

Supplemental File 2

R estimation code library for Linear and partially linear models of behavioral trait variation

####

#merge csv files

```
library(pacman)
library(rlang)
library(data.table)
```

```
##
```

```
## Attaching package: 'data.table'
```

```
## The following object is masked from 'package:rlang':
```

```
##
```

```
##      :=
```

```
library (plyr)
```

```
library(dplyr)
```

```
##
```

```
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:plyr':
```

```
##
```

```
##      arrange, count, desc, failwith, id, mutate, rename, summarise,
##      summarize
```

```
## The following objects are masked from 'package:data.table':
```

```
##
```

```
##      between, first, last
```

```
## The following objects are masked from 'package:stats':
```

```
##
```

```
##      filter, lag
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##      intersect, setdiff, setequal, union
```

```
library(dbplyr)
```

```
##
```

```
## Attaching package: 'dbplyr'
```

```
## The following objects are masked from 'package:dplyr':
```

```
##
```

```
##      ident, sql
```

```
library(mice)
```

```
##
## Attaching package: 'mice'

## The following object is masked from 'package:stats':
##
##   filter

## The following objects are masked from 'package:base':
##
##   cbind, rbind

library(survey)

## Loading required package: grid
## Loading required package: Matrix
## Loading required package: survival

##
## Attaching package: 'survey'

## The following object is masked from 'package:graphics':
##
##   dotchart

library(lme4)
library(nlme)

##
## Attaching package: 'nlme'

## The following object is masked from 'package:lme4':
##
##   lmList

## The following object is masked from 'package:dplyr':
##
##   collapse

library(plm)

##
## Attaching package: 'plm'

## The following objects are masked from 'package:dplyr':
##
##   between, lag, lead

## The following object is masked from 'package:data.table':
##
##   between
```

```
library(nlme)
library(sjstats)

##
## Attaching package: 'sjstats'

## The following object is masked from 'package:survey':
##
##      cv

library(fastDummies)
library(knitr)
library(Hmisc)

## Loading required package: lattice
## Loading required package: Formula
## Loading required package: ggplot2

##
## Attaching package: 'Hmisc'

## The following object is masked from 'package:survey':
##
##      deff

## The following objects are masked from 'package:dplyr':
##
##      src, summarize

## The following objects are masked from 'package:plyr':
##
##      is.discrete, summarize

## The following objects are masked from 'package:base':
##
##      format.pval, units

library(ggpubr)

##
## Attaching package: 'ggpubr'

## The following object is masked from 'package:plyr':
##
##      mutate

library(psych)

##
## Attaching package: 'psych'
```

```
## The following object is masked from 'package:Hmisc':  
##  
## describe  
  
## The following objects are masked from 'package:ggplot2':  
##  
## %+%, alpha  
  
## The following object is masked from 'package:sjstats':  
##  
## phi  
  
library(assertthat)  
  
##  
## Attaching package: 'assertthat'  
  
## The following object is masked from 'package:rlang':  
##  
## has_name  
  
library(broom)  
  
##  
## Attaching package: 'broom'  
  
## The following object is masked from 'package:sjstats':  
##  
## bootstrap  
  
library(modelr)  
  
##  
## Attaching package: 'modelr'  
  
## The following object is masked from 'package:broom':  
##  
## bootstrap  
  
## The following objects are masked from 'package:sjstats':  
##  
## bootstrap, mse, rmse  
  
library(dplR)  
library(merDeriv)  
  
## Loading required package: nonnest2  
  
## This is nonnest2 0.5-5.  
## nonnest2 has not been tested with all combinations of model classes.  
  
## Loading required package: sandwich  
  
## Loading required package: lavaan
```

```

## This is lavaan 0.6-9
## lavaan is FREE software! Please report any bugs.

##
## Attaching package: 'lavaan'

## The following object is masked from 'package:psych':
##
##   cor2cov

library(np)

## Nonparametric Kernel Methods for Mixed Datatypes (version 0.60-11)
## [vignette("np_faq",package="np") provides answers to frequently asked ques
tions]
## [vignette("np",package="np") an overview]
## [vignette("entropy_np",package="np") an overview of entropy-based methods]

##
## Attaching package: 'np'

## The following object is masked from 'package:sjstats':
##
##   se

library(tidyverse)

## -- Attaching packages ----- tidyverse 1.
3.1 --

## v tibble  3.1.2      v purrr  0.3.4
## v tidyr   1.1.3      v stringr 1.4.0
## v readr   1.4.0      v forcats 0.5.1

## -- Conflicts ----- tidyverse_conflict
s() --
## x purrr::%@%()          masks rlang::%@%()
## x psych::%+%()         masks ggplot2::%+%()
## x data.table:::=(())    masks rlang:::=(())
## x psych::alpha()       masks ggplot2::alpha()
## x dplyr::arrange()     masks plyr::arrange()
## x purrr::as_function() masks rlang::as_function()
## x plm::between()       masks dplyr::between(), data.table::between()
## x modelr::bootstrap()  masks broom::bootstrap(), sjstats::bootstrap()
## x nlme::collapse()     masks dplyr::collapse()
## x purrr::compact()     masks plyr::compact()
## x dplyr::count()       masks plyr::count()
## x tidyr::expand()      masks Matrix::expand()
## x dplyr::failwith()    masks plyr::failwith()
## x mice::filter()       masks dplyr::filter(), stats::filter()
## x dplyr::first()       masks data.table::first()
## x purrr::flatten()     masks rlang::flatten()

```

```
## x purrr::flatten_chr() masks rlang::flatten_chr()
## x purrr::flatten_dbl() masks rlang::flatten_dbl()
## x purrr::flatten_int() masks rlang::flatten_int()
## x purrr::flatten_lgl() masks rlang::flatten_lgl()
## x purrr::flatten_raw() masks rlang::flatten_raw()
## x tibble::has_name() masks assertthat::has_name(), rlang::has_name()
## x dplyr::id() masks plyr::id()
## x dbplyr::ident() masks dplyr::ident()
## x purrr::invoke() masks rlang::invoke()
## x plm::lag() masks dplyr::lag(), stats::lag()
## x dplyr::last() masks data.table::last()
## x plm::lead() masks dplyr::lead()
## x purrr::list_along() masks rlang::list_along()
## x purrr::modify() masks rlang::modify()
## x modelr::mse() masks sjstats::mse()
## x ggpubr::mutate() masks dplyr::mutate(), plyr::mutate()
## x tidyr::pack() masks Matrix::pack()
## x purrr::prepend() masks rlang::prepend()
## x dplyr::rename() masks plyr::rename()
## x modelr::rmse() masks sjstats::rmse()
## x purrr::splice() masks rlang::splice()
## x dbplyr::sql() masks dplyr::sql()
## x Hmisc::src() masks dplyr::src()
## x dplyr::summarise() masks plyr::summarise()
## x Hmisc::summarize() masks dplyr::summarize(), plyr::summarize()
## x purrr::transpose() masks data.table::transpose()
## x tidyr::unpack() masks Matrix::unpack()
```

```
library(rms)
```

```
## Loading required package: SparseM
```

```
##
```

```
## Attaching package: 'SparseM'
```

```
## The following object is masked from 'package:base':
```

```
##
```

```
## backsolve
```

```
##
```

```
## Attaching package: 'rms'
```

```
## The following object is masked from 'package:dplyr':
```

```
##
```

```
## rcs
```

```
## The following object is masked from 'package:survey':
```

```
##
```

```
## calibrate
```

```
library("survey") #
```

```
library(lavaan)
```

```

library(tidyverse)
library(corr)
library(data.table)
library(PCAmixdata)
library(apaTables)

# Load data

merged_df_original=fread("E:/ABCD/Hippo_3.0/merged_df_withedu_withsite_new.csv")

#Cognitive ability

merged_df_original$CA_Z= scale(merged_df_original$nihtbx_totalcomp_agecorrected, center = TRUE, scale = TRUE)

#Subset to cases with only cognitive ability

merged_df <- merged_df_original[complete.cases(merged_df_original$nihtbx_totalcomp_agecorrected), ]
str(merged_df)

## Classes 'data.table' and 'data.frame': 9972 obs. of 2417 variables:
## $ subjectkey : chr "NDAR_INV003RTV85" "NDAR_INV00BD7DC" "NDAR_INV00CY2MDM" "NDAR_INV00HEV6HB" ...
## $ interview_age : int 131 112 130 124 110 109 121 118 114 130 ...
## $ sex : chr "F" "M" "M" "M" ...
## $ eventname.x : chr "baseline_year_1_arm_1" "baseline_year_1_arm_1" "baseline_year_1_arm_1" "baseline_year_1_arm_1" ...
## $ anthro_1_height_in : num 56.5 57.5 56.5 57.3 50.9 52 53.5 58.4 54 52.5 ...
## $ anthro2heightin : num 56.5 57.5 56.5 57.3 50.9 52 53.5 58.2 54 52.5 ...
## $ anthro3heightin : num NA NA NA NA NA NA NA NA NA NA ...
## $ anthroheightcalc : num 56.5 57.5 56.5 57.3 50.9 52 53.5 58.3 54 52.5 ...
## $ anthroweightcast : int 0 0 0 0 0 0 0 0 0 0 ...
## $ anthro_weight_a_location : chr "" "" "" "" ...
## $ anthroweight1lb : num 93 76.8 91.5 70.8 70.3 80 81.4 85.5 64 97.1 ...
## $ anthroweight2lb : num 93 76.8 91.5 71 70.2 80 81.4 85.3 64 96.9 ...
## $ anthroweight3lb : num NA NA NA 70.8 NA NA NA 85.4 NA 96.9 ...
## $ anthroweightcalc : num 93 76.8 91.5 70.9 70.2 ...
## $ anthro_waist_cm : num 31 23.5 30 28 26 30 25.2 26 25.5 2

```

9.5 ...

```
## $ anthro_timestamp      : chr "10/1/2018 14:16" "6/12/2018 9:46"
"8/22/2017 9:52" "7/8/2017 10:32" ...
## $ demo_l_p_select_language__1 : int 0 0 0 0 0 1 0 0 0 0 ...
## $ demo_prim_1           : int 1 1 1 1 1 1 1 1 1 1 ...
## $ demo_brthdat_v2_1    : num 11 10 11 11 10 10 11 10 10 11 ...
## $ demo_ed_v2_1         : int 6 5 6 6 5 4 6 5 4 5 ...
## $ demo_gender_id_v2_1  : int 2 1 1 1 1 1 1 2 2 2 ...
## $ demo_nat_lang_1      : int 58 58 58 58 58 47 58 58 58 58 ...
## $ demo_nat_lang_2_1    : int 1 1 1 1 1 4 1 1 1 1 ...
## $ demo_dual_lang_v2_1  : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__1 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__2 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__3 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__4 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__5 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__6 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__7 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__8 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__9 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_dual_lang_years_p__10 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_relig_v2_1      : int 2 9 13 13 17 2 2 13 13 13 ...
## $ demo_prnt_age_v2_1   : int 44 40 40 37 46 43 39 51 39 36 ...
## $ demo_prnt_age_v2_refuse_1 : int NA NA NA NA NA NA NA NA NA NA ...
## $ demo_prnt_gender_id_v2_1 : int 2 2 2 2 2 2 2 2 2 2 ...
## $ demo_prnt_race_a_v2_1__10 : int 0 0 0 0 0 0 0 1 0 0 ...
## $ demo_prnt_race_a_v2_1__11 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__12 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__13 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__14 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__15 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__16 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__17 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__18 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__19 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__20 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__21 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__22 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__23 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__24 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__25 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__77 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_race_a_v2_1__99 : int 0 0 0 0 0 0 0 0 0 0 ...
## $ demo_prnt_ethn_v2_1   : int 2 2 2 2 2 1 2 2 2 2 ...
## $ demo_prnt_ethn2_v2_1  : int NA NA NA NA NA 18 NA NA NA NA ...
## $ demo_prnt_nat_lang_1  : int 58 58 58 58 15 47 58 58 58 58 ...
## $ demo_prnt_nat_lang_2_1 : int 1 1 1 1 4 4 1 1 1 1 ...
## $ demo_prnt_marital_v2_1 : int 1 1 4 1 777 1 5 4 1 1 ...
## $ demo_prnt_ed_v2_1     : int 13 20 15 13 21 13 14 16 19 14 ...
## $ demo_prnt_empl_v2_1   : int 1 1 1 1 1 6 1 1 1 1 ...
```



```

## $ demo_prnt_empl_time_1      : int  1 2 1 2 1 NA 1 1 1 1 ...
## $ demo_prnt_indust_refuse_1  : int  NA NA NA NA NA NA NA NA NA NA ...
## $ demo_prnt_income_v2_1     : int  5 4 6 999 777 4 1 6 6 6 ...
## $ demo_prnt_prtnr_v2_1      : int  1 1 2 1 2 1 2 1 1 1 ...
## $ demo_prnt_prtnr_bio_1     : int  1 1 NA 1 NA 1 NA 1 1 1 ...
## $ demo_prnt_prtnr_adopt_1   : int  NA NA NA NA NA NA NA NA NA NA ...
## $ demo_prtnr_ed_v2_1        : int  13 20 NA 13 NA 13 NA 18 18 12 ...
## $ demo_prtnr_empl_v2_1      : int  1 1 NA 1 NA 8 NA 1 1 1 ...
## $ demo_prtnr_empl_time_1    : int  1 1 NA 1 NA NA NA 1 1 1 ...
## $ demo_prtnr_indust_refuse_1 : int  NA NA NA NA NA NA NA NA NA NA ...
## $ demo_prtnr_income_v2_1    : int  8 10 NA 999 NA 7 NA 7 9 5 ...
## $ demo_child_time_v2_1      : int  0 1 0 0 1 0 0 0 1 0 ...
## $ demo_child_time2_v2_1     : int  NA 5 NA NA NA NA NA NA 5 NA ...
## $ demo_child_time2_v2_dk_1  : int  NA NA NA NA 777 NA NA NA NA NA ...
## $ demo_child_time3_v2_1     : int  NA 4 NA NA 1 NA NA NA 8 NA ...
## $ demo_comb_income_v2_1     : int  8 10 6 999 999 7 1 8 9 7 ...
## $ demo_roster_v2_1          : int  6 4 5 5 2 6 5 4 4 8 ...
## $ demo_roster_v2_refuse_1   : int  NA NA NA NA NA NA NA NA NA NA ...
## $ fam_roster_2c_v2_1        : int  1 1 3 1 3 1 3 1 1 1 ...
## $ fam_roster_3c_v2_1        : int  3 3 3 3 NA 3 3 3 3 3 ...
## $ fam_roster_4c_v2_1        : int  3 2 3 3 NA 3 3 3 3 3 ...
## $ fam_roster_5c_v2_1        : int  3 NA 3 3 NA 3 3 NA NA 3 ...
## $ fam_roster_6c_v2_1        : int  3 NA NA NA NA 3 NA NA NA 14 ...
## $ fam_roster_7c_v2_1        : int  NA NA NA NA NA NA NA NA NA NA 11 ...
## $ fam_roster_8c_v2_1        : int  NA NA NA NA NA NA NA NA NA NA 4 ...
## $ fam_roster_9c_v2_1        : int  NA NA NA NA NA NA NA NA NA NA ...
## $ fam_roster_10c_v2_1       : int  NA NA NA NA NA NA NA NA NA NA ...
## $ fam_roster_11c_v2_1       : int  NA NA NA NA NA NA NA NA NA NA ...
## $ fam_roster_12c_v2_1       : int  NA NA NA NA NA NA NA NA NA NA ...
## $ fam_roster_13c_v2_1       : int  NA NA NA NA NA NA NA NA NA NA ...
## $ fam_roster_14c_v2_1       : int  NA NA NA NA NA NA NA NA NA NA ...
## $ fam_roster_15c_v2_1       : int  NA NA NA NA NA NA NA NA NA NA ...
## $ demo_fam_exp1_v2_1        : int  0 0 0 0 0 0 0 0 0 1 ...
## $ demo_fam_exp2_v2_1        : int  0 0 0 0 0 0 0 0 0 1 ...
## $ demo_fam_exp3_v2_1        : int  0 0 0 0 0 0 0 0 0 0 ...
## $ demo_fam_exp4_v2_1        : int  0 0 0 0 0 0 0 0 0 0 ...
## [list output truncated]
## - attr(*, ".internal.selfref")=<externalptr>

```

```
summary(merged_df$CA_Z)
```

```

##      Min.  1st Qu.  Median    Mean  3rd Qu.    Max.
## -3.88552 -0.67504 -0.05547  0.00000  0.62042  5.57696

```

```
#age
```

```
merged_df$age = merged_df$interview_age %>% as.numeric()
```

```
# sex numeric
```

```

merged_df$sex_numeric[merged_df$sex=="M"] <- "0"
merged_df$sex_numeric[merged_df$sex=="F"] <- "1"
merged_df$sex_n = as.numeric(merged_df$sex_numeric)

#adjust CA for sex

d2 <- lm(CA_Z ~ sex_numeric, data = merged_df) # fit the model
merged_df$CA_Z_adj <- residuals(d2)

cor(merged_df$CA_Z_adj, merged_df$CA_Z, use = "complete.obs")

## [1] 0.9999212

summary(merged_df$CA_Z_adj)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.8989 -0.6884 -0.0437  0.0000  0.6322  5.5887

#Child_US_Born
pdem02_origin <- read.delim("E:/ABCD/Hippo_3.0/Files 3.0/ABCDStudyNDA/pdem02.
txt")

pdem02_origin$Child_US_Born <- NA
pdem02_origin= mutate(pdem02_origin, Child_US_Born = case_when(
  demo_origin_v2 %in% 189 ~ 1,
  demo_origin_v2 <189 ~ 0,
  demo_origin_v2 >189 ~ 0,
  TRUE ~ as.numeric(Child_US_Born)) # This is for all other values
)

describe(pdem02_origin$Child_US_Born)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 11879 0.97 0.17      1      1  0  0  1      1 -5.43  27.48  0

table(pdem02_origin$Child_US_Born)

##
##      0      1
## 366 11513

pdem02_origin_USB<- c("Child_US_Born", "subjectkey")
pdem02_origin_USB_df <- pdem02_origin[pdem02_origin_USB]
merged_df=merge(merged_df, pdem02_origin_USB_df, by.x="subjectkey", by.y= "su
bjectkey")
merged_df$Child_US_Born= as.numeric(merged_df$Child_US_Born)

#recode SIRE Not used in this analysis
merged_df$race <- NA

```

```

merged_df= mutate(merged_df,
  race = case_when(
    demo_race_a_p__10 %in% "1" ~ "White_1",
    demo_race_a_p__11 %in% "1" ~ "Black_1",
    demo_race_a_p__12 %in% "1" ~ "Native American_1",
    demo_race_a_p__13 %in% "1" ~ "Native American_1",
    demo_race_a_p__14 %in% "1" ~ "Pacific Islander_1",
    demo_race_a_p__15 %in% "1" ~ "Pacific Islander_1",
    demo_race_a_p__16 %in% "1" ~ "Pacific Islander_1",
    demo_race_a_p__17 %in% "1" ~ "Pacific Islander_1",
    demo_race_a_p__18 %in% "1" ~ "SouthAsian_1",
    demo_race_a_p__19 %in% "1" ~ "EastAsian_1",
    demo_race_a_p__20 %in% "1" ~ "EastAsian_1",
    demo_race_a_p__21 %in% "1" ~ "EastAsian_1",
    demo_race_a_p__22 %in% "1" ~ "EastAsian_1",
    demo_race_a_p__23 %in% "1" ~ "EastAsian_1",
    demo_race_a_p__24 %in% "1" ~ "EastAsian_1", #other Asia
    demo_race_a_p__25 %in% "1" ~ "Other Race_1", #other Race
    demo_race_a_p__77 %in% "1" ~ "Other Race_1",
    demo_race_a_p__99 %in% "1" ~ "Other Race_1",

    TRUE ~ as.character(race)) # This is for all other values
  )

table(merged_df$race, exclude=NULL)

##
##          Black_1          EastAsian_1 Native American_1          Other Race_1
##          1583             130             49             488
##          SouthAsian_1          White_1             <NA>
##           49             7653             20

merged_df$race=merged_df$race %>% replace_na("Other Race_1")
table(merged_df$race, exclude=NULL)

##
##          Black_1          EastAsian_1 Native American_1          Other Race_1
##          1583             130             49             508
##          SouthAsian_1          White_1
##           49             7653

merged_df$race= as.factor(merged_df$race)
merged_df$race <- relevel(merged_df$race, ref = "White_1")

#recode dummy SIRE

merged_df$White <-0

```

```

merged_df= mutate(merged_df,
  White= case_when(
    demo_race_a_p__10 == 1 ~ 1,
    TRUE ~ as.numeric(White)) # This is for all other values
)

describe(merged_df$White)

##   vars   n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.77 0.42     1   0.83  0  0  1     1 -1.27   -0.4  0

summary(merged_df$White)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000  1.0000  1.0000  0.7674  1.0000  1.0000

table(merged_df$White,exclude=NULL)

##
##   0   1
## 2319 7653

merged_df$Black <-0
merged_df= mutate(merged_df,
  Black= case_when(
    demo_race_a_p__11 == 1 ~ 1,
    TRUE ~ as.numeric(Black)) # This is for all other values
)

describe(merged_df$Black)

##   vars   n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972  0.2 0.4     0   0.13  0  0  1     1  1.48   0.19  0

summary(merged_df$Black)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000  0.0000  0.0000  0.2027  0.0000  1.0000

table(merged_df$Black, exclude=NULL)

##
##   0   1
## 7951 2021

merged_df$EastAsian <-0
merged_df= mutate(merged_df,
  EastAsian= case_when(
    demo_race_a_p__19 == 1 ~ 1,
    demo_race_a_p__20 == 1 ~ 1,
    demo_race_a_p__21 == 1 ~ 1,
    demo_race_a_p__22 == 1 ~ 1,

```

```

        demo_race_a_p__23 == 1 ~ 1,
        demo_race_a_p__24 == 1 ~ 1,
        TRUE ~ as.numeric(EastAsian)) # This is for all other val
ues
)

describe(merged_df$EastAsian)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.05 0.21      0          0 0 0 1      1 4.25    16.04 0

summary(merged_df$EastAsian)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.00000 0.00000 0.00000 0.04763 0.00000 1.00000

table(merged_df$EastAsian, exclude=NULL)

##
##      0      1
## 9497 475

merged_df$Native_American <-0
merged_df= mutate(merged_df,
                  Native_American= case_when(
                    demo_race_a_p__12 == 1 ~ 1,
                    demo_race_a_p__13 == 1 ~ 1,
                    TRUE ~ as.numeric(Native_American)) # This is for all oth
er values
)

describe(merged_df$Native_American)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.03 0.18      0          0 0 0 1      1 5.09    23.93 0

summary(merged_df$Native_American)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.00000 0.00000 0.00000 0.0346 0.00000 1.00000

table(merged_df$Native_American)

##
##      0      1
## 9627 345

merged_df$SouthAsian <-0
merged_df= mutate(merged_df,
                  SouthAsian= case_when(
                    demo_race_a_p__18 == 1 ~ 1,
                    TRUE ~ as.numeric(SouthAsian)) # This is for all other va

```

```

Lues
)

describe(merged_df$SouthAsian)

##      vars      n mean  sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.01 0.1    0      0  0  0  1    1 10.04   98.86  0

summary(merged_df$SouthAsian)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.000000 0.000000 0.000000 0.009627 0.000000 1.000000

table(merged_df$SouthAsian)

##
##      0      1
## 9876   96

merged_df$Other_Race <-0
merged_df= mutate(merged_df,
                  Other_Race= case_when(
                    race == "Other Race_1" ~ 1,
                    TRUE ~ as.numeric(Other_Race)) # This is for all other va

Lues
)

describe(merged_df$Other_Race)

##      vars      n mean  sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.05 0.22    0      0  0  0  1    1 4.08   14.68  0

summary(merged_df$Other_Race)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.000000 0.000000 0.000000 0.05094 0.000000 1.000000

table(merged_df$Other_Race, exclude=NULL)

##
##      0      1
## 9464   508

#add Hispanic # define as people who are only positively identified as Hispan
ic

merged_df$Hispanic <-0
merged_df= mutate(merged_df,
                  Hispanic= case_when(

```

```

        demo_ethn_v2 ==1 ~ 1,
        TRUE ~ as.numeric(Hispanic)) # This is for all other valu
es
)

describe(merged_df$Hispanic)

##      vars      n mean  sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.19 0.39      0   0.11  0  0  1      1 1.6      0.57 0

summary(merged_df$Hispanic)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.0000  0.0000  0.0000  0.1874  0.0000  1.0000

table(merged_df$Hispanic, exclude=NULL)

##
##      0      1
## 8103 1869

#non-Hispanic categories

merged_df$NH_White_only <-0
merged_df= mutate(merged_df,
                  NH_White_only= case_when(
                    White == 1 & !Black == 1 & !EastAsian ==1 & !Native_Ameri
can ==1 & !SouthAsian ==1 & !Other_Race ==1
                    & !Hispanic ==1 ~ 1,
                    TRUE ~ as.numeric(NH_White_only)) # This is for all other
values
)
describe(merged_df$NH_White_only)

##      vars      n mean  sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.55 0.5      1   0.57  0  0  1      1 -0.22  -1.95 0

summary(merged_df$NH_White_only)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.0000  0.0000  1.0000  0.5549  1.0000  1.0000

table(merged_df$NH_White_only)

##
##      0      1
## 4439 5533

merged_df$NH_Black_only <-0
merged_df= mutate(merged_df,
                  NH_Black_only= case_when(
                    Black == 1 & !White == 1 & !EastAsian ==1 & !Native_Americ

```

```

an ==1 & !SouthAsian ==1 & !Other_Race ==1
      & !Hispanic ==1 ~ 1,
      TRUE ~ as.numeric(NH_Black_only)) # This is for all other
values
)
describe(merged_df$NH_Black_only)

##   vars    n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.14 0.35     0   0.05  0  0  1     1 2.03    2.12  0

summary(merged_df$NH_Black_only)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000 0.0000  0.0000  0.1438 0.0000  1.0000

table(merged_df$NH_Black_only)

##
##    0    1
## 8538 1434

merged_df$NH_EastAsian_only <-0
merged_df= mutate(merged_df,
                  NH_EastAsian_only= case_when(
                    !Black == 1 & !White == 1 & EastAsian ==1 & !Native_Ameri
can ==1 & !SouthAsian ==1 & !Other_Race ==1
                    & !Hispanic ==1 ~ 1,
                    TRUE ~ as.numeric(NH_EastAsian_only)) # This is for all o
ther values
)
describe(merged_df$NH_EastAsian_only)

##   vars    n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.01 0.1     0     0  0  0  1     1 9.5    88.19  0

summary(merged_df$NH_EastAsian_only)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.00000 0.00000 0.00000 0.01073 0.00000 1.00000

table(merged_df$NH_EastAsian_only)

##
##    0    1
## 9865  107

merged_df$NH_SouthAsian_only <-0
merged_df= mutate(merged_df,
                  NH_SouthAsian_only= case_when(
                    !Black == 1 & !White == 1 & !EastAsian ==1 & !Native_Ameri
ican ==1 & SouthAsian ==1 & !Other_Race ==1
                    & !Hispanic ==1 ~ 1,

```



```

TRUE ~ as.numeric(NH_SouthAsian_only)) # This is for all
other values
)
describe(merged_df$NH_SouthAsian_only)

##   vars    n mean  sd median trimmed mad min max range  skew kurtosis se
## X1     1 9972   0 0.07   0     0  0  0  1     1 15.13  226.87  0

summary(merged_df$NH_SouthAsian_only)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.000000 0.000000 0.000000 0.004312 0.000000 1.000000

table(merged_df$NH_SouthAsian_only)

##
##    0    1
## 9929  43

merged_df$NH_Native_American_only <-0
merged_df= mutate(merged_df,
  NH_Native_American_only= case_when(
    !Black == 1 & !White == 1 & !EastAsian ==1 & Native_American ==1 & !SouthAsian ==1 & !Other_Race ==1
    & !Hispanic ==1 ~ 1,
    TRUE ~ as.numeric(NH_Native_American_only)) # This is for
all other values
)
describe(merged_df$NH_Native_American_only)

##   vars    n mean  sd median trimmed mad min max range  skew kurtosis se
## X1     1 9972   0 0.06   0     0  0  0  1     1 17.85  316.62  0

summary(merged_df$NH_Native_American_only)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.000000 0.000000 0.000000 0.003109 0.000000 1.000000

table(merged_df$NH_Native_American_only)

##
##    0    1
## 9941  31

merged_df$NH_Other_Race_only <-0
merged_df= mutate(merged_df,
  NH_Other_Race_only= case_when(
    !Black == 1 & !White == 1 & !EastAsian ==1 & !Native_American ==1 & !SouthAsian ==1 & Other_Race ==1
    & !Hispanic ==1 ~ 1,
    TRUE ~ as.numeric(NH_Other_Race_only)) # This is for all
other values

```

```

)
describe(merged_df$NH_Other_Race_only)

##      vars      n mean  sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.01 0.1      0      0  0  0  1      1 9.99   97.79  0

summary(merged_df$NH_Other_Race_only)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.000000 0.000000 0.000000 0.009727 0.000000 1.000000

table(merged_df$NH_Other_Race_only)

##
##      0      1
## 9875   97

#Mixed categories

merged_df$NH_Black_White_only <-0
merged_df= mutate(merged_df,
                  NH_Black_White_only= case_when(
                    Black == 1 & White == 1 & !EastAsian ==1 & !Native_Americ
an ==1 & !SouthAsian ==1 & !Other_Race ==1
                    & !Hispanic ==1 ~ 1,
                    TRUE ~ as.numeric(NH_Black_White_only)) # This is for all
other values
)

describe(merged_df$NH_Black_White_only)

##      vars      n mean  sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.03 0.17      0      0  0  0  1      1 5.48   28.04  0

table(merged_df$NH_Black_White_only)

##
##      0      1
## 9670  302

merged_df$H_Black_White_only <-0
merged_df= mutate(merged_df,
                  H_Black_White_only= case_when(
                    Black == 1 & White == 1 & !EastAsian ==1 & !Native_Americ
an ==1 & !SouthAsian ==1 & !Other_Race ==1
                    & Hispanic ==1 ~ 1,
                    TRUE ~ as.numeric(H_Black_White_only)) # This is for all
other values
)

describe(merged_df$H_Black_White_only)

```

```

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.01 0.07      0      0  0  0  1      1 14.01  194.41  0

table(merged_df$H_Black_White_only)

##
##      0      1
## 9922   50

merged_df$H_Black_only <-0
merged_df= mutate(merged_df,
                  H_Black_only= case_when(
                    Black == 1 & !White ==1 & !EastAsian ==1 & !Native_Americ
an ==1 & !SouthAsian ==1 & !Other_Race ==1
                    & Hispanic ==1 ~ 1,
                    TRUE ~ as.numeric(H_Black_only)) # This is for all other
values
)

describe(merged_df$H_Black_only)

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.01 0.09      0      0  0  0  1      1 10.76  113.7  0

table(merged_df$H_Black_only)

##
##      0      1
## 9888   84

merged_df$H_White_only <-0
merged_df= mutate(merged_df,
                  H_White_only= case_when(
                    !Black == 1 & White ==1 & !EastAsian ==1 & !Native_Americ
an ==1 & !SouthAsian ==1 & !Other_Race ==1
                    & Hispanic ==1 ~ 1,
                    TRUE ~ as.numeric(H_White_only)) # This is for all other
values
)

describe(merged_df$H_White_only)

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.12 0.32      0   0.02  0  0  1      1 2.38   3.65  0

table(merged_df$H_White_only)

##
##      0      1
## 8801 1171

```

```

merged_df$NH_EastAsian_White_only <-0
merged_df= mutate(merged_df,
  NH_EastAsian_White_only = case_when(
    EastAsian == 1 & White == 1 & !Black ==1 & !Native_Americ
an ==1 & !SouthAsian ==1 & !Other_Race ==1
    & !Hispanic ==1 ~ 1,
    TRUE ~ as.numeric(NH_EastAsian_White_only)) # This is for
all other values
)

describe(merged_df$NH_EastAsian_White_only)

##   vars    n mean   sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.02 0.16     0         0 0 0 1 1 6.09 35.07 0

table(merged_df$NH_EastAsian_White_only)

##
##    0    1
## 9723 249

merged_df$NH_SouthAsian_White_only <-0
merged_df= mutate(merged_df,
  NH_SouthAsian_White_only = case_when(
    SouthAsian == 1 & White == 1 & !Black ==1 & !Native_Ameri
can ==1 & !EastAsian ==1 & !Other_Race ==1
    & !Hispanic ==1 ~ 1,
    TRUE ~ as.numeric(NH_SouthAsian_White_only)) # This is fo
r all other values
)

describe(merged_df$NH_SouthAsian_White_only)

##   vars    n mean   sd median trimmed mad min max range skew kurtosis se
## X1     1 9972  0 0.06     0         0 0 0 1 1 15.69 244.25 0

table(merged_df$NH_SouthAsian_White_only)

##
##    0    1
## 9932  40

merged_df$NH_Native_American_White_only <-0
merged_df= mutate(merged_df,
  NH_Native_American_White_only = case_when(
    Native_American == 1 & White == 1 & !Black ==1 & !SouthAs
ian ==1 & !EastAsian ==1 & !Other_Race ==1
    & !Hispanic ==1 ~ 1,
    TRUE ~ as.numeric(NH_Native_American_White_only)) # This
is for all other values
)

```

```

describe(merged_df$NH_Native_American_White_only)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.01 0.11      0      0  0  0  1      1 8.55   71.12  0

table(merged_df$NH_Native_American_White_only)

##
##      0      1
## 9841  131

merged_df$H_Native_American_White_only <-0
merged_df= mutate(merged_df,
                   H_Native_American_White_only = case_when(
                     Native_American == 1 & White == 1 & !Black ==1 & !SouthAsian ==1 & !EastAsian ==1 & !Other_Race ==1
                     & Hispanic ==1 ~ 1,
                     TRUE ~ as.numeric(H_Native_American_White_only)) # This is for all other values
)

describe(merged_df$H_Native_American_White_only)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972  0 0.07      0      0  0  0  1      1 14.62  211.74  0

table(merged_df$H_Native_American_White_only)

##
##      0      1
## 9926   46

merged_df$H_Other_only <-0
merged_df= mutate(merged_df,
                   H_Other_only = case_when(
                     Other_Race == 1 & !White == 1 & !Black ==1 & !SouthAsian ==1 & !EastAsian ==1 & !Native_American ==1
                     & Hispanic ==1 ~ 1,
                     TRUE ~ as.numeric(H_Other_only)) # This is for all other values
)

describe(merged_df$H_Other_only)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.04 0.2      0      0  0  0  1      1 4.62   19.3  0

table(merged_df$H_Other_only)

```

```

##
##      0      1
## 9561  411

merged_df$NH_Native_American_Black <-0
merged_df= mutate(merged_df,
  NH_Native_American_Black = case_when(
    Native_American == 1 & Black == 1 & !White ==1 & !SouthAsian ==1 & !EastAsian ==1 & !Other_Race ==1
    & !Hispanic ==1 ~ 1,
    TRUE ~ as.numeric(NH_Native_American_Black)) # This is for
r all other values
)

describe(merged_df$NH_Native_American_Black)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972   0 0.05   0      0  0  0  1  1 19.5  378.46  0

table(merged_df$NH_Native_American_Black)

##
##      0      1
## 9946  26

merged_df$H_Native_American <-0
merged_df= mutate(merged_df,
  H_Native_American = case_when(
    Native_American == 1 & !Black == 1 & !White ==1 & !SouthAsian ==1 & !EastAsian ==1 & !Other_Race ==1
    & !Hispanic ==1 ~ 1,
    TRUE ~ as.numeric(H_Native_American)) # This is for all o
ther values
)

describe(merged_df$H_Native_American)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972   0 0.06   0      0  0  0  1  1 17.85  316.62  0

table(merged_df$H_Native_American)

##
##      0      1
## 9941  31

merged_df$White_only <-0
merged_df= mutate(merged_df,
  White_only= case_when(
    White == 1 & !Black ==1 & !EastAsian ==1 & !Native_American ==1 & !SouthAsian ==1 & !Other_Race ==1 ~ 1,
    TRUE ~ as.numeric(White_only)) # This is for all other va

```

```

Lues
)

describe(merged_df$White_only)

##   vars    n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.67 0.47     1   0.72  0  0  1     1 -0.73   -1.46  0

summary(merged_df$White_only)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000 0.0000  1.0000  0.6723  1.0000  1.0000

table(merged_df$White_only)

##
##    0    1
## 3268 6704

merged_df$Black_only <-0
merged_df= mutate(merged_df,
                  Black_only= case_when(
                    Black == 1 & !White ==1 & !EastAsian ==1 & !Native_Americ
an ==1 & !SouthAsian ==1 & !Other_Race ==1 ~ 1,
                    TRUE ~ as.numeric(Black_only)) # This is for all other va
Lues
)

describe(merged_df$Black_only)

##   vars    n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.15 0.36     0   0.07  0  0  1     1 1.94   1.75  0

summary(merged_df$Black_only)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000 0.0000  0.0000  0.1522  0.0000  1.0000

table(merged_df$Black_only)

##
##    0    1
## 8454 1518

merged_df$EastAsian_only <-0
merged_df= mutate(merged_df,
                  EastAsian_only= case_when(
                    EastAsian == 1 & !Black ==1 & !White ==1 & !Native_Americ
an ==1 & !SouthAsian ==1 & !Other_Race ==1 ~ 1,
                    TRUE ~ as.numeric(EastAsian_only)) # This is for all othe
r values
)

```

```

describe(merged_df$EastAsian_only)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.01 0.11      0      0  0  0  1      1 8.58   71.71  0

summary(merged_df$EastAsian_only)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.000000 0.000000 0.000000 0.01304 0.000000 1.000000

table(merged_df$EastAsian_only)

##
##      0      1
## 9842  130

merged_df$Native_American_only <-0
merged_df= mutate(merged_df,
                  Native_American_only= case_when(
                    Native_American == 1 & !Black ==1 & !White ==1 & !EastAsian ==1 & !SouthAsian ==1 & !Other_Race ==1 ~ 1,
                    TRUE ~ as.numeric(Native_American_only)) # This is for all
                  )

describe(merged_df$Native_American_only)

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972      0 0.07      0      0  0  0  1      1 14.46  207.13  0

summary(merged_df$Native_American_only)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.000000 0.000000 0.000000 0.004713 0.000000 1.000000

table(merged_df$Native_American_only)

##
##      0      1
## 9925   47

merged_df$SouthAsian_only <-0
merged_df= mutate(merged_df,
                  SouthAsian_only= case_when(
                    SouthAsian == 1 & !Black ==1 & !White ==1 & !EastAsian ==1 & !Native_American ==1 & !Other_Race ==1 ~ 1,
                    TRUE ~ as.numeric(SouthAsian_only)) # This is for all other
                  )

describe(merged_df$SouthAsian_only)

```



```

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972    0 0.07     0       0  0  0  1    1 14.62  211.74  0

summary(merged_df$SouthAsian_only)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.000000 0.000000 0.000000 0.004613 0.000000 1.000000

table(merged_df$SouthAsian_only)

##
##      0      1
## 9926   46

merged_df$Hispanic_only <- 0
merged_df= mutate(merged_df,
                  Hispanic_only= case_when(
                    Hispanic ==1 & !SouthAsian == 1 & !Black ==1 & !White ==1
& !EastAsian ==1 & !Native_American ==1 & !Other_Race ==1 ~ 1,
                    TRUE ~ as.numeric(Hispanic_only)) # This is for all other
values
)

describe(merged_df$Hispanic_only)

##      vars      n mean sd median trimmed mad min max range skew kurtosis se
## X1      1 9972    0  0     0       0  0  0  0  0    0 NaN      NaN  0

summary(merged_df$Hispanic_only)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##         0         0         0         0         0         0

table(merged_df$Hispanic_only)

##
##      0
## 9972

merged_df$Any_Other <- 1
merged_df= mutate(merged_df,
                  Any_Other= case_when(
                    Hispanic ==1 ~ 0,
                    NH_White_only ==1~ 0,
                    NH_Black_only ==1~ 0,
                    NH_EastAsian_only ==1~ 0,
                    NH_SouthAsian_only ==1~ 0,
                    NH_Native_American_only ==1~ 0,
                    NH_Other_Race_only ==1~ 0,
                    NH_Black_White_only ==1~ 0,
                    NH_EastAsian_White_only ==1~ 0,
                    NH_SouthAsian_White_only ==1~ 0,

```

```

NH_Native_American_White_only ==1~ 0,

TRUE ~ as.numeric(Any_Other)) # This is for all other val
ues
)

describe(merged_df$Any_Other)

##   vars   n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.01 0.12      0      0  0  0  1     1 8.39   68.32  0

summary(merged_df$Any_Other)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.00000 0.00000 0.00000 0.01364 0.00000 1.00000

table(merged_df$Any_Other)

##
##      0      1
## 9836  136

#Interval SIRE_regular

merged_df$sum_SIRE = merged_df$Black + merged_df$White + merged_df$EastAsian
+ merged_df$Native_American + merged_df$SouthAsian + merged_df$Other_Race + m
erged_df$Hispanic
summary(merged_df$sum_SIRE)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    1.0     1.0     1.0     1.3     2.0     5.0

describe(merged_df$sum_SIRE)

##   vars   n mean  sd median trimmed mad min max range skew kurtosis  se
## X1     1 9972  1.3 0.52      1   1.22  0  1  5     4 1.63   2.63 0.01

table(merged_df$sum_SIRE)

##
##    1    2    3    4    5
## 7245 2487  214  24    2

merged_df$frac_Black_SIRE <-NA
merged_df$frac_Black_SIRE = merged_df$Black / merged_df$sum_SIRE
merged_df$frac_Black_SIRE[is.nan(merged_df$frac_Black_SIRE)]<-0
summary(merged_df$frac_Black_SIRE)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000 0.0000 0.0000 0.1705 0.0000 1.0000

describe(merged_df$frac_Black_SIRE)

```

```

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.17 0.36      0   0.09  0  0  1      1 1.76      1.28  0

table(merged_df$frac_Black_SIRE)

##
##              0              0.2              0.25 0.3333333333333333
##          7951              2              21              126
##          0.5              1
##          438              1434

merged_df$frac_White_SIRE <-NA
merged_df$frac_White_SIRE = merged_df$White / merged_df$sum_SIRE
merged_df$frac_White_SIRE[is.nan(merged_df$frac_White_SIRE)]<-0
summary(merged_df$frac_White_SIRE)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.0000 0.3333  1.0000  0.6571  1.0000  1.0000

describe(merged_df$frac_White_SIRE)

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.66 0.42      1   0.7  0  0  1      1 -0.63      -1.28  0

table(merged_df$frac_White_SIRE)

##
##              0              0.2              0.25 0.3333333333333333
##          2319              2              24              201
##          0.5              1
##          1893              5533

merged_df$frac_EastAsian_SIRE <-NA
merged_df$frac_EastAsian_SIRE = merged_df$EastAsian / merged_df$sum_SIRE
merged_df$frac_EastAsian_SIRE[is.nan(merged_df$frac_EastAsian_SIRE)]<-0
summary(merged_df$frac_EastAsian_SIRE)

##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
## 0.00000 0.00000 0.00000 0.02793 0.00000 1.00000

describe(merged_df$frac_EastAsian_SIRE)

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.03 0.13      0   0  0  0  1      1 5.38      30.71  0

table(merged_df$frac_EastAsian_SIRE)

##
##              0              0.2              0.25 0.3333333333333333
##          9497              2              10              56
##          0.5              1
##          300              107

```

```

merged_df$frac_Native_American_SIRE <-NA
merged_df$frac_Native_American_SIRE = merged_df$Native_American / merged_df$sum_SIRE
merged_df$frac_Native_American_SIRE[is.nan(merged_df$frac_Native_American_SIRE)]<-0
summary(merged_df$frac_Native_American_SIRE)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.00000 0.00000 0.00000 0.01632 0.00000 1.00000

describe(merged_df$frac_Native_American_SIRE)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.02 0.09      0      0 0 0 1      1 6.63  50.29 0

table(merged_df$frac_Native_American_SIRE)

##
##              0              0.2              0.25 0.3333333333333333
##          9627              2              22              115
##          0.5              1
##          175              31

merged_df$frac_SouthAsian_SIRE <-NA
merged_df$frac_SouthAsian_SIRE = merged_df$SouthAsian / merged_df$sum_SIRE
merged_df$frac_SouthAsian_SIRE[is.nan(merged_df$frac_SouthAsian_SIRE)]<-0
summary(merged_df$frac_SouthAsian_SIRE)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.000000 0.000000 0.000000 0.006903 0.000000 1.000000

describe(merged_df$frac_SouthAsian_SIRE)

##      vars      n mean   sd median trimmed mad min max range skew kurtosis se
## X1      1 9972 0.01 0.07      0      0 0 0 1      1 11.71  143.38 0

table(merged_df$frac_SouthAsian_SIRE)

##
##          0 0.3333333333333333              0.5              1
##        9876              4              49              43

merged_df$frac_Other_SIRE <-NA
merged_df$frac_Other_SIRE = merged_df$Other_Race / merged_df$sum_SIRE
merged_df$frac_Other_SIRE[is.nan(merged_df$frac_Other_SIRE)]<-0
summary(merged_df$frac_Other_SIRE)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.000000 0.000000 0.000000 0.03033 0.000000 1.000000

describe(merged_df$frac_Other_SIRE)

```

```
## vars n mean sd median trimmed mad min max range skew kurtosis se
## X1 1 9972 0.03 0.14 0 0 0 0 1 1 4.96 26.03 0
```

```
table(merged_df$frac_Other_SIRE)
```

```
##
## 0 0.5 1
## 9464 411 97
```

```
merged_df$frac_Hispanic_SIRE <- NA
merged_df$frac_Hispanic_SIRE = merged_df$Hispanic / merged_df$sum_SIRE
merged_df$frac_Hispanic_SIRE[is.nan(merged_df$frac_Hispanic_SIRE)] <- 0
summary(merged_df$frac_Hispanic_SIRE)
```

```
## Min. 1st Qu. Median Mean 3rd Qu. Max.
## 0.00000 0.00000 0.00000 0.09084 0.00000 0.50000
```

```
describe(merged_df$frac_Hispanic_SIRE)
```

```
## vars n mean sd median trimmed mad min max range skew kurtosis se
## X1 1 9972 0.09 0.19 0 0.05 0 0 0.5 0.5 1.64 0.73 0
```

```
table(merged_df$frac_Hispanic_SIRE)
```

```
##
## 0 0.2 0.25 0.3333333333333333
## 8103 2 19 140
## 0.5
## 1708
```

#See if add up to 1.00

```
merged_df$frac_SIRE_SIRE = merged_df$frac_Black_SIRE + merged_df$frac_White_SIRE + merged_df$frac_EastAsian_SIRE + merged_df$frac_Native_American_SIRE + merged_df$frac_SouthAsian_SIRE + merged_df$frac_Other_SIRE + merged_df$frac_Hispanic_SIRE
```

```
table(merged_df$frac_SIRE_SIRE)
```

```
##
## 1
## 9972
```

#Interval SIRE with combinations, code 0 when combination is 1.

```
merged_df$common_combination <- 0
merged_df = mutate (merged_df,
  common_combination = case_when(
    NH_Black_White_only == "1" ~ 1,
    NH_SouthAsian_White_only == "1" ~ 1,
    NH_EastAsian_White_only == "1" ~ 1,
```

```

NH_Native_American_White_only == "1" ~ 1,
H_White_only == "1" ~ 1,
H_Black_only == "1" ~ 1,
H_Other_only == "1" ~ 1,
TRUE ~ as.numeric(common_combination)) # This is for all
other values
)

table(merged_df$common_combination)

##
##    0    1
## 7584 2388

describe(merged_df$common_combination)

##   vars    n mean  sd median trimmed mad min max range skew kurtosis se
## X1     1 9972 0.24 0.43     0   0.17  0  0  1     1 1.22   -0.51  0

merged_df$Black_woc <- 0
merged_df= mutate (merged_df,
                    Black_woc = case_when(
                      Black == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(Black_woc)) # This is for all other va
Lues
)

table(merged_df$Black)

##
##    0    1
## 7951 2021

table(merged_df$Black_woc)

##
##    0    1
## 8337 1635

merged_df$White_woc <- 0
merged_df= mutate (merged_df,
                    White_woc = case_when(
                      White == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(White_woc)) # This is for all other va
Lues
)

table(merged_df$White)

##
##    0    1
## 2319 7653

```

```

table(merged_df$White_woc)

##
##    0    1
## 4212 5760

merged_df$EastAsian_woc <- 0
merged_df= mutate (merged_df,
                    EastAsian_woc = case_when(
                      EastAsian == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(EastAsian_woc)) # This is for all othe
r values
)

table(merged_df$EastAsian)

##
##    0    1
## 9497  475

table(merged_df$EastAsian_woc)

##
##    0    1
## 9746  226

merged_df$SouthAsian_woc <- 0
merged_df= mutate (merged_df,
                    SouthAsian_woc = case_when(
                      SouthAsian == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(SouthAsian_woc)) # This is for all oth
er values
)

table(merged_df$SouthAsian)

##
##    0    1
## 9876   96

table(merged_df$SouthAsian_woc)

##
##    0    1
## 9916   56

merged_df$Native_American_woc <- 0
merged_df= mutate (merged_df,
                    Native_American_woc = case_when(
                      Native_American == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(Native_American_woc)) # This is for al
l other values

```

```

)

table(merged_df$Native_American)

##
##    0    1
## 9627 345

table(merged_df$Native_American_woc)

##
##    0    1
## 9758 214

merged_df$Native_American_woc <- 0
merged_df= mutate (merged_df,
                    Native_American_woc = case_when(
                      Native_American == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(Native_American_woc)) # This is for al

l other values
)

table(merged_df$Native_American)

##
##    0    1
## 9627 345

table(merged_df$Native_American_woc)

##
##    0    1
## 9758 214

merged_df$Other_Race_woc <- 0
merged_df= mutate (merged_df,
                    Other_Race_woc = case_when(
                      Other_Race == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(Other_Race_woc)) # This is for all oth

er values
)

table(merged_df$Other_Race)

##
##    0    1
## 9464 508

table(merged_df$Other_Race_woc)

```



```

##
##    0    1
## 9875   97

merged_df$Hispanic_woc <- 0
merged_df= mutate (merged_df,
                    Hispanic_woc = case_when(
                      Hispanic == 1 & !common_combination == 1 ~ 1,
                      TRUE ~ as.numeric(Hispanic_woc)) # This is for all other
values
)

table(merged_df$Hispanic)

##
##    0    1
## 8103 1869

table(merged_df$Hispanic_woc)

##
##    0    1
## 9769  203

merged_df$sum_SIRE_woc <- NA
merged_df$sum_SIRE_woc = merged_df$Black_woc + merged_df$White_woc + merged_d
f$EastAsian_woc + merged_df$Native_American_woc + merged_df$SouthAsian_woc +
merged_df$Other_Race_woc + merged_df$Hispanic_woc
merged_df$sum_SIRE_woc = as.numeric(merged_df$sum_SIRE_woc)

summary(merged_df$sum_SIRE_woc)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000  1.0000  1.0000  0.8214  1.0000  5.0000

describe(merged_df$sum_SIRE_woc)

##   vars    n mean   sd median trimmed mad min max range skew kurtosis   se
## X1     1 9972 0.82 0.57     1   0.83  0  0  5     5 1.07     5.53 0.01

table(merged_df$sum_SIRE_woc)

##
##    0    1    2    3    4    5
## 2388 7245  99  214  24   2

merged_df$frac_White_SIRE_woc <-NA
merged_df$frac_White_SIRE_woc = merged_df$White_woc / merged_df$sum_SIRE_woc
merged_df$frac_White_SIRE_woc[is.nan(merged_df$frac_White_SIRE_woc)]<-0
table(merged_df$frac_White_SIRE_woc)

```

```
##
##          0          0.2          0.25 0.3333333333333333
##        4212          2          24          201
##          1
##        5533
```

```
merged_df$frac_Black_SIRE_woc <-NA
merged_df$frac_Black_SIRE_woc = merged_df$Black_woc / merged_df$sum_SIRE_woc
merged_df$frac_Black_SIRE_woc[is.nan(merged_df$frac_Black_SIRE_woc)]<-0
table(merged_df$frac_Black_SIRE_woc)
```

```
##
##          0          0.2          0.25 0.3333333333333333
##        8337          2          21          126
##        0.5          1
##        52          1434
```

```
merged_df$frac_EastAsian_SIRE_woc <-NA
merged_df$frac_EastAsian_SIRE_woc = merged_df$EastAsian_woc / merged_df$sum_SIRE_woc
merged_df$frac_EastAsian_SIRE_woc[is.nan(merged_df$frac_EastAsian_SIRE_woc)]<-0
table(merged_df$frac_EastAsian_SIRE_woc)
```

```
##
##          0          0.2          0.25 0.3333333333333333
##        9746          2          10          56
##        0.5          1
##        51          107
```

```
merged_df$frac_SouthAsian_SIRE_woc <-NA
merged_df$frac_SouthAsian_SIRE_woc = merged_df$SouthAsian_woc / merged_df$sum_SIRE_woc
merged_df$frac_SouthAsian_SIRE_woc[is.nan(merged_df$frac_SouthAsian_SIRE_woc)]<-0
table(merged_df$frac_SouthAsian_SIRE_woc)
```

```
##
##          0 0.3333333333333333          0.5          1
##        9916          4          9          43
```

```
merged_df$frac_Native_American_SIRE_woc <-NA
merged_df$frac_Native_American_SIRE_woc = merged_df$Native_American_woc / merged_df$sum_SIRE_woc
merged_df$frac_Native_American_SIRE_woc[is.nan(merged_df$frac_Native_American_SIRE_woc)]<-0
table(merged_df$frac_Native_American_SIRE_woc)
```

```
##
##          0          0.2          0.25 0.3333333333333333
##        9758          2          22          115
```

```

##           0.5           1
##           44           31

merged_df$frac_Other_Race_SIRE_woc <-NA
merged_df$frac_Other_Race_SIRE_woc = merged_df$Other_Race_woc / merged_df$sum
_SIRE_woc
merged_df$frac_Other_Race_SIRE_woc[is.nan(merged_df$frac_Other_Race_SIRE_woc)
]<-0
table(merged_df$frac_Other_Race_SIRE_woc)

##
##    0    1
## 9875  97

merged_df$frac_Hispanic_SIRE_woc <-NA
merged_df$frac_Hispanic_SIRE_woc = merged_df$Hispanic_woc / merged_df$sum_SIR
E_woc
merged_df$frac_Hispanic_SIRE_woc[is.nan(merged_df$frac_Hispanic_SIRE_woc)]<-0
table(merged_df$frac_Hispanic_SIRE_woc)

##
##           0           0.2           0.25 0.3333333333333333
##           9769           2           19           140
##           0.5
##           42

#See if add up to 1.00, except for xxxx combinations

table(merged_df$common_combination) #2388 combo

##
##    0    1
## 7584 2388

merged_df$frac_SIRE_SIRE_woc <- NA
merged_df$frac_SIRE_SIRE_woc = merged_df$frac_Hispanic_SIRE_woc + merged_df$f
rac_Other_Race_SIRE_woc + merged_df$frac_Native_American_SIRE_woc + merged_df
$frac_SouthAsian_SIRE_woc + merged_df$frac_EastAsian_SIRE_woc + merged_df$fra
c_Black_SIRE_woc + merged_df$frac_White_SIRE_woc

table(merged_df$frac_SIRE_SIRE_woc) #2388 combo

##
##    0    1
## 2388 7584

#Create SES variables (personal subjective ses, personal objective, neighborh
ood ses)
#Subjective SES
#

```

```
#meim_p_ss_total Ethnic identity
```

```
merged_df$ses_1 <- NA  
merged_df= mutate (merged_df,  
  ses_1= case_when(  
    demo_fam_exp1_v2 == "0" ~ 0,  
    demo_fam_exp1_v2 == "1" ~ -1,  
    TRUE ~ as.numeric(ses_1)) # This is for all other values  
)
```

```
merged_df$ses_2 <- NA  
merged_df= mutate (merged_df,  
  ses_2= case_when(  
    demo_fam_exp2_v2 == "0" ~ 0,  
    demo_fam_exp2_v2 == "1" ~ -1,  
    TRUE ~ as.numeric(ses_2)) # This is for all other values  
)
```

```
merged_df$ses_3 <- NA  
merged_df= mutate (merged_df,  
  ses_3= case_when(  
    demo_fam_exp3_v2 == "0" ~ 0,  
    demo_fam_exp3_v2 == "1" ~ -1,  
    TRUE ~ as.numeric(ses_3)) # This is for all other values  
)
```

```
merged_df$ses_4 <- NA  
merged_df= mutate (merged_df,  
  ses_4= case_when(  
    demo_fam_exp4_v2 == "0" ~ 0,  
    demo_fam_exp4_v2 == "1" ~ -1,  
    TRUE ~ as.numeric(ses_4)) # This is for all other values  
)
```

```
merged_df$ses_5 <- NA  
merged_df= mutate (merged_df,  
  ses_5= case_when(  
    demo_fam_exp5_v2 == "0" ~ 0,  
    demo_fam_exp5_v2 == "1" ~ -1,  
    TRUE ~ as.numeric(ses_5)) # This is for all other values  
)
```

```
merged_df$ses_6 <- NA  
merged_df= mutate (merged_df,
```

```

ses_6= case_when(
  demo_fam_exp6_v2 == "0" ~ 0,
  demo_fam_exp6_v2 == "1" ~ -1,
  TRUE ~ as.numeric(ses_6)) # This is for all other values
)

merged_df$ses_7 <- NA
merged_df= mutate (merged_df,
  ses_7= case_when(
    demo_fam_exp7_v2 == "0" ~ 0,
    demo_fam_exp7_v2 == "1" ~ -1,
    TRUE ~ as.numeric(ses_7)) # This is for all other values
)

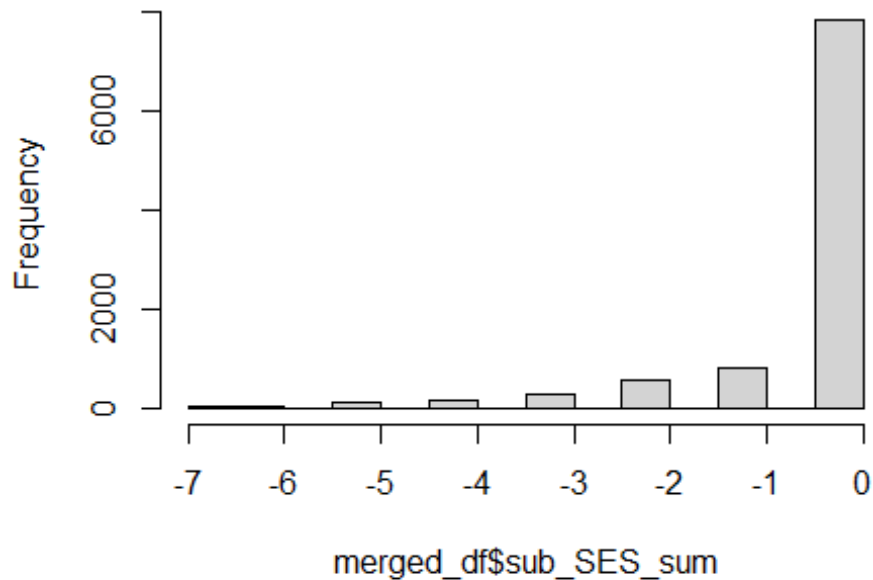
n_ses=which(names(merged_df)%in%c("ses_1"))

#compute sum

merged_df$sub_SES_sum= merged_df$ses_1 + merged_df$ses_2 + merged_df$ses_3 +
merged_df$ses_4 + merged_df$ses_5 + merged_df$ses_6 + merged_df$ses_7
hist(merged_df$sub_SES_sum)

```

Histogram of merged_df\$sub_SES_sum



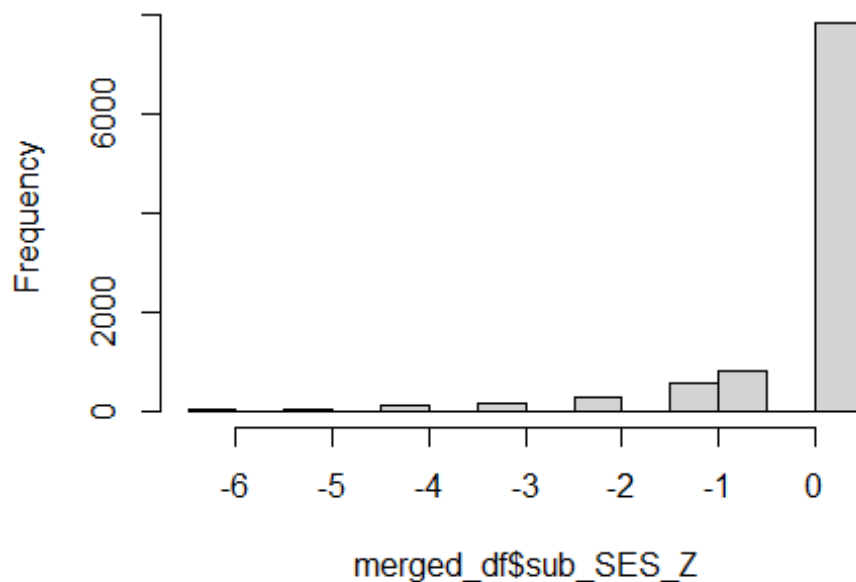
```

#standardize "sub_SES"

```

```
merged_df$sub_SES_Z= scale(merged_df$sub_SES_sum, center = TRUE, scale = TRUE
)
describe(merged_df$sub_SES_Z)
##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis
se
## X1      1 9876   0  1  0.41   0.27  0 -6.04 0.41  6.45 -2.93   9.08 0.
01
hist(merged_df$sub_SES_Z)
```

Histogram of merged_df\$sub_SES_Z



#Neighborhood SES simplified by just using address 1

```
table(merged_df$reshist_addr1_adi_perc)
##
##  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 1
9 20
## 544 189 172 73 98 121 134 125 178 134 130 128 115 126 89 175 124 177 17
4 171
## 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 3
9 40
## 183 128 217 142 179 91 191 188 141 137 207 107 127 116 125 142 145 167 12
6 88
## 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 5
9 60
```

```
## 113 82 94 80 96 71 63 108 76 82 56 73 83 76 50 64 84 54 10
2 52
## 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 7
9 80
## 67 89 68 40 44 77 56 50 28 108 33 48 51 52 31 42 49 38 4
6 28
## 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 9
9 100
## 117 48 29 51 60 34 50 49 54 31 47 85 61 57 26 51 50 42 6
5 67
## 101 102
## 66 104
```

```
describe(as.numeric(merged_df$reshist_addr1_adi_perc))
```

```
## vars n mean sd median trimmed mad min max range skew kurtosis
se
## X1 1 9972 38.39 28.33 32 35.98 28.17 1 102 101 0.64 -0.61
0.28
```

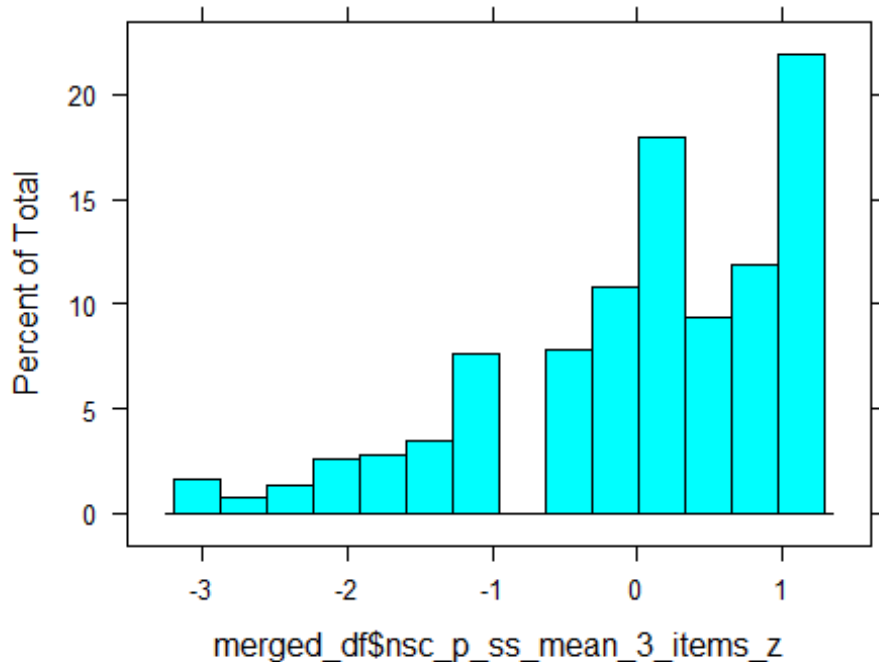
```
merged_df$reshist_weighted_Z= scale(as.numeric(merged_df$reshist_addr1_adi_pe
rc, center = TRUE, scale = TRUE))*-1
describe(merged_df$reshist_weighted_Z)
```

```
## vars n mean sd median trimmed mad min max range skew kurtosis
se
## X1 1 9972 0 1 0.23 0.09 0.99 -2.25 1.32 3.56 -0.64 -0.61 0
.01
```

#Neighborhood Crime

```
#abcd_sscep01 <- read.delim("E:/ABCD/Hippo_3.0/Files 3.0/ABCStudyNDA/abcd_ss
cep01.txt")
#abcd_sscep01_1_baseline=abcd_sscep01[abcd_sscep01$eventname=="baseline_year_
1_arm_1",]
#nsc_p_ss_mean_3_items <- c("nsc_p_ss_mean_3_items", "subjectkey")
#nsc_p_ss_mean_3_items_df <- abcd_sscep01_1_baseline[nsc_p_ss_mean_3_items]
#merged_df=merge(merged_df, nsc_p_ss_mean_3_items_df, by.x="subjectkey", by.y
= "subjectkey", all=T)
```

```
merged_df$nsc_p_ss_mean_3_items_z = scale(as.numeric(merged_df$nsc_p_ss_mean_
3_items), center = TRUE, scale = TRUE)
histogram(merged_df$nsc_p_ss_mean_3_items_z )
```



```
describe(merged_df$nsc_p_ss_mean_3_items_z)

##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis
## X1      1 9968   0  1  0.09  0.12 1.03 -3.04 1.13  4.16 -0.91    0.44 0
## .01

#Personal SES

#Education

#Recode parental edu
#0=0, 1=1, 2=2, 12=12, 13 = 12, 14 = 12, 15 = 14, 16 = 14, 17 = 14, 18 = 16, 19
=18, 20 = 18, 21=18

merged_df$edu_1 <- NA
merged_df= mutate (merged_df,
  edu_1 = case_when(
    demo_prnt_ed_v2_1 %in% "0" ~ 0,
    demo_prnt_ed_v2_1 %in% "1" ~ 1,
    demo_prnt_ed_v2_1 %in% "2" ~ 2,
    demo_prnt_ed_v2_1 %in% "3" ~ 3,
    demo_prnt_ed_v2_1 %in% "4" ~ 4,
    demo_prnt_ed_v2_1 %in% "5" ~ 5,
    demo_prnt_ed_v2_1 %in% "6" ~ 6,
    demo_prnt_ed_v2_1 %in% "7" ~ 7,
```



```

demo_prnt_ed_v2_1 %in% "8" ~ 8,
demo_prnt_ed_v2_1 %in% "9" ~ 9,
demo_prnt_ed_v2_1 %in% "10" ~ 10,
demo_prnt_ed_v2_1 %in% "11" ~ 11,
demo_prnt_ed_v2_1 %in% "12" ~ 12,
demo_prnt_ed_v2_1 %in% "13" ~ 12,
demo_prnt_ed_v2_1 %in% "14" ~ 12,
demo_prnt_ed_v2_1 %in% "15" ~ 14,
demo_prnt_ed_v2_1 %in% "16" ~ 14,
demo_prnt_ed_v2_1 %in% "17" ~ 14,
demo_prnt_ed_v2_1 %in% "18" ~ 16,
demo_prnt_ed_v2_1 %in% "19" ~ 18,
demo_prnt_ed_v2_1 %in% "20" ~ 18,
demo_prnt_ed_v2_1 %in% "21" ~ 18,
TRUE ~ as.numeric(edu_1)) # This is for all other values
)

```

```

merged_df$edu_2 <- NA
merged_df= mutate (merged_df,
  edu_2 = case_when(
    demo_prtnr_ed_v2_1 %in% "0" ~ 0,
    demo_prtnr_ed_v2_1 %in% "1" ~ 1,
    demo_prtnr_ed_v2_1 %in% "2" ~ 2,
    demo_prtnr_ed_v2_1 %in% "3" ~ 3,
    demo_prtnr_ed_v2_1 %in% "4" ~ 4,
    demo_prtnr_ed_v2_1 %in% "5" ~ 5,
    demo_prtnr_ed_v2_1 %in% "6" ~ 6,
    demo_prtnr_ed_v2_1 %in% "7" ~ 7,
    demo_prtnr_ed_v2_1 %in% "8" ~ 8,
    demo_prtnr_ed_v2_1 %in% "9" ~ 9,
    demo_prtnr_ed_v2_1 %in% "10" ~ 10,
    demo_prtnr_ed_v2_1 %in% "11" ~ 11,
    demo_prtnr_ed_v2_1 %in% "12" ~ 12,
    demo_prtnr_ed_v2_1 %in% "13" ~ 12,
    demo_prtnr_ed_v2_1 %in% "14" ~ 12,
    demo_prtnr_ed_v2_1 %in% "15" ~ 14,
    demo_prtnr_ed_v2_1 %in% "16" ~ 14,
    demo_prtnr_ed_v2_1 %in% "17" ~ 14,
    demo_prtnr_ed_v2_1 %in% "18" ~ 16,
    demo_prtnr_ed_v2_1 %in% "19" ~ 18,
    demo_prtnr_ed_v2_1 %in% "20" ~ 18,
    demo_prtnr_ed_v2_1 %in% "21" ~ 18,
    TRUE ~ as.numeric(edu_2)) # This is for all other values
)

```

```
describe(merged_df$edu_1)
```

```

##      vars      n mean   sd median trimmed  mad min max range  skew kurtosis
se
## X1      1 9914 15.24 2.29     16   15.43 2.97   1  18   17 -0.78     1.22 0
.02

describe(merged_df$edu_2)

##      vars      n mean   sd median trimmed  mad min max range  skew kurtosis
se
## X1      1 7859 15.04 2.53     16   15.24 2.97   0  18   18 -0.94     1.82 0
.03

merged_df$edu_1_2 <-merged_df$edu_1
merged_df$edu_2_2 <-merged_df$edu_2

merged_df$education_mean <- rowMeans(merged_df[,2492:2493], na.rm=TRUE)
merged_df$edu_average_z= scale(merged_df$education_mean, center = TRUE, scale
= TRUE)
describe(merged_df$edu_average_z)

##      vars      n mean sd median trimmed  mad   min max range  skew kurtosis
se
## X1      1 9922   0  1 -0.02   0.07 0.67 -5.45 1.33  6.78 -0.83     1.22 0
.01

#Marital status

merged_df$marital_status <- NA
merged_df= mutate(merged_df, marital_status
= case_when(
  demo_prnt_marital_v2_1 %in% 1 ~ 1,
  demo_prnt_marital_v2_1 %in% 2 ~ 0,
  demo_prnt_marital_v2_1 %in% 3 ~ 0,
  demo_prnt_marital_v2_1 %in% 4 ~ 0,
  demo_prnt_marital_v2_1 %in% 5 ~ 0,
  demo_prnt_marital_v2_1 %in% 6 ~ 0,
  demo_prnt_marital_v2_1 %in% 7 ~ 0,
  demo_prnt_marital_v2_1 %in% 777 ~ 0,
  TRUE ~ as.numeric(marital_status)) # This is for all o
ther values
)

describe(merged_df$marital_status)

##      vars      n mean   sd median trimmed mad min max range  skew kurtosis se
## X1      1 9939 0.68 0.47     1   0.73  0  0  1   1 -0.79   -1.38 0

```

```

table(merged_df$marital_status)

##
##      0      1
## 3147 6792

#Employed

merged_df$employed_1 <- NA
merged_df= mutate(merged_df, employed_1 = case_when(
  demo_prnt_empl_v2_1 %in% 1 ~ 1,
  demo_prnt_empl_v2_1 %in% 2 ~ 0,
  demo_prnt_empl_v2_1 %in% 3 ~ 0,
  demo_prnt_empl_v2_1 %in% 4 ~ 0,
  demo_prnt_empl_v2_1 %in% 5 ~ 0,
  demo_prnt_empl_v2_1 %in% 6 ~ 0,
  demo_prnt_empl_v2_1 %in% 7 ~ 0,
  demo_prnt_empl_v2_1 %in% 8 ~ 0,
  demo_prnt_empl_v2_1 %in% 9 ~ 0,
  demo_prnt_empl_v2_1 %in% 10 ~ 0,
  demo_prnt_empl_v2_1 %in% 11 ~ 0,
  demo_prnt_empl_v2_1 %in% 777 ~ 0,
  TRUE ~ as.numeric(employed_1)) # This is for all other values
)

merged_df$employed_2 <- NA
merged_df= mutate(merged_df, employed_2 = case_when(
  demo_prtnr_empl_v2_1 %in% 1 ~ 1,
  demo_prtnr_empl_v2_1 %in% 2 ~ 0,
  demo_prtnr_empl_v2_1 %in% 3 ~ 0,
  demo_prtnr_empl_v2_1 %in% 4 ~ 0,
  demo_prtnr_empl_v2_1 %in% 5 ~ 0,
  demo_prtnr_empl_v2_1 %in% 6 ~ 0,
  demo_prtnr_empl_v2_1 %in% 7 ~ 0,
  demo_prtnr_empl_v2_1 %in% 8 ~ 0,
  demo_prtnr_empl_v2_1 %in% 9 ~ 0,
  demo_prtnr_empl_v2_1 %in% 10 ~ 0,
  demo_prtnr_empl_v2_1 %in% 11 ~ 0,
  demo_prtnr_empl_v2_1 %in% 777 ~ 0,
  TRUE ~ as.numeric(employed_2)) # This is for all other values
)

merged_df$employed_sum=rowSums(cbind(merged_df$employed_1, merged_df$employed_2), na.rm = TRUE)
table(merged_df$employed_sum)

```

```

##
##    0    1    2
## 868 3941 5163

merged_df$employed <- NA
merged_df= mutate(merged_df, employed = case_when(
  employed_sum %in% 0 ~ 0,
  employed_sum %in% 1 ~ 1,
  employed_sum %in% 2 ~ 1,
  TRUE ~ as.numeric(employed)) # This is for all other values
)

table(merged_df$employed)

##
##    0    1
## 868 9104

#parental income

merged_df$income <- NA
merged_df= mutate (merged_df,
  income = case_when(
    demo_comb_income_v2 %in% "1" ~ 4500,
    demo_comb_income_v2 %in% "2" ~ 5000,
    demo_comb_income_v2 %in% "3" ~ 12000,
    demo_comb_income_v2 %in% "4" ~ 16000,
    demo_comb_income_v2 %in% "5" ~ 25000,
    demo_comb_income_v2 %in% "6" ~ 35000,
    demo_comb_income_v2 %in% "7" ~ 50000,
    demo_comb_income_v2 %in% "8" ~ 75000,
    demo_comb_income_v2 %in% "9" ~ 100000,
    demo_comb_income_v2 %in% "10" ~ 200000,
    TRUE ~ as.numeric(income)) # This is for all other values
)

merged_df$income_z= scale(merged_df$income, center = TRUE, scale = TRUE)
describe(merged_df$income_z)

##   vars    n mean sd median trimmed  mad   min  max range skew kurtosis
## X1     1 9204   0  1  -0.08  -0.11 0.68 -1.37 2.21  3.58  0.9    0.33 0.
## 01

#create "parent objective SES" factor: edu_average + income + marital_status
+ employed_tot

#descriptives

```

```

describe(merged_df$sub_SES_Z)
##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis
se
## X1      1 9876    0  1  0.41   0.27  0 -6.04 0.41  6.45 -2.93    9.08 0.
01

describe(merged_df$reshist_weighted_Z)
##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis
se
## X1      1 9972    0  1  0.23   0.09 0.99 -2.25 1.32  3.56 -0.64   -0.61 0
.01

describe(merged_df$nsc_p_ss_mean_3_items_z)
##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis
se
## X1      1 9968    0  1  0.09   0.12 1.03 -3.04 1.13  4.16 -0.91    0.44 0
.01

describe(merged_df$edu_average_z)
##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis
se
## X1      1 9922    0  1 -0.02   0.07 0.67 -5.45 1.33  6.78 -0.83    1.22 0
.01

describe(merged_df$income_z)
##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis
se
## X1      1 9204    0  1 -0.08  -0.11 0.68 -1.37 2.21  3.58  0.9    0.33 0.
01

describe(merged_df$marital_status)
##      vars      n mean  sd median trimmed mad min max range  skew kurtosis se
## X1      1 9939 0.68 0.47    1  0.73  0  0  1  1 -0.79   -1.38 0

describe(merged_df$employed)
##      vars      n mean  sd median trimmed mad min max range  skew kurtosis se
## X1      1 9972 0.91 0.28    1    1  0  0  1  1 -2.93    6.58 0

describe(merged_df$CA_Z_adj)
##      vars      n mean sd median trimmed mad   min  max range  skew kurtosis  s
e
## X1      1 9972    0  1 -0.04  -0.02 0.96 -3.9 5.59  9.49 0.29    0.34 0.0
1

```

```
#subset to cases with CA
```

```
merged_dfs_CA_Z<-subset(merged_df,!merged_df$CA_Z_adj=="NA")  
merged_df <- merged_dfs_CA_Z
```

```
#Create general SES based on neighborhood, personal, and subjective alternative
```

```
df_general_SES_alt=data.frame(merged_df$subjectkey, merged_df$sub_SES_Z, merged_df$reshist_weighted_Z, merged_df$nsc_p_ss_mean_3_items_z, merged_df$edu_average_z, merged_df$income_z, merged_df$marital_status, merged_df$employed)  
df.imputed_general_SES_alt=mice(df_general_SES_alt, m=5, maxit = 50, method = 'pmm', seed = 500)
```

```
##
```

```
## iter imp variable
```

```
## 1 1 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 1 2 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 1 3 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 1 4 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 1 5 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 2 1 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 2 2 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 2 3 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 2 4 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 2 5 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 3 1 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 3 2 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 3 3 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 3 4 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 3 5 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 4 1 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status  
## 4 2 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_df.edu_average_z merged_df.income_z merged_df.marital_status
```



```

## 49 3 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status
## 49 4 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status
## 49 5 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status
## 50 1 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status
## 50 2 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status
## 50 3 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status
## 50 4 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status
## 50 5 merged_df.sub_SES_Z merged_df.nsc_p_ss_mean_3_items_z merged_d
f.edu_average_z merged_df.income_z merged_df.marital_status

## Warning: Number of logged events: 1

completeData_general_SES_alt <- complete(df.imputed_general_SES_alt,2)

#rescale

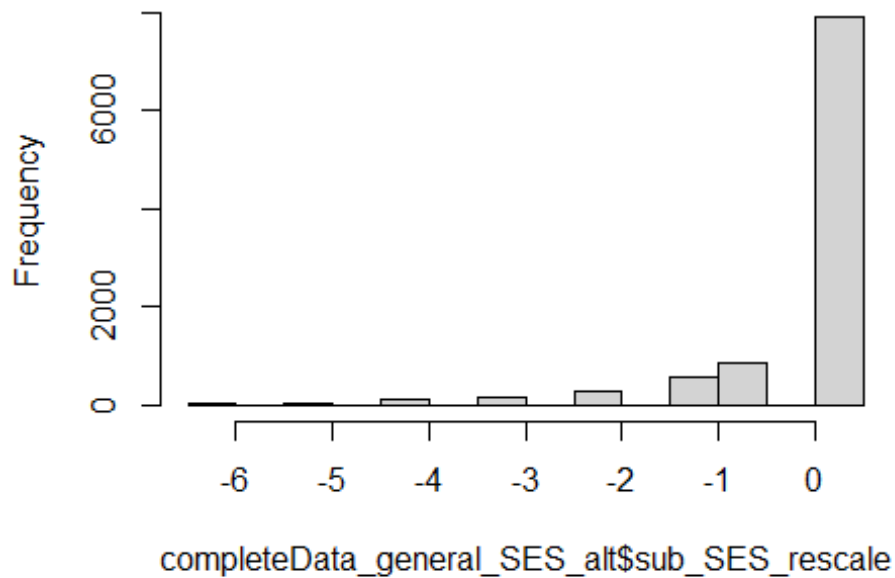
completeData_general_SES_alt$sub_SES_rescale= scale(completeData_general_SES_
alt$merged_df.sub_SES_Z, center = TRUE, scale = TRUE)
describe(completeData_general_SES_alt$sub_SES_rescale)

## vars n mean sd median trimmed mad min max range skew kurtosis se
## X1 1 9972 0 1 0.42 0.27 0 -6 0.42 6.42 -2.91 8.96 0.01

hist(completeData_general_SES_alt$sub_SES_rescale)

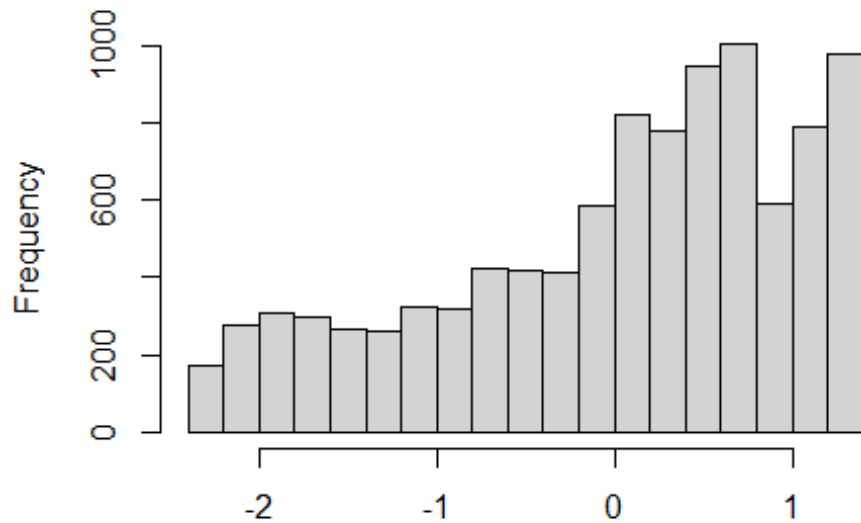
```


ogram of completeData_general_SES_alt\$sub_SES_



```
completeData_general_SES_alt$reshist_weighted_rescale= scale(completeData_gen  
eral_SES_alt$merged_df.reshist_weighted_Z, center = TRUE, scale = TRUE)  
describe(completeData_general_SES_alt$reshist_weighted_rescale)  
## vars n mean sd median trimmed mad min max range skew kurtosis  
se  
## X1 1 9972 0 1 0.23 0.09 0.99 -2.25 1.32 3.56 -0.64 -0.61 0  
.01  
hist(completeData_general_SES_alt$reshist_weighted_rescale)
```

am of completeData_general_SES_alt\$reshist_weigh



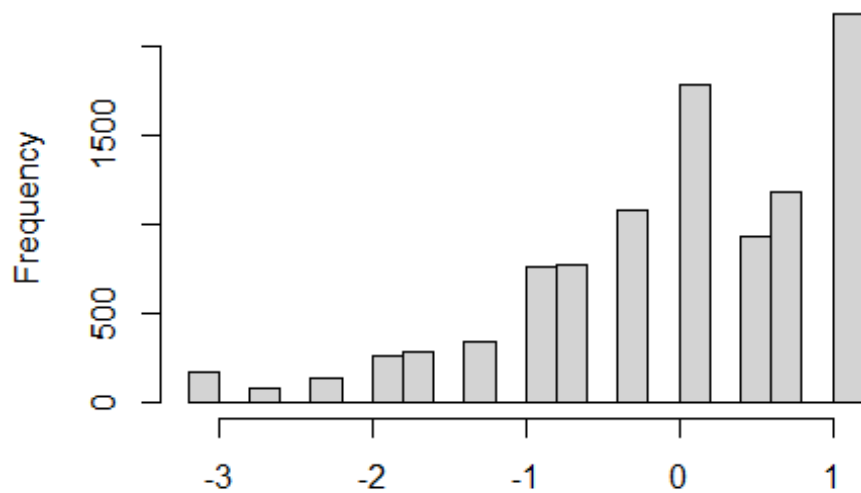
completeData_general_SES_alt\$reshist_weighted_rescale

```
completeData_general_SES_alt$nsc_p_ss_mean_3_items_rescale= scale(completeDat
a_general_SES_alt$merged_df.nsc_p_ss_mean_3_items_z, center = TRUE, scale = T
RUE)
describe(completeData_general_SES_alt$nsc_p_ss_mean_3_items_rescale)

##   vars    n mean sd median trimmed  mad   min  max range  skew kurtosis
se
## X1     1 9972   0  1  0.09   0.12 1.03 -3.04 1.13  4.16 -0.91   0.44 0
.01

hist(completeData_general_SES_alt$nsc_p_ss_mean_3_items_rescale)
```

```
f completeData_general_SES_alt$nsc_p_ss_mean_3
```



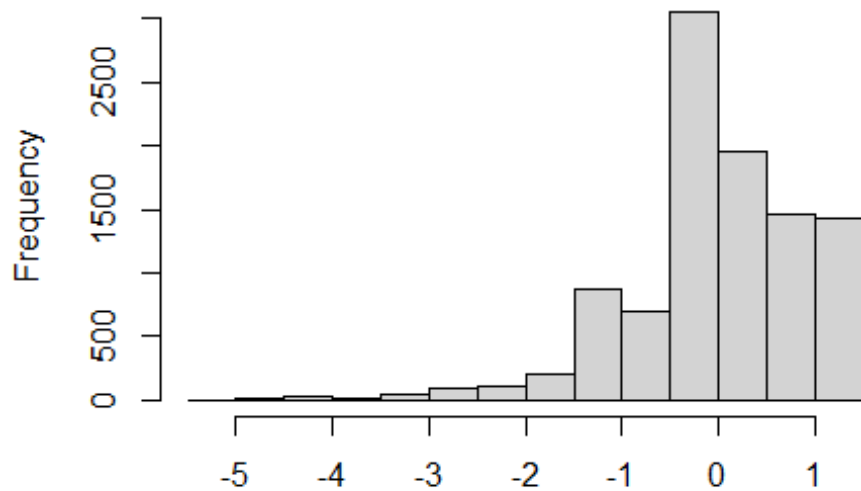
```
completeData_general_SES_alt$nsc_p_ss_mean_3_items_rescaled
```

```
completeData_general_SES_alt$edu_average_rescale= scale(completeData_general_
SES_alt$merged_df.edu_average_z, center = TRUE, scale = TRUE)
describe(completeData_general_SES_alt$edu_average_rescale)

##    vars      n mean sd median trimmed mad   min  max range  skew kurtosis
se
## X1      1 9972   0  1 -0.02  0.07 0.67 -5.45 1.33  6.78 -0.82   1.21 0
.01

hist(completeData_general_SES_alt$edu_average_rescale)
```

gram of completeData_general_SES_alt\$edu_averag



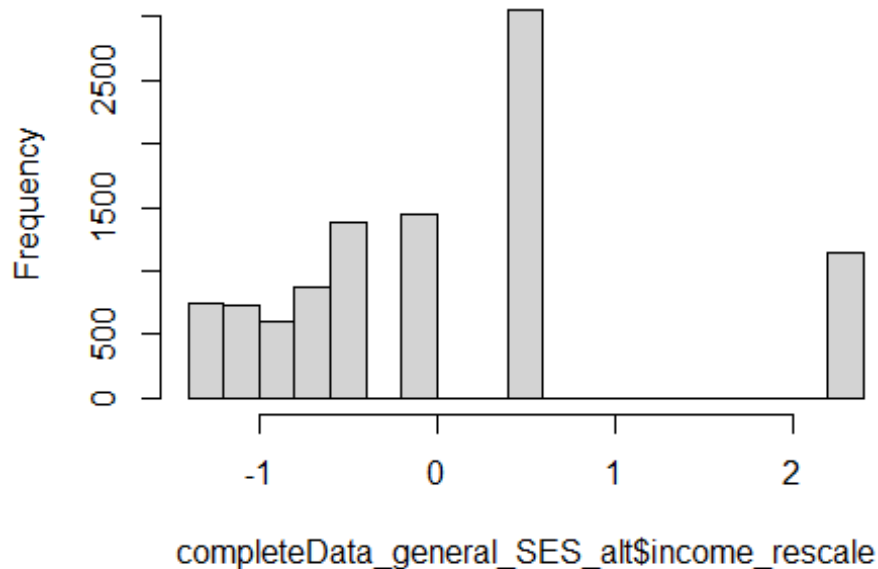
completeData_general_SES_alt\$edu_averag_rescale

```
completeData_general_SES_alt$income_rescale= scale(completeData_general_SES_a
lt$merged_df.income_z, center = TRUE, scale = TRUE)
describe(completeData_general_SES_alt$income_rescale)

##   vars    n mean sd median trimmed mad   min  max range skew kurtosis
se
## X1     1 9972   0  1 -0.04  -0.12 0.68 -1.34 2.25  3.58 0.92    0.37 0.
01

hist(completeData_general_SES_alt$income_rescale)
```

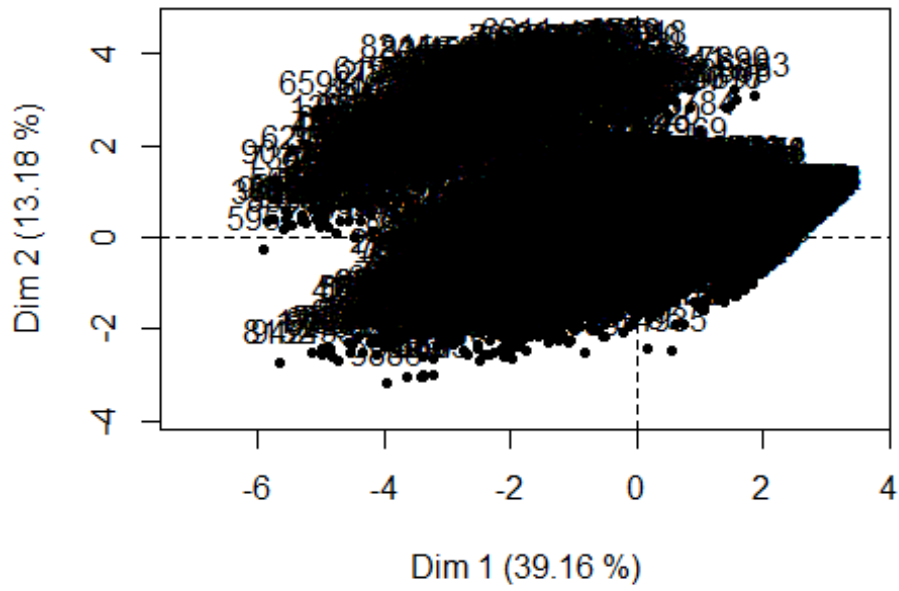
Histogram of completeData_general_SES_alt\$income_1



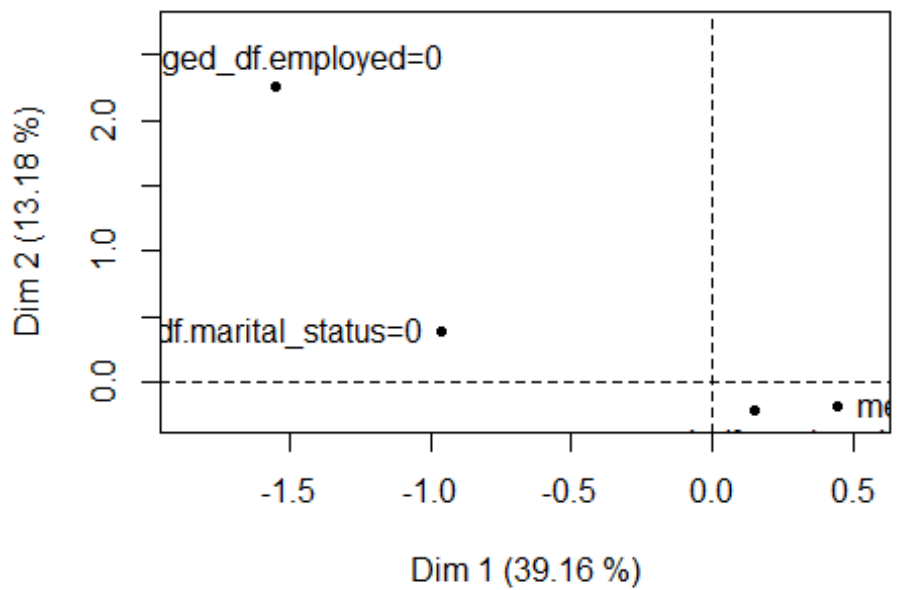
```
completeData_general_SES_alt_no_subject_key <- completeData_general_SES_alt[,
-c(1,2,3,4,5,6)]
apa.cor.table(completeData_general_SES_alt_no_subject_key, filename="APA_SES_
full_Connor.doc", table.number=1)
```

```
##
##
## Table 1
##
## Means, standard deviations, and correlations with confidence intervals
##
##
## Variable M SD 1 2 3
## 1. merged_df.marital_status 0.68 0.47
##
## 2. merged_df.employed 0.91 0.28 .28**
## [.27, .30]
##
## 3. sub_SES_rescale -0.00 1.00 .27** .16**
## [.25, .29] [.14, .18]
##
## 4. reshist_weighted_rescale 0.00 1.00 .23** .13** .21**
## [.21, .25] [.11, .15] [.19,
.23]
##
## 5. nsc_p_ss_mean_3_items_rescale -0.00 1.00 .23** .15** .24**
## [.21, .25] [.13, .17] [.22,
```

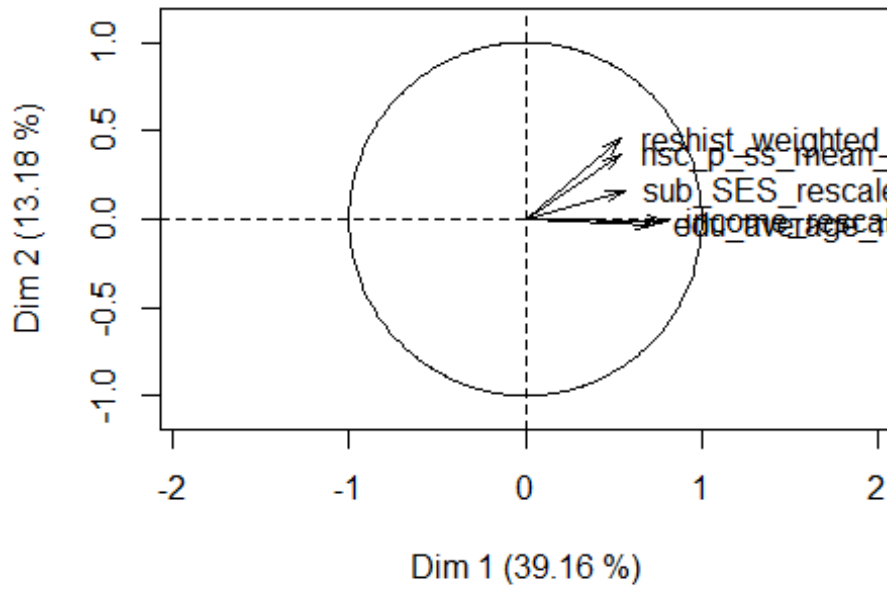

Individuals component map



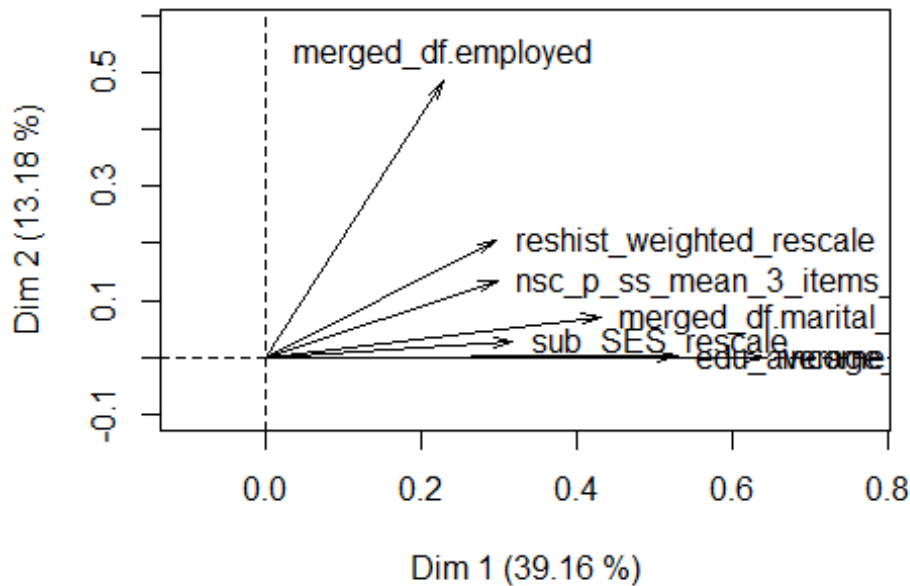
Levels component map



Correlation circle



Squared loadings



```
# SES_factor_scores -----  
#fit_PCAmix$ind$coord #factor (component) scores  
fit_PCAmix$eig #eigenvalues and % variance explained by each component
```



```
##      Eigenvalue Proportion Cumulative
## dim 1  2.7413510  39.162157  39.16216
## dim 2  0.9223616  13.176594  52.33875
## dim 3  0.7848404  11.212005  63.55076
## dim 4  0.7673274  10.961820  74.51258
## dim 5  0.7162696  10.232423  84.74500
## dim 6  0.6693712   9.562446  94.30745
## dim 7  0.3984788   5.692554 100.00000
```

```
fit_PCAmix$loadings #factor(component) Loadings
```

```
##          dim 1      dim 2      dim 3      d
im 4
## sub_SES_rescale      0.3174741 2.667689e-02 0.5208302181 1.484611
e-09
## reshist_weighted_rescale      0.2959331 2.043658e-01 0.2164826317 3.820776
e-02
## nsc_p_ss_mean_3_items_rescale      0.2982979 1.353574e-01 0.0036273894 5.065040
e-01
## edu_average_rescale      0.5288097 1.188647e-03 0.0058096501 4.025448
e-02
## income_rescale      0.6405717 5.607137e-05 0.0004570532 5.581240
e-02
## merged_df.marital_status      0.4305694 7.061298e-02 0.0037420828 2.373145
e-02
## merged_df.employed      0.2296951 4.841038e-01 0.0338913475 1.028173
e-01
##          dim 5
## sub_SES_rescale      0.113996241
## reshist_weighted_rescale      0.242501427
## nsc_p_ss_mean_3_items_rescale      0.043499265
## edu_average_rescale      0.151357719
## income_rescale      0.058355170
## merged_df.marital_status      0.001279327
## merged_df.employed      0.105280447
```

```
# SES_factor_scores -----
```

```
general_ses_fact_alt_PCA= fit_PCAmix$ind$coord[,1]
describe(general_ses_fact_alt_PCA)
```

```
## vars  n mean  sd median trimmed mad  min  max range  skew kurtosis
se
## X1    1 9972   0 1.66  0.34  0.12 1.59 -5.91 2.98  8.89 -0.66  -0.09
0.02
```

```
completeData_general_SES_alt$general_ses_PCA_z= scale(general_ses_fact_alt_PC
A, center = TRUE, scale = TRUE)
describe(completeData_general_SES_alt$general_ses_PCA_z)
```

```

##      vars      n mean sd median trimmed  mad   min max range  skew kurtosis se
## X1      1 9972    0  1    0.2    0.07 0.96 -3.57 1.8  5.37 -0.66   -0.09 0.
01

general_ses_PCA_z <- c("merged_df.marital_status", "merged_df.employed", "sub
_SES_rescale", "reshist_weighted_rescale", "nsc_p_ss_mean_3_items_rescale", "
edu_average_rescale", "income_rescale", "general_ses_PCA_z", "merged_df.subjec
tkey")
general_ses_PCA_z_df <- completeData_general_SES_alt[general_ses_PCA_z]
merged_df=merge(merged_df, general_ses_PCA_z_df, by.x="subjectkey", by.y= "me
rged_df.subjectkey", all=T)

# SES correlations

SES_correlations <- merged_df[,c(2505,2506,2507,2508,2509,2503,2504,2510)]
#apa.cor.table(SES_correlations, filename="APA_SES_full_Connor.doc", table.nu
mber=1)

#Kink variable

merged_df$African0_.9 <- ifelse(merged_df$African >= .9, "1", ifelse(merged_d
f$African < .9, "0", NA))
merged_df$African0_.9_num <- as.numeric(merged_df$African0_.9)
merged_df$upper_kink <- merged_df$African0_.9_num*merged_df$African
summary(merged_df$upper_kink)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.00000 0.00000 0.00000 0.01397 0.00000 0.99996

describe(merged_df$upper_kink)

##      vars      n mean  sd median trimmed  mad  min max range  skew kurtosis se
## X1      1 9972 0.01 0.11    0        0  0  0  1    1  8.01   62.22  0

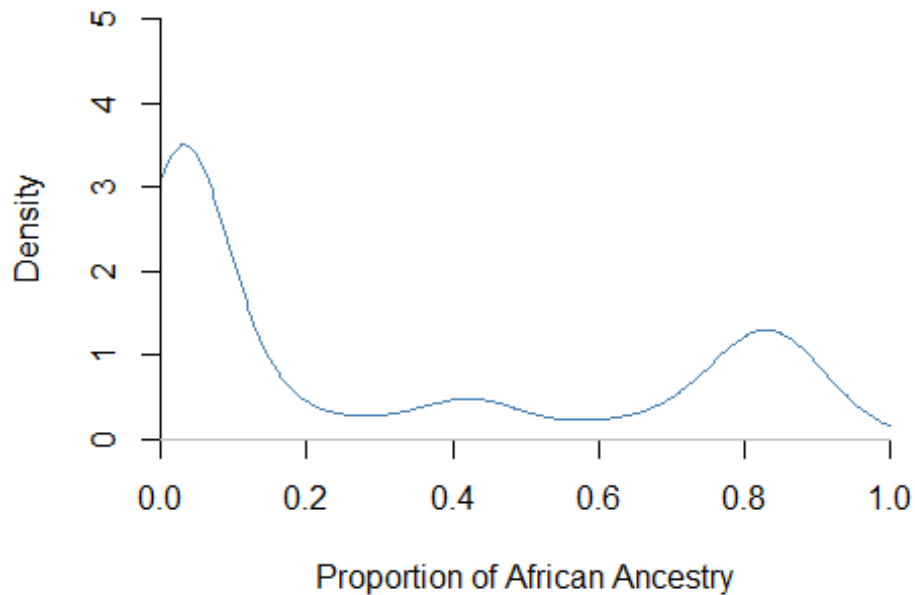
#Desnisty Plots_AA
merged_df_African_ancestry005 = filter(merged_df, African >=.005)
dens_African_ancestry005 <- density(merged_df_African_ancestry005$African)

# plot density_AA

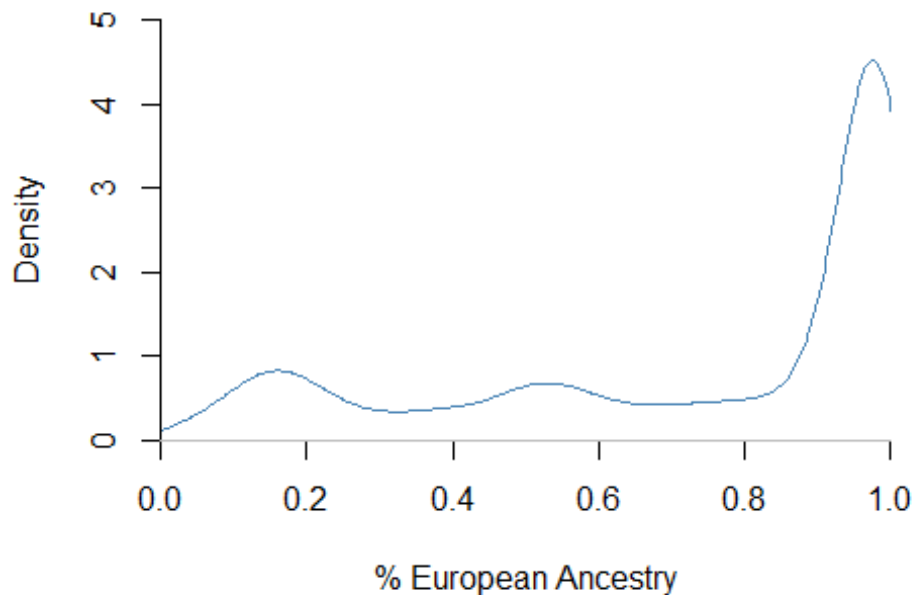
plot(dens_African_ancestry005, frame = FALSE, col = "steelblue",
     main = "",
     xlab="Proportion of African Ancestry",
     xlim=c(0,1),

```

```
ylim=c(0,5),  
xaxs="i",  
yaxs="i")
```



```
#Density Plots_EA  
merged_df_European_ancestry005 = filter(merged_df, European >=.005)  
dens_European_ancestry005 <- density(merged_df_European_ancestry005$European)  
  
# plot density_EA  
  
plot(dens_European_ancestry005, frame = FALSE, col = "steelblue",  
      main = "",  
      xlab="% European Ancestry",  
      xlim=c(0,1),  
      ylim=c(0,5),  
      xaxs="i",  
      yaxs="i")
```



```

#npplreg analysis

#library(np)

#bw <- npplregbw(formula=CA_Z_adj ~ South_Asian + Amerindian + East_Asian + f
rac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
#
#          frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispani
c_SIRE | African, merged_df)

#summary(bw)
#pl <- npplreg(bws=bw, residuals=TRUE)
#summary(pl)
#coef(pl)
#coef(pl, errors = TRUE)
#summary(pl$resid)
#describe(pl$resid)

#par(mar = rep(3, 5))
#plot(pl$resid)

#merged_df$CA_Z_adj_hat <- 0.7376529*merged_df$South_Asian - 1.191356*merged_
df$Amerindian + 0.6923586*merged_df$East_Asian -0.1288999*merged_df$frac_Blac
k_SIRE -0.1368878*merged_df$frac_EastAsian_SIRE + 0.1523298*merged_df$frac_So
uthAsian_SIRE -0.2577826*merged_df$frac_Native_American_SIRE -0.07611056*merg

```

```

ed_df$frac_Other_SIRE -0.1202465*merged_df$frac_Hispanic_SIRE
#merged_df$CA_Z_adj_sub <- (merged_df$CA_Z_adj - merged_df$CA_Z_adj_hat) -.26
20
#bw2 <- npregbw(formula=merged_df$CA_Z_adj_sub ~ merged_df$African)

#summary(bw2)
#plot(npreg(bw2),xlim=c(0,1), ylim=c(-1,0), xaxs="i", xlab="Proportion of Afr
ican Ancestry", ylab="Test Scores")
#par(new=TRUE)
# create pairs of data points
#x = c(0,1)
#y = c(0,-1.00136)
# Create a normal plot
#plot(x, y,type="l", xlim=c(0,1), ylim=c(-1,0),
#      xlab="Proportion of African Ancestry", ylab="Test Scores")

# AA Deciles

merged_df_African_interval1 = filter(merged_df, African >=.0000 & African <.0
005)
describe(merged_df_African_interval1$African)

##      vars      n mean sd median trimmed mad min max range skew kurtosis se
## X1      1 4622   0  0      0      0  0  0  0  0  16.91  307.58  0

merged_df_African_interval2 = filter(merged_df, African >= .0005 & African <
.1 )
describe(merged_df_African_interval2$African)

##      vars      n mean  sd median trimmed mad min max range skew kurtosis se
## X1      1 2935 0.03 0.02  0.02  0.03 0.02  0 0.1  0.1 1.02  0.14  0

merged_df_African_interval3 = filter(merged_df, African >= .1 & African < .2
)
describe(merged_df_African_interval3$African)

##      vars      n mean  sd median trimmed mad min max range skew kurtosis se
## X1      1 286 0.14 0.03  0.14  0.14 0.03 0.1 0.2  0.1 0.34  -1.02  0

merged_df_African_interval4 = filter(merged_df, African >= .2 & African < .3
)
describe(merged_df_African_interval4$African)

##      vars      n mean  sd median trimmed mad min max range skew kurtosis se
## X1      1 125 0.24 0.03  0.24  0.24 0.04 0.2 0.3  0.1 0.27  -1.16  0

merged_df_African_interval5 = filter(merged_df, African >= .3 & African < .4
)
describe(merged_df_African_interval5$African)

```

```

##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis se
## X1      1 165 0.36 0.03   0.36   0.36 0.04 0.3 0.4   0.1 -0.29   -1.35  0

merged_df_African_interval6 = filter(merged_df, African >= .4 & African < .5
)
describe(merged_df_African_interval6$African)

##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis se
## X1      1 279 0.44 0.03   0.44   0.44 0.03 0.4 0.5   0.1 0.51   -0.68  0

merged_df_African_interval7 = filter(merged_df, African >= .5 & African < .6
)
describe(merged_df_African_interval7$African)

##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis se
## X1      1  88 0.55 0.03   0.56   0.55 0.04 0.5 0.6   0.1 -0.17   -1.42  0

merged_df_African_interval8 = filter(merged_df, African >= .6 & African < .7
)
describe(merged_df_African_interval8$African)

##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis se
## X1      1 130 0.65 0.03   0.65   0.65 0.04 0.6 0.7   0.1 -0.13   -1.31  0

merged_df_African_interval9 = filter(merged_df, African >= .7 & African < .8
)
describe(merged_df_African_interval9$African)

##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis se
## X1      1 406 0.76 0.03   0.77   0.77 0.03 0.7 0.8   0.1 -0.61   -0.74  0

merged_df_African_interval10 = filter(merged_df, African >= .8 & African < .9
)
describe(merged_df_African_interval10$African)

##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis se
## X1      1 787 0.85 0.03   0.84   0.85 0.03 0.8 0.9   0.1 0.11   -1.07  0

merged_df_African_interval11 = filter(merged_df, African >= .9 & African < .9
95 )
describe(merged_df_African_interval11$African)

##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis se
## X1      1 137 0.93 0.02   0.92   0.93 0.02 0.9 0.99 0.09 1.03   0.28  0

merged_df_African_interval12 = filter(merged_df, African >= .995 & African <=
1 )
describe(merged_df_African_interval12$African)

##      vars   n mean sd median trimmed mad min max range skew kurtosis se
## X1      1  12   1  0     1     1  0  1  1     0 NaN      NaN  0

```

European Deciles

```
merged_df_Eur_interval1 = filter(merged_df, European >=.0000 & European <.0005)  
describe(merged_df_Eur_interval1$European)
```

```
##   vars  n mean sd median trimmed mad min max range skew kurtosis se  
## X1    1 15  0  0    0        0  0  0  0    0 NaN      NaN  0
```

```
merged_df_Eur_interval2 = filter(merged_df, European >= .0005 & European < .1)  
)  
describe(merged_df_Eur_interval2$European)
```

```
##   vars  n mean  sd median trimmed mad min max range skew kurtosis se  
## X1    1 283 0.06 0.03  0.07    0.06 0.03  0 0.1  0.1 -0.33  -1.1  0
```

```
merged_df_Eur_interval3 = filter(merged_df, European >= .1 & European < .2 )  
describe(merged_df_Eur_interval3$European)
```

```
##   vars  n mean  sd median trimmed mad min max range skew kurtosis se  
## X1    1 908 0.15 0.03  0.15    0.15 0.03 0.1 0.2  0.1 -0.07  -1.11  0
```

```
merged_df_Eur_interval4 = filter(merged_df, European >= .2 & European < .3 )  
describe(merged_df_Eur_interval4$European)
```

```
##   vars  n mean  sd median trimmed mad min max range skew kurtosis se  
## X1    1 425 0.24 0.03  0.24    0.24 0.03 0.2 0.3  0.1 0.43  -1.01  0
```

```
merged_df_Eur_interval5 = filter(merged_df, European >= .3 & European < .4 )  
describe(merged_df_Eur_interval5$European)
```

```
##   vars  n mean  sd median trimmed mad min max range skew kurtosis se  
## X1    1 346 0.35 0.03  0.36    0.35 0.04 0.3 0.4  0.1 -0.19  -1.21  0
```

```
merged_df_Eur_interval6 = filter(merged_df, European >= .4 & European < .5 )  
describe(merged_df_Eur_interval6$European)
```

```
##   vars  n mean  sd median trimmed mad min max range skew kurtosis se  
## X1    1 461 0.46 0.03  0.46    0.46 0.04 0.4 0.5  0.1 -0.29  -1.27  0
```

```
merged_df_Eur_interval7 = filter(merged_df, European >= .5 & European < .6 )  
describe(merged_df_Eur_interval7$European)
```

```
##   vars  n mean  sd median trimmed mad min max range skew kurtosis se  
## X1    1 700 0.55 0.03  0.55    0.54 0.04 0.5 0.6  0.1 0.11  -1.22  0
```

```
merged_df_Eur_interval8 = filter(merged_df, European >= .6 & European < .7 )  
describe(merged_df_Eur_interval8$European)
```

```
##   vars  n mean  sd median trimmed mad min max range skew kurtosis se  
## X1    1 406 0.65 0.03  0.65    0.65 0.04 0.6 0.7  0.1 0.01  -1.33  0
```

```

merged_df_Eur_interval9 = filter(merged_df, European >= .7 & European < .8 )
describe(merged_df_Eur_interval9$European)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 462 0.75 0.03  0.75    0.75 0.04 0.7 0.8  0.1 -0.1    -1.2  0

merged_df_Eur_interval10 = filter(merged_df, European >= .8 & European < .9 )
describe(merged_df_Eur_interval10$European)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 514 0.86 0.03  0.86    0.86 0.04 0.8 0.9  0.1 -0.24   -1.18  0

merged_df_Eur_interval11 = filter(merged_df, European >= .9 & European < .995
)
describe(merged_df_Eur_interval11$European)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 5113 0.97 0.02  0.98    0.98 0.01 0.9 0.99 0.09 -1.51    2.03
##      0

merged_df_Eur_interval12 = filter(merged_df, European >= .995 & European <= 1
)
describe(merged_df_Eur_interval12$European)

##      vars      n mean sd median trimmed  mad min max range skew kurtosis se
## X1      1 339  1 0  1  1  0  1  1  0 -0.03  -1.55  0

# East Asian Deciles

merged_df_East_Asian_interval1 = filter(merged_df, East_Asian >=.0000 & East_
Asian <.0005)
describe(merged_df_East_Asian_interval1$East_Asian)

##      vars      n mean sd median trimmed  mad min max range skew kurtosis se
## X1      1 6230  0 0  0  0  0  0  0  0  0 9.54  94.64  0

merged_df_East_Asian_interval2 = filter(merged_df, East_Asian >= .0005 & East
_Asian < .1 )
describe(merged_df_East_Asian_interval2$East_Asian)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 3225 0.01 0.01  0.01    0.01 0.01  0 0.1  0.1 3.65    18.5  0

merged_df_East_Asian_interval3 = filter(merged_df, East_Asian >= .1 & East_A
sian < .2 )
describe(merged_df_East_Asian_interval3$East_Asian)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 74 0.15 0.03  0.15    0.15 0.04 0.1 0.2  0.1 0.15   -1.34  0

```



```

merged_df_East_Asian_interval4 = filter(merged_df, East_Asian >= .2 & East_Asian < .3 )
describe(merged_df_East_Asian_interval4$East_Asian)

##      vars  n mean   sd median trimmed  mad  min  max range skew kurtosis  se
## X1      1 84 0.24 0.02  0.24   0.24 0.02 0.21 0.3  0.09 0.34   -0.4 0

merged_df_East_Asian_interval5 = filter(merged_df, East_Asian >= .3 & East_Asian < .4 )
describe(merged_df_East_Asian_interval5$East_Asian)

##      vars  n mean   sd median trimmed  mad  min  max range skew kurtosis  se
## X1      1 20 0.34 0.03  0.34   0.34 0.03 0.3 0.39  0.09 0.37   -1.37 0.01

merged_df_East_Asian_interval6 = filter(merged_df, East_Asian >= .4 & East_Asian < .5 )
describe(merged_df_East_Asian_interval6$East_Asian)

##      vars  n mean   sd median trimmed  mad  min  max range skew kurtosis  se
## X1      1 225 0.47 0.02  0.48   0.48 0.02 0.4 0.5  0.1 -1.21   1.32 0

merged_df_East_Asian_interval7 = filter(merged_df, East_Asian >= .5 & East_Asian < .6 )
describe(merged_df_East_Asian_interval7$East_Asian)

##      vars  n mean   sd median trimmed  mad  min  max range skew kurtosis  se
## X1      1 18 0.51 0.02  0.5   0.51 0 0.5 0.57  0.07 2.22   3.27 0.01

merged_df_East_Asian_interval8 = filter(merged_df, East_Asian >= .6 & East_Asian < .7 )
describe(merged_df_East_Asian_interval8$East_Asian)

##      vars n mean   sd median trimmed  mad  min  max range skew kurtosis  s
## X1      1 4 0.65 0.03  0.66   0.65 0.02 0.61 0.68  0.07 -0.57   -1.8 0.0
2

merged_df_East_Asian_interval9 = filter(merged_df, East_Asian >= .7 & East_Asian < .8 )
describe(merged_df_East_Asian_interval9$East_Asian)

##      vars n mean   sd median trimmed  mad  min  max range skew kurtosis  se
## X1      1 8 0.75 0.02  0.75   0.75 0.03 0.72 0.78  0.05 0.21   -1.79 0.01

merged_df_East_Asian_interval10 = filter(merged_df, East_Asian >= .8 & East_Asian < .9 )
describe(merged_df_East_Asian_interval10$East_Asian)

##      vars  n mean   sd median trimmed  mad  min  max range skew kurtosis  se
## X1      1 10 0.87 0.03  0.88   0.87 0.02 0.8 0.9  0.1 -1.01   -0.04 0.01

```

```

merged_df_East_Asian_interval11 = filter(merged_df, East_Asian >= .9 & East_A
sian < .995 )
describe(merged_df_East_Asian_interval11$East_Asian)

##      vars  n mean   sd median trimmed  mad min  max range  skew kurtosis se
## X1      1 74 0.95 0.02  0.96    0.95 0.02 0.91 0.98  0.08 -0.57   -1.12  0

merged_df_East_Asian_interval12 = filter(merged_df, East_Asian >= .995 & East
_Asian <= 1 )
describe(merged_df_East_Asian_interval12$East_Asian)

## Warning in min(x, na.rm = na.rm): no non-missing arguments to min; returni
ng Inf

## Warning in max(x, na.rm = na.rm): no non-missing arguments to max; returni
ng
## -Inf

##      vars n mean sd median trimmed mad min  max range skew kurtosis se
## X1      1 0 NaN NA      NA      NaN NA Inf -Inf -Inf  NA      NA NA

# Amerindian Deciles

merged_df_Amerindian_interval1 = filter(merged_df, Amerindian >=.0000 & Ameri
ndian <.0005)
describe(merged_df_Amerindian_interval1$Amerindian)

##      vars      n mean sd median trimmed mad min max range skew kurtosis se
## X1      1 1229  0 0  0  0  0  0  0  0  0  4.15  16.62  0

merged_df_Amerindian_interval2 = filter(merged_df, Amerindian >= .0005 & Amer
indian < .1 )
describe(merged_df_Amerindian_interval2$Amerindian)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 7135 0.01 0.02  0.01    0.01 0.01  0 0.1  0.1 3.09   10.57  0

merged_df_Amerindian_interval3 = filter(merged_df, Amerindian >= .1 & Amerind
ian < .2 )
describe(merged_df_Amerindian_interval3$Amerindian)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 443 0.15 0.03  0.15    0.15 0.04 0.1 0.2  0.1 0.12   -1.12  0

merged_df_Amerindian_interval4 = filter(merged_df, Amerindian >= .2 & Amerind
ian < .3 )
describe(merged_df_Amerindian_interval4$Amerindian)

##      vars      n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 329 0.25 0.03  0.25    0.25 0.03 0.2 0.3  0.1 0.12   -1.11  0

```

```

merged_df_Amerindian_interval5 = filter(merged_df, Amerindian >= .3 & Amerindian < .4 )
describe(merged_df_Amerindian_interval5$Amerindian)

##      vars   n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 301 0.35 0.03  0.35    0.35 0.04 0.3 0.4   0.1 -0.1   -1.15 0

merged_df_Amerindian_interval6 = filter(merged_df, Amerindian >= .4 & Amerindian < .5 )
describe(merged_df_Amerindian_interval6$Amerindian)

##      vars   n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 282 0.44 0.03  0.44    0.44 0.03 0.4 0.5   0.1 0.26   -1.14 0

merged_df_Amerindian_interval7 = filter(merged_df, Amerindian >= .5 & Amerindian < .6 )
describe(merged_df_Amerindian_interval7$Amerindian)

##      vars   n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1 156 0.54 0.03  0.54    0.54 0.03 0.5 0.6   0.1 0.32   -0.96 0

merged_df_Amerindian_interval8 = filter(merged_df, Amerindian >= .6 & Amerindian < .7 )
describe(merged_df_Amerindian_interval8$Amerindian)

##      vars   n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1  75 0.65 0.03  0.65    0.65 0.04 0.6 0.7   0.1 0.15   -1.21 0

merged_df_Amerindian_interval9 = filter(merged_df, Amerindian >= .7 & Amerindian < .8 )
describe(merged_df_Amerindian_interval9$Amerindian)

##      vars   n mean   sd median trimmed  mad min max range skew kurtosis se
## X1      1  18 0.72 0.02  0.71    0.72 0.01 0.7 0.77  0.06 0.89   -0.14 0

merged_df_Amerindian_interval10 = filter(merged_df, Amerindian >= .8 & Amerindian < .9 )
describe(merged_df_Amerindian_interval10$Amerindian)

## Warning in min(x, na.rm = na.rm): no non-missing arguments to min; returning Inf

## Warning in min(x, na.rm = na.rm): no non-missing arguments to max; returning -Inf
## -Inf

##      vars n mean sd median trimmed mad min max range skew kurtosis se
## X1      1 0 NaN NA      NA      NaN NA Inf -Inf -Inf  NA      NA NA

merged_df_Amerindian_interval11 = filter(merged_df, Amerindian >= .9 & Amerindian < .995 )
describe(merged_df_Amerindian_interval11$Amerindian)

```

```

##   vars n mean  sd median trimmed  mad min  max range  skew kurtosis  se
## X1   1 4 0.96 0.03  0.96    0.96 0.03 0.92 0.98  0.06 -0.11   -2.24 0.0
1

merged_df_Amerindian_interval12 = filter(merged_df, Amerindian >= .995 & Amer
indian <= 1 )
describe(merged_df_Amerindian_interval12$Amerindian)

## Warning in min(x, na.rm = na.rm): no non-missing arguments to min; returni
ng Inf

## Warning in min(x, na.rm = na.rm): no non-missing arguments to max; returni
ng
## -Inf

##   vars n mean  sd median trimmed  mad min  max range  skew kurtosis  se
## X1   1 0 NaN NA    NA    NaN NA Inf -Inf -Inf  NA    NA NA

# South_Asian Deciles

merged_df_South_Asian_interval1 = filter(merged_df, South_Asian >=.0000 & Sou
th_Asian <.0005)
describe(merged_df_South_Asian_interval1$South_Asian)

##   vars  n mean  sd median trimmed  mad min  max range  skew kurtosis  se
## X1   1 5414  0  0    0    0  0  0  0  0  8.93  83.29  0

merged_df_South_Asian_interval2 = filter(merged_df, South_Asian >= .0005 & So
uth_Asian < .1 )
describe(merged_df_South_Asian_interval2$South_Asian)

##   vars  n mean  sd median trimmed  mad min  max range  skew kurtosis  se
## X1   1 4382 0.02 0.02  0.01    0.01 0.01  0 0.1  0.1 1.97   4.38  0

merged_df_South_Asian_interval3 = filter(merged_df, South_Asian >= .1 & South
_Asian < .2 )
describe(merged_df_South_Asian_interval3$South_Asian)

##   vars  n mean  sd median trimmed  mad min  max range  skew kurtosis  se
## X1   1 55 0.14 0.03  0.13    0.14 0.04 0.1 0.2  0.1 0.28   -1.52  0

merged_df_South_Asian_interval4 = filter(merged_df, South_Asian >= .2 & South
_Asian < .3 )
describe(merged_df_South_Asian_interval4$South_Asian)

##   vars  n mean  sd median trimmed  mad min  max range  skew kurtosis  se
## X1   1 30 0.24 0.03  0.24    0.24 0.02 0.2 0.3  0.09 0.68   -0.52  0

merged_df_South_Asian_interval5 = filter(merged_df, South_Asian >= .3 & South
_Asian < .4 )
describe(merged_df_South_Asian_interval5$South_Asian)

```

```

##   vars  n mean   sd median trimmed  mad  min max range skew kurtosis se
## X1    1 29 0.35 0.03  0.35    0.35 0.02 0.31 0.4  0.09 0.03   -1.13  0

merged_df_South_Asian_interval6 = filter(merged_df, South_Asian >= .4 & South
_Asian < .5 )
describe(merged_df_South_Asian_interval6$South_Asian)

##   vars  n mean   sd median trimmed  mad  min max range skew kurtosis  s
e
## X1    1 17 0.44 0.03  0.43    0.44 0.03 0.41 0.49  0.09 0.54   -1.21 0.0
1

merged_df_South_Asian_interval7 = filter(merged_df, South_Asian >= .5 & South
_Asian < .6 )
describe(merged_df_South_Asian_interval7$South_Asian)

##   vars n mean   sd median trimmed  mad  min max range  skew kurtosis  s
e
## X1    1 4 0.53 0.02  0.53    0.53 0.02 0.51 0.56  0.05 -0.09   -2 0.0
1

merged_df_South_Asian_interval8 = filter(merged_df, South_Asian >= .6 & South
_Asian < .7 )
describe(merged_df_South_Asian_interval8$South_Asian)

##   vars  n mean   sd median trimmed  mad  min max range skew kurtosis  se
## X1    1 11 0.65 0.02  0.65    0.65 0.02 0.63 0.7  0.07 0.62   -0.46 0.01

merged_df_South_Asian_interval9 = filter(merged_df, South_Asian >= .7 & South
_Asian < .8 )
describe(merged_df_South_Asian_interval9$South_Asian)

##   vars n mean   sd median trimmed  mad  min max range skew kurtosis  se
## X1    1 9 0.75 0.03  0.75    0.75 0.03 0.71 0.8  0.09 0.23   -1.4 0.01

merged_df_South_Asian_interval10 = filter(merged_df, South_Asian >= .8 & Sout
h_Asian < .9 )
describe(merged_df_South_Asian_interval10$South_Asian)

##   vars  n mean   sd median trimmed  mad  min max range skew kurtosis  se
## X1    1 21 0.83 0.03  0.82    0.83 0.03 0.8 0.89  0.09 0.73   -0.95 0.01

merged_df_South_Asian_interval11 = filter(merged_df, South_Asian >= .9 & Sout
h_Asian < .995 )
describe(merged_df_South_Asian_interval11$South_Asian)

## Warning in min(x, na.rm = na.rm): no non-missing arguments to min; returni
ng Inf

## Warning in min(x, na.rm = na.rm): no non-missing arguments to max; returni
ng
## -Inf

```

```

##      vars n mean sd median trimmed mad min  max range skew kurtosis se
## X1      1 0 NaN NA      NA      NaN NA Inf -Inf -Inf  NA      NA NA

merged_df_South_Asian_interval12 = filter(merged_df, South_Asian >= .995 & South_Asian <= 1 )
describe(merged_df_South_Asian_interval12$South_Asian)

## Warning in min(x, na.rm = na.rm): no non-missing arguments to min; returning Inf

## Warning in min(x, na.rm = na.rm): no non-missing arguments to max; returning
## -Inf

##      vars n mean sd median trimmed mad min  max range skew kurtosis se
## X1      1 0 NaN NA      NA      NaN NA Inf -Inf -Inf  NA      NA NA

#Alternative

density(merged_df$African)

##
## Call:
## density.default(x = merged_df$African)
##
## Data: merged_df$African (9972 obs.); Bandwidth 'bw' = 0.009363
##
##      x              y
## Min.   :-0.02808   Min.    : 0.000635
## 1st Qu.: 0.23595   1st Qu.: 0.119599
## Median : 0.49999   Median : 0.180692
## Mean   : 0.49999   Mean    : 0.946076
## 3rd Qu.: 0.76402   3rd Qu.: 0.459462
## Max.   : 1.02805   Max.    :23.383350

summary(merged_df$African)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.000010 0.000010 0.006356 0.158984 0.087922 0.999960

describe(merged_df$African)

##      vars      n mean  sd median trimmed  mad min max range skew kurtosis se
## X1      1 9972 0.16 0.29  0.01  0.09 0.01  0  1  1 1.68  1.13  0

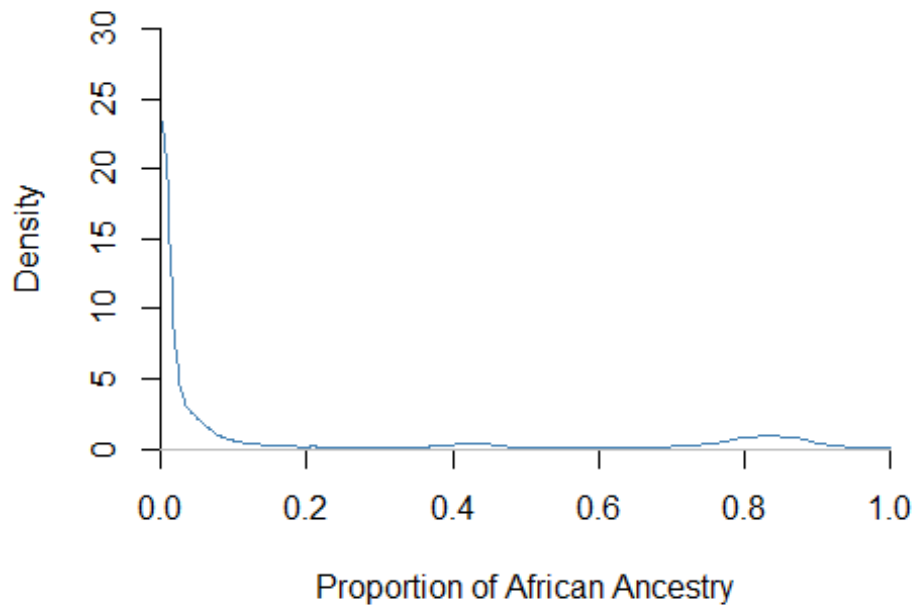
dens_all <- density(merged_df$African)

plot(dens_all, frame = FALSE, col = "steelblue",
     main = "Density Plot of African Ancestry",
     xlab="Proportion of African Ancestry",
     xlim=c(0,1),
     ylim=c(0,30),

```

```
xaxs="i",  
yaxs="i")
```

Density Plot of African Ancestry



```
#merged_df_all_African_ancestry01 = filter(merged_df, African >=.01)  
#summary(merged_df_all_African_ancestry01$African)  
#describe(merged_df_all_African_ancestry01$African)  
#density(merged_df_all_African_ancestry01$African)
```

```
# Compute the density data  
#dens <- density(merged_df_all_African_ancestry$African)  
# plot density  
#plot(dens, frame = FALSE, col = "steelblue",  
#     main = "Density Plot of African Ancestry")
```

```
# Compute the density data  
#dens2 <- density(merged_df_all_African_ancestry01$African)  
# plot density  
#plot(dens2, frame = FALSE, col = "steelblue",  
#     main = "Density Plot of African Ancestry")
```

```
#create subsets
```

```
##ethnicity
```

```

merged_df_all = merged_df
summary(merged_df_all$race)

##           White_1           Black_1           EastAsian_1 Native American_1
##           7653           1583           130           49
##           Other Race_1           SouthAsian_1
##           508           49

summary(merged_df_all$Hispanic)

##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000 0.0000 0.0000 0.1874 0.0000 1.0000

merged_df_all_Model3_spec = filter(merged_df_all, frac_White_SIRE_woc > 0 | f
rac_Black_SIRE_woc > 0 | frac_EastAsian_SIRE_woc > 0 | frac_SouthAsian_SIRE_w
oc > 0 |
                                frac_Native_American_SIRE_woc > 0 | frac
_Other_Race_SIRE_woc > 0 | frac_Hispanic_SIRE_woc > 0 | NH_Black_White_only >
0 |
                                NH_SouthAsian_White_only > 0 | NH_EastAs
ian_White_only > 0 | NH_Native_American_White_only > 0 | H_White_only > 0 | H
_Black_only > 0 | H_Other_only > 0)

describe(merged_df_all_Model3_spec$CA_Z_adj)

##   vars    n mean sd median trimmed  mad  min  max range skew kurtosis  s
e
## X1     1 9972    0  1 -0.04  -0.02 0.96 -3.9 5.59  9.49 0.29    0.34 0.0
1

#Models

#Descriptives

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_White_only, data=merged_df, FUN=function(x
) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), c
ount=length(x)))

##   NH_White_only V1.mean  V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1              0   9.90   0.62 4439.00      -0.31      1.01
## 2              1   9.93   0.63 5533.00       0.25       0.92
##   CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1          4439.00                -0.50                1.04
## 2          5533.00                 0.40                 0.75
##   general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          4439.00                0.45                0.27          4439.00
0.35

```



```

## 2          5533.00          0.97          0.05          5533.00
0.01
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.35          4439.00          0.06          0.17          4439.00
## 2          0.02          5533.00          0.00          0.02          5533.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.02          0.09          4439.00          0.13
## 2          0.01          0.02          5533.00          0.01
## Amerindian.sd Amerindian.count
## 1          0.18          4439.00
## 2          0.03          5533.00

table(merged_df$NH_White_only, merged_df$Child_US_Born)

##
##          0          1
## 0 195 4244
## 1  74 5459

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_Black_only, data=merged_df, FUN=function(x
) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), c
ount=length(x)))

## NH_Black_only V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1          0  9.91  0.63 8538.00          0.13          0.96
## 2          1  9.91  0.61 1434.00         -0.77          0.87
## CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1          8538.00          0.17          0.91
## 2          1434.00          -1.00          0.95
## general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          8538.00          0.83          0.23          8538.00
0.05
## 2          1434.00          0.18          0.11          1434.00
0.80
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.13          8538.00          0.03          0.13          8538.00
## 2          0.11          1434.00          0.00          0.02          1434.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.02          0.06          8538.00          0.07
## 2          0.00          0.01          1434.00          0.01
## Amerindian.sd Amerindian.count
## 1          0.14          8538.00
## 2          0.02          1434.00

table(merged_df$NH_Black_only, merged_df$Child_US_Born)

##
##          0          1

```

```

## 0 237 8301
## 1 32 1402

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_EastAsian_only, data=merged_df, FUN=functi
on(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2
), count=length(x)))

## NH_EastAsian_only V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1 0 9.91 0.62 9865.00 -0.01 1.00
## 2 1 10.02 0.62 107.00 0.57 1.02
## CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1 9865.00 -0.01 1.00
## 2 107.00 0.60 0.75
## general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1 9865.00 0.74 0.31 9865.00
0.16
## 2 107.00 0.14 0.18 107.00
0.01
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1 0.29 9865.00 0.02 0.08 9865.00
## 2 0.05 107.00 0.82 0.23 107.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1 0.01 0.06 9865.00 0.06
## 2 0.02 0.10 107.00 0.01
## Amerindian.sd Amerindian.count
## 1 0.13 9865.00
## 2 0.02 107.00

table(merged_df$NH_EastAsian_only, merged_df$Child_US_Born)

##
## 0 1
## 0 250 9615
## 1 19 88

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_SouthAsian_only, data=merged_df, FUN=functi
on(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE),
2), count=length(x)))

## NH_SouthAsian_only V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1 0 9.91 0.62 9929.00 0.00 1.00
## 2 1 10.03 0.68 43.00 0.45 1.02
## CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1 9929.00 0.00 1.00
## 2 43.00 0.88 0.46
## general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1 9929.00 0.74 0.31 9929.00

```

```

0.16
## 2          43.00          0.24          0.13          43.00
0.00
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.29          9929.00          0.03          0.12          9929.00
## 2          0.00          43.00          0.03          0.07          43.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.01          0.04          9929.00          0.06
## 2          0.73          0.14          43.00          0.01
## Amerindian.sd Amerindian.count
## 1          0.13          9929.00
## 2          0.01          43.00

table(merged_df$NH_SouthAsian_only, merged_df$Child_US_Born)

##
##      0      1
## 0 261 9668
## 1   8   35

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_Native_American_only, data=merged_df, FUN=
function(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TR
UE), 2), count=length(x)))

## NH_Native_American_only V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj.
sd
## 1          0  9.91  0.63 9941.00          0.00          1.
00
## 2          1  9.70  0.60  31.00          -0.42          0.
79
## CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1          9941.00          0.00          1.00
## 2          31.00          -0.81          0.72
## general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          9941.00          0.74          0.31          9941.00
0.16
## 2          31.00          0.71          0.30          31.00
0.11
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.29          9941.00          0.03          0.12          9941.00
## 2          0.26          31.00          0.01          0.02          31.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.01          0.06          9941.00          0.06
## 2          0.01          0.01          31.00          0.15
## Amerindian.sd Amerindian.count
## 1          0.13          9941.00
## 2          0.19          31.00

table(merged_df$NH_Native_American_only, merged_df$Child_US_Born)

```

```

##
##      0      1
##    0 269 9672
##    1   0   31

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_Other_Race_only, data=merged_df, FUN=funct
ion(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE),
2), count=length(x)))

##   NH_Other_Race_only V1.mean   V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1                   0   9.91   0.63 9875.00      0.00      1.00
## 2                   1   9.96   0.61  97.00      -0.22      1.12
##   CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1          9875.00              0.01              1.00
## 2           97.00              -0.53              1.11
##   general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          9875.00              0.74              0.31          9875.00
0.16
## 2           97.00              0.55              0.30           97.00
0.28
##   African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.29          9875.00              0.03              0.12          9875.00
## 2          0.31           97.00              0.06              0.19           97.00
##   South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.01          0.06              9875.00              0.06
## 2          0.04          0.11              97.00              0.07
##   Amerindian.sd Amerindian.count
## 1          0.13          9875.00
## 2          0.15           97.00

table(merged_df$NH_Other_Race_only, merged_df$Child_US_Born)

##
##      0      1
##    0 259 9616
##    1  10   87

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~Hispanic, data=merged_df, FUN=function(x) c(m
ean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), count=
length(x)))

##   Hispanic V1.mean   V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd CA_Z_adj.cou
nt
## 1         0   9.92   0.62 8103.00      0.05      1.00      8103.
00
## 2         1   9.88   0.63 1869.00      -0.23      0.96      1869.
00
##   general_ses_PCA_z.mean general_ses_PCA_z.sd general_ses_PCA_z.count

```

```

## 1          0.10          0.99          8103.00
## 2         -0.41          0.93          1869.00
##   European.mean European.sd European.count African.mean African.sd
## 1          0.77          0.33          8103.00          0.17          0.32
## 2          0.60          0.20          1869.00          0.10          0.14
##   African.count East_Asian.mean East_Asian.sd East_Asian.count South_Asian
.mean
## 1          8103.00          0.03          0.13          8103.00
0.02
## 2          1869.00          0.02          0.06          1869.00
0.01
##   South_Asian.sd South_Asian.count Amerindian.mean Amerindian.sd
## 1          0.07          8103.00          0.01          0.04
## 2          0.02          1869.00          0.27          0.18
##   Amerindian.count
## 1          8103.00
## 2          1869.00

table(merged_df$Hispanic, merged_df$Child_US_Born)

##
##      0      1
## 0 155 7948
## 1 114 1755

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~H_White_only, data=merged_df, FUN=function(x)
c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), cou
nt=length(x)))

##   H_White_only V1.mean   V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1           0   9.92   0.62 8801.00      0.03      1.00
## 2           1   9.89   0.64 1171.00     -0.19      0.96
##   CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1          8801.00          0.04          1.00
## 2          1171.00         -0.29          0.91
##   general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          8801.00          0.75          0.33          8801.00
0.17
## 2          1171.00          0.67          0.18          1171.00
0.06
##   African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.31          8801.00          0.03          0.13          8801.00
## 2          0.06          1171.00          0.01          0.02          1171.00
##   South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.02          0.06          8801.00          0.04
## 2          0.01          0.01          1171.00          0.26
##   Amerindian.sd Amerindian.count
## 1          0.10          8801.00
## 2          0.17          1171.00

```

```
table(merged_df$H_White_only, merged_df$Child_US_Born)
```

```
##
##      0      1
## 0 195 8606
## 1   74 1097
```

```
aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~H_Black_only, data=merged_df, FUN=function(x)
c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), cou
nt=length(x)))
```

```
##  H_Black_only V1.mean  V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1           0   9.91   0.62 9888.00      0.00      1.00
## 2           1   9.80   0.64  84.00     -0.34      0.93
##  CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1       9888.00              0.01              1.00
## 2         84.00             -0.64              0.98
##  general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1           9888.00              0.74              0.31           9888.00
0.16
## 2           84.00              0.35              0.13           84.00
0.53
##  African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1         0.29           9888.00              0.03              0.12           9888.00
## 2         0.17           84.00              0.00              0.01           84.00
##  South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1           0.01              0.06           9888.00              0.06
## 2           0.00              0.01           84.00              0.11
##  Amerindian.sd Amerindian.count
## 1           0.13           9888.00
## 2           0.09           84.00
```

```
table(merged_df$H_Black_only, merged_df$Child_US_Born)
```

```
##
##      0      1
## 0 264 9624
## 1   5   79
```

```
aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~H_Other_only, data=merged_df, FUN=function(x)
c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), cou
nt=length(x)))
```

```
##  H_Other_only V1.mean  V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1           0   9.91   0.62 9561.00      0.02      1.00
## 2           1   9.89   0.63  411.00     -0.45      0.92
##  CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1       9561.00              0.03              0.99
```

```

## 2          411.00          -0.75          0.88
##  general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          9561.00          0.75          0.32          9561.00
0.16
## 2          411.00          0.49          0.15          411.00
0.09
##  African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.30          9561.00          0.03          0.12          9561.00
## 2          0.11          411.00          0.02          0.03          411.00
##  South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.01          0.06          9561.00          0.05
## 2          0.00          0.01          411.00          0.40
##  Amerindian.sd Amerindian.count
## 1          0.11          9561.00
## 2          0.17          411.00

```

```
table(merged_df$H_Other_only, merged_df$Child_US_Born)
```

```

##
##      0      1
## 0 241 9320
## 1   28  383

```

```

#aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East
_Asian, South_Asian, Amerindian)~Hispanic_only, data=merged_df, FUN=function(
x) c(mean = round(mean(x, na.rm=TRUE), 2), count=length(x)))
#table(merged_df$Hispanic_only, merged_df$Child_US_Born)

```

```

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East
Asian, South_Asian, Amerindian)~NH_Black_White_only, data=merged_df, FUN=func
tion(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE),
2), count=length(x)))

```

```

##  NH_Black_White_only V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd
## 1          0  9.91  0.63 9670.00          0.00          1.00
## 2          1  9.88  0.62  302.00         -0.13          0.95
##  CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1          9670.00          0.01          0.99
## 2          302.00          -0.45          1.06
##  general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          9670.00          0.74          0.32          9670.00
0.15
## 2          302.00          0.58          0.12          302.00
0.41
##  African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.29          9670.00          0.03          0.12          9670.00
## 2          0.12          302.00          0.00          0.01          302.00
##  South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.01          0.06          9670.00          0.06

```

```

## 2          0.00          0.01          302.00          0.01
## Amerindian.sd Amerindian.count
## 1          0.14          9670.00
## 2          0.02          302.00

table(merged_df$NH_Black_White_only, merged_df$Child_US_Born)

##
##      0      1
## 0 268 9402
## 1   1   301

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_EastAsian_White_only, data=merged_df, FUN=
function(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TR
UE), 2), count=length(x)))

## NH_EastAsian_White_only V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj.
sd
## 1          0  9.91  0.62 9723.00          -0.01          1.
00
## 2          1  9.99  0.64  249.00           0.58          0.
98
## CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1          9723.00          -0.02           1.00
## 2          249.00           0.66           0.67
## general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1          9723.00           0.74           0.32          9723.00
0.16
## 2          249.00           0.56           0.12          249.00
0.01
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1          0.30          9723.00           0.02           0.10          9723.00
## 2          0.01          249.00           0.41           0.14          249.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1          0.01           0.06          9723.00           0.06
## 2          0.02           0.04          249.00           0.01
## Amerindian.sd Amerindian.count
## 1          0.13          9723.00
## 2          0.01          249.00

table(merged_df$NH_EastAsian_White_only, merged_df$Child_US_Born)

##
##      0      1
## 0 264 9459
## 1   5  244

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_Native_American_White_only, data=merged_df

```



```
, FUN=function(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), count=length(x)))
```

```
## NH_Native_American_White_only V1.mean V1.sd V1.count CA_Z_adj.mean
## 1 0 9.92 0.63 9841.00 0.00
## 2 1 9.78 0.60 131.00 0.01
## CA_Z_adj.sd CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1 1.00 9841.00 0.00 1.00
## 2 0.86 131.00 -0.09 0.91
## general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1 9841.00 0.73 0.32 9841.00
0.16
## 2 131.00 0.90 0.10 131.00
0.01
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1 0.29 9841.00 0.03 0.12 9841.00
## 2 0.03 131.00 0.01 0.02 131.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1 0.01 0.06 9841.00 0.06
## 2 0.01 0.01 131.00 0.07
## Amerindian.sd Amerindian.count
## 1 0.13 9841.00
## 2 0.09 131.00
```

```
table(merged_df$NH_Native_American_White_only, merged_df$Child_US_Born)
```

```
##
## 0 1
## 0 269 9572
## 1 0 131
```

```
aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~NH_SouthAsian_White_only, data=merged_df, FUN
=function(x) c(mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=T
RUE), 2), count=length(x)))
```

```
## NH_SouthAsian_White_only V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj
.sd
## 1 0 9.91 0.63 9932.00 0.00 1
.00
## 2 1 9.79 0.54 40.00 0.83 0
.84
## CA_Z_adj.count general_ses_PCA_z.mean general_ses_PCA_z.sd
## 1 9932.00 0.00 1.00
## 2 40.00 0.78 0.77
## general_ses_PCA_z.count European.mean European.sd European.count African
.mean
## 1 9932.00 0.74 0.32 9932.00
0.16
## 2 40.00 0.63 0.11 40.00
```

```

0.00
## African.sd African.count East_Asian.mean East_Asian.sd East_Asian.count
## 1 0.29 9932.00 0.03 0.12 9932.00
## 2 0.00 40.00 0.02 0.08 40.00
## South_Asian.mean South_Asian.sd South_Asian.count Amerindian.mean
## 1 0.01 0.06 9932.00 0.06
## 2 0.34 0.12 40.00 0.01
## Amerindian.sd Amerindian.count
## 1 0.13 9932.00
## 2 0.01 40.00

table(merged_df$NH_SouthAsian_White_only, merged_df$Child_US_Born)

##
## 0 1
## 0 268 9664
## 1 1 39

aggregate(cbind(age/12, CA_Z_adj, general_ses_PCA_z, European, African, East_
Asian, South_Asian, Amerindian)~Any_Other, data=merged_df, FUN=function(x) c(
mean = round(mean(x, na.rm=TRUE), 2), sd = round(sd(x, na.rm=TRUE), 2), count
=length(x)))

## Any_Other V1.mean V1.sd V1.count CA_Z_adj.mean CA_Z_adj.sd CA_Z_adj.co
unt
## 1 0 9.91 0.63 9836.00 0.00 1.00 9836
.00
## 2 1 9.87 0.62 136.00 -0.27 1.06 136
.00
## general_ses_PCA_z.mean general_ses_PCA_z.sd general_ses_PCA_z.count
## 1 0.01 1.00 9836.00
## 2 -0.63 1.03 136.00
## European.mean European.sd European.count African.mean African.sd
## 1 0.74 0.31 9836.00 0.15 0.29
## 2 0.37 0.21 136.00 0.46 0.25
## African.count East_Asian.mean East_Asian.sd East_Asian.count South_Asian
.mean
## 1 9836.00 0.03 0.12 9836.00
0.01
## 2 136.00 0.13 0.20 136.00
0.02
## South_Asian.sd South_Asian.count Amerindian.mean Amerindian.sd
## 1 0.06 9836.00 0.06 0.13
## 2 0.07 136.00 0.02 0.05
## Amerindian.count
## 1 9836.00
## 2 136.00

table(merged_df$Any_Other, merged_df$Child_US_Born)

```

```
##
##      0    1
##    0 264 9572
##    1   5  131
```

#Model 1: ancestral proportions and single-SIRE categories - no restriction test

```
model_1=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE
+ frac_EastAsian_SIRE
+ frac_SouthAsian_SIRE
+ frac_Native_American_SIRE
+ frac_Other_SIRE
+ frac_Hispanic_SIRE
+ (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df, R
```

```
EML = FALSE)
```

```
summary(model_1)
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
##   frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispanic_SIRE +
##   (1 | site_id_l) + (1 | site_id_l:rel_family_id)
## Data: merged_df
##
##           AIC           BIC    logLik deviance df.resid
## 26073.5 26174.4 -13022.8 26045.5     9958
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.7367 -0.5233 -0.0435  0.4714  4.6289
##
## Random effects:
## Groups                Name                Variance Std.Dev.

```

```

## site_id_1:rel_family_id (Intercept) 0.37361 0.6112
## site_id_1 (Intercept) 0.01885 0.1373
## Residual 0.44956 0.6705
## Number of obs: 9972, groups: site_id_1:rel_family_id, 8419; site_id_1, 22
##
## Fixed effects:
##
## Estimate Std. Error t value
## (Intercept) 0.30100 0.03321 9.064
## South_Asian 0.48674 0.32639 1.491
## Amerindian -1.38037 0.12140 -11.370
## East_Asian 0.64389 0.20217 3.185
## African -1.02422 0.12284 -8.338
## frac_Black_SIRE -0.14201 0.10111 -1.405
## frac_EastAsian_SIRE -0.21204 0.17580 -1.206
## frac_SouthAsian_SIRE -0.07348 0.26062 -0.282
## frac_Native_American_SIRE -0.14276 0.10705 -1.334
## frac_Other_SIRE -0.19670 0.07802 -2.521
## frac_Hispanic_SIRE -0.09395 0.08427 -1.115

```

```
performance::icc(model_1)
```

```

## # Intraclass Correlation Coefficient
##
## Adjusted ICC: 0.466
## Conditional ICC: 0.393

```

```
performance::r2(model_1)
```

```

## # R2 for Mixed Models
##
## Conditional R2: 0.550
## Marginal R2: 0.157

```

#Model 2: ancestral proportions, single SIRE categories and 7 chosen multi-SIRE categories - restriction test

```

model_2=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE_woc
+ frac_EastAsian_SIRE_woc
+ frac_SouthAsian_SIRE_woc
+ frac_Native_American_SIRE_woc
+ frac_Other_Race_SIRE_woc
+ frac_Hispanic_SIRE_woc
+ NH_Black_White_only
+ NH_SouthAsian_White_only
+ NH_EastAsian_White_only
+ NH_Native_American_White_only
+ H_White_only
+ H_Black_only
+ H_Other_only
+ (1|site_id_1) + (1|site_id_1:rel_family_id), data=merged_df, R

```



```

## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE_woc + frac_EastAsian_SIRE_woc + frac_SouthAsian_SIRE_w
oc +
##   frac_Native_American_SIRE_woc + frac_Other_Race_SIRE_woc +
##   frac_Hispanic_SIRE_woc + NH_Black_White_only + NH_SouthAsian_White_onl
y +
##   NH_EastAsian_White_only + NH_Native_American_White_only +
##   H_White_only + H_Black_only + H_Other_only + (1 | site_id_l) +
##   (1 | site_id_l:rel_family_id)
## Data: merged_df
##
##      AIC      BIC  logLik deviance df.resid
## 26060.5 26211.9 -13009.2 26018.5     9951
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.7237 -0.5245 -0.0432  0.4733  4.6672
##
## Random effects:
## Groups                Name      Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.37088  0.6090
## site_id_l              (Intercept) 0.01844  0.1358
## Residual                0.44980  0.6707
## Number of obs: 9972, groups:  site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)  0.294890  0.033011  8.933
## South_Asian  0.543943  0.327815  1.659
## Amerindian   -1.335821  0.123882 -10.783
## East_Asian   0.660174  0.202965  3.253

```

```

## African -1.029756 0.125197 -8.225
## frac_Black_SIRE_woc -0.150326 0.102834 -1.462
## frac_EastAsian_SIRE_woc -0.352299 0.182740 -1.928
## frac_SouthAsian_SIRE_woc -0.267888 0.269723 -0.993
## frac_Native_American_SIRE_woc -0.185570 0.135215 -1.372
## frac_Other_Race_SIRE_woc -0.179576 0.101808 -1.764
## frac_Hispanic_SIRE_woc 0.339005 0.196570 1.725
## NH_Black_White_only 0.053278 0.074907 0.711
## NH_SouthAsian_White_only 0.336091 0.186694 1.800
## NH_EastAsian_White_only 0.004296 0.102153 0.042
## NH_Native_American_White_only -0.099930 0.084357 -1.185
## H_White_only -0.081305 0.045454 -1.789
## H_Black_only 0.036120 0.122835 0.294
## H_Other_only -0.165678 0.069026 -2.400

##
## Correlation matrix not shown by default, as p = 18 > 12.
## Use print(x, correlation=TRUE) or
## vcov(x) if you need it

performance::icc(model_2)

## # Intraclass Correlation Coefficient
##
## Adjusted ICC: 0.464
## Conditional ICC: 0.390

performance::r2(model_2)

## # R2 for Mixed Models
##
## Conditional R2: 0.550
## Marginal R2: 0.160

#For Restriction Test
# the test applies to models 2, 3, 6, 8a and 8b

coeffvec <- coef(model_2)
varcov <- vcov(model_2, full=FALSE)

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

```



```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
varcov
```

```
## 18 x 18 Matrix of class "dgeMatrix"
##           [,1]           [,2]           [,3]           [,4]           [,5]
]
## [1,]  1.089702e-03 -0.0016919742 -0.0003248982 -0.0004161887 -0.000273801
5
## [2,] -1.691974e-03  0.1074627066  0.0029553784  0.0122650732  0.005085401
4
## [3,] -3.248982e-04  0.0029553784  0.0153468402  0.0010638535  0.002086864
3
## [4,] -4.161887e-04  0.0122650732  0.0010638535  0.0411949073  0.003421129
6
## [5,] -2.738015e-04  0.0050854014  0.0020868643  0.0034211296  0.015674382
9
## [6,] -4.863816e-06 -0.0026669657 -0.0015828064 -0.0025553051 -0.012303002
5
## [7,]  1.198616e-04 -0.0104900199 -0.0004383571 -0.0327622849 -0.003103790
8
## [8,]  9.761001e-04 -0.0760421212 -0.0019861684 -0.0095689419 -0.003743811
5
## [9,] -9.513949e-05 -0.0008681135 -0.0024163513 -0.0017912201 -0.003542884
4
## [10,] -2.574126e-05 -0.0049257457 -0.0014905339 -0.0035434188 -0.004493307
8
## [11,] -1.966832e-04  0.0004304433 -0.0063185727  0.0011900806 -0.001517522
2
## [12,] -9.251167e-05 -0.0010833521 -0.0007913929 -0.0012994966 -0.006170715
7
```

```

## [13,] 3.580343e-04 -0.0351547697 -0.0009023477 -0.0046212964 -0.001649651
0
## [14,] -2.858465e-05 -0.0051248168 -0.0002297898 -0.0164516073 -0.001382117
2
## [15,] -1.581221e-04 0.0003398944 -0.0007907175 -0.0002333280 -0.000228752
2
## [16,] -1.400277e-04 -0.0001057062 -0.0036849175 -0.0004517136 -0.001210938
9
## [17,] -6.264296e-05 -0.0014575986 -0.0025535864 -0.0017061928 -0.008163383
8
## [18,] -1.040079e-04 -0.0003686854 -0.0055950994 -0.0008607627 -0.002110306
4
##          [,6]          [,7]          [,8]          [,9]          [,10
]
## [1,] -4.863816e-06 0.0001198616 9.761001e-04 -9.513949e-05 -2.574126e-0
5
## [2,] -2.666966e-03 -0.0104900199 -7.604212e-02 -8.681135e-04 -4.925746e-0
3
## [3,] -1.582806e-03 -0.0004383571 -1.986168e-03 -2.416351e-03 -1.490534e-0
3
## [4,] -2.555305e-03 -0.0327622849 -9.568942e-03 -1.791220e-03 -3.543419e-0
3
## [5,] -1.230300e-02 -0.0031037908 -3.743812e-03 -3.542884e-03 -4.493308e-0
3
## [6,] 1.057474e-02 0.0024790079 2.149139e-03 2.887397e-03 3.694942e-0
3
## [7,] 2.479008e-03 0.0333937758 8.418767e-03 1.935152e-03 3.137613e-0
3
## [8,] 2.149139e-03 0.0084187669 7.275023e-02 9.782450e-04 3.805566e-0
3
## [9,] 2.887397e-03 0.0019351525 9.782450e-04 1.828305e-02 1.384932e-0
3
## [10,] 3.694942e-03 0.0031376131 3.805566e-03 1.384932e-03 1.036489e-0
2
## [11,] 1.292176e-03 -0.0033274506 -6.551623e-04 -5.399951e-03 9.293187e-0
4
## [12,] 5.090968e-03 0.0013585778 9.951562e-04 1.641914e-03 1.923894e-0
3
## [13,] 1.033680e-03 0.0042088532 2.519095e-02 4.766738e-04 1.815985e-0
3
## [14,] 1.203865e-03 0.0133874310 4.241236e-03 8.724652e-04 1.604841e-0
3
## [15,] 3.593683e-04 0.0003329228 -7.811707e-05 9.424408e-04 2.689939e-0
4
## [16,] 1.149161e-03 0.0005321098 2.647847e-04 9.354580e-04 7.356380e-0
4
## [17,] 6.667216e-03 0.0017305341 1.303781e-03 2.238406e-03 2.592881e-0
3
## [18,] 1.832296e-03 0.0009196182 4.815302e-04 1.373959e-03 1.128508e-0
3

```

```

##          [,11]          [,12]          [,13]          [,14]          [,15
]
## [1,] -1.966832e-04 -9.251167e-05  3.580343e-04 -2.858465e-05 -1.581221e-0
4
## [2,]  4.304433e-04 -1.083352e-03 -3.515477e-02 -5.124817e-03  3.398944e-0
4
## [3,] -6.318573e-03 -7.913929e-04 -9.023477e-04 -2.297898e-04 -7.907175e-0
4
## [4,]  1.190081e-03 -1.299497e-03 -4.621296e-03 -1.645161e-02 -2.333280e-0
4
## [5,] -1.517522e-03 -6.170716e-03 -1.649651e-03 -1.382117e-03 -2.287522e-0
4
## [6,]  1.292176e-03  5.090968e-03  1.033680e-03  1.203865e-03  3.593683e-0
4
## [7,] -3.327451e-03  1.358578e-03  4.208853e-03  1.338743e-02  3.329228e-0
4
## [8,] -6.551623e-04  9.951562e-04  2.519095e-02  4.241236e-03 -7.811707e-0
5
## [9,] -5.399951e-03  1.641914e-03  4.766738e-04  8.724652e-04  9.424408e-0
4
## [10,]  9.293187e-04  1.923894e-03  1.815985e-03  1.604841e-03  2.689939e-0
4
## [11,]  3.863964e-02  8.578214e-04  9.202374e-05 -1.644750e-04  5.462919e-0
4
## [12,]  8.578214e-04  5.611085e-03  5.121305e-04  6.936420e-04  2.886982e-0
4
## [13,]  9.202374e-05  5.121305e-04  3.485468e-02  2.156628e-03  4.287971e-0
5
## [14,] -1.644750e-04  6.936420e-04  2.156628e-03  1.043516e-02  2.439338e-0
4
## [15,]  5.462919e-04  2.886982e-04  4.287971e-05  2.439338e-04  7.116111e-0
3
## [16,]  2.067421e-03  6.506733e-04  1.942084e-04  3.536636e-04  3.932445e-0
4
## [17,]  1.836495e-03  3.421402e-03  6.450000e-04  8.740130e-04  3.939479e-0
4
## [18,]  2.976524e-03  9.994005e-04  3.000158e-04  5.434390e-04  5.096368e-0
4
##          [,16]          [,17]          [,18]
## [1,] -0.0001400277 -6.264296e-05 -0.0001040079
## [2,] -0.0001057062 -1.457599e-03 -0.0003686854
## [3,] -0.0036849175 -2.553586e-03 -0.0055950994
## [4,] -0.0004517136 -1.706193e-03 -0.0008607627
## [5,] -0.0012109389 -8.163384e-03 -0.0021103064
## [6,]  0.0011491612  6.667216e-03  0.0018322956
## [7,]  0.0005321098  1.730534e-03  0.0009196182
## [8,]  0.0002647847  1.303781e-03  0.0004815302
## [9,]  0.0009354580  2.238406e-03  0.0013739589
## [10,] 0.0007356380  2.592881e-03  0.0011285080
## [11,] 0.0020674209  1.836495e-03  0.0029765239

```

```
## [12,] 0.0006506733 3.421402e-03 0.0009994005
## [13,] 0.0001942084 6.450000e-04 0.0003000158
## [14,] 0.0003536636 8.740130e-04 0.0005434390
## [15,] 0.0003932445 3.939479e-04 0.0005096368
## [16,] 0.0020660902 1.286499e-03 0.0018062727
## [17,] 0.0012864989 1.508833e-02 0.0019533857
## [18,] 0.0018062727 1.953386e-03 0.0047645688
```

#Model 3: same as model 2 but with smaller data set (cutting out 50 multi-SIR E observations which do not match the 7 categories) - restriction test

```
model_3=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE_woc
+ frac_EastAsian_SIRE_woc
+ frac_SouthAsian_SIRE_woc
+ frac_Native_American_SIRE_woc
+ frac_Other_Race_SIRE_woc
+ frac_Hispanic_SIRE_woc
+ NH_Black_White_only
+ NH_SouthAsian_White_only
+ NH_EastAsian_White_only
+ NH_Native_American_White_only
+ H_White_only
+ H_Black_only
+ H_Other_only
+ (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df_al
l_Model3_spec, REML = FALSE)
summary(model_3)
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
```

```
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##      frac_Black_SIRE_woc + frac_EastAsian_SIRE_woc + frac_SouthAsian_SIRE_w
oc +
##      frac_Native_American_SIRE_woc + frac_Other_Race_SIRE_woc +
##      frac_Hispanic_SIRE_woc + NH_Black_White_only + NH_SouthAsian_White_onl
```

```

y +
##      NH_EastAsian_White_only + NH_Native_American_White_only +
##      H_White_only + H_Black_only + H_Other_only + (1 | site_id_l) +
##      (1 | site_id_l:rel_family_id)
##      Data: merged_df_all_Model3_spec
##
##      AIC      BIC   logLik deviance df.resid
## 26060.5 26211.9 -13009.2 26018.5     9951
##
## Scaled residuals:
##      Min      1Q  Median      3Q      Max
## -3.7237 -0.5245 -0.0432  0.4733  4.6672
##
## Random effects:
##      Groups                Name      Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.37088  0.6090
## site_id_l                (Intercept) 0.01844  0.1358
## Residual                    0.44980  0.6707
## Number of obs: 9972, groups:  site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##
##      Estimate Std. Error t value
## (Intercept)      0.294890   0.033011   8.933
## South_Asian      0.543943   0.327815   1.659
## Amerindian      -1.335821   0.123882 -10.783
## East_Asian       0.660174   0.202965   3.253
## African         -1.029756   0.125197  -8.225
## frac_Black_SIRE_woc -0.150326   0.102834  -1.462
## frac_EastAsian_SIRE_woc -0.352299   0.182740  -1.928
## frac_SouthAsian_SIRE_woc -0.267888   0.269723  -0.993
## frac_Native_American_SIRE_woc -0.185570   0.135215  -1.372
## frac_Other_Race_SIRE_woc -0.179576   0.101808  -1.764
## frac_Hispanic_SIRE_woc  0.339005   0.196570   1.725
## NH_Black_White_only  0.053278   0.074907   0.711
## NH_SouthAsian_White_only  0.336091   0.186694   1.800
## NH_EastAsian_White_only  0.004296   0.102153   0.042
## NH_Native_American_White_only -0.099930   0.084357  -1.185
## H_White_only     -0.081305   0.045454  -1.789
## H_Black_only      0.036120   0.122835   0.294
## H_Other_only     -0.165678   0.069026  -2.400
##
##
## Correlation matrix not shown by default, as p = 18 > 12.
## Use print(x, correlation=TRUE) or
##      vcov(x)      if you need it
performance::icc(model_3)
## # Intraclass Correlation Coefficient
##

```



```

## 18 x 18 Matrix of class "dgeMatrix"
##           [,1]           [,2]           [,3]           [,4]           [,5]
]
## [1,]  1.089702e-03 -0.0016919742 -0.0003248982 -0.0004161887 -0.000273801
5
## [2,] -1.691974e-03  0.1074627066  0.0029553784  0.0122650732  0.005085401
4
## [3,] -3.248982e-04  0.0029553784  0.0153468402  0.0010638535  0.002086864
3
## [4,] -4.161887e-04  0.0122650732  0.0010638535  0.0411949073  0.003421129
6
## [5,] -2.738015e-04  0.0050854014  0.0020868643  0.0034211296  0.015674382
9
## [6,] -4.863816e-06 -0.0026669657 -0.0015828064 -0.0025553051 -0.012303002
5
## [7,]  1.198616e-04 -0.0104900199 -0.0004383571 -0.0327622849 -0.003103790
8
## [8,]  9.761001e-04 -0.0760421212 -0.0019861684 -0.0095689419 -0.003743811
5
## [9,] -9.513949e-05 -0.0008681135 -0.0024163513 -0.0017912201 -0.003542884
4
## [10,] -2.574126e-05 -0.0049257457 -0.0014905339 -0.0035434188 -0.004493307
8
## [11,] -1.966832e-04  0.0004304433 -0.0063185727  0.0011900806 -0.001517522
2
## [12,] -9.251167e-05 -0.0010833521 -0.0007913929 -0.0012994966 -0.006170715
7
## [13,]  3.580343e-04 -0.0351547697 -0.0009023477 -0.0046212964 -0.001649651
0
## [14,] -2.858465e-05 -0.0051248168 -0.0002297898 -0.0164516073 -0.001382117
2
## [15,] -1.581221e-04  0.0003398944 -0.0007907175 -0.0002333280 -0.000228752
2
## [16,] -1.400277e-04 -0.0001057062 -0.0036849175 -0.0004517136 -0.001210938
9
## [17,] -6.264296e-05 -0.0014575986 -0.0025535864 -0.0017061928 -0.008163383
8
## [18,] -1.040079e-04 -0.0003686854 -0.0055950994 -0.0008607627 -0.002110306
4
##           [,6]           [,7]           [,8]           [,9]           [,10]
]
## [1,] -4.863816e-06  0.0001198616  9.761001e-04 -9.513949e-05 -2.574126e-0
5
## [2,] -2.666966e-03 -0.0104900199 -7.604212e-02 -8.681135e-04 -4.925746e-0
3
## [3,] -1.582806e-03 -0.0004383571 -1.986168e-03 -2.416351e-03 -1.490534e-0
3
## [4,] -2.555305e-03 -0.0327622849 -9.568942e-03 -1.791220e-03 -3.543419e-0
3
## [5,] -1.230300e-02 -0.0031037908 -3.743812e-03 -3.542884e-03 -4.493308e-0

```



```

3
## [6,] 1.057474e-02 0.0024790079 2.149139e-03 2.887397e-03 3.694942e-0
3
## [7,] 2.479008e-03 0.0333937758 8.418767e-03 1.935152e-03 3.137613e-0
3
## [8,] 2.149139e-03 0.0084187669 7.275023e-02 9.782450e-04 3.805566e-0
3
## [9,] 2.887397e-03 0.0019351525 9.782450e-04 1.828305e-02 1.384932e-0
3
## [10,] 3.694942e-03 0.0031376131 3.805566e-03 1.384932e-03 1.036489e-0
2
## [11,] 1.292176e-03 -0.0033274506 -6.551623e-04 -5.399951e-03 9.293187e-0
4
## [12,] 5.090968e-03 0.0013585778 9.951562e-04 1.641914e-03 1.923894e-0
3
## [13,] 1.033680e-03 0.0042088532 2.519095e-02 4.766738e-04 1.815985e-0
3
## [14,] 1.203865e-03 0.0133874310 4.241236e-03 8.724652e-04 1.604841e-0
3
## [15,] 3.593683e-04 0.0003329228 -7.811707e-05 9.424408e-04 2.689939e-0
4
## [16,] 1.149161e-03 0.0005321098 2.647847e-04 9.354580e-04 7.356380e-0
4
## [17,] 6.667216e-03 0.0017305341 1.303781e-03 2.238406e-03 2.592881e-0
3
## [18,] 1.832296e-03 0.0009196182 4.815302e-04 1.373959e-03 1.128508e-0
3
##           [,11]           [,12]           [,13]           [,14]           [,15
]
## [1,] -1.966832e-04 -9.251167e-05 3.580343e-04 -2.858465e-05 -1.581221e-0
4
## [2,] 4.304433e-04 -1.083352e-03 -3.515477e-02 -5.124817e-03 3.398944e-0
4
## [3,] -6.318573e-03 -7.913929e-04 -9.023477e-04 -2.297898e-04 -7.907175e-0
4
## [4,] 1.190081e-03 -1.299497e-03 -4.621296e-03 -1.645161e-02 -2.333280e-0
4
## [5,] -1.517522e-03 -6.170716e-03 -1.649651e-03 -1.382117e-03 -2.287522e-0
4
## [6,] 1.292176e-03 5.090968e-03 1.033680e-03 1.203865e-03 3.593683e-0
4
## [7,] -3.327451e-03 1.358578e-03 4.208853e-03 1.338743e-02 3.329228e-0
4
## [8,] -6.551623e-04 9.951562e-04 2.519095e-02 4.241236e-03 -7.811707e-0
5
## [9,] -5.399951e-03 1.641914e-03 4.766738e-04 8.724652e-04 9.424408e-0
4
## [10,] 9.293187e-04 1.923894e-03 1.815985e-03 1.604841e-03 2.689939e-0
4
## [11,] 3.863964e-02 8.578214e-04 9.202374e-05 -1.644750e-04 5.462919e-0

```

```

4
## [12,] 8.578214e-04 5.611085e-03 5.121305e-04 6.936420e-04 2.886982e-0
4
## [13,] 9.202374e-05 5.121305e-04 3.485468e-02 2.156628e-03 4.287971e-0
5
## [14,] -1.644750e-04 6.936420e-04 2.156628e-03 1.043516e-02 2.439338e-0
4
## [15,] 5.462919e-04 2.886982e-04 4.287971e-05 2.439338e-04 7.116111e-0
3
## [16,] 2.067421e-03 6.506733e-04 1.942084e-04 3.536636e-04 3.932445e-0
4
## [17,] 1.836495e-03 3.421402e-03 6.450000e-04 8.740130e-04 3.939479e-0
4
## [18,] 2.976524e-03 9.994005e-04 3.000158e-04 5.434390e-04 5.096368e-0
4
##           [,16]           [,17]           [,18]
## [1,] -0.0001400277 -6.264296e-05 -0.0001040079
## [2,] -0.0001057062 -1.457599e-03 -0.0003686854
## [3,] -0.0036849175 -2.553586e-03 -0.0055950994
## [4,] -0.0004517136 -1.706193e-03 -0.0008607627
## [5,] -0.0012109389 -8.163384e-03 -0.0021103064
## [6,] 0.0011491612 6.667216e-03 0.0018322956
## [7,] 0.0005321098 1.730534e-03 0.0009196182
## [8,] 0.0002647847 1.303781e-03 0.0004815302
## [9,] 0.0009354580 2.238406e-03 0.0013739589
## [10,] 0.0007356380 2.592881e-03 0.0011285080
## [11,] 0.0020674209 1.836495e-03 0.0029765239
## [12,] 0.0006506733 3.421402e-03 0.0009994005
## [13,] 0.0001942084 6.450000e-04 0.0003000158
## [14,] 0.0003536636 8.740130e-04 0.0005434390
## [15,] 0.0003932445 3.939479e-04 0.0005096368
## [16,] 0.0020660902 1.286499e-03 0.0018062727
## [17,] 0.0012864989 1.508833e-02 0.0019533857
## [18,] 0.0018062727 1.953386e-03 0.0047645688

```

```
#Model 4: nonparametric - no restriction test
```

```
#bw <- npplregbw(formula=CA_Z_adj ~ South_Asian + Amerindian + East_Asian + f
rac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
#
frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispani
c_SIRE | African, merged_df)
#summary(bw)
```

```
#pl <- npplreg(bws=bw, residuals=TRUE)
#summary(pl)
#coef(pl)
#coef(pl, errors = TRUE)
#summary(pl$resid)
#describe(pl$resid)
```

```

#par(mar = rep(3, 5))
#plot(pl$resid)

#merged_df$CA_Z_adj_hat <- 0.7376529*merged_df$South_Asian - 1.191356*merged_
df$Amerindian + 0.6923586*merged_df$East_Asian -0.1288999*merged_df$frac_Blac
k_SIRE -0.1368878*merged_df$frac_EastAsian_SIRE + 0.1523298*merged_df$frac_So
uthAsian_SIRE -0.2577826*merged_df$frac_Native_American_SIRE -0.07611056*merg
ed_df$frac_Other_SIRE -0.1202465*merged_df$frac_Hispanic_SIRE
#merged_df$CA_Z_adj_sub <- (merged_df$CA_Z_adj - merged_df$CA_Z_adj_hat) -.26
20
#bw2 <- npregbw(formula=merged_df$CA_Z_adj_sub ~ merged_df$African)

# plot density_AA

#plot(dens_African_ancestry005, frame = FALSE, col = "steelblue",
#     main = "",
#     xlab="% African Ancestry",
#     xlim=c(0,1),
#     ylim=c(0,5),
#     xaxs="i",
#     yaxs="i")

#Desnisty Plots_EA
#merged_df_European_ancestry005 = filter(merged_df, European >=.005)
#dens_European_ancestry005 <- density(merged_df_European_ancestry005$European
)

# plot density_EA

#plot(dens_European_ancestry005, frame = FALSE, col = "steelblue",
#     main = "",
#     xlab="% European Ancestry",
#     xlim=c(0,1),
#     ylim=c(0,5),
#     xaxs="i",
#     yaxs="i")

#summary(bw2)
#plot(npreg(bw2),xlim=c(0,1), ylim=c(-1,0), xaxs="i", xlab="Proportion of Afr
ican Ancestry", ylab="Test Scores")
#par(new=TRUE)
# create pairs of data points
#x = c(0,1)
#y = c(0,-1.00136)
# Create a normal plot
#plot(x, y,type="l", xlim=c(0,1), ylim=c(-1,0),
#     xlab="Proportion of African Ancestry", ylab="Test Scores")

```

#Model 5: upper kink, ancestry proportions and individual SIRE categories - no restriction test

```
model_5=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE
+ frac_EastAsian_SIRE
+ frac_SouthAsian_SIRE
+ frac_Native_American_SIRE
+ frac_Other_SIRE
+ frac_Hispanic_SIRE
+ upper_kink
+ (1|site_id_1) + (1|site_id_1:rel_family_id), data=merged_df, R
```

```
EML = FALSE)
```

```
summary(model_5)
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
##   frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispanic_SIRE +
##   upper_kink + (1 | site_id_l) + (1 | site_id_l:rel_family_id)
## Data: merged_df
##
##      AIC      BIC  logLik deviance df.resid
## 26072.3 26180.4 -13021.1 26042.3     9957
##
## Scaled residuals:
##      Min      1Q  Median      3Q      Max
## -3.7384 -0.5247 -0.0448  0.4723  4.6302
##
## Random effects:
## Groups              Name              Variance Std.Dev.

```

```

## site_id_1:rel_family_id (Intercept) 0.37322 0.6109
## site_id_1 (Intercept) 0.01871 0.1368
## Residual 0.44965 0.6706
## Number of obs: 9972, groups: site_id_1:rel_family_id, 8419; site_id_1, 22
##
## Fixed effects:
##
## Estimate Std. Error t value
## (Intercept) 0.30171 0.03311 9.112
## South_Asian 0.47757 0.32637 1.463
## Amerindian -1.38966 0.12148 -11.439
## East_Asian 0.63646 0.20217 3.148
## African -1.07908 0.12652 -8.529
## frac_Black_SIRE -0.11323 0.10234 -1.106
## frac_EastAsian_SIRE -0.20485 0.17581 -1.165
## frac_SouthAsian_SIRE -0.06677 0.26060 -0.256
## frac_Native_American_SIRE -0.13510 0.10711 -1.261
## frac_Other_SIRE -0.18816 0.07815 -2.408
## frac_Hispanic_SIRE -0.08185 0.08451 -0.969
## upper_kink 0.15979 0.08850 1.805

```

```
performance::icc(model_5)
```

```

## # Intraclass Correlation Coefficient
##
## Adjusted ICC: 0.466
## Conditional ICC: 0.393

```

```
performance::r2(model_5)
```

```

## # R2 for Mixed Models
##
## Conditional R2: 0.550
## Marginal R2: 0.157

```

#Model 6: upper kink, ancestry proportions, individual SIRE categories, 7 multi-SIRE categories with smaller data set - restriction test

```

model_6=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE_woc
+ frac_EastAsian_SIRE_woc
+ frac_SouthAsian_SIRE_woc
+ frac_Native_American_SIRE_woc
+ frac_Other_Race_SIRE_woc
+ frac_Hispanic_SIRE_woc
+ NH_Black_White_only
+ NH_SouthAsian_White_only
+ NH_EastAsian_White_only
+ NH_Native_American_White_only
+ H_White_only
+ H_Black_only
+ H_Other_only

```

```
      + upper_kink
      + (1|site_id_1) + (1|site_id_1:rel_family_id), data=merged_df_al
l_Model3_spec, REML = FALSE)
summary(model_6)
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE_woc + frac_EastAsian_SIRE_woc + frac_SouthAsian_SIRE_w
oc +
##   frac_Native_American_SIRE_woc + frac_Other_Race_SIRE_woc +
##   frac_Hispanic_SIRE_woc + NH_Black_White_only + NH_SouthAsian_White_onl
y +
##   NH_EastAsian_White_only + NH_Native_American_White_only +
##   H_White_only + H_Black_only + H_Other_only + upper_kink +
##   (1 | site_id_l) + (1 | site_id_l:rel_family_id)
## Data: merged_df_all_Model3_spec
##
##           AIC           BIC   logLik deviance df.resid
## 26058.3 26216.9 -13007.2 26014.3     9950
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.7255 -0.5242 -0.0438  0.4725  4.6693
##
## Random effects:
##   Groups                Name      Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.37031  0.6085
## site_id_l                (Intercept) 0.01826  0.1351
## Residual                  0.44998  0.6708
## Number of obs: 9972, groups: site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##
##              Estimate Std. Error t value
## (Intercept)  0.295577  0.032884  8.989
## South_Asian  0.531618  0.327789  1.622

```



```

## Amerindian                -1.343729    0.123909 -10.844
## East_Asian                0.650113    0.202978   3.203
## African                   -1.094851    0.129180  -8.475
## frac_Black_SIRE_woc       -0.116278    0.104162  -1.116
## frac_EastAsian_SIRE_woc   -0.341833    0.182770  -1.870
## frac_SouthAsian_SIRE_woc  -0.258389    0.269696  -0.958
## frac_Native_American_SIRE_woc -0.171245    0.135368  -1.265
## frac_Other_Race_SIRE_woc  -0.165017    0.102038  -1.617
## frac_Hispanic_SIRE_woc    0.350075    0.196595   1.781
## NH_Black_White_only       0.078160    0.075878   1.030
## NH_SouthAsian_White_only   0.340133    0.186653   1.822
## NH_EastAsian_White_only    0.008492    0.102148   0.083
## NH_Native_American_White_only -0.099662    0.084335  -1.182
## H_White_only              -0.074910    0.045549  -1.645
## H_Black_only              0.070014    0.123923   0.565
## H_Other_only              -0.156631    0.069150  -2.265
## upper_kink                0.180855    0.088764   2.037

##
## Correlation matrix not shown by default, as p = 19 > 12.
## Use print(x, correlation=TRUE) or
##     vcov(x)         if you need it

performance::icc(model_6)

## # Intraclass Correlation Coefficient
##
##     Adjusted ICC: 0.463
##     Conditional ICC: 0.389

performance::r2(model_6)

## # R2 for Mixed Models
##
##     Conditional R2: 0.549
##     Marginal R2: 0.160

#For Restriction Test
# the test applies to models 2, 3, 6, 8a and 8b

coeffvec <- coef(model_6)
varcov <- vcov(model_6, full=FALSE)

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

```

```

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

varcov

## 19 x 19 Matrix of class "dgeMatrix"
##           [,1]      [,2]      [,3]      [,4]      [,5]
]
## [1,]  1.081342e-03 -0.0016929455 -0.0003260876 -0.0004176675 -0.000285445
1
## [2,] -1.692945e-03  0.1074454880  0.0029781999  0.0122896390  0.005282189
0
## [3,] -3.260876e-04  0.0029781999  0.0153534935  0.0010827362  0.002213107
2
## [4,] -4.176675e-04  0.0122896390  0.0010827362  0.0412001946  0.003580329
1
## [5,] -2.854451e-04  0.0052821890  0.0022131072  0.0035803291  0.016687356
6
## [6,]  1.332020e-06 -0.0027702367 -0.0016487579 -0.0026384459 -0.012831875
0
## [7,]  1.216425e-04 -0.0105169277 -0.0004585429 -0.0327730674 -0.003266530
7
## [8,]  9.772374e-04 -0.0760326435 -0.0020037457 -0.0095878872 -0.003893309
4
## [9,] -9.249743e-05 -0.0009115948 -0.0024432081 -0.0018256879 -0.003767293
2
## [10,] -2.309961e-05 -0.0049680873 -0.0015183787 -0.0035779618 -0.004720129
8
## [11,] -1.945298e-04  0.0003957984 -0.0063368503  0.0011618958 -0.001689876

```

```

6
## [12,] -8.792783e-05 -0.0011591314 -0.0008396583 -0.0013603462 -0.006558048
8
## [13,]  3.585559e-04 -0.0351491082 -0.0009097298 -0.0046290394 -0.001712832
1
## [14,] -2.782752e-05 -0.0051351842 -0.0002379140 -0.0164543509 -0.001447389
8
## [15,] -1.579883e-04  0.0003387854 -0.0007909811 -0.0002339436 -0.000233666
2
## [16,] -1.387457e-04 -0.0001255133 -0.0036954849 -0.0004673686 -0.001310805
3
## [17,] -5.643086e-05 -0.0015610100 -0.0026184519 -0.0017891485 -0.008690488
8
## [18,] -1.022532e-04 -0.0003965641 -0.0056101283 -0.0008828274 -0.002251009
4
## [19,]  3.298522e-05 -0.0005543034 -0.0003527612 -0.0004462628 -0.002835713
4
##           [,6]           [,7]           [,8]           [,9]           [,10
]
## [1,]  1.332020e-06  0.0001216425  9.772374e-04 -9.249743e-05 -2.309961e-0
5
## [2,] -2.770237e-03 -0.0105169277 -7.603264e-02 -9.115948e-04 -4.968087e-0
3
## [3,] -1.648758e-03 -0.0004585429 -2.003746e-03 -2.443208e-03 -1.518379e-0
3
## [4,] -2.638446e-03 -0.0327730674 -9.587887e-03 -1.825688e-03 -3.577962e-0
3
## [5,] -1.283188e-02 -0.0032665307 -3.893309e-03 -3.767293e-03 -4.720130e-0
3
## [6,]  1.084981e-02  0.0025639424  2.227530e-03  3.004474e-03  3.813217e-0
3
## [7,]  2.563942e-03  0.0334048971  8.439059e-03  1.970355e-03  3.173100e-0
3
## [8,]  2.227530e-03  0.0084390589  7.273592e-02  1.011131e-03  3.837635e-0
3
## [9,]  3.004474e-03  0.0019703553  1.011131e-03  1.832437e-02  1.434942e-0
3
## [10,] 3.813217e-03  0.0031731002  3.837635e-03  1.434942e-03  1.041170e-0
2
## [11,] 1.382273e-03 -0.0032977197 -6.288440e-04 -5.359291e-03  9.677262e-0
4
## [12,] 5.292981e-03  0.0014206837  1.052605e-03  1.727545e-03  2.010529e-0
3
## [13,] 1.066747e-03  0.0042170640  2.518740e-02  4.905243e-04  1.829467e-0
3
## [14,] 1.237861e-03  0.0133919515  4.248969e-03  8.865648e-04  1.618933e-0
3
## [15,] 3.618033e-04  0.0003335259 -7.735361e-05  9.425424e-04  2.699948e-0
4
## [16,] 1.201253e-03  0.0005480188  2.796852e-04  9.572301e-04  7.578196e-0

```

```

4
## [17,] 6.942231e-03 0.0018151881 1.382155e-03 2.354972e-03 2.710772e-0
3
## [18,] 1.905683e-03 0.0009419915 5.025055e-04 1.404710e-03 1.159776e-0
3
## [19,] 1.485558e-03 0.0004557376 4.206799e-04 6.279305e-04 6.352738e-0
4
##          [,11]          [,12]          [,13]          [,14]          [,15
]
## [1,] -0.0001945298 -8.792783e-05 3.585559e-04 -2.782752e-05 -1.579883e-0
4
## [2,] 0.0003957984 -1.159131e-03 -3.514911e-02 -5.135184e-03 3.387854e-0
4
## [3,] -0.0063368503 -8.396583e-04 -9.097298e-04 -2.379140e-04 -7.909811e-0
4
## [4,] 0.0011618958 -1.360346e-03 -4.629039e-03 -1.645435e-02 -2.339436e-0
4
## [5,] -0.0016898766 -6.558049e-03 -1.712832e-03 -1.447390e-03 -2.336662e-0
4
## [6,] 0.0013822729 5.292981e-03 1.066747e-03 1.237861e-03 3.618033e-0
4
## [7,] -0.0032977197 1.420684e-03 4.217064e-03 1.339195e-02 3.335259e-0
4
## [8,] -0.0006288440 1.052605e-03 2.518740e-02 4.248969e-03 -7.735361e-0
5
## [9,] -0.0053592913 1.727545e-03 4.905243e-04 8.865648e-04 9.425424e-0
4
## [10,] 0.0009677262 2.010529e-03 1.829467e-03 1.618933e-03 2.699948e-0
4
## [11,] 0.0386494136 9.235635e-04 1.029876e-04 -1.532161e-04 5.469727e-0
4
## [12,] 0.0009235635 5.757454e-03 5.363769e-04 7.184990e-04 2.904552e-0
4
## [13,] 0.0001029876 5.363769e-04 3.483925e-02 2.159684e-03 4.316409e-0
5
## [14,] -0.0001532161 7.184990e-04 2.159684e-03 1.043428e-02 2.441201e-0
4
## [15,] 0.0005469727 2.904552e-04 4.316409e-05 2.441201e-04 7.112422e-0
3
## [16,] 0.0020831239 6.887562e-04 2.004803e-04 3.599695e-04 3.935318e-0
4
## [17,] 0.0019254287 3.622805e-03 6.781080e-04 9.078983e-04 3.963515e-0
4
## [18,] 0.0029988406 1.053102e-03 3.088375e-04 5.523224e-04 5.100844e-0
4
## [19,] 0.0004806715 1.084358e-03 1.779972e-04 1.829171e-04 1.405558e-0
5
##          [,16]          [,17]          [,18]          [,19]
## [1,] -0.0001387457 -5.643086e-05 -0.0001022532 3.298522e-05
## [2,] -0.0001255133 -1.561010e-03 -0.0003965641 -5.543034e-04

```

```

## [3,] -0.0036954849 -2.618452e-03 -0.0056101283 -3.527612e-04
## [4,] -0.0004673686 -1.789148e-03 -0.0008828274 -4.462628e-04
## [5,] -0.0013108053 -8.690489e-03 -0.0022510094 -2.835713e-03
## [6,] 0.0012012531 6.942231e-03 0.0019056827 1.485558e-03
## [7,] 0.0005480188 1.815188e-03 0.0009419915 4.557376e-04
## [8,] 0.0002796852 1.382155e-03 0.0005025055 4.206799e-04
## [9,] 0.0009572301 2.354972e-03 0.0014047102 6.279305e-04
## [10,] 0.0007578196 2.710772e-03 0.0011597760 6.352738e-04
## [11,] 0.0020831239 1.925429e-03 0.0029988406 4.806715e-04
## [12,] 0.0006887562 3.622805e-03 0.0010531017 1.084358e-03
## [13,] 0.0002004803 6.781080e-04 0.0003088375 1.779972e-04
## [14,] 0.0003599695 9.078983e-04 0.0005523224 1.829171e-04
## [15,] 0.0003935318 3.963515e-04 0.0005100844 1.405558e-05
## [16,] 0.0020746800 1.337971e-03 0.0018191412 2.783945e-04
## [17,] 0.0013379707 1.535700e-02 0.0020260093 1.474992e-03
## [18,] 0.0018191412 2.026009e-03 0.0047817747 3.932758e-04
## [19,] 0.0002783945 1.474992e-03 0.0003932758 7.879004e-03

```

#Model 7a: upper kink, raw SES, US child, ancestry proportions and individual SIRE categories - no restriction test

```

model_7a=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE
+ frac_EastAsian_SIRE
+ frac_SouthAsian_SIRE
+ frac_Native_American_SIRE
+ frac_Other_SIRE
+ frac_Hispanic_SIRE
+ upper_kink
+ Child_US_Born
+ general_ses_PCA_z
+ (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df,

```

REML = FALSE)

```
summary(model_7a)
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
```



```

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
##   frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispanic_SIRE +
##   upper_kink + Child_US_Born + general_ses_PCA_z + (1 | site_id_l) +
##   (1 | site_id_l:rel_family_id)
## Data: merged_df
##
##      AIC      BIC  logLik deviance df.resid
## 25536.1 25658.6 -12751.0 25502.1    9955
##
## Scaled residuals:
##      Min      1Q  Median      3Q      Max
## -3.9197 -0.5388 -0.0475  0.4950  4.9804
##
## Random effects:
## Groups              Name          Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.321000 0.56657
## site_id_l              (Intercept) 0.008193 0.09052
## Residual                0.454391 0.67409
## Number of obs: 9972, groups: site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)    0.07991    0.06179   1.293
## South_Asian    0.42998    0.31742   1.355
## Amerindian    -0.82075    0.11946  -6.870
## East_Asian    0.62222    0.19635   3.169
## African      -0.62986    0.12415  -5.073
## frac_Black_SIRE -0.09594    0.09930  -0.966
## frac_EastAsian_SIRE -0.21786    0.17079  -1.276
## frac_SouthAsian_SIRE -0.11397    0.25288  -0.451
## frac_Native_American_SIRE -0.03397    0.10374  -0.327
## frac_Other_SIRE -0.07625    0.07611  -1.002
## frac_Hispanic_SIRE -0.03131    0.08167  -0.383
## upper_kink     0.02086    0.08612   0.242
## Child_US_Born  0.10053    0.05697   1.765
## general_ses_PCA_z  0.27999    0.01180  23.728
##
## Correlation matrix not shown by default, as p = 14 > 12.
## Use print(x, correlation=TRUE) or
##   vcov(x)      if you need it
performance::icc(model_7a)
## # Intraclass Correlation Coefficient
##
##      Adjusted ICC: 0.420
##      Conditional ICC: 0.329

```

```

performance::r2(model_7a)

## # R2 for Mixed Models
##
##   Conditional R2: 0.546
##   Marginal R2: 0.218

#Model 7b: upper kink, orthogonalized SES, US child, ancestry proportions and
individual SIRE categories - no restriction test
# Model 7b same as model 7a except using orthogonalized SES in place of raw SES
# using the LM command to get the projection of SES on the other variables (a
LL except Child_US_born)

orthostep = lm(general_ses_PCA_z ~ South_Asian + Amerindian + East_Asian + Af
rican
              + frac_Black_SIRE
              + frac_EastAsian_SIRE
              + frac_SouthAsian_SIRE
              + frac_Native_American_SIRE
              + frac_Other_SIRE
              + frac_Hispanic_SIRE
              + upper_kink, data=merged_df)
ortho_ses <- residuals(orthostep)

model_7b=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
              + frac_Black_SIRE
              + frac_EastAsian_SIRE
              + frac_SouthAsian_SIRE
              + frac_Native_American_SIRE
              + frac_Other_SIRE
              + frac_Hispanic_SIRE
              + upper_kink
              + Child_US_Born
              + ortho_ses
              + (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df,
REML = FALSE)
summary(model_7b)

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only

```



```

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
##   frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispanic_SIRE +
##   upper_kink + Child_US_Born + ortho_ses + (1 | site_id_1) +
##   (1 | site_id_1:rel_family_id)
## Data: merged_df
##
##      AIC      BIC  logLik deviance df.resid
## 25536.1 25658.6 -12751.0 25502.1    9955
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.9197 -0.5388 -0.0475  0.4950  4.9804
##
## Random effects:
## Groups                Name                Variance Std.Dev.
## site_id_1:rel_family_id (Intercept) 0.321000 0.56657
## site_id_1                (Intercept) 0.008193 0.09052
## Residual                    0.454391 0.67409
## Number of obs: 9972, groups:  site_id_1:rel_family_id, 8419; site_id_1, 22
##
## Fixed effects:
##
##              Estimate Std. Error t value
## (Intercept)    0.19868    0.06149   3.231
## South_Asian    0.62293    0.31740   1.963
## Amerindian    -1.35902    0.11720 -11.596
## East_Asian     0.71815    0.19635   3.657
## African       -1.11791    0.12268  -9.113
## frac_Black_SIRE -0.11908    0.09930  -1.199
## frac_EastAsian_SIRE -0.21402    0.17079  -1.253
## frac_SouthAsian_SIRE -0.11798    0.25289  -0.467
## frac_Native_American_SIRE -0.24121    0.10372  -2.326
## frac_Other_SIRE -0.17395    0.07598  -2.290
## frac_Hispanic_SIRE -0.08514    0.08165  -1.043
## upper_kink     0.20551    0.08592   2.392
## Child_US_Born  0.10053    0.05697   1.765
## ortho_ses      0.27999    0.01180  23.728
##
##
## Correlation matrix not shown by default, as p = 14 > 12.
## Use print(x, correlation=TRUE) or
##   vcov(x)         if you need it
performance::icc(model_7b)

```

```

## # Intraclass Correlation Coefficient
##
##     Adjusted ICC: 0.420
##     Conditional ICC: 0.329

performance::r2(model_7b)

## # R2 for Mixed Models
##
##     Conditional R2: 0.546
##     Marginal R2: 0.218

#Model 8a: upper kink, raw SES, US child, ancestry proportions, individual SIRE categories, and 7 multi-SIRE categories with smaller data set - restriction test
# same steps for models 8 which splits into models 8a and 8b using raw vs. orthogonalized SES
# model 8a (already run but included for completeness)

model_8a=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
              + frac_Black_SIRE_woc
              + frac_EastAsian_SIRE_woc
              + frac_SouthAsian_SIRE_woc
              + frac_Native_American_SIRE_woc
              + frac_Other_Race_SIRE_woc
              + frac_Hispanic_SIRE_woc
              + NH_Black_White_only
              + NH_SouthAsian_White_only
              + NH_EastAsian_White_only
              + NH_Native_American_White_only
              + H_White_only
              + H_Black_only
              + H_Other_only
              + upper_kink
              + Child_US_Born
              + general_ses_PCA_z
              + (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df_a
ll_Model3_spec, REML = FALSE)
summary(model_8a)

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only

```



```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE_woc + frac_EastAsian_SIRE_woc + frac_SouthAsian_SIRE_w
oc +
##   frac_Native_American_SIRE_woc + frac_Other_Race_SIRE_woc +
##   frac_Hispanic_SIRE_woc + NH_Black_White_only + NH_SouthAsian_White_onl
y +
##   NH_EastAsian_White_only + NH_Native_American_White_only +
##   H_White_only + H_Black_only + H_Other_only + upper_kink +
##   Child_US_Born + general_ses_PCA_z + (1 | site_id_l) + (1 |
##   site_id_l:rel_family_id)
## Data: merged_df_all_Model3_spec
##
##      AIC      BIC  logLik deviance df.resid
## 25523.4 25696.4 -12737.7 25475.4     9948
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.9088 -0.5421 -0.0481  0.4970  5.0183
##
## Random effects:
##   Groups                Name      Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.318111 0.56401
## site_id_l                (Intercept) 0.008041 0.08967
## Residual                    0.454931 0.67449
## Number of obs: 9972, groups:  site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##
##              Estimate Std. Error t value
## (Intercept)    0.08464    0.06173   1.371
## South_Asian    0.47092    0.31872   1.478
## Amerindian   -0.78284    0.12175  -6.430
## East_Asian    0.63061    0.19711   3.199
## African     -0.65025    0.12672  -5.132
## frac_Black_SIRE_woc -0.09775    0.10111  -0.967
## frac_EastAsian_SIRE_woc -0.31764    0.17758  -1.789
## frac_SouthAsian_SIRE_woc -0.28412    0.26170  -1.086
## frac_Native_American_SIRE_woc -0.05166    0.13147  -0.393
## frac_Other_Race_SIRE_woc -0.04434    0.09947  -0.446
## frac_Hispanic_SIRE_woc  0.37824    0.19062   1.984
## NH_Black_White_only  0.11856    0.07357   1.611
## NH_SouthAsian_White_only  0.28393    0.18080   1.570
## NH_EastAsian_White_only -0.03175    0.09917  -0.320
## NH_Native_American_White_only -0.05843    0.08171  -0.715
## H_White_only  -0.04267    0.04400  -0.970

```

```

## H_Black_only          0.06452    0.12024    0.537
## H_Other_only         -0.07644    0.06717   -1.138
## upper_kink           0.04466    0.08638    0.517
## Child_US_Born        0.08967    0.05700    1.573
## general_ses_PCA_z    0.27956    0.01179   23.710

##
## Correlation matrix not shown by default, as p = 21 > 12.
## Use print(x, correlation=TRUE) or
##     vcov(x)         if you need it

performance::icc(model_8a)

## # Intraclass Correlation Coefficient
##
##     Adjusted ICC: 0.418
##     Conditional ICC: 0.326

performance::r2(model_8a)

## # R2 for Mixed Models
##
##     Conditional R2: 0.546
##     Marginal R2: 0.220

#For Restriction Test
# the test applies to models 2, 3, 6, 8a and 8b

coeffvec <- coef(model_8a)
varcov <- vcov(model_8a, full=FALSE)

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
varcov
```

```
## 21 x 21 Matrix of class "dgeMatrix"
```

```
##           [,1]           [,2]           [,3]           [,4]           [,5]
]
## [1,]  3.810613e-03 -3.028438e-03 -5.050505e-04 -8.132799e-04 -3.003166e-0
4
## [2,] -3.028438e-03  1.015837e-01  2.660925e-03  1.170635e-02  4.801454e-0
3
## [3,] -5.050505e-04  2.660925e-03  1.482285e-02  9.287695e-04  2.542400e-0
3
## [4,] -8.132799e-04  1.170635e-02  9.287695e-04  3.885379e-02  3.339094e-0
3
## [5,] -3.003166e-04  4.801454e-03  2.542400e-03  3.339094e-03  1.605685e-0
2
## [6,] -8.274242e-05 -2.574710e-03 -1.550110e-03 -2.492550e-03 -1.207505e-0
2
## [7,]  3.923823e-06 -9.850360e-03 -4.078969e-04 -3.091528e-02 -3.074560e-0
3
## [8,]  1.497433e-03 -7.169775e-02 -1.871128e-03 -9.083546e-03 -3.633797e-0
3
## [9,] -1.367436e-04 -8.537170e-04 -2.169991e-03 -1.707128e-03 -3.454007e-0
3
## [10,] -2.927433e-04 -4.594624e-03 -1.321775e-03 -3.366236e-03 -4.381957e-0
3
## [11,] -2.615675e-04  3.445999e-04 -5.931145e-03  1.070336e-03 -1.585242e-0
3
## [12,] -1.045448e-04 -1.094222e-03 -7.611873e-04 -1.286907e-03 -6.144770e-0
3
## [13,]  8.271006e-04 -3.322530e-02 -8.939964e-04 -4.412793e-03 -1.623529e-0
3
## [14,]  1.595409e-04 -4.909056e-03 -2.671318e-04 -1.554601e-02 -1.394785e-0
3
## [15,] -1.239069e-04  2.951593e-04 -7.020244e-04 -2.223535e-04 -1.782817e-0
4
## [16,] -2.534889e-04 -9.466475e-05 -3.438503e-03 -4.355404e-04 -1.237594e-0
3
## [17,] -2.107689e-04 -1.420793e-03 -2.482619e-03 -1.680641e-03 -8.212494e-0
```

```

3
## [18,] -2.854221e-04 -3.443819e-04 -5.221790e-03 -8.321198e-04 -2.080635e-0
3
## [19,] -1.044473e-04 -4.038132e-04 -4.690650e-04 -3.838164e-04 -2.783608e-0
3
## [20,] -3.224048e-03  1.519110e-03  9.968029e-05  4.506410e-04 -5.254879e-0
5
## [21,] -7.437288e-05 -6.306044e-05  2.688630e-04 -2.318242e-05  2.229803e-0
4
##          [,6]          [,7]          [,8]          [,9]          [,10
]
## [1,] -8.274242e-05  3.923823e-06  1.497433e-03 -1.367436e-04 -2.927433e-0
4
## [2,] -2.574710e-03 -9.850360e-03 -7.169775e-02 -8.537170e-04 -4.594624e-0
3
## [3,] -1.550110e-03 -4.078969e-04 -1.871128e-03 -2.169991e-03 -1.321775e-0
3
## [4,] -2.492550e-03 -3.091528e-02 -9.083546e-03 -1.707128e-03 -3.366236e-0
3
## [5,] -1.207505e-02 -3.074560e-03 -3.633797e-03 -3.454007e-03 -4.381957e-0
3
## [6,]  1.022361e-02  2.431929e-03  2.088053e-03  2.839258e-03  3.621325e-0
3
## [7,]  2.431929e-03  3.153547e-02  7.927243e-03  1.845409e-03  3.019124e-0
3
## [8,]  2.088053e-03  7.927243e-03  6.848801e-02  9.323143e-04  3.569012e-0
3
## [9,]  2.839258e-03  1.845409e-03  9.323143e-04  1.728500e-02  1.382902e-0
3
## [10,] 3.621325e-03  3.019124e-03  3.569012e-03  1.382902e-03  9.893901e-0
3
## [11,] 1.314366e-03 -3.077850e-03 -5.748590e-04 -5.060809e-03  9.301960e-0
4
## [12,] 4.986384e-03  1.342261e-03  9.901618e-04  1.635766e-03  1.912655e-0
3
## [13,] 9.892599e-04  3.948519e-03  2.373882e-02  4.396407e-04  1.677863e-0
3
## [14,] 1.166233e-03  1.263783e-02  4.034418e-03  8.206871e-04  1.512399e-0
3
## [15,] 3.379193e-04  3.098053e-04 -6.867245e-05  8.471200e-04  2.610141e-0
4
## [16,] 1.150196e-03  5.267812e-04  2.571593e-04  9.127086e-04  7.366314e-0
4
## [17,] 6.551513e-03  1.727556e-03  1.292867e-03  2.223744e-03  2.578940e-0
3
## [18,] 1.812416e-03  9.014318e-04  4.607795e-04  1.347702e-03  1.129136e-0
3
## [19,] 1.397494e-03  4.289011e-04  3.637195e-04  5.670579e-04  5.839357e-0
4
## [20,] 7.781056e-05  1.018102e-04 -5.978332e-04  2.016807e-05  2.465960e-0

```



```

4
## [21,] 1.070702e-05 1.114521e-05 2.948499e-07 6.391754e-05 5.886088e-0
5
##          [,11]          [,12]          [,13]          [,14]          [,15
]
## [1,] -2.615675e-04 -1.045448e-04 8.271006e-04 1.595409e-04 -1.239069e-0
4
## [2,] 3.445999e-04 -1.094222e-03 -3.322530e-02 -4.909056e-03 2.951593e-0
4
## [3,] -5.931145e-03 -7.611873e-04 -8.939964e-04 -2.671318e-04 -7.020244e-0
4
## [4,] 1.070336e-03 -1.286907e-03 -4.412793e-03 -1.554601e-02 -2.223535e-0
4
## [5,] -1.585242e-03 -6.144770e-03 -1.623529e-03 -1.394785e-03 -1.782817e-0
4
## [6,] 1.314366e-03 4.986384e-03 9.892599e-04 1.166233e-03 3.379193e-0
4
## [7,] -3.077850e-03 1.342261e-03 3.948519e-03 1.263783e-02 3.098053e-0
4
## [8,] -5.748590e-04 9.901618e-04 2.373882e-02 4.034418e-03 -6.867245e-0
5
## [9,] -5.060809e-03 1.635766e-03 4.396407e-04 8.206871e-04 8.471200e-0
4
## [10,] 9.301960e-04 1.912655e-03 1.677863e-03 1.512399e-03 2.610141e-0
4
## [11,] 3.633766e-02 8.733144e-04 9.809366e-05 -1.483698e-04 5.225947e-0
4
## [12,] 8.733144e-04 5.412899e-03 4.992183e-04 6.743144e-04 2.732446e-0
4
## [13,] 9.809366e-05 4.992183e-04 3.268872e-02 2.060372e-03 4.147527e-0
5
## [14,] -1.483698e-04 6.743144e-04 2.060372e-03 9.833969e-03 2.266268e-0
4
## [15,] 5.225947e-04 2.732446e-04 4.147527e-05 2.266268e-04 6.676801e-0
3
## [16,] 1.939642e-03 6.592617e-04 1.759742e-04 3.317126e-04 3.699171e-0
4
## [17,] 1.801906e-03 3.416495e-03 6.232322e-04 8.516297e-04 3.668215e-0
4
## [18,] 2.809708e-03 1.003249e-03 2.665368e-04 5.068941e-04 4.840023e-0
4
## [19,] 4.483225e-04 1.013793e-03 1.515043e-04 1.716059e-04 5.103002e-0
7
## [20,] 7.917292e-05 1.308757e-05 -4.907737e-04 -1.814400e-04 -3.508767e-0
5
## [21,] 1.091741e-05 2.033967e-05 -2.145044e-05 -1.822603e-05 2.364441e-0
5
##          [,16]          [,17]          [,18]          [,19]          [,20
]
## [1,] -2.534889e-04 -2.107689e-04 -2.854221e-04 -1.044473e-04 -3.224048e-0

```

```

3
## [2,] -9.466475e-05 -1.420793e-03 -3.443819e-04 -4.038132e-04 1.519110e-0
3
## [3,] -3.438503e-03 -2.482619e-03 -5.221790e-03 -4.690650e-04 9.968029e-0
5
## [4,] -4.355404e-04 -1.680641e-03 -8.321198e-04 -3.838164e-04 4.506410e-0
4
## [5,] -1.237594e-03 -8.212494e-03 -2.080635e-03 -2.783608e-03 -5.254879e-0
5
## [6,] 1.150196e-03 6.551513e-03 1.812416e-03 1.397494e-03 7.781056e-0
5
## [7,] 5.267812e-04 1.727556e-03 9.014318e-04 4.289011e-04 1.018102e-0
4
## [8,] 2.571593e-04 1.292867e-03 4.607795e-04 3.637195e-04 -5.978332e-0
4
## [9,] 9.127086e-04 2.223744e-03 1.347702e-03 5.670579e-04 2.016807e-0
5
## [10,] 7.366314e-04 2.578940e-03 1.129136e-03 5.839357e-04 2.465960e-0
4
## [11,] 1.939642e-03 1.801906e-03 2.809708e-03 4.483225e-04 7.917292e-0
5
## [12,] 6.592617e-04 3.416495e-03 1.003249e-03 1.013793e-03 1.308757e-0
5
## [13,] 1.759742e-04 6.232322e-04 2.665368e-04 1.515043e-04 -4.907737e-0
4
## [14,] 3.317126e-04 8.516297e-04 5.068941e-04 1.716059e-04 -1.814400e-0
4
## [15,] 3.699171e-04 3.668215e-04 4.840023e-04 5.103002e-07 -3.508767e-0
5
## [16,] 1.935920e-03 1.262883e-03 1.709036e-03 2.583599e-04 1.225166e-0
4
## [17,] 1.262883e-03 1.445878e-02 1.909890e-03 1.402884e-03 1.627351e-0
4
## [18,] 1.709036e-03 1.909890e-03 4.511544e-03 3.600099e-04 1.809086e-0
4
## [19,] 2.583599e-04 1.402884e-03 3.600099e-04 7.460997e-03 1.659287e-0
4
## [20,] 1.225166e-04 1.627351e-04 1.809086e-04 1.659287e-04 3.249072e-0
3
## [21,] 1.483741e-05 -6.428915e-06 3.704333e-05 -7.162455e-05 1.669474e-0
5
##          [,21]
## [1,] -7.437288e-05
## [2,] -6.306044e-05
## [3,] 2.688630e-04
## [4,] -2.318242e-05
## [5,] 2.229803e-04
## [6,] 1.070702e-05
## [7,] 1.114521e-05
## [8,] 2.948499e-07

```

```
## [9,] 6.391754e-05
## [10,] 5.886088e-05
## [11,] 1.091741e-05
## [12,] 2.033967e-05
## [13,] -2.145044e-05
## [14,] -1.822603e-05
## [15,] 2.364441e-05
## [16,] 1.483741e-05
## [17,] -6.428915e-06
## [18,] 3.704333e-05
## [19,] -7.162455e-05
## [20,] 1.669474e-05
## [21,] 1.390228e-04
```

#Model 8b: upper kink, orthogonalized SES, US child, ancestry proportions, in individual SIRE categories and 7 multi-SIRE categories with smaller data set - restriction test

```
orthostep=lm(general_ses_PCA_z ~ South_Asian + Amerindian + East_Asian + African
```

```
    + frac_Black_SIRE_woc
    + frac_EastAsian_SIRE_woc
    + frac_SouthAsian_SIRE_woc
    + frac_Native_American_SIRE_woc
    + frac_Other_Race_SIRE_woc
    + frac_Hispanic_SIRE_woc
    + NH_Black_White_only
    + NH_SouthAsian_White_only
    + NH_EastAsian_White_only
    + NH_Native_American_White_only
    + H_White_only
    + H_Black_only
    + H_Other_only
    + upper_kink, data=merged_df_all_Model3_spec)
```

```
ortho_ses <- residuals(orthostep)
```

```
model_8b=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
    + frac_Black_SIRE_woc
    + frac_EastAsian_SIRE_woc
    + frac_SouthAsian_SIRE_woc
    + frac_Native_American_SIRE_woc
    + frac_Other_Race_SIRE_woc
    + frac_Hispanic_SIRE_woc
    + NH_Black_White_only
    + NH_SouthAsian_White_only
    + NH_EastAsian_White_only
    + NH_Native_American_White_only
    + H_White_only
    + H_Black_only
    + H_Other_only
```



```

## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE_woc + frac_EastAsian_SIRE_woc + frac_SouthAsian_SIRE_w
oc +
##   frac_Native_American_SIRE_woc + frac_Other_Race_SIRE_woc +
##   frac_Hispanic_SIRE_woc + NH_Black_White_only + NH_SouthAsian_White_onl
y +
##   NH_EastAsian_White_only + NH_Native_American_White_only +
##   H_White_only + H_Black_only + H_Other_only + upper_kink +
##   Child_US_Born + ortho_ses + (1 | site_id_l) + (1 | site_id_l:rel_famil
y_id)
## Data: merged_df_all_Model3_spec
##
##      AIC      BIC  logLik deviance df.resid
## 25523.4 25696.4 -12737.7 25475.4    9948
##
## Scaled residuals:
##      Min      1Q  Median      3Q      Max
## -3.9088 -0.5421 -0.0481  0.4970  5.0183
##
## Random effects:
## Groups              Name          Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.318111 0.56401
## site_id_l              (Intercept) 0.008041 0.08967
## Residual                0.454931 0.67449
## Number of obs: 9972, groups: site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:

```

```

##              Estimate Std. Error t value
## (Intercept)    0.20374    0.06142   3.317
## South_Asian    0.67434    0.31869   2.116
## Amerindian    -1.31322    0.11960 -10.981
## East_Asian     0.73163    0.19712   3.712
## African       -1.13272    0.12530  -9.040
## frac_Black_SIRE_woc -0.12356    0.10111  -1.222
## frac_EastAsian_SIRE_woc -0.35045    0.17758  -1.973
## frac_SouthAsian_SIRE_woc -0.31474    0.26171  -1.203
## frac_Native_American_SIRE_woc -0.26980    0.13142  -2.053
## frac_Other_Race_SIRE_woc -0.15932    0.09934  -1.604
## frac_Hispanic_SIRE_woc  0.35837    0.19062   1.880
## NH_Black_White_only  0.07349    0.07355   0.999
## NH_SouthAsian_White_only  0.31835    0.18079   1.761
## NH_EastAsian_White_only -0.00356    0.09915  -0.036
## NH_Native_American_White_only -0.16176    0.08172  -1.979
## H_White_only    -0.07995    0.04398  -1.818
## H_Black_only    0.08074    0.12024   0.671
## H_Other_only   -0.14922    0.06710  -2.224
## upper_kink     0.22672    0.08618   2.631
## Child_US_Born  0.08967    0.05700   1.573
## ortho_ses      0.27956    0.01179  23.710

##
## Correlation matrix not shown by default, as p = 21 > 12.
## Use print(x, correlation=TRUE) or
##   vcov(x)       if you need it

performance::icc(model_8b)

## # Intraclass Correlation Coefficient
##
##   Adjusted ICC: 0.418
##   Conditional ICC: 0.326

performance::r2(model_8b)

## # R2 for Mixed Models
##
##   Conditional R2: 0.546
##   Marginal R2: 0.220

#For Restriction Test
# the test applies to models 2, 3, 6, 8a and 8b

coeffvec <- coef(model_8b)
varcov <- vcov(model_8b, full=FALSE)

## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used

```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
## Warning in site_id_1:rel_family_id: numerical expression has 9972 elements
: only
## the first used
```

```
varcov
```

```
## 21 x 21 Matrix of class "dgeMatrix"
##           [,1]      [,2]      [,3]      [,4]      [,5]
## [1,]  3.772475e-03 -3.066324e-03 -3.617732e-04 -0.0008286291 -1.791825e-0
4
## [2,] -3.066324e-03  1.015655e-01  2.784280e-03  0.0117032554  4.897951e-0
3
## [3,] -3.617732e-04  2.784280e-03  1.430307e-02  0.0009745968  2.110545e-0
3
## [4,] -8.286291e-04  1.170326e-02  9.745968e-04  0.0388551916  3.372978e-0
3
## [5,] -1.791825e-04  4.897951e-03  2.110545e-03  0.0033729775  1.570128e-0
2
## [6,] -7.678252e-05 -2.570437e-03 -1.570895e-03 -0.0024911787 -1.209196e-0
2
## [7,]  1.044963e-05 -9.846722e-03 -4.296411e-04 -0.0309144280 -3.091805e-0
3
## [8,]  1.499217e-03 -7.170171e-02 -1.872247e-03 -0.0090864033 -3.632449e-0
3
```

```

## [9,] -9.769570e-05 -8.369377e-04 -2.295241e-03 -0.0017051427 -3.551091e-0
3
## [10,] -2.614378e-04 -4.567464e-03 -1.435547e-03 -0.0033560937 -4.476570e-0
3
## [11,] -2.558403e-04 3.498370e-04 -5.952221e-03 0.0010723585 -1.602880e-0
3
## [12,] -9.343767e-05 -1.085565e-03 -8.005994e-04 -0.0012839194 -6.177140e-0
3
## [13,] 8.160974e-04 -3.323622e-02 -8.526716e-04 -0.0044172140 -1.588596e-0
3
## [14,] 1.502489e-04 -4.918477e-03 -2.320382e-04 -0.0155498663 -1.365039e-0
3
## [15,] -1.082359e-04 2.982806e-04 -7.487704e-04 -0.0002238102 -2.128224e-0
4
## [16,] -2.451481e-04 -8.894926e-05 -3.467334e-03 -0.0004337868 -1.260940e-0
3
## [17,] -2.143863e-04 -1.423260e-03 -2.470126e-03 -0.0016813946 -8.202382e-0
3
## [18,] -2.656976e-04 -3.273462e-04 -5.293399e-03 -0.0008257773 -2.140153e-0
3
## [19,] -1.448244e-04 -4.311182e-04 -3.298522e-04 -0.0003920790 -2.671035e-0
3
## [20,] -3.216936e-03 1.531259e-03 6.800664e-05 0.0004566741 -8.136141e-0
5
## [21,] -1.514321e-05 3.810320e-05 5.105780e-06 0.0000270577 -1.695209e-0
5
##          [,6]          [,7]          [,8]          [,9]          [,10
]
## [1,] -7.678252e-05 1.044963e-05 1.499217e-03 -9.769570e-05 -2.614378e-0
4
## [2,] -2.570437e-03 -9.846722e-03 -7.170171e-02 -8.369377e-04 -4.567464e-0
3
## [3,] -1.570895e-03 -4.296411e-04 -1.872247e-03 -2.295241e-03 -1.435547e-0
3
## [4,] -2.491179e-03 -3.091443e-02 -9.086403e-03 -1.705143e-03 -3.356094e-0
3
## [5,] -1.209196e-02 -3.091805e-03 -3.632449e-03 -3.551091e-03 -4.476570e-0
3
## [6,] 1.022282e-02 2.431150e-03 2.088259e-03 2.835018e-03 3.616765e-0
3
## [7,] 2.431150e-03 3.153477e-02 7.927775e-03 1.841943e-03 3.014343e-0
3
## [8,] 2.088259e-03 7.927775e-03 6.848961e-02 9.369651e-04 3.568707e-0
3
## [9,] 2.835018e-03 1.841943e-03 9.369651e-04 1.726990e-02 1.355300e-0
3
## [10,] 3.616765e-03 3.014343e-03 3.568707e-03 1.355300e-03 9.869001e-0
3
## [11,] 1.313509e-03 -3.078764e-03 -5.749938e-04 -5.066162e-03 9.255863e-0
4

```



```

## [12,] 4.984849e-03 1.340708e-03 9.903415e-04 1.627080e-03 1.904018e-0
3
## [13,] 9.909783e-04 3.950400e-03 2.373933e-02 4.508924e-04 1.686892e-0
3
## [14,] 1.167702e-03 1.263945e-02 4.034908e-03 8.304157e-04 1.520064e-0
3
## [15,] 3.365233e-04 3.089420e-04 -6.574278e-05 8.451418e-04 2.506675e-0
4
## [16,] 1.149110e-03 5.257295e-04 2.575255e-04 9.070736e-04 7.303046e-0
4
## [17,] 6.551983e-03 1.728010e-03 1.292705e-03 2.226176e-03 2.581682e-0
3
## [18,] 1.809550e-03 8.984305e-04 4.606097e-04 1.330399e-03 1.113463e-0
3
## [19,] 1.402721e-03 4.339394e-04 3.618399e-04 5.939258e-04 6.144897e-0
4
## [20,] 7.626905e-05 9.985063e-05 -5.996618e-04 7.141136e-06 2.397296e-0
4
## [21,] -2.129676e-06 -5.172888e-06 -1.493225e-05 -4.456215e-05 1.682562e-0
6
##          [,11]          [,12]          [,13]          [,14]          [,15
]
## [1,] -2.558403e-04 -9.343767e-05 8.160974e-04 1.502489e-04 -1.082359e-0
4
## [2,] 3.498370e-04 -1.085565e-03 -3.323622e-02 -4.918477e-03 2.982806e-0
4
## [3,] -5.952221e-03 -8.005994e-04 -8.526716e-04 -2.320382e-04 -7.487704e-0
4
## [4,] 1.072359e-03 -1.283919e-03 -4.417214e-03 -1.554987e-02 -2.238102e-0
4
## [5,] -1.602880e-03 -6.177140e-03 -1.588596e-03 -1.365039e-03 -2.128224e-0
4
## [6,] 1.313509e-03 4.984849e-03 9.909783e-04 1.167702e-03 3.365233e-0
4
## [7,] -3.078764e-03 1.340708e-03 3.950400e-03 1.263945e-02 3.089420e-0
4
## [8,] -5.749938e-04 9.903415e-04 2.373933e-02 4.034908e-03 -6.574278e-0
5
## [9,] -5.066162e-03 1.627080e-03 4.508924e-04 8.304157e-04 8.451418e-0
4
## [10,] 9.255863e-04 1.904018e-03 1.686892e-03 1.520064e-03 2.506675e-0
4
## [11,] 3.633681e-02 8.717016e-04 9.974573e-05 -1.469700e-04 5.205304e-0
4
## [12,] 8.717016e-04 5.409955e-03 5.024213e-04 6.770438e-04 2.701994e-0
4
## [13,] 9.974573e-05 5.024213e-04 3.268554e-02 2.057691e-03 4.598853e-0
5
## [14,] -1.469700e-04 6.770438e-04 2.057691e-03 9.831707e-03 2.305663e-0
4

```

```

## [15,] 5.205304e-04 2.701994e-04 4.598853e-05 2.305663e-04 6.678316e-0
3
## [16,] 1.938449e-03 6.571462e-04 1.783790e-04 3.337699e-04 3.681324e-0
4
## [17,] 1.802423e-03 3.417411e-03 6.221893e-04 8.507374e-04 3.675886e-0
4
## [18,] 2.806806e-03 9.978166e-04 2.722259e-04 5.117248e-04 4.775326e-0
4
## [19,] 4.540886e-04 1.023989e-03 1.398633e-04 1.616433e-04 8.917681e-0
6
## [20,] 7.798675e-05 1.039585e-05 -4.887183e-04 -1.797566e-04 -4.125857e-0
5
## [21,] 1.039737e-06 -2.075177e-06 -4.334976e-06 -4.208289e-06 -2.774271e-0
5
##          [,16]          [,17]          [,18]          [,19]          [,20
]
## [1,] -2.451481e-04 -2.143863e-04 -2.656976e-04 -1.448244e-04 -3.216936e-0
3
## [2,] -8.894926e-05 -1.423260e-03 -3.273462e-04 -4.311182e-04 1.531259e-0
3
## [3,] -3.467334e-03 -2.470126e-03 -5.293399e-03 -3.298522e-04 6.800664e-0
5
## [4,] -4.337868e-04 -1.681395e-03 -8.257773e-04 -3.920790e-04 4.566741e-0
4
## [5,] -1.260940e-03 -8.202382e-03 -2.140153e-03 -2.671035e-03 -8.136141e-0
5
## [6,] 1.149110e-03 6.551983e-03 1.809550e-03 1.402721e-03 7.626905e-0
5
## [7,] 5.257295e-04 1.728010e-03 8.984305e-04 4.339394e-04 9.985063e-0
5
## [8,] 2.575255e-04 1.292705e-03 4.606097e-04 3.618399e-04 -5.996618e-0
4
## [9,] 9.070736e-04 2.226176e-03 1.330399e-03 5.939258e-04 7.141136e-0
6
## [10,] 7.303046e-04 2.581682e-03 1.113463e-03 6.144897e-04 2.397296e-0
4
## [11,] 1.938449e-03 1.802423e-03 2.806806e-03 4.540886e-04 7.798675e-0
5
## [12,] 6.571462e-04 3.417411e-03 9.978166e-04 1.023989e-03 1.039585e-0
5
## [13,] 1.783790e-04 6.221893e-04 2.722259e-04 1.398633e-04 -4.887183e-0
4
## [14,] 3.337699e-04 8.507374e-04 5.117248e-04 1.616433e-04 -1.797566e-0
4
## [15,] 3.681324e-04 3.675886e-04 4.775326e-04 8.917681e-06 -4.125857e-0
5
## [16,] 1.934435e-03 1.263525e-03 1.705060e-03 2.655005e-04 1.202903e-0
4
## [17,] 1.263525e-03 1.445851e-02 1.911613e-03 1.399795e-03 1.637036e-0
4

```

```

## [18,] 1.705060e-03 1.911613e-03 4.501679e-03 3.792102e-04 1.765623e-0
4
## [19,] 2.655005e-04 1.399795e-03 3.792102e-04 7.426670e-03 1.768010e-0
4
## [20,] 1.202903e-04 1.637036e-04 1.765623e-04 1.768010e-04 3.249072e-0
3
## [21,] -3.702312e-06 1.635365e-06 8.496086e-07 1.891318e-05 1.669474e-0
5
##           [,21]
## [1,] -1.514321e-05
## [2,] 3.810320e-05
## [3,] 5.105780e-06
## [4,] 2.705770e-05
## [5,] -1.695209e-05
## [6,] -2.129676e-06
## [7,] -5.172888e-06
## [8,] -1.493225e-05
## [9,] -4.456215e-05
## [10,] 1.682562e-06
## [11,] 1.039737e-06
## [12,] -2.075177e-06
## [13,] -4.334976e-06
## [14,] -4.208289e-06
## [15,] -2.774271e-05
## [16,] -3.702312e-06
## [17,] 1.635365e-06
## [18,] 8.496086e-07
## [19,] 1.891318e-05
## [20,] 1.669474e-05
## [21,] 1.390228e-04

```

*# I now repeat the same procedures as for models 7 and 8 but without upper_ki
nk to create models 9a,9b,10a and 10b*

model 9a same as model 7a without upper_kink variable

```

model_9a=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE
+ frac_EastAsian_SIRE
+ frac_SouthAsian_SIRE
+ frac_Native_American_SIRE
+ frac_Other_SIRE
+ frac_Hispanic_SIRE
+ Child_US_Born
+ general_ses_PCA_z
+ (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df,
REML = FALSE)
summary(model_9a)

```

```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only

```



```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
##   frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispanic_SIRE +
##   Child_US_Born + general_ses_PCA_z + (1 | site_id_l) + (1 |
##   site_id_l:rel_family_id)
## Data: merged_df
##
##      AIC      BIC  logLik deviance df.resid
## 25534.1 25649.5 -12751.1 25502.1     9956
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -3.9196 -0.5387 -0.0476  0.4944  4.9804
##
## Random effects:
## Groups                Name                Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.321015 0.56658
## site_id_l              (Intercept) 0.008186 0.09048
## Residual                0.454384 0.67408
## Number of obs: 9972, groups: site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##              Estimate Std. Error t value
## (Intercept)    0.08017    0.06177   1.298
## South_Asian    0.43092    0.31740   1.358
## Amerindian    -0.81910    0.11927  -6.867
## East_Asian     0.62312    0.19631   3.174
## African       -0.62242    0.12029  -5.174
## frac_Black_SIRE -0.09968    0.09810  -1.016
## frac_EastAsian_SIRE -0.21879    0.17074  -1.281
## frac_SouthAsian_SIRE -0.11478    0.25286  -0.454
## frac_Native_American_SIRE -0.03491    0.10367  -0.337
## frac_Other_SIRE -0.07731    0.07598  -1.017
## frac_Hispanic_SIRE -0.03286    0.08142  -0.404
## Child_US_Born  0.10007    0.05694   1.757
## general_ses_PCA_z  0.28020    0.01177  23.808

```

```

##
## Correlation matrix not shown by default, as p = 13 > 12.
## Use print(x, correlation=TRUE) or
##     vcov(x)         if you need it

performance::icc(model_9a)

## # Intraclass Correlation Coefficient
##
##     Adjusted ICC: 0.420
##     Conditional ICC: 0.329

performance::r2(model_9a)

## # R2 for Mixed Models
##
##     Conditional R2: 0.546
##     Marginal R2: 0.218

# model 9b same as model 7b without upper_kink variable

orthostep = lm(general_ses_PCA_z ~ South_Asian + Amerindian + East_Asian + Af
rican
              + frac_Black_SIRE
              + frac_EastAsian_SIRE
              + frac_SouthAsian_SIRE
              + frac_Native_American_SIRE
              + frac_Other_SIRE
              + frac_Hispanic_SIRE, data=merged_df)
ortho_ses <- residuals(orthostep)

model_9b=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
              + frac_Black_SIRE
              + frac_EastAsian_SIRE
              + frac_SouthAsian_SIRE
              + frac_Native_American_SIRE
              + frac_Other_SIRE
              + frac_Hispanic_SIRE
              + Child_US_Born
              + ortho_ses
              + (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df,
REML = FALSE)
summary(model_9b)

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only

```



```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE + frac_EastAsian_SIRE + frac_SouthAsian_SIRE +
##   frac_Native_American_SIRE + frac_Other_SIRE + frac_Hispanic_SIRE +
##   Child_US_Born + ortho_ses + (1 | site_id_l) + (1 | site_id_l:rel_famil
y_id)
##   Data: merged_df
##
##       AIC       BIC   logLik deviance df.resid
## 25534.1 25649.5 -12751.1 25502.1    9956
##
## Scaled residuals:
##   Min      1Q  Median      3Q      Max
## -3.9196 -0.5387 -0.0476  0.4944  4.9804
##
## Random effects:
##   Groups                Name      Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.321015 0.56658
## site_id_l                (Intercept) 0.008186 0.09048
## Residual                    0.454384 0.67408
## Number of obs: 9972, groups:  site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##
##              Estimate Std. Error t value
## (Intercept)      0.19822    0.06147   3.225
## South_Asian      0.63433    0.31738   1.999
## Amerindian     -1.34634    0.11709  -11.498
## East_Asian      0.72811    0.19632   3.709
## African        -1.04807    0.11909  -8.801
## frac_Black_SIRE -0.15667    0.09808  -1.597
## frac_EastAsian_SIRE -0.22341    0.17074  -1.308
## frac_SouthAsian_SIRE -0.12655    0.25287  -0.500
## frac_Native_American_SIRE -0.25296    0.10364  -2.441
## frac_Other_SIRE  -0.18569    0.07583  -2.449
## frac_Hispanic_SIRE -0.09937    0.08139  -1.221
## Child_US_Born    0.10007    0.05694   1.757
## ortho_ses        0.28020    0.01177  23.808
##
##
## Correlation matrix not shown by default, as p = 13 > 12.

```



```

## Use print(x, correlation=TRUE) or
##   vcov(x)           if you need it

performance::icc(model_9b)

## # Intraclass Correlation Coefficient
##
##   Adjusted ICC: 0.420
##   Conditional ICC: 0.329

performance::r2(model_9b)

## # R2 for Mixed Models
##
##   Conditional R2: 0.546
##   Marginal R2: 0.218

# model 10a same as 8a without upper_kink variable

model_10a=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
+ frac_Black_SIRE_woc
+ frac_EastAsian_SIRE_woc
+ frac_SouthAsian_SIRE_woc
+ frac_Native_American_SIRE_woc
+ frac_Other_Race_SIRE_woc
+ frac_Hispanic_SIRE_woc
+ NH_Black_White_only
+ NH_SouthAsian_White_only
+ NH_EastAsian_White_only
+ NH_Native_American_White_only
+ H_White_only
+ H_Black_only
+ H_Other_only
+ Child_US_Born
+ general_ses_PCA_z
+ (1|site_id_l) + (1|site_id_l:rel_family_id), data=merged_df_
all_Model3_spec, REML = FALSE)
summary(model_10a)

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

```



```

: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE_woc + frac_EastAsian_SIRE_woc + frac_SouthAsian_SIRE_w
oc +
##   frac_Native_American_SIRE_woc + frac_Other_Race_SIRE_woc +
##   frac_Hispanic_SIRE_woc + NH_Black_White_only + NH_SouthAsian_White_onl
y +
##   NH_EastAsian_White_only + NH_Native_American_White_only +
##   H_White_only + H_Black_only + H_Other_only + Child_US_Born +
##   general_ses_PCA_z + (1 | site_id_l) + (1 | site_id_l:rel_family_id)
## Data: merged_df_all_Model3_spec
##
##      AIC      BIC   logLik deviance df.resid
## 25521.7 25687.5 -12737.8 25475.7    9949
##
## Scaled residuals:
##      Min      1Q  Median      3Q      Max
## -3.9086 -0.5418 -0.0480  0.4970  5.0183
##
## Random effects:
##   Groups                Name      Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.318174 0.56407
## site_id_l                (Intercept) 0.008022 0.08957
## Residual                    0.454899 0.67446
## Number of obs: 9972, groups:  site_id_l:rel_family_id, 8419; site_id_l, 22
##
## Fixed effects:
##
##              Estimate Std. Error t value
## (Intercept)    0.08525   0.06171   1.381
## South_Asian    0.47344   0.31869   1.486
## Amerindian    -0.77998   0.12163  -6.413
## East_Asian     0.63296   0.19707   3.212
## African       -0.63358   0.12255  -5.170
## frac_Black_SIRE_woc -0.10612   0.09981  -1.063
## frac_EastAsian_SIRE_woc -0.32022   0.17752  -1.804
## frac_SouthAsian_SIRE_woc -0.28634   0.26167  -1.094
## frac_Native_American_SIRE_woc -0.05507   0.13131  -0.419
## frac_Other_Race_SIRE_woc -0.04784   0.09924  -0.482
## frac_Hispanic_SIRE_woc  0.37558   0.19056   1.971
## NH_Black_White_only  0.11249   0.07263   1.549
## NH_SouthAsian_White_only  0.28301   0.18080   1.565
## NH_EastAsian_White_only -0.03278   0.09915  -0.331
## NH_Native_American_White_only -0.05843   0.08171  -0.715
## H_White_only   -0.04421   0.04390  -1.007
## H_Black_only    0.05614   0.11915   0.471
## H_Other_only   -0.07858   0.06704  -1.172

```

```
## Child_US_Born          0.08867    0.05697    1.556
## general_ses_PCA_z      0.27999    0.01176   23.805
```

```
##
## Correlation matrix not shown by default, as p = 20 > 12.
## Use print(x, correlation=TRUE) or
##   vcov(x)         if you need it
```

```
performance::icc(model_10a)
```

```
## # Intraclass Correlation Coefficient
```

```
##
```

```
##   Adjusted ICC: 0.418
```

```
##   Conditional ICC: 0.326
```

```
performance::r2(model_10a)
```

```
## # R2 for Mixed Models
```

```
##
```

```
##   Conditional R2: 0.546
```

```
##   Marginal R2: 0.220
```

```
# model 10b same as model 8b but without upper_kink variable
```

```
orthostep=lm(general_ses_PCA_z ~ South_Asian + Amerindian + East_Asian + African
```

```
  + frac_Black_SIRE_woc
  + frac_EastAsian_SIRE_woc
  + frac_SouthAsian_SIRE_woc
  + frac_Native_American_SIRE_woc
  + frac_Other_Race_SIRE_woc
  + frac_Hispanic_SIRE_woc
  + NH_Black_White_only
  + NH_SouthAsian_White_only
  + NH_EastAsian_White_only
  + NH_Native_American_White_only
  + H_White_only
  + H_Black_only
  + H_Other_only, data=merged_df_all_Model3_spec)
```

```
ortho_ses <- residuals(orthostep)
```

```
model_10b=lmer(CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African
```

```
  + frac_Black_SIRE_woc
  + frac_EastAsian_SIRE_woc
  + frac_SouthAsian_SIRE_woc
  + frac_Native_American_SIRE_woc
  + frac_Other_Race_SIRE_woc
  + frac_Hispanic_SIRE_woc
  + NH_Black_White_only
  + NH_SouthAsian_White_only
  + NH_EastAsian_White_only
```



```

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Warning in site_id_l:rel_family_id: numerical expression has 9972 elements
: only
## the first used

## Linear mixed model fit by maximum likelihood ['lmerMod']
## Formula: CA_Z_adj ~ South_Asian + Amerindian + East_Asian + African +
##   frac_Black_SIRE_woc + frac_EastAsian_SIRE_woc + frac_SouthAsian_SIRE_w
oc +
##   frac_Native_American_SIRE_woc + frac_Other_Race_SIRE_woc +
##   frac_Hispanic_SIRE_woc + NH_Black_White_only + NH_SouthAsian_White_onl
y +
##   NH_EastAsian_White_only + NH_Native_American_White_only +
##   H_White_only + H_Black_only + H_Other_only + Child_US_Born +
##   ortho_ses + (1 | site_id_l) + (1 | site_id_l:rel_family_id)
## Data: merged_df_all_Model3_spec
##
##      AIC      BIC  logLik deviance df.resid
## 25521.7 25687.5 -12737.8 25475.7    9949
##
## Scaled residuals:
##   Min      1Q  Median      3Q      Max
## -3.9086 -0.5418 -0.0480  0.4970  5.0183
##
## Random effects:
##   Groups                Name      Variance Std.Dev.
## site_id_l:rel_family_id (Intercept) 0.318174 0.56407
## site_id_l                (Intercept) 0.008022 0.08957
## Residual                  0.454899 0.67446

```

```

## Number of obs: 9972, groups:  site_id_1:rel_family_id, 8419; site_id_1, 22
##
## Fixed effects:
##
##              Estimate Std. Error t value
## (Intercept)    0.203865   0.061395   3.321
## South_Asian    0.689227   0.318660   2.163
## Amerindian    -1.302745   0.119535  -10.898
## East_Asian    0.744480   0.197068   3.778
## African      -1.051815   0.121413  -8.663
## frac_Black_SIRE_woc -0.166786   0.099791  -1.671
## frac_EastAsian_SIRE_woc -0.363629   0.177512  -2.048
## frac_SouthAsian_SIRE_woc -0.326581   0.261677  -1.248
## frac_Native_American_SIRE_woc -0.290241   0.131238  -2.212
## frac_Other_Race_SIRE_woc -0.178356   0.099088  -1.800
## frac_Hispanic_SIRE_woc 0.345424   0.190553   1.813
## NH_Black_White_only 0.041481   0.072588   0.571
## NH_SouthAsian_White_only 0.313697   0.180788   1.735
## NH_EastAsian_White_only -0.008765   0.099139  -0.088
## NH_Native_American_White_only -0.162652   0.081722  -1.990
## H_White_only  -0.087275   0.043874  -1.989
## H_Black_only   0.037741   0.119144   0.317
## H_Other_only  -0.160358   0.066951  -2.395
## Child_US_Born 0.088671   0.056969   1.556
## ortho_ses     0.279987   0.011762  23.805

##
## Correlation matrix not shown by default, as p = 20 > 12.
## Use print(x, correlation=TRUE) or
##   vcov(x)           if you need it

performance::icc(model_10b)

## # Intraclass Correlation Coefficient
##
##   Adjusted ICC: 0.418
##   Conditional ICC: 0.326

performance::r2(model_10b)

## # R2 for Mixed Models
##
##   Conditional R2: 0.546
##   Marginal R2: 0.220

```