ABCD Simulations for Manuscript

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```
abcd= read.csv("data/simulated_data_with_family.csv")
```

Model 1 observing effects of covariates without heat as a moderator

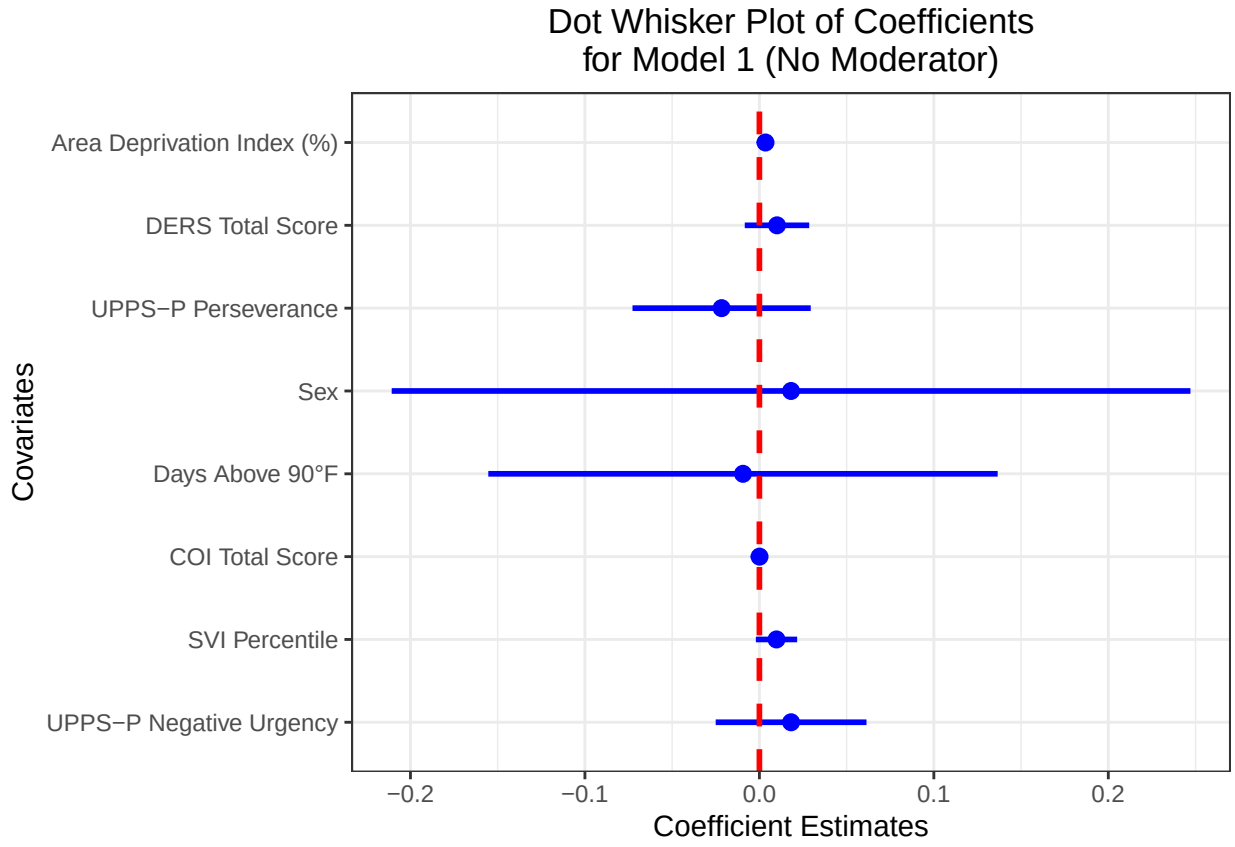
```
results <- tidy(model_1)
# Doing Benjamini-Hochberg (FDR)
results$p.adjusted <- p.adjust(results$p.value, method = "BH")
results %>% mutate(
  p.value = round(p.value, 3),
  p.adjusted = round(p.adjusted, 3))
```

```
## # A tibble: 9 x 6
##   term                           estimate std.error statistic p.value p.adjusted
##   <chr>                             <dbl>     <dbl>     <dbl>   <dbl>      <dbl>
## 1 (Intercept)                     3.94e+0   0.373     10.6      0          0
## 2 le_l_adi_addr1_national_prcnt   3.49e-3   0.00217    1.61     0.108      0.324
## 3 sdev_y_ders_total               1.01e-2   0.00942    1.07     0.284      0.615
## 4 mh_y_upps_pers_sum             -2.17e-2   0.0261    -0.831    0.406      0.615
## 5 sex                             1.82e-2   0.117      0.156    0.876      0.97
## 6 Days_Above_90                  -9.40e-3   0.0745    -0.126    0.9        0.97
## 7 le_l_coi_addr1_coi_total_nati~  7.97e-5   0.00214    0.0372   0.97       0.97
## 8 le_l_svi_addr1_total_prcntile   9.81e-3   0.00604    1.62     0.104      0.324
## 9 mh_y_upps_nurg_sum              1.82e-2   0.0220     0.824    0.41       0.615
```

Dot Whisker Plot of Coefficients for Model 1 (No Moderator)

```
dwplot(model_1,
       dot_args = list(color = "blue", size = 2.5),
       whisker_args = list(color="blue",size = 1)) %>%
  relabel_predictors(c(
    "(Intercept)" = "Intercept",
    "le_l_adi_addr1_national_prcnt" = "Area Deprivation Index (%)",
    "sdev_y_ders_total" = "DERS Total Score",
    "mh_y_upps_pers_sum" = "UPPS-P Perseverance",
    "sex" = "Sex",
    "Days_Above_90" = "Days Above 90°F",
```

```
    "le_l_coi_addr1_coi_total_national_score" = "COI Total Score",
    "le_l_svi_addr1_total_prcntile" = "SVI Percentile",
    "mh_y_upps_nurg_sum" = "UPPS-P Negative Urgency"
  )) +
  geom_vline(xintercept = 0, colour = "red", linetype = 2, linewidth = 1) +
  ggtitle(str_wrap("Dot Whisker Plot of Coefficients for Model 1 (No Moderator)", width =35)) +
  xlab("Coefficient Estimates") +
  ylab("Covariates") +
  theme_bw()+
  theme(plot.title = element_text(hjust = 0.5))
```



Model 1 Post-hoc and effects size (no moderator)

```
# Eta squared
eta_squared(model_1, partial = TRUE)
```

```
## # Effect Size for ANOVA (Type I)
##
## Parameter                          | Eta2 (partial) |       95% CI
## ------------------------------------------------------------------
## le_l_adi_addr1_national_prcnt      |       2.56e-04 | [0.00, 1.00]
## sdev_y_ders_total                  |       1.12e-04 | [0.00, 1.00]
## mh_y_upps_pers_sum                 |       6.85e-05 | [0.00, 1.00]
```

```
## sex                                     |       1.77e-06 | [0.00, 1.00]
## Days_Above_90                           |       1.48e-06 | [0.00, 1.00]
## le_l_coi_addr1_coi_total_national_score |       4.53e-08 | [0.00, 1.00]
## le_l_svi_addr1_total_prcntile           |       2.65e-04 | [0.00, 1.00]
## mh_y_upps_nurg_sum                      |       6.79e-05 | [0.00, 1.00]
##
## - One-sided CIs: upper bound fixed at [1.00].
```

```
# Standardized betas
standardize_parameters(model_1)
```

```
## # Standardization method: refit
##
## Parameter                                | Std. Coef. |        95% CI
## ------------------------------------------------------------------------
## (Intercept)                              |   6.08e-17 | [-0.02, 0.02]
## le l adi addr1 national prcnt            |       0.02 | [ 0.00, 0.04]
## sdev y ders total                        |       0.01 | [-0.01, 0.03]
## mh y upps pers sum                       |  -8.31e-03 | [-0.03, 0.01]
## sex                                      |   1.56e-03 | [-0.02, 0.02]
## Days Above 90                            |  -1.26e-03 | [-0.02, 0.02]
## le l coi addr1 coi total national score  |   3.73e-04 | [-0.02, 0.02]
## le l svi addr1 total prcntile            |       0.02 | [ 0.00, 0.04]
## mh y upps nurg sum                       |   8.24e-03 | [-0.01, 0.03]
```

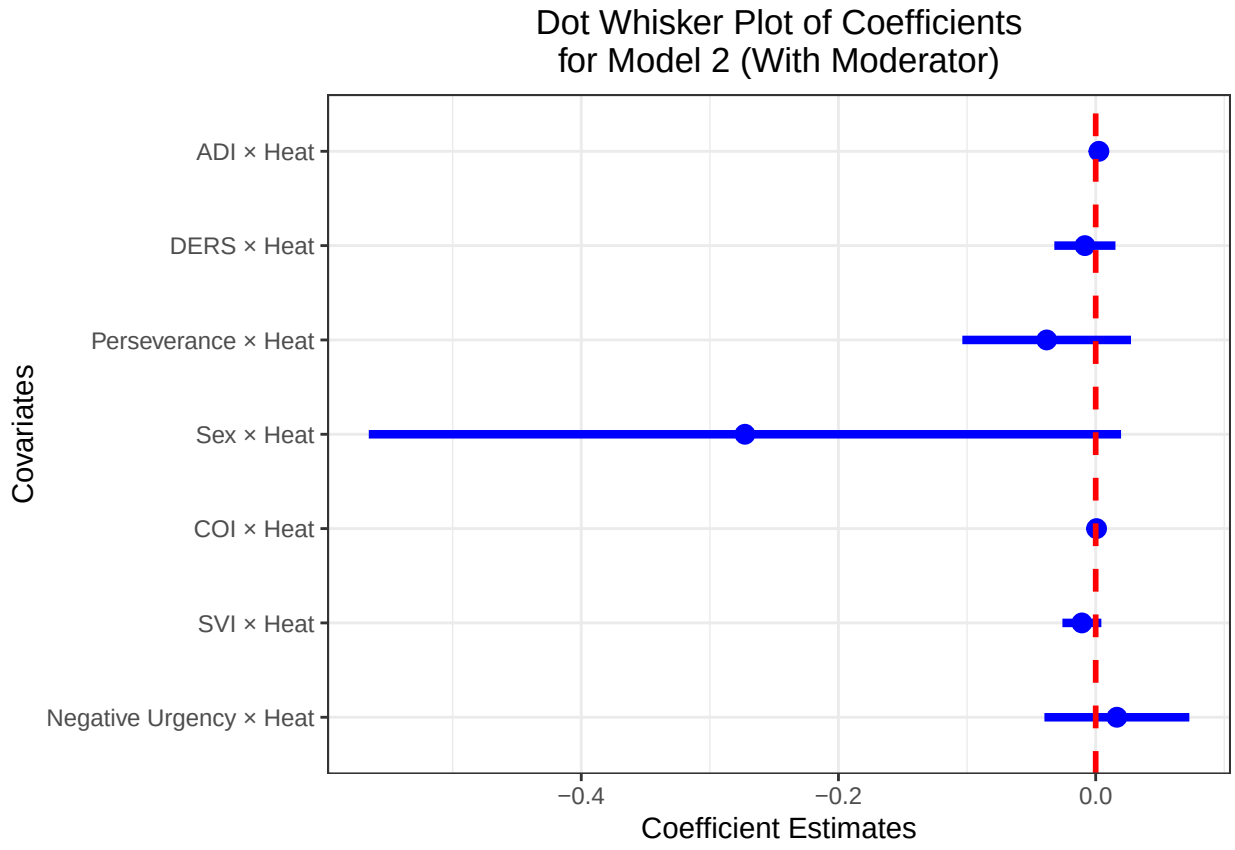
Model 2 observing effects of covariates with heat as a moderator

```
results2<- tidy(model_2)
# Doing Benjamini-Hochberg (FDR)
results2$p.adjusted <- p.adjust(results2$p.value, method = "BH")
results2%>% mutate(
  p.value = round(p.value, 3),
  p.adjusted = round(p.adjusted, 3))
```

```
## # A tibble: 16 x 6
##    term                          estimate std.error statistic p.value p.adjusted
##    <chr>                            <dbl>     <dbl>     <dbl>   <dbl>      <dbl>
##  1 (Intercept)                    3.72e+0   0.498       7.47    0          0
##  2 le_l_adi_addr1_national_prcnt  1.73e-3   0.00293     0.591   0.554      0.755
##  3 Days_Above_90                  2.98e-1   0.482       0.618   0.537      0.755
##  4 sdev_y_ders_total              1.62e-2   0.0127      1.28    0.202      0.538
##  5 mh_y_upps_pers_sum             5.52e-3   0.0349      0.158   0.874      0.874
##  6 sex                            2.14e-1   0.157       1.37    0.172      0.538
##  7 le_l_coi_addr1_coi_total_nat~ -4.82e-4   0.00287    -0.168   0.867      0.874
##  8 le_l_svi_addr1_total_prcntile  1.76e-2   0.00808     2.17    0.03       0.238
##  9 mh_y_upps_nurg_sum             7.26e-3   0.0294      0.247   0.805      0.874
## 10 le_l_adi_addr1_national_prcn~  2.50e-3   0.00281     0.890   0.374      0.747
## 11 Days_Above_90:sdev_y_ders_to~ -8.39e-3   0.0121     -0.692   0.489      0.755
## 12 Days_Above_90:mh_y_upps_pers~ -3.81e-2   0.0335     -1.14    0.255      0.583
## 13 Days_Above_90:sex             -2.73e-1   0.149      -1.83    0.068      0.361
## 14 Days_Above_90:le_l_coi_addr1~  6.79e-4   0.00272     0.250   0.803      0.874
```

```
## 15 Days_Above_90:le_l_svi_addr1~ -1.07e-2   0.00773    -1.39    0.165       0.538
## 16 Days_Above_90:mh_y_upps_nurg~  1.65e-2   0.0288      0.573   0.566       0.755
```

```r
interaction <- tidy(model_2) %>% filter(str_detect(term, ":"))
dwplot(interaction,
       dot_args = list(color = "blue", size = 3),
       whisker_args = list(color = "blue", size = 1.5)) %>%
  relabel_predictors(c(
    "le_l_adi_addr1_national_prcnt:Days_Above_90" = "ADI × Heat",
    "Days_Above_90:sdev_y_ders_total" = "DERS × Heat",
    "Days_Above_90:mh_y_upps_pers_sum" = "Perseverance × Heat",
    "Days_Above_90:sex" = "Sex × Heat",
    "Days_Above_90:le_l_coi_addr1_coi_total_national_score" = "COI × Heat",
    "Days_Above_90:le_l_svi_addr1_total_prcntile" = "SVI × Heat",
    "Days_Above_90:mh_y_upps_nurg_sum" = "Negative Urgency × Heat"
  )) +
  geom_vline(xintercept = 0, colour = "red", linetype = 2, linewidth = 1) +
  ggtitle(str_wrap("Dot Whisker Plot of Coefficients for Model 2 (With Moderator)", width = 35)) +
  xlab("Coefficient Estimates") +
  ylab("Covariates") +
  theme_bw() +
  theme(plot.title = element_text(hjust = 0.5))
```



Model 2 Post-hoc and effects size for moderation effects of heat

```
# eta squared
eta_squared(model_2, partial = TRUE)
```

```
## # Effect Size for ANOVA (Type I)
##
## Parameter                                                | Eta2 (partial) |       95% CI
## ---------------------------------------------------------------------------------------
## le_l_adi_addr1_national_prcnt                            |       2.56e-04 | [0.00, 1.00]
## Days_Above_90                                            |       1.42e-06 | [0.00, 1.00]
## sdev_y_ders_total                                        |       1.12e-04 | [0.00, 1.00]
## mh_y_upps_pers_sum                                       |       6.85e-05 | [0.00, 1.00]
## sex                                                      |       1.78e-06 | [0.00, 1.00]
## le_l_coi_addr1_coi_total_national_score                  |       4.54e-08 | [0.00, 1.00]
## le_l_svi_addr1_total_prcntile                            |       2.66e-04 | [0.00, 1.00]
## mh_y_upps_nurg_sum                                       |       6.80e-05 | [0.00, 1.00]
## le_l_adi_addr1_national_prcnt:Days_Above_90              |       8.28e-05 | [0.00, 1.00]
## Days_Above_90:sdev_y_ders_total                          |       5.46e-05 | [0.00, 1.00]
## Days_Above_90:mh_y_upps_pers_sum                         |       1.29e-04 | [0.00, 1.00]
## Days_Above_90:sex                                        |       3.52e-04 | [0.00, 1.00]
## Days_Above_90:le_l_coi_addr1_coi_total_national_score    |       6.96e-06 | [0.00, 1.00]
## Days_Above_90:le_l_svi_addr1_total_prcntile              |       1.91e-04 | [0.00, 1.00]
## Days_Above_90:mh_y_upps_nurg_sum                         |       3.29e-05 | [0.00, 1.00]
##
## - One-sided CIs: upper bound fixed at [1.00].
```

```
# standardized betas
standardize_parameters(model_2)
```

```
## # Standardization method: refit
##
## Parameter                                                 | Std. Coef. |        95% CI
## ------------------------------------------------------------------------------------
## (Intercept)                                               |   4.00e-04 | [-0.02, 0.02]
## le l adi addr1 national prcnt                             |       0.02 | [ 0.00, 0.04]
## Days Above 90                                             |  -7.11e-04 | [-0.02, 0.02]
## sdev y ders total                                         |       0.01 | [-0.01, 0.03]
## mh y upps pers sum                                        |  -8.12e-03 | [-0.03, 0.01]
## sex                                                       |   1.97e-03 | [-0.02, 0.02]
## le l coi addr1 coi total national score                   |  -3.04e-05 | [-0.02, 0.02]
## le l svi addr1 total prcntile                             |       0.02 | [ 0.00, 0.04]
## mh y upps nurg sum                                        |   8.53e-03 | [-0.01, 0.03]
## le l adi addr1 national prcnt × Days Above 90             |   9.02e-03 | [-0.01, 0.03]
## Days Above 90 × sdev y ders total                         |  -6.98e-03 | [-0.03, 0.01]
## Days Above 90 × mh y upps pers sum                        |      -0.01 | [-0.03, 0.01]
## Days Above 90 × sex                                       |      -0.02 | [-0.04, 0.00]
## Days Above 90 × le l coi addr1 coi total national score   |   2.49e-03 | [-0.02, 0.02]
## Days Above 90 × le l svi addr1 total prcntile             |      -0.01 | [-0.03, 0.01]
## Days Above 90 × mh y upps nurg sum                        |   5.87e-03 | [-0.01, 0.03]
```

Finally... The differences in R^2...

```
#R2
r2model1 = summary(model_1)$r.squared
r2model2 = summary(model_2)$r.squared

# adj R2
r2adjmodel1 = summary(model_1)$adj.r.squared
r2adjmodel2 = summary(model_2)$adj.r.squared

# data frame for comparison
df = data.frame(
  Models = c("Residual Squared for model 1", "Residual squared for model 2"),
  R2 = c(r2model1, r2model2),
  AdjustedR2= c(r2adjmodel1, r2adjmodel2)
)
print(df)
```

```
##                          Models           R2    AdjustedR2
## 1 Residual Squared for model 1 0.0007732181 -2.688341e-05
## 2 Residual squared for model 2 0.0016221356  1.221688e-04
```

```
# Testing for each site
# Parsing data
# california <- abcd %>% filter(site_id==5)
# head(california)
#
# lme_test <- lmer(mh_p_cbcl__synd__ext_sum ~ le_l_adi_addr1_national_prcnt +
#       sdev_y_ders_total +
#       mh_y_upps_pers_sum+
#       sex+
#       Days_Above_90+
#       le_l_coi_addr1_coi_total_national_score+
#       le_l_svi_addr1_total_prcntile+
#       mh_y_upps_nurg_sum,
#       data = california)
#
# summary(lme_test)
```

Conclusions...

- **The model has low adjusted** R^2, with the moderator it increases a bit (still pretty low).
- **With moderation effects, Social Vulnerability Index is the only significant covariate.**
- **It may be interesting to see how this changes state by state since this model looks at things nationally.**