

ABCD Simulations for Manuscript

2025-08-13

Model 1 observing effects of covariates without heat as a moderator

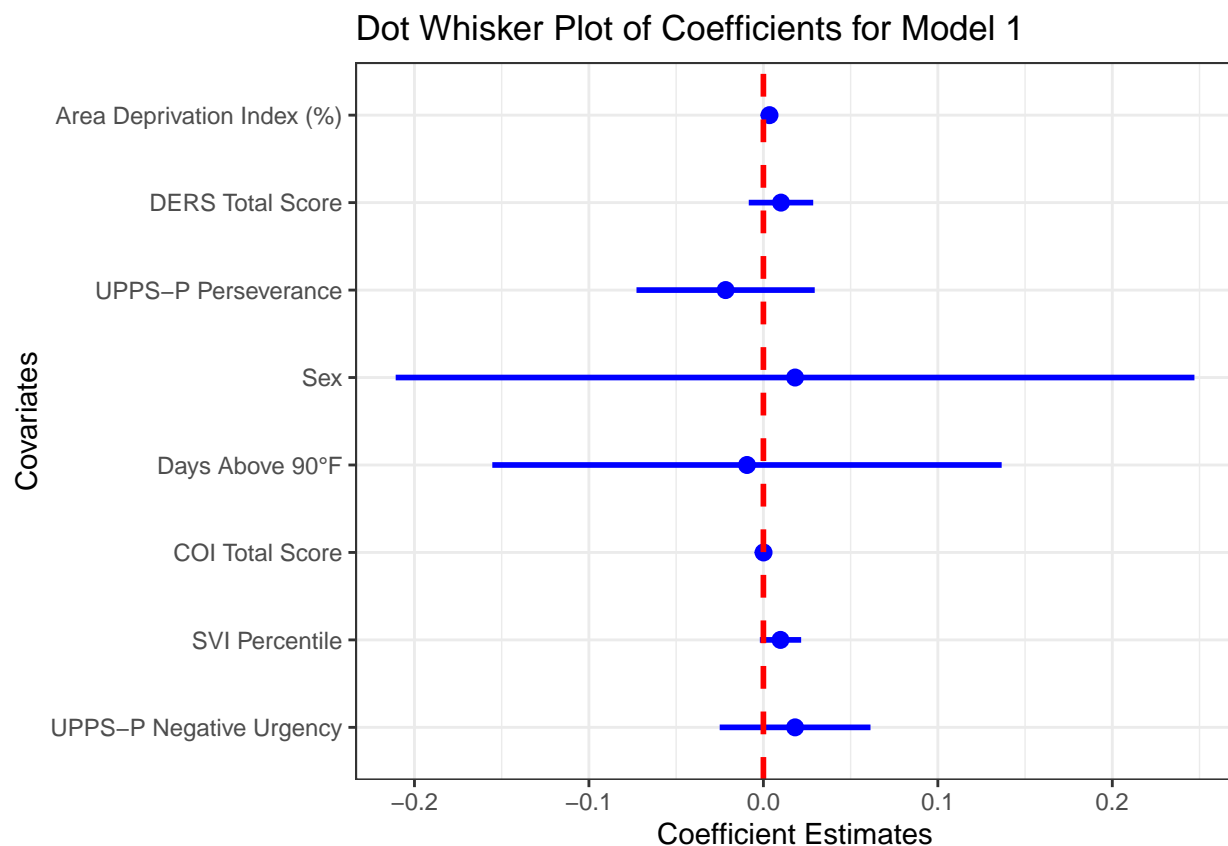
```
summary(model_1)
```

```
##
## Call:
## lm(formula = 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 = abcd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -21.4871  -4.0130  -0.0402   3.9501  23.3224
##
## Coefficients:
##                                Estimate Std. Error t value Pr(>|t|)
## (Intercept)                   3.943e+00  3.734e-01  10.560   <2e-16
## le_l_adi_addr1_national_prct    3.489e-03  2.171e-03   1.607   0.108
## sdev_y_ders_total               1.009e-02  9.424e-03   1.071   0.284
## mh_y_upps_pers_sum             -2.165e-02  2.606e-02  -0.831   0.406
## sex                           1.816e-02  1.168e-01   0.156   0.876
## Days_Above_90                 -9.399e-03  7.447e-02  -0.126   0.900
## le_l_coi_addr1_coi_total_national_score  7.966e-05  2.139e-03   0.037   0.970
## le_l_svi_addr1_total_prctile    9.807e-03  6.039e-03   1.624   0.104
## mh_y_upps_nurg_sum             1.817e-02  2.205e-02   0.824   0.410
##
## (Intercept)                    ***
## 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
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.838 on 9991 degrees of freedom
## Multiple R-squared:  0.0007732, Adjusted R-squared: -2.688e-05
## F-statistic: 0.9664 on 8 and 9991 DF, p-value: 0.4602
```

```

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_prct" = "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_prctile" = "SVI Percentile",
  "mh_y_upps_nurg_sum" = "UPPS-P Negative Urgency"
)) +
geom_vline(xintercept = 0, colour = "red", linetype = 2, linewidth = 1) +
ggtitle("Dot Whisker Plot of Coefficients for Model 1") +
xlab("Coefficient Estimates") +
ylab("Covariates") +
theme_bw()

```



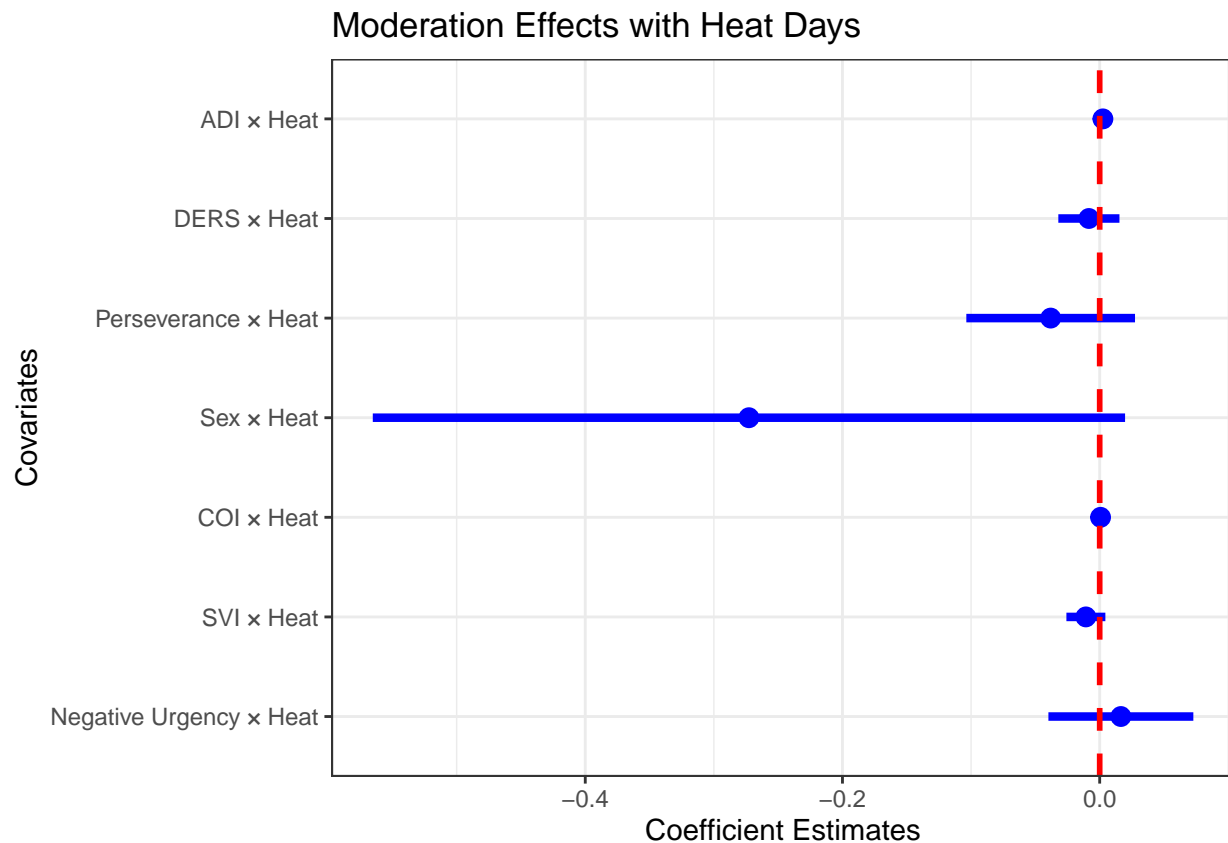
Model 2 observing effects of covariates with heat as a moderator

```
summary(model_2)
```

```
##
## Call:
## lm(formula = mh_p_cbcl__synd__ext_sum ~ le_l_adi_addr1_national_prct *
##     Days_Above_90 + sdev_y_ders_total * Days_Above_90 + mh_y_upps_pers_sum *
##     Days_Above_90 + sex * Days_Above_90 + le_l_coi_addr1_coi_total_national_score *
##     Days_Above_90 + le_l_svi_addr1_total_prctile * Days_Above_90 +
##     mh_y_upps_nurg_sum * Days_Above_90, data = abcd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -21.4457  -3.9967  -0.0284   3.9621  23.3317
##
## Coefficients:
##                                     Estimate Std. Error
## (Intercept)                       3.7193710  0.4976331
## le_l_adi_addr1_national_prct       0.0017343  0.0029323
## Days_Above_90                     0.2978868  0.4820770
## sdev_y_ders_total                  0.0162085  0.0126971
## mh_y_upps_pers_sum                 0.0055157  0.0349103
## sex                               0.2139535  0.1566375
## le_l_coi_addr1_coi_total_national_score -0.0004819  0.0028728
## le_l_svi_addr1_total_prctile       0.0175650  0.0080807
## mh_y_upps_nurg_sum                0.0072606  0.0294011
## le_l_adi_addr1_national_prct:Days_Above_90 0.0024964  0.0028062
## Days_Above_90:sdev_y_ders_total    -0.0083859  0.0121240
## Days_Above_90:mh_y_upps_pers_sum   -0.0381012  0.0334656
## Days_Above_90:sex                 -0.2727332  0.1492309
## Days_Above_90:le_l_coi_addr1_coi_total_national_score 0.0006791  0.0027217
## Days_Above_90:le_l_svi_addr1_total_prctile -0.0107246  0.0077311
## Days_Above_90:mh_y_upps_nurg_sum   0.0164876  0.0287513
##                                     t value Pr(>|t|)
## (Intercept)                       7.474 8.42e-14 ***
## le_l_adi_addr1_national_prct       0.591  0.5542
## Days_Above_90                     0.618  0.5366
## sdev_y_ders_total                  1.277  0.2018
## mh_y_upps_pers_sum                 0.158  0.8745
## sex                               1.366  0.1720
## le_l_coi_addr1_coi_total_national_score -0.168  0.8668
## le_l_svi_addr1_total_prctile       2.174  0.0298 *
## mh_y_upps_nurg_sum                0.247  0.8050
## le_l_adi_addr1_national_prct:Days_Above_90 0.890  0.3737
## Days_Above_90:sdev_y_ders_total    -0.692  0.4892
## Days_Above_90:mh_y_upps_pers_sum   -1.139  0.2549
## Days_Above_90:sex                 -1.828  0.0676 .
## Days_Above_90:le_l_coi_addr1_coi_total_national_score 0.250  0.8030
## Days_Above_90:le_l_svi_addr1_total_prctile -1.387  0.1654
## Days_Above_90:mh_y_upps_nurg_sum   0.573  0.5663
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.838 on 9984 degrees of freedom
```

```
## Multiple R-squared:  0.001622,   Adjusted R-squared:  0.0001222
## F-statistic: 1.081 on 15 and 9984 DF,  p-value: 0.3676
```

```
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("Moderation Effects with Heat Days") +
  xlab("Coefficient Estimates") +
  ylab("Covariates") +
  theme_bw()
```



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("With moderator", "Without moderator"),
  R2 = c(r2model1, r2model2),
  AdjustedR2= c(r2adjmodel1, r2adjmodel2)
)
print(df)
```

```
##           Models           R2    AdjustedR2
## 1 With moderator 0.0007732181 -2.688341e-05
## 2 Without moderator 0.0016221356 1.221688e-04
```