

```

libname library 'C:\Users\Croissant\Desktop\SAS';

/*look at types of missing for raracem and cogtot
proc freq data=library.march;
table raracem r8cogtot/missing;
run;*/

/*change missing to . in cogtot*/
data temp;
  set library.march;
  Array recode(4)
  /*outcome*/
  r8cogtot
  r9cogtot
  r10cogtot
  r11cogtot;
  Do I = 1 to 4;
    If recode(i)=' ' then recode(I)=.;
    If recode(i)=.N then recode(I)=.;
    If recode(i)=.X then recode(I)=.;
    If recode(i)=.S then recode(I)=.;
    If recode(i)=.D then recode(I)=.;
    If recode(i)=.R then recode(I)=.;
    If recode(i)=.M then recode(I)=.;
  End;
  Drop I;
Run;

/*check
proc freq data=temp;
table r8cogtot/missing;
run;*/

```

```

DATA temp;

set temp;

/*delete if outcome variable missing across all 4 cognitive function
measures*/

if (r8cogtot=. and r9cogtot=. and r10cogtot=. and r11cogtot=.) then delete;

/*delete if one of the <5 cases of missing race or education*/

if raracem=.M then delete;

if raeduc in (1 2 3 4 5);

/*create hypothetical age*/

hyp_age1=r8agey_b;

if r9agey_b='.' then hyp_age2=(r8agey_b + 2);

else hyp_age2=r9agey_b;

if r10agey_b='.' then hyp_age3=(r8agey_b + 4);

else hyp_age3=r10agey_b;

if r11agey_b='.' then hyp_age4=(r8agey_b + 6);

else hyp_age4=r11agey_b;

run;


/*check hypothetical age

proc means data=temp;

var r8agey_b r9agey_b r10agey_b r11agey_b hyp_age1 hyp_age2 hyp_age3
hyp_age4;

run;*/

/*check cogtot

proc means nmiss n data=temp;

var r8cogtot r9cogtot r10cogtot r11cogtot;

run;*/


/*create missing variable*/

/*1=missing, 0=not missing*/

data temp; set temp;

if r8cogtot=. then miss1=1;

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else if r8cogtot>=0 then miss1=0;

if r9cogtot=. then miss2=1;
else if r9cogtot>=0 then miss2=0;

if r10cogtot=. then miss3=1;
else if r10cogtot>=0 then miss3=0;

if r11cogtot=. then miss4=1;
else if r11cogtot>=0 then miss4=0;
run;

/*check*/
proc freq data=temp;
table miss1 miss2 miss3 miss4;
run;

proc means nmiss data=temp;
var r8cogtot r9cogtot r10cogtot r11cogtot;
run;

/*create variable dropout - REDUNDANT CODE*/
data temp; set temp;
if miss4=0 then dropout4=0;
else if miss4=1 then dropout4=1;
if miss3=0 then dropout3=0;
else if miss4=0 then dropout3=0;
else if (miss4=1 and miss3=1)then dropout3=1;
if miss2=0 then dropout2=0;
else if miss4=0 then dropout2=0;
else if miss3=0 then dropout2=0;
else if (miss4=1 and miss3=1 and miss2=1)then dropout2=1;

```

```

dropout1=0;

run;

/*
proc means nmiss data=temp;
var dropout1 dropout2 dropout3 dropout4;
run;*/

PROC STANDARD data=temp MEAN=0 OUT=TEMP;
VAR
r8cogtot
r9cogtot
r10cogtot
r11cogtot
r8agey_b
r9agey_b
r10agey_b
r11agey_b
lon6
lon8
lon10
lon12
int6
int8
int10
int12
cyn6
cyn8
cyn10
cyn12
;
RUN;

```

```

/*Change data format - horizontal to vertical*/
data temp1;
set temp;
/*outcome*/
cogtot1=r8cogtot;
cogtot2=r9cogtot;
cogtot3=r10cogtot;
cogtot4=r11cogtot;

/*psychosocial*/
lon1=lon6;
lon2=lon8;
lon3=lon10;
lon4=lon12;

int1=int6;
int2=int8;
int3=int10;
int4=int12;

cyn1=cyn6;
cyn2=cyn8;
cyn3=cyn10;
cyn4=cyn12;

/*marriage*/
mstat1=r8mstat;
mstat2=r9mstat;
mstat3=r10mstat;
mstat4=r11mstat;

/*age*/

```

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age1=r8agey_b;
age2=r9agey_b;
age3=r10agey_b;
age4=r11agey_b;

/*SES*/
money1=th8atotb;
money2=th9atotb;
money3=th10atotb;
money4=th11atotb;

/*SES*/
lower1=h8lower;
lowmid1=h8lowmid;
upmid1=h8upmid;
upper1=h8upper;

lower2=h9lower;
lowmid2=h9lowmid;
upmid2=h9upmid;
upper2=h9upper;

lower3=h10lower;
lowmid3=h10lowmid;
upmid3=h10upmid;
upper3=h10upper;

lower4=h11lower;
lowmid4=h11lowmid;
upmid4=h11upmid;
upper4=h11upper;

```

```

/*health*/
h1=R8SHLT;
h2=R9SHLT;
h3=R10SHLT;
h4=R11SHLT;

eh1=r8exhealth;
eh2=r9exhealth;
eh3=r10exhealth;
eh4=r11exhealth;
vh1=r8vghealth;
vh2=r9vghealth;
vh3=r10vghealth;
vh4=r11vghealth;
fh1=r8fhealth;
fh2=r9fhealth;
fh3=r10fhealth;
fh4=r11fhealth;
ph1=r8phealth;
ph2=r9phealth;
ph3=r10phealth;
ph4=r11phealth;

/*activity*/
ad1=R8ADL;
ad2=R9ADL;
ad3=R10ADL;
ad4=R11ADL;

array cogtot[4];

array lon[4];

```

```
array int[4];
array cyn[4];

array part[4];
array mstat[4];
array widow[4];
array single[4];
array split[4];

array age[4];
array hyp_age[4];

array money[4];

array lower[4];
array lowmid[4];
array upmid[4];
array upper[4];

array h[4];
array eh[4];
array vh[4];
array fh[4];
array ph[4];

array ad[4];

array dropout[4];
array miss[4];

do time = 1 to 4;
```



```
CT=cogtot[time];
L=lon[time];
INTr=int[time];
CH=cyn[time];

AGEr=age[time];
ha=hyp_age[time];

ptr=part[time];
ms=mstat[time];
splitr=split[time];
widowr=widow[time];
sing=single[time];

ses=money[time];
low=lower[time];
lmid=lowmid[time];
umid=upmid[time];
up=upper[time];

health=h[time];
excellent=eh[time];
verygood=vh[time];
fair=fh[time];
poor=ph[time];

activity=ad[time];

mizing=miss[time];
drp=dropout[time];

output;
```

```

end;

keep hhidpn time
CT
L INTr CH
ptr ms splitr widowr sing
ager ha
raracem black other
rahispan
gender
raeduc nohs ged scollege college
ses low lmid umid up
health excellent verygood fair poor
activity
mizing drp
;
run;

/*Shifting time points so that the first time point is 0*/
data temp1; set temp1;
time=time-1;
run;

/**Using Equation (7) in our eAppendix 2 to estimate stabilized weights for
loss to follow up, sw, and in turn the stabilized weighted survival function
and risk ratios for the entire study population in Figure 3 of the main
text;*/

/**Part 1a: Estimating conditional probabilities for numerator using pooled
logistic regression;*/

*Modeling the log odds that DROPOUT=0 and outputting corresponding
probabilities as n_drop into n_data dataset;
proc logistic data=temp1;
model drp=time;

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output out=n_data (keep=hhidpn time n_drop) p=n_drop;

run;

/*
proc freq data=temp1;
table ms;
run;

proc freq data=library.march;
table r8mstat;
run;

data temp1; set temp1;

if r10mstat in (4 5 6) then split3=1;
else if r10mstat in (1 2 3 7 8) then split3=0;
else split3=.;

if r10mstat in (7) then widow3=1;
else if r10mstat in (1 2 3 4 5 6 8) then widow3=0;
else widow3=.;

if r10mstat in (8) then single3=1;
else if r10mstat in (1 2 3 4 5 6 7) then single3=0;
else single3=.;

ms_c
*/

/**Part 1b: Estimating conditional probabilities for denominator using pooled
logistic regression;*/

*Modeling the log odds that DROPOUT=0 and outputting corresponding
probabilities as d_drop into d_data dataset;

proc logistic data=temp1;

class raeduc(ref='3.High-school graduate')raracem(ref='1.White/Caucasian')
rahispan gender/param=ref;

```

```

model drp=time ha raracem rahispan gender raeduc;

output out=d_data (keep=hhidpn time d_drop) p=d_drop;

run;

/**Part 1c: Calculating cumulative probabilities for stabilized weights
(sw);**/

*Sorting records in UNCDATA and all generated datasets (n_data and d_data) by
ID and VISIT;

proc sort data=temp1; by hhidpn time; run;

proc sort data=n_data; by hhidpn time; run;

proc sort data=d_data; by hhidpn time; run;

*Merging UNCDATA with generated datasets (n_data and d_data) by ID and VISIT
and calculating sw;

data merged;

merge temp1 n_data d_data;

by hhidpn time;

retain num_drop den_drop;

if first.hhidpn then do; num_drop=1; den_drop=1; end;

num_drop=num_drop*n_drop;

den_drop=den_drop*d_drop;

sw=num_drop/den_drop;

run;

*Assessing distribution of sw;

proc means data=merged n min mean max std p1 p25 p50 p75 p99;

var sw;

run;

proc sort; by hhidpn; run;

ods pdf file='C:\Users\Croissant\Desktop\Thesis Pub\Take
2\Revision\Materials\Results Files\S3(dem weight)_Model_0.pdf';

/*Unconditional model*/

proc mixed covtest info data=merged;

```

```

class hhidpn;
model ct=time/solution ddfm=bw;
random intercept time/ SUB=HHIDPN TYPE=UN;
weight sw;
RUN;

ods pdf close;

ods pdf file='C:\Users\Croissant\Desktop\Thesis Pub\Take
2\Revision\Materials\Results Files\S3(dem weight)_Model_1.pdf';

/*Intercepts and slopes as outcomes model*/
/*Model 1 - just predictors of interest*/
PROC MIXED COVTEST INFO DATA=merged;
CLASS HHIDPN;
MODEL CT = L CH time time*L time*CH/ SOLUTION DDFM=BW cl;
RANDOM INTERCEPT TIME / SUB=HHIDPN TYPE=UN;
weight sw;
RUN;

ods pdf close;

ods pdf file='C:\Users\Croissant\Desktop\Thesis Pub\Take
2\Revision\Materials\Results Files\S3(dem weight)_Model_2.pdf';

/*Model 2 - add demographics*/
PROC MIXED COVTEST INFO DATA=merged;
CLASS HHIDPN black other rahispan gender nohs ged scollege college low lmid
umid up;
MODEL CT =
black other rahispan
gender
nohs ged scollege college
ager
low lmid umid up

```

```

L CH time time*L time*CH/ SOLUTION DDFM=BW cl;

RANDOM INTERCEPT TIME / SUB=HHIDPN TYPE=UN;

weight sw;

RUN;


ods pdf close;

ods pdf file='C:\Users\Croissant\Desktop\Thesis Pub\Take
2\Revision\Materials\Results Files\S3(dem weight)_Model_3.pdf';


/*Model 3 - add health behaviors*/
PROC MIXED COVTEST INFO DATA=merged;
CLASS HHIDPN black other rahispan gender nohs ged scollege college
excellent verygood fair poor
activity
low lmid umid up;
MODEL CT =
black other rahispan
gender
nohs ged scollege college
ager
excellent verygood fair poor
activity
low lmid umid up
L CH time time*L time*CH/ SOLUTION DDFM=BW cl;

RANDOM INTERCEPT TIME / SUB=HHIDPN TYPE=UN;

weight sw;

RUN;


ods pdf close;

ods pdf file='C:\Users\Croissant\Desktop\Thesis Pub\Take
2\Revision\Materials\Results Files\S3(dem weight)_Model_4.pdf';


/*Model 4 - add social*/

```

```

PROC MIXED COVTEST INFO DATA=merged;

CLASS HHIDPN black other rahispan gender nohs ged scollege college
excellent verygood fair poor
activity
low lmid umid up
splitr widowr sing;

MODEL CT =
black other rahispan
gender
nohs ged scollege college
ager
excellent verygood fair poor
activity
splitr widowr sing
intr
low lmid umid up
L CH time time*L time*CH/ SOLUTION DDFM=BW cl;

RANDOM INTERCEPT TIME / SUB=HHIDPN TYPE=UN;

weight sw;

RUN;

ods pdf close;

ods pdf file='C:\Users\Croissant\Desktop\Thesis Pub\Take
2\Revision\Materials\Results Files\S3(dem weight)_Model_5.pdf';

/*Model 5 - add social as predictor of cognitive decline*/
PROC MIXED COVTEST INFO DATA=merged;

CLASS HHIDPN black other rahispan
gender nohs ged scollege college
low lmid umid up
excellent verygood fair poor
activity

```

```

splitr widowr sing;
MODEL CT =
/*dem*/
black other rahispan
gender
nohs ged scollege college
ager
low lmid umid up
/*health and limitations*/
excellent verygood fair poor
activity
/*time*/
time
/*psychosocial*/
splitr widowr sing
intr
L CH time*L time*CH intr*time/ SOLUTION DDFM=BW cl;
RANDOM INTERCEPT TIME / SUB=HHIDPN TYPE=UN;
weight sw;
RUN;
ods pdf close;

```