/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

/\* Stout Mixed Model

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

options symbolgen;

%macro mixedmod(condition, reps, clustdist, subs, nclust, ICC, L1effect, L2effect, L12effect);

proc printto log = "C:\SAS\_MC\Logs\_1\condition\_&condition..log";

run;

/\* Uniform Distribution \*/

%do i = 1 %to &reps;

%if &clustdist = 1 %then %do;

data one;

seed = -1;

i = &i;

nclust = &nclust;

subs = &subs;

ICC = &ICC;

L1effect = &L1effect;

L2effect = &L2effect;

L12effect = &L12effect;

intercept = 50;

reps = &reps;

clustdist = &clustdist;

do clust = 1 to &nclust;

indvarnum = (25\*ICC);

indvarden = (1-ICC);

intvar = sqrt(indvarnum/indvarden)\*rannor(-1);

SD = sqrt(16 + 25);

b01 = L2effect\*SD;

x2 = rannor(123);

do indiv = 1 to &subs;

err = sqrt(25)\*rannor(-1);

b10 = L1effect\*SD;

b11 = L12effect\*SD;

x1 = rannor(-1);

x3 = x1\*x2;

y = intercept + b10\*(x1) + b01\*(x2) + b11\*(x3) + intvar + err;

output;

keep reps y i x1 x2 x3 clustdist clust subs nclust indiv ICC L1effect L2effect L12effect b10 b01 b11 err indvarnum indvarden intvar SD;

end;

end;

run;

%end;

/\* Binomial distribution \*/

%if &clustdist = 2 %then %do;

data one;

seed = -1;

i = &i;

nclust = &nclust;

subs = &subs;

ICC = &ICC;

L1effect = &L1effect;

L2effect = &L2effect;

L12effect = &L12effect;

intercept = 50;

reps = &reps;

clustdist = &clustdist;

do clust = 1 to &nclust;

indvarnum = (25\*ICC);

indvarden = (1-ICC);

intvar = sqrt(indvarnum/indvarden)\*rannor(-1);

SD = sqrt(16 + 25);

b01 = L2effect\*SD;

x2 = rannor(123);

do indiv = 1 to ranbin (-1, 1000000, %sysevalf(&subs/1000000));

err = sqrt(25)\*rannor(-1);

b10 = L1effect\*SD;

b11 = L12effect\*SD;

x1 = rannor(-1);

x3 = x1\*x2;

y = intercept + b10\*(x1) + b01\*(x2) + b11\*(x3) + intvar + err;

output;

keep reps y i x1 x2 x3 clustdist clust subs nclust indiv ICC L1effect L2effect L12effect b10 b01 b11 err indvarnum indvarden intvar SD;

end;

end;

run;

%end;

data out\_data;

set one;

file "C:\SAS\_MC\Data\_1\Condition\_&condition..txt" mod;

put reps y i x1 x2 x3 clustdist clust subs nclust indiv ICC L1effect L2effect L12effect b10 b01 b11 err indvarnum indvarden intvar SD;

run;

%end;

%mend mixedmod;

%mixedmod(condition=, reps=, clustdist=, subs=, nclust=, ICC=, L1effect=, L2effect=, L12effect=)

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

%macro mixedanalyze(start, stop, type);

proc printto log="C:\SAS\_MC\Logs\_1\Acondition\_&start.\_to\_&stop..log";

run;

%do i=&start %to &stop;

/\* Pull in marked data files and make a working file from them, renaming them with their respective condition no. \*/

data Cond\_&i;

infile "C:\SAS\_MC\Data\_1\Condition\_&i..txt";

input reps y repno x1 x2 x3 clustdist clust subs nclust indiv ICC L1effect L2effect L12effect b10 b01 b11 err indvarnum indvarden intvar

SD;

run;

%end;

data analyze;

set Cond\_&start - Cond\_&stop;

/\*sort 'analyze' by each replication and each cluster \*/

proc sort data= analyze;

by clustdist subs nclust ICC L1effect L2effect L12effect repno clust indiv;

run;

\*Get the mean x1 for each clust;

\*output these to a new SAS data set called clust\_means;

proc means data=analyze noprint;

by clustdist subs nclust ICC L1effect L2effect L12effect repno clust;

var x1;

output out=clust\_means mean(x1)=clustmean;

run;

\*Open the clust\_means data set and keep only the relevant variables;

data clust\_means (keep=clustdist subs nclust ICC L1effect L2effect L12effect repno clust clustmean);

set clust\_means;

run;

proc means data=analyze noprint;

var x2;

\*adding BY statement to perform calculation for each repetition;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

output out=grand\_mean mean(x2)=grandmean;

run;

data grand\_mean (keep = clustdist subs nclust ICC L1effect L2effect L12effect repno grandmean mergevar);

set grand\_mean;

mergevar=1;

run;

\*to add grand\_mean to everyone;

data analyze;

set analyze;

mergevar=1;

run;

data analyze2 (drop=mergevar);

merge analyze grand\_mean;

by clustdist subs nclust ICC L1effect L2effect L12effect repno mergevar;

run;

\*Merge the clust\_means data set with analyze2 and create centered vars;

data analyze3;

merge analyze2 clust\_means;

by clustdist subs nclust ICC L1effect L2effect L12effect repno clust;

x1\_CWC=x1-clustmean;

x2\_GMC=x2-grandmean;

x3\_Cen=x1\_CWC\*x2\_GMC;

run;

/\*MYOUTPUT only \*/

%if &type=1 %then %do;

libname NFixed "C:\SAS\_MC\Test\NFixed";

libname NCov "C:\SAS\_MC\Test\NCov";

libname Fixed "C:\SAS\_MC\Test\Fixed";

libname Random "C:\SAS\_MC\Test\Random";

libname Converge "C:\SAS\_MC\Test\Converge";

libname Interate "C:\SAS\_MC\Test\IntHist";

libname NObs "C:\SAS\_MC\Test\NObs";

libname FitStats "C:\SAS\_MC\Test\FitStats";

libname Type3 "C:\SAS\_MC\Test\Type3";

libname CovParms "C:\SAS\_MC\Test\CovParms";

libname Clust "C:\SAS\_MC\Test\Clust";

/\* Null model \*/

ods select none;

ods output SolutionF = NFixed.NFixed\_&start.\_to\_&stop.;

ods output CovParms = NCov.Cov\_&start.\_to\_&stop.;

proc mixed data=analyze3 covtest method=ML;

class clust;

model y= /s ddfm=satterthwaite;

random int /s type=un subject=clust g;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

/\* Full model \*/

ods output SolutionF = Fixed.Fixed\_&start.\_to\_&stop.;

ods output SolutionR = Random.Random\_&start.\_to\_&stop.;

ods output ConvergenceStatus = Converge.Convergence\_&start.\_to\_&stop.;

ods output IterHistory = Interate.Iteration\_&start.\_to\_&stop.;

ods output NObs = NObs.NoObservations\_&start.\_to\_&stop.;

ods output FitStatistics = FitStats.FitStat\_&start.\_to\_&stop.;

ods output Tests3 = Type3.Type3\_&start.\_to\_&stop.;

ods output CovParms = CovParms.Cov\_&start.\_to\_&stop.;

ods output ClassLevels = Clust.Clust\_&start.\_to\_&stop.;

proc mixed data = analyze3 covtest method=ML;

class clust;

model y = x1\_CWC x2\_GMC x3\_Cen /s corrb ddfm=sat;

random int /subject = clust g s type = un;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

ods output close;

ods select all;

quit;

/\* Regression model \*/

ods output SolutionF = Fixed.RFixed\_&start.\_to\_&stop.;

\*ods output ConvergenceStatus = Converge.RConvergence\_&start.\_to\_&stop.;

\*ods output IterHistory = Interate.RIteration\_&start.\_to\_&stop.;

ods output NObs = NObs.RNoObservations\_&start.\_to\_&stop.;

ods output FitStatistics = FitStats.RFitStat\_&start.\_to\_&stop.;

ods output Tests3 = Type3.RType3\_&start.\_to\_&stop.;

ods output CovParms = CovParms.RCov\_&start.\_to\_&stop.;

ods output ClassLevels = Clust.RClust\_&start.\_to\_&stop.;

proc mixed data = analyze3 covtest method=ML;

class clust;

model y = x1\_CWC x2\_GMC x3\_Cen /s corrb ddfm=sat;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

ods output close;

ods select all;

quit;

%end;

/\* ODS output only ALL MODELS \*/

%if &type=2 %then %do;

proc mixed data=analyze3 covtest method=ML;

class clust;

model y= /s ddfm=satterthwaite;

random int /s type=un subject=clust g;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

proc mixed data = analyze3 covtest method=ML;

class clust;

model y = x1\_CWC x2\_GMC x3\_Cen /s corrb ddfm=sat;

random int /subject = clust g s type = un;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

proc mixed data = analyze3 covtest method=ML;

class clust;

model y = x1\_CWC x2\_GMC x3\_Cen /s corrb ddfm=sat;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

quit;

%end;

/\* ODS output for Mixed Model only \*/

%if &type=3 %then %do;

proc mixed data = analyze3 covtest method=ML;

class clust;

model y = x1\_CWC x2\_GMC x3\_Cen /s corrb ddfm=sat;

random int /subject = clust g s type = un;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

quit;

%end;

/\* ODS output for Mixed and Regression models \*/

%if &type=4 %then %do;

proc mixed data = analyze3 covtest method=ML;

class clust;

model y = x1\_CWC x2\_GMC x3\_Cen /s corrb ddfm=sat;

random int /subject = clust g s type = un;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

proc mixed data = analyze3 covtest method=ML;

class clust;

model y = x1\_CWC x2\_GMC x3\_Cen /s corrb ddfm=sat;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

run;

quit;

%end;

%mend mixedanalyze;

%mixedanalyze (start=, stop=, type=)

%mixedanalyze (start=, stop=, type=)

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

/\* Results file \*/

%macro mixedresults(batch, type);

proc printto log="C:\SAS\_MC\Logs\_1\Batch\_&batch..log";

run;

%if &type=0 %then %do;

/\*Transpose data: Create columns from rows for the CovParm estimates\*/

proc transpose data="C:\SAS\_MC\Test\NCov\cov\_&batch." out=Results1\_0 name=Estimate\_column;

var estimate;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

id CovParm;

run;

/\*Transpose data: Create columns from rows for the Estimates of SE from mixed and regression estimates\*/

proc transpose data="C:\SAS\_MC\Test\Fixed\fixed\_&batch." out=Results1\_1 name=Estimate\_column;

var stderr;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

id effect;

run;

data Results1\_1;

set Results1\_1;

IntSE\_MLM=Intercept;

x1SE\_MLM=x1\_CWC;

x2SE\_MLM=x2\_GMC;

x3SE\_MLM=x3\_Cen;

drop Intercept x1\_CWC x2\_GMC x3\_Cen Estimate\_column \_Label\_;

run;

/\*\*/

proc transpose data="C:\SAS\_MC\Test\Fixed\rfixed\_&batch" out=Results1\_2 name=Estimate\_column;

var stderr;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

id effect;

run;

data Results1\_2;

set Results1\_2;

IntSE\_OLS=Intercept;

x1SE\_OLS=x1\_CWC;

x2SE\_OLS=x2\_GMC;

x3SE\_OLS=x3\_Cen;

drop Intercept x1\_CWC x2\_GMC x3\_Cen Estimate\_column \_Label\_;

run;

/\*Merge the transposed files, create effect variances from SEs\*/

data Results2\_0;

merge Results1\_0 Results1\_1 Results1\_2;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

IntVar\_MLM=IntSE\_MLM\*\*2;

x1Var\_MLM=x1SE\_MLM\*\*2;

x2Var\_MLM=x2SE\_MLM\*\*2;

x3Var\_MLM=x3SE\_MLM\*\*2;

IntVar\_OLS=IntSE\_OLS\*\*2;

x1Var\_OLS=x1SE\_OLS\*\*2;

x2Var\_OLS=x2SE\_OLS\*\*2;

x3Var\_OLS=x3SE\_OLS\*\*2;

run;

/\*Calculate ratio of mixed var to regression var for each effect\*/

/\*Calculate the Total Variance, Observed ICC, and resulting Observed Design Effect in each replication\*/

data Results3;

set Results2\_0;

by clustdist subs nclust ICC L1effect L2effect L12effect repno;

TotVar=UN\_1\_1\_+Residual;

ObsICC=UN\_1\_1\_/TotVar;

ObsDE=1+(subs-1)\*ObsICC;

Int\_DE=IntVar\_MLM/IntVar\_OLS;

x1\_DE=x1Var\_MLM/x1Var\_OLS;

x2\_DE=x2Var\_MLM/x2Var\_OLS;

x3\_DE=x3Var\_MLM/x2Var\_OLS;

drop Estimate\_column;

run;

/\*Cleanup\*/

data Results3;

set Results3;

drop IntSE\_MLM IntSE\_OLS x1SE\_MLM x1SE\_OLS x2SE\_MLM x2SE\_OLS x3SE\_MLM x3SE\_OLS IntVar\_MLM IntVar\_OLS x1Var\_MLM x1Var\_OLS

x2Var\_MLM x2Var\_OLS x3Var\_MLM x3Var\_OLS UN\_1\_1\_ Residual TotVar;

run;

/\*Calculate average observed ICC/DE in each condition\*/

proc means data=Results3 noprint;

by clustdist subs nclust ICC L1effect L2effect L12effect;

var ObsICC ObsDE Int\_DE x1\_DE x2\_DE x3\_DE;

output out=batch\_&batch.\_means

mean(ObsICC)=AvgObsICC mean(ObsDE)=AvgModelDE

mean(Int\_DE)=Avg\_Int\_DE

mean(x1\_DE)=Avg\_x1\_DE

mean(x2\_DE)=Avg\_x2\_DE

mean(x3\_DE)=Avg\_x3\_DE;

output out="C:\SAS\_MC\Test\Batch\_&Batch.\_results" mean(ObsICC)=AvgObsICC mean(ObsDE)=AvgModelDE

mean(Int\_DE)=Avg\_Int\_DE

mean(x1\_DE)=Avg\_x1\_DE

mean(x2\_DE)=Avg\_x2\_DE

mean(x3\_DE)=Avg\_x3\_DE;

run;

data batch\_&batch.\_output;

set batch\_&batch.\_means;

drop \_TYPE\_ \_FREQ\_;

run;

proc export data=Batch\_&batch.\_output outfile= "C:\SAS\_MC\Test\Batch\_&Batch..xlsx" dbms=xlsx replace;

run;

%end;

%mend;

%mixedresults (batch=,type=)

%mixedresults (batch=,type=)

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/