

ABCD Simulations for Manuscript

Kyle Baacke and Michael Nima Hekmat

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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
```

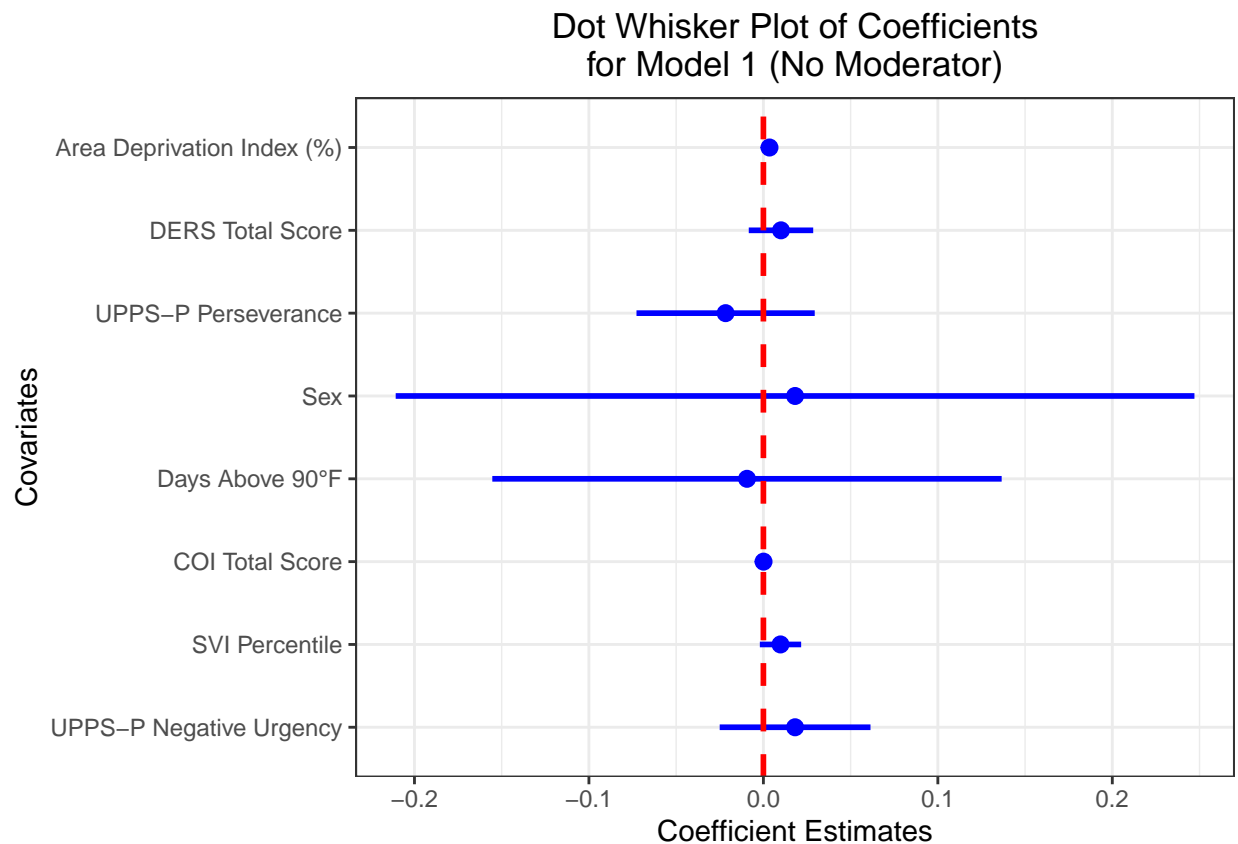
Dot Whisker Plot of Coefficients for Model 1 (No Moderator)

```
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_prntile" = "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_prnt | 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]
```

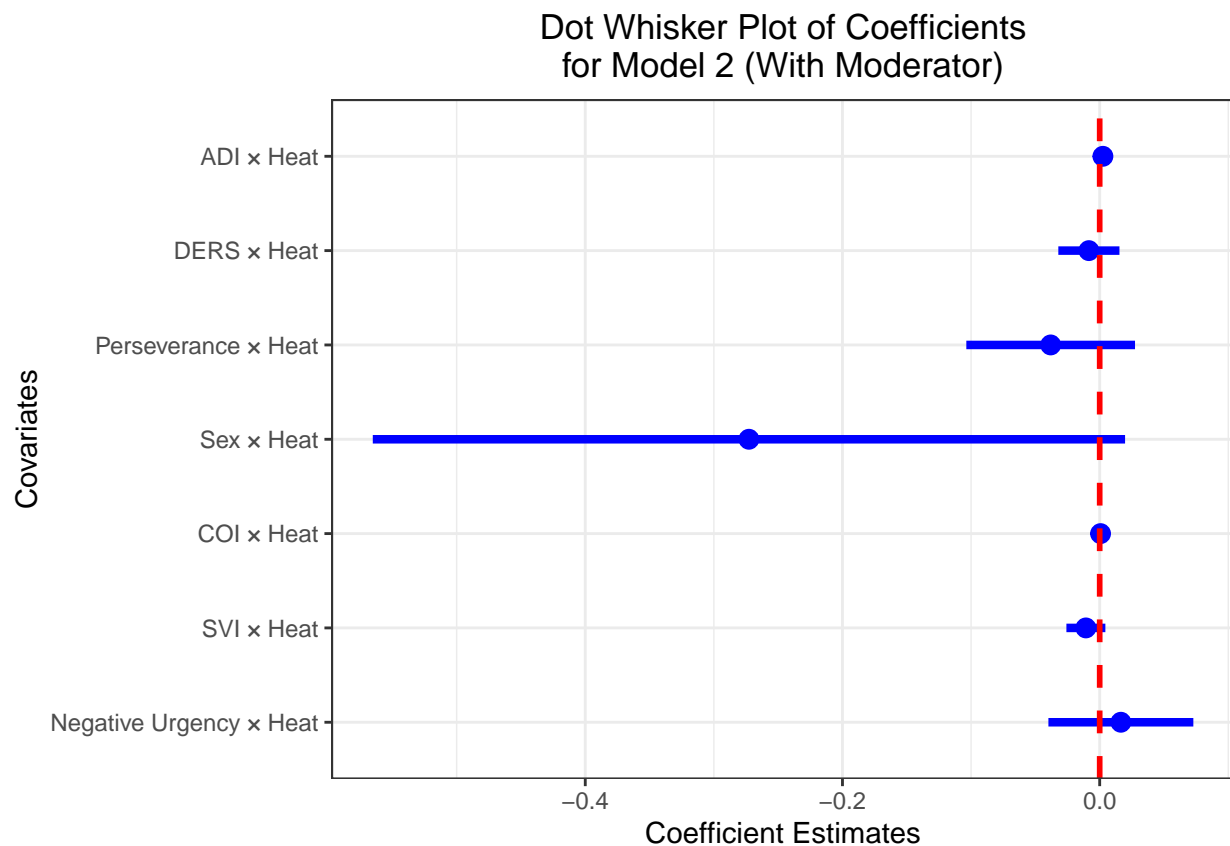
Model 2 observing effects of covariates with heat as a moderator

```
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
```

```
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_prct: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_prctile" = "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_prct	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_prct: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_prct	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_prct × 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_prct +
#   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_prctile+
#   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.