindex\_deciles -1 0 0 1 0 0 /exp cl;

estimate "80-90 vs 00-50" covid\_surgeindex\_deciles -1 0 0 0 1 0 /exp cl;

estimate "90-100 vs 00-50" covid\_surgeindex\_deciles -1 0 0 0 0 1 /exp cl;

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/\* Analysis with the unweighted surge groups

estimate "50-75 vs 00-50" unwgt\_covid\_surge\_grps -1 1 0 0 0 0 /exp cl;

estimate "75-90 vs 00-50" unwgt\_covid\_surge\_grps -1 0 1 0 0 0 /exp cl;

estimate "90-95 vs 00-50" unwgt\_covid\_surge\_grps -1 0 0 1 0 0 /exp cl;

estimate "95-99 vs 00-50" unwgt\_covid\_surge\_grps -1 0 0 0 1 0 /exp cl;

estimate "99-100 vs 00-50" unwgt\_covid\_surge\_grps -1 0 0 0 0 1 /exp cl;

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/\* Analysis with the unweighted surge index

estimate "ln\_unweighted\_covid\_surgeindex" ln\_unwgt\_covid\_surgeindex 1 /exp cl;

\*/

/\* Analysis with the Elixhauser score

estimate "elixhauser\_score" elixhauser\_score 1 / exp cl;

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