Sensitivity Analysis: High Carbon Emissions Scenario

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Contents

```
library(here)
```

```
## Warning in readLines(f, n): line 1 appears to contain an embedded nul
```

```
## Warning in readLines(f, n): incomplete final line found on '/Volumes/
## ALVINDRIVE2/flood-risk-health-effects/._flood-risk-health-effects.Rproj'
```

```
## here() starts at /Volumes/ALVINDRIVE2/flood-risk-health-effects
```

```
library(coda)
library(CARBayes)
```

```
## Loading required package: MASS
```

```
## Loading required package: Rcpp
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
library(ggplot2)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v tibble  3.1.8      v dplyr   1.0.10
## v tidyr   1.2.1      v stringr 1.4.0
## v readr   2.1.1      v forcats 0.5.1
## v purrr   0.3.4
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x dplyr::select() masks MASS::select()
```

```
fhs_model_df <- readRDS("intermediary_data/sensitivity_analysis/fhs_model_df_high_ver.rds")

var_names <- c("Intercept", "flood_risk_pc1", "flood_risk_pc2",
                          "flood_risk_pc3", "flood_risk_pc4", "flood_risk_pc5",
                          "EP_UNINSUR", "pollute_conc_pc1", "pollute_conc_pc2",
                          "pollute_conc_pc3", "tmmx", "rmax", "Data_Value_CSMOKING")
```

```
names_high_ver_strat <- c(paste("strat0", var_names, sep = ":"),
                          paste("strat1", var_names, sep = ":"))
```

Function for post-processing the inference

```
pc2flip <- c(-1, 1, -1, -1, -1,
             -1, 1, -1, -1, -1)

post_flip <- function(beta_inf_subset, pc2flip) {
  names_temp <- colnames(beta_inf_subset)
  beta_inf_subset[pc2flip == -1, ] <- beta_inf_subset[pc2flip == -1, c(1, 3, 2)]
  colnames(beta_inf_subset) <- names_temp
  return(sweep(beta_inf_subset, 1, pc2flip, FUN = "*"))
}
```

CAR model results, Coronary Heart Disease Stratified on RPL_THEMES

Inference is based on 3 markov chains, each of which has been run for 110000 samples, the first 10000 of which has been removed for burn-in. The remaining 100000 samples are thinned by 2, resulting in 150000 samples for inference across the 3 Markov chains.

```
load(here("modeling_files/sensitivity_analysis/high_ver/all_census_tract_CHD.RData"))
```

```
beta_samples_matrix <- rbind(chain1$samples$beta, chain2$samples$beta, chain3$samples$beta)

colnames(beta_samples_matrix) <- names_high_ver_strat
```

```
beta_inference <- round(t(apply(beta_samples_matrix, 2, quantile, c(0.5, 0.025, 0.975))),5)

pc_idx <- c(2:6,
            nrow(beta_inference)/2 + 2:6)

# flipping the inference results according to the flipped PCs
beta_inference[pc_idx, ] <- post_flip(beta_inference[pc_idx, ], pc2flip)

beta_inference
```

```
##                                  50%     2.5%    97.5%
## strat0:Intercept             6.23204  6.21241  6.25165
## strat0:flood_risk_pc1        0.07936  0.05923  0.09950
## strat0:flood_risk_pc2        0.02971  0.00669  0.05288
## strat0:flood_risk_pc3        0.02726  0.01014  0.04441
## strat0:flood_risk_pc4        0.01366 -0.00350  0.03074
## strat0:flood_risk_pc5       -0.03485 -0.05131 -0.01835
## strat0:EP_UNINSUR           -0.00995 -0.03847  0.01843
## strat0:pollute_conc_pc1     -0.43871 -0.49563 -0.38132
## strat0:pollute_conc_pc2     -0.50583 -0.58725 -0.42180
## strat0:pollute_conc_pc3     -0.20753 -0.28378 -0.13098
## strat0:tmmx                  0.00797 -0.11486  0.13512
## strat0:rmax                  0.14064  0.05181  0.23007
## strat0:Data_Value_CSMOKING   0.38001  0.34876  0.41130
## strat1:Intercept             6.86987  6.85306  6.88658
## strat1:flood_risk_pc1        0.05927  0.03990  0.07858
## strat1:flood_risk_pc2        0.02036 -0.00105  0.04173
## strat1:flood_risk_pc3        0.01851  0.00111  0.03589
## strat1:flood_risk_pc4        0.00737 -0.00769  0.02242
## strat1:flood_risk_pc5       -0.00530 -0.02006  0.00951
## strat1:EP_UNINSUR           -0.13940 -0.15819 -0.12074
## strat1:pollute_conc_pc1     -0.27859 -0.33670 -0.22072
## strat1:pollute_conc_pc2     -0.40605 -0.48638 -0.32378
## strat1:pollute_conc_pc3     -0.27433 -0.35099 -0.19737
## strat1:tmmx                  0.09690 -0.02635  0.22525
## strat1:rmax                  0.13836  0.04978  0.22876
## strat1:Data_Value_CSMOKING   0.85712  0.83351  0.88052
```

```
saveRDS(beta_inference, file = here("modeling_files/sensitivity_analysis/high_ver/beta_inference_files/C
```

List of significant beta coefficients:

```
row.names(beta_inference)[sign(beta_inference[, 2]) == sign(beta_inference[, 3])]
```

```
##  [1] "strat0:Intercept"           "strat0:flood_risk_pc1"
##  [3] "strat0:flood_risk_pc2"      "strat0:flood_risk_pc3"
##  [5] "strat0:flood_risk_pc5"      "strat0:pollute_conc_pc1"
##  [7] "strat0:pollute_conc_pc2"    "strat0:pollute_conc_pc3"
##  [9] "strat0:rmax"                "strat0:Data_Value_CSMOKING"
## [11] "strat1:Intercept"           "strat1:flood_risk_pc1"
## [13] "strat1:flood_risk_pc3"      "strat1:EP_UNINSUR"
## [15] "strat1:pollute_conc_pc1"    "strat1:pollute_conc_pc2"
## [17] "strat1:pollute_conc_pc3"    "strat1:rmax"
## [19] "strat1:Data_Value_CSMOKING"
```

Credible Interval plots for the coefficients, in ggplot

```
# first, process the beta_inference matrix in a form ggplot can understand
beta_inference_df <- as.data.frame(beta_inference)
beta_inference_df <- mutate(beta_inference_df, var_name = row.names(beta_inference_df))
beta_inference_df <- rename(beta_inference_df,
                            post_median = `50%`,
                            post_2.5 = `2.5%`,
                            post_97.5 = `97.5%`)
beta_inference_df$var_name <- substring(beta_inference_df$var_name, first = 8)
beta_inference_df$var_name <- factor(beta_inference_df$var_name,
                                     levels = unique(beta_inference_df$var_name))
beta_inference_df$strat <- factor(c(rep("Low SV", (nrow(beta_inference_df)/2)),
                                    rep("High SV", (nrow(beta_inference_df)/2))), levels = c("Low SV
```

Splitting up the beta coefficients for each strata

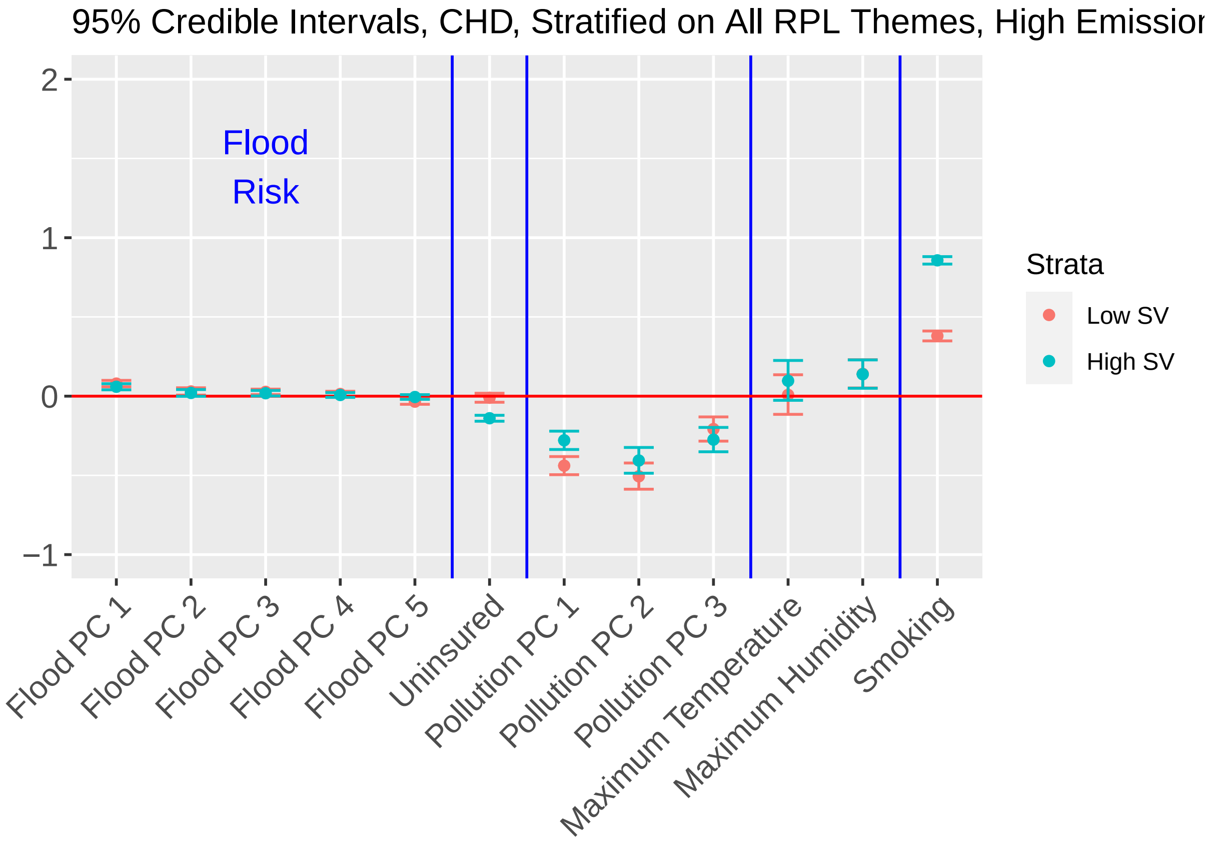
```
beta_inference_df_strat0 <- beta_inference_df[1:(nrow(beta_inference_df)/2),]

beta_inference_df_strat1 <- beta_inference_df[(nrow(beta_inference_df)/2 + 1):nrow(beta_inference_df),]
```

Note: The intercept for both strata is not included.

```
p <- ggplot(beta_inference_df_strat0[-1, ], aes(x = var_name, y = post_median, color = strat)) +
  geom_point() +
  ylim(c(-1, 2)) +
  theme(axis.text.x = element_text(angle = 45, vjust = 1, hjust=1), axis.title.x = element_blank(), axi
        axis.text=element_text(size=12),
        plot.margin = margin(5.5, 5.5, 5.5, 25)) +
  geom_errorbar(aes(ymin = post_2.5, ymax = post_97.5, width = 0.4), col = "#F8766D") +
  geom_vline(xintercept = c(5.5, 6.5, 9.5, 11.5), col = "blue") +
  geom_hline(yintercept = 0, col = "red") +
  annotate(geom = "text", x = 3, y = 1.45, label = "Flood\nRisk",
           col = "blue", size = 4.5) +
  scale_x_discrete(labels = c("Flood PC 1", "Flood PC 2", "Flood PC 3", "Flood PC 4", "Flood PC 5",
                              "Uninsured",
                              "Pollution PC 1", "Pollution PC 2", "Pollution PC 3",
                              "Maximum Temperature", "Maximum Humidity",
                              "Smoking")) + ggtitle("95% Credible Intervals, CHD, Stratified on All RPL
  geom_point(data = beta_inference_df_strat1[-1, ], col = "#00BFC4") + # strat 1
  geom_errorbar(data = beta_inference_df_strat1[-1, ], aes(ymin = post_2.5, ymax = post_97.5, width = 0
  scale_color_manual(name = "Strata",
                     values = c("#F8766D", "#00BFC4"),
                     drop = FALSE)

p
```



```
ggsave(here("figures/final_figures/sensitivity_analysis/high_ver/CHD_CI_rpls.pdf"),
       plot = p, device = "pdf",
       width = 8, height = 6, units = "in")
```

CAR model results, High Blood Pressure Stratified on RPL_THEMES

```
load(here("modeling_files/sensitivity_analysis/high_ver/all_census_tract_BPHIGH.RData"))
```

```
beta_samples_matrix <- rbind(chain1$samples$beta, chain2$samples$beta, chain3$samples$beta)

colnames(beta_samples_matrix) <- names_high_ver_strat
```

```
beta_inference <- round(t(apply(beta_samples_matrix, 2, quantile, c(0.5, 0.025, 0.975))),5)

pc_idx <- c(2:6,
            nrow(beta_inference)/2 + 2:6)

# flipping the inference results according to the flipped PCs
beta_inference[pc_idx, ] <- post_flip(beta_inference[pc_idx, ], pc2flip)
```

```
beta_inference
```

```
##                                   50%     2.5%    97.5%
## strat0:Intercept           31.04608 30.98788 31.10365
## strat0:flood_risk_pc1       0.15288  0.09178  0.21413
## strat0:flood_risk_pc2       0.12965  0.06019  0.20008
## strat0:flood_risk_pc3       0.07425  0.02258  0.12622
## strat0:flood_risk_pc4       0.05816  0.00645  0.10987
## strat0:flood_risk_pc5      -0.10308 -0.15292 -0.05322
## strat0:EP_UNINSUR          -0.09830 -0.18394 -0.01331
## strat0:pollute_conc_pc1    -1.65581 -1.83271 -1.47905
## strat0:pollute_conc_pc2    -2.35288 -2.60503 -2.09228
## strat0:pollute_conc_pc3     0.36135  0.12267  0.60339
## strat0:tmmx                -0.00842 -0.40119  0.39529
## strat0:rmax                 0.19692 -0.09047  0.48460
## strat0:Data_Value_CSMOKING  0.72553  0.63032  0.82081
## strat1:Intercept           32.84385 32.79459 32.89314
## strat1:flood_risk_pc1      -0.00237 -0.06145  0.05644
## strat1:flood_risk_pc2      -0.09588 -0.16015 -0.03125
## strat1:flood_risk_pc3       0.02375 -0.02888  0.07605
## strat1:flood_risk_pc4      -0.04526 -0.09054  0.00027
## strat1:flood_risk_pc5      -0.03879 -0.08345  0.00578
## strat1:EP_UNINSUR          -0.47550 -0.53209 -0.41906
## strat1:pollute_conc_pc1    -0.79115 -0.97196 -0.61366
## strat1:pollute_conc_pc2    -2.23186 -2.48107 -1.97449
## strat1:pollute_conc_pc3    -0.19213 -0.43284  0.05089
## strat1:tmmx                 0.51303  0.11860  0.91780
## strat1:rmax                 0.28168 -0.00540  0.57023
## strat1:Data_Value_CSMOKING  2.12764  2.05562  2.19902
```

```
saveRDS(beta_inference, file = here("modeling_files/sensitivity_analysis/high_ver/beta_inference_files/
```

List of significant beta coefficients:

```
row.names(beta_inference)[sign(beta_inference[, 2]) == sign(beta_inference[, 3])]
```

```
##  [1] "strat0:Intercept"           "strat0:flood_risk_pc1"
##  [3] "strat0:flood_risk_pc2"      "strat0:flood_risk_pc3"
##  [5] "strat0:flood_risk_pc4"      "strat0:flood_risk_pc5"
##  [7] "strat0:EP_UNINSUR"          "strat0:pollute_conc_pc1"
##  [9] "strat0:pollute_conc_pc2"    "strat0:pollute_conc_pc3"
## [11] "strat0:Data_Value_CSMOKING" "strat1:Intercept"
## [13] "strat1:flood_risk_pc2"      "strat1:EP_UNINSUR"
## [15] "strat1:pollute_conc_pc1"    "strat1:pollute_conc_pc2"
## [17] "strat1:tmmx"                "strat1:Data_Value_CSMOKING"
```

Credible Interval plots for the coefficients, in ggplot

```
# first, process the beta_inference matrix in a form ggplot can understand
beta_inference_df <- as.data.frame(beta_inference)
beta_inference_df <- mutate(beta_inference_df, var_name = row.names(beta_inference_df))
beta_inference_df <- rename(beta_inference_df,
                            post_median = `50%`,
                            post_2.5 = `2.5%`,
                            post_97.5 = `97.5%`)
beta_inference_df$var_name <- substring(beta_inference_df$var_name, first = 8)
beta_inference_df$var_name <- factor(beta_inference_df$var_name,
                                     levels = unique(beta_inference_df$var_name))
beta_inference_df$strat <- factor(c(rep("Low SV", (nrow(beta_inference_df)/2)),
                                       rep("High SV", (nrow(beta_inference_df)/2))), levels = c("Low SV
```

Splitting up the beta coefficients for each strata

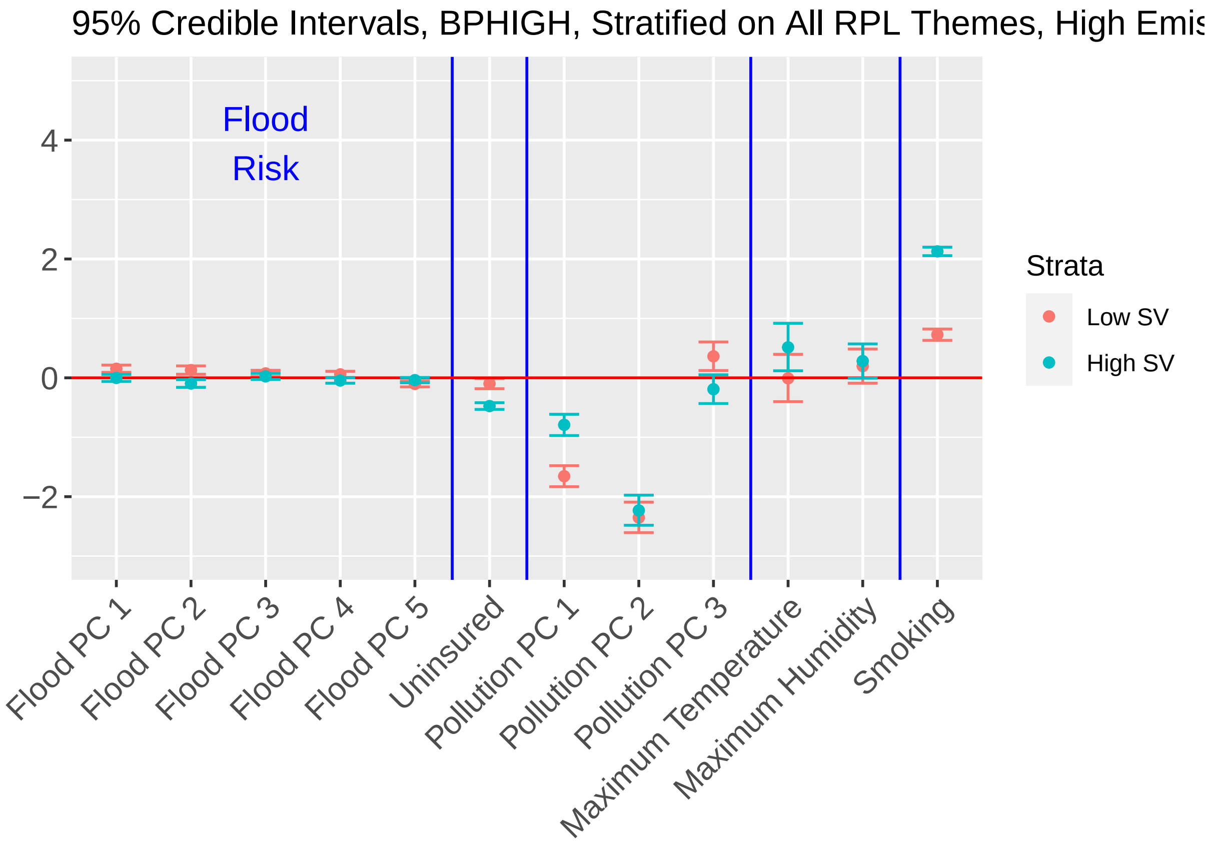
```
beta_inference_df_strat0 <- beta_inference_df[1:(nrow(beta_inference_df)/2),]

beta_inference_df_strat1 <- beta_inference_df[(nrow(beta_inference_df)/2 + 1):nrow(beta_inference_df),]
```

Note: The intercept for both strata is not included.

```
p <- ggplot(beta_inference_df_strat0[-1, ], aes(x = var_name, y = post_median, color = strat)) +
  geom_point() +
  ylim(c(-3, 5)) +
  theme(axis.text.x = element_text(angle = 45, vjust = 1, hjust=1), axis.title.x = element_blank(), axi
        axis.text=element_text(size=12),
        plot.margin = margin(5.5, 5.5, 5.5, 25)) +
  geom_errorbar(aes(ymin = post_2.5, ymax = post_97.5, width = 0.4), col = "#F8766D") +
  geom_vline(xintercept = c(5.5, 6.5, 9.5, 11.5), col = "blue") +
  geom_hline(yintercept = 0, col = "red") +
  annotate(geom = "text", x = 3, y = 3.95, label = "Flood\nRisk",
           col = "blue", size = 4.5) +
  scale_x_discrete(labels = c("Flood PC 1", "Flood PC 2", "Flood PC 3", "Flood PC 4", "Flood PC 5",
                              "Uninsured",
                              "Pollution PC 1", "Pollution PC 2", "Pollution PC 3",
                              "Maximum Temperature", "Maximum Humidity",
                              "Smoking")) + ggtitle("95% Credible Intervals, BPHIGH, Stratified on All
  geom_point(data = beta_inference_df_strat1[-1, ], col = "#00BFC4") + # strat 1
  geom_errorbar(data = beta_inference_df_strat1[-1, ], aes(ymin = post_2.5, ymax = post_97.5, width = 0
  scale_color_manual(name = "Strata",
                     values = c("#F8766D", "#00BFC4"),
                     drop = FALSE)

p
```



```
ggsave(here("figures/final_figures/sensitivity_analysis/high_ver/BPHIGH_CI_rpls.pdf"),
       plot = p, device = "pdf",
       width = 8, height = 6, units = "in")
```

CAR model results, Asthma Stratified on RPL_THEMES

```
load(here("modeling_files/sensitivity_analysis/high_ver/all_census_tract_CASTHMA.RData"))
```

```
beta_samples_matrix <- rbind(chain1$samples$beta, chain2$samples$beta, chain3$samples$beta)

colnames(beta_samples_matrix) <- names_high_ver_strat
```

```
beta_inference <- round(t(apply(beta_samples_matrix, 2, quantile, c(0.5, 0.025, 0.975))),5)

pc_idx <- c(2:6,
            nrow(beta_inference)/2 + 2:6)

# flipping the inference results according to the flipped PCs
beta_inference[pc_idx, ] <- post_flip(beta_inference[pc_idx, ], pc2flip)

beta_inference
```

```
##                                  50%     2.5%    97.5%
## strat0:Intercept             9.76050  9.75369  9.76723
## strat0:flood_risk_pc1       -0.00587 -0.01311  0.00138
## strat0:flood_risk_pc2        0.01063  0.00236  0.01897
## strat0:flood_risk_pc3       0.00108 -0.00504  0.00726
## strat0:flood_risk_pc4      -0.01382 -0.01995 -0.00771
## strat0:flood_risk_pc5      -0.00047 -0.00637  0.00542
## strat0:EP_UNINSUR          -0.02861 -0.03875 -0.01857
## strat0:pollute_conc_pc1     0.11342  0.09231  0.13434
## strat0:pollute_conc_pc2    -0.17283 -0.20283 -0.14192
## strat0:pollute_conc_pc3    -0.05378 -0.08218 -0.02493
## strat0:tmmx                -0.00203 -0.04934  0.04691
## strat0:rmax                -0.08548 -0.12059 -0.05070
## strat0:Data_Value_CSMOKING  1.12435  1.11305  1.13567
## strat1:Intercept            9.94422  9.93845  9.95001
## strat1:flood_risk_pc1      -0.01576 -0.02281 -0.00878
## strat1:flood_risk_pc2      -0.02671 -0.03432 -0.01903
## strat1:flood_risk_pc3       0.00576 -0.00048  0.01197
## strat1:flood_risk_pc4      -0.01723 -0.02258 -0.01183
## strat1:flood_risk_pc5      -0.00165 -0.00694  0.00363
## strat1:EP_UNINSUR          -0.08539 -0.09209 -0.07871
## strat1:pollute_conc_pc1     0.17751  0.15588  0.19847
## strat1:pollute_conc_pc2    -0.16714 -0.19671 -0.13651
## strat1:pollute_conc_pc3    -0.10748 -0.13628 -0.07844
## strat1:tmmx                 0.04378 -0.00385  0.09288
## strat1:rmax                -0.12055 -0.15580 -0.08586
## strat1:Data_Value_CSMOKING  1.31079  1.30227  1.31930
```

```
saveRDS(beta_inference, file = here("modeling_files/sensitivity_analysis/high_ver/beta_inference_files/
```

List of significant beta coefficients:

```
row.names(beta_inference)[sign(beta_inference[, 2]) == sign(beta_inference[, 3])]
```

```
##  [1] "strat0:Intercept"           "strat0:flood_risk_pc2"
##  [3] "strat0:flood_risk_pc4"      "strat0:EP_UNINSUR"
##  [5] "strat0:pollute_conc_pc1"    "strat0:pollute_conc_pc2"
##  [7] "strat0:pollute_conc_pc3"    "strat0:rmax"
##  [9] "strat0:Data_Value_CSMOKING" "strat1:Intercept"
## [11] "strat1:flood_risk_pc1"      "strat1:flood_risk_pc2"
## [13] "strat1:flood_risk_pc4"      "strat1:EP_UNINSUR"
## [15] "strat1:pollute_conc_pc1"    "strat1:pollute_conc_pc2"
## [17] "strat1:pollute_conc_pc3"    "strat1:rmax"
## [19] "strat1:Data_Value_CSMOKING"
```

Credible Interval plots for the coefficients, in ggplot

```
# first, process the beta_inference matrix in a form ggplot can understand
beta_inference_df <- as.data.frame(beta_inference)
beta_inference_df <- mutate(beta_inference_df, var_name = row.names(beta_inference_df))
beta_inference_df <- rename(beta_inference_df,
                            post_median = `50%`,
                            post_2.5 = `2.5%`,
                            post_97.5 = `97.5%`)
beta_inference_df$var_name <- substring(beta_inference_df$var_name, first = 8)
beta_inference_df$var_name <- factor(beta_inference_df$var_name,
                                     levels = unique(beta_inference_df$var_name))
beta_inference_df$strat <- factor(c(rep("Low SV", (nrow(beta_inference_df)/2)),
                                        rep("High SV", (nrow(beta_inference_df)/2))), levels = c("Low SV
```

Splitting up the beta coefficients for each strata

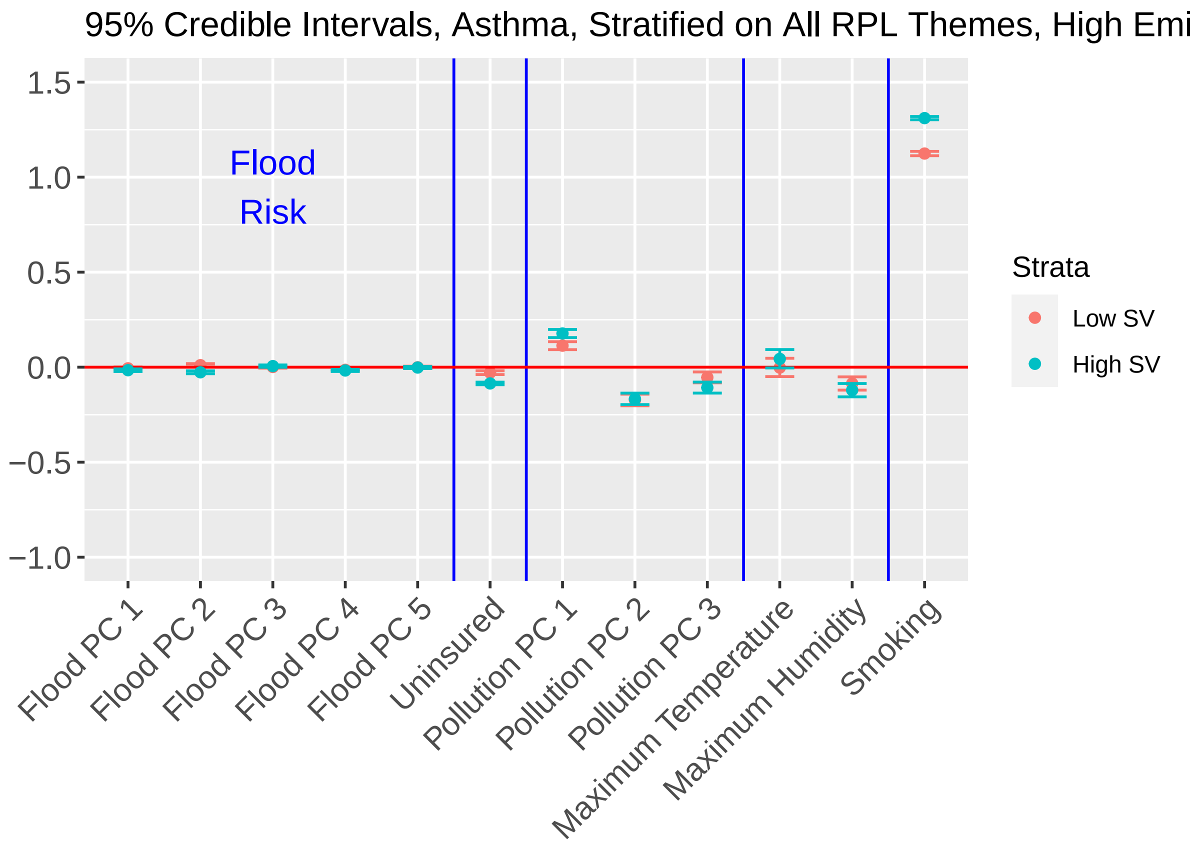
```
beta_inference_df_strat0 <- beta_inference_df[1:(nrow(beta_inference_df)/2),]

beta_inference_df_strat1 <- beta_inference_df[(nrow(beta_inference_df)/2 + 1):nrow(beta_inference_df),]
```

Note: The intercept for both strata is not included.

```
p <- ggplot(beta_inference_df_strat0[-1, ], aes(x = var_name, y = post_median, color = strat)) +
  geom_point() +
  ylim(c(-1, 1.5)) +
  theme(axis.text.x = element_text(angle = 45, vjust = 1, hjust=1), axis.title.x = element_blank(), axi
        axis.text=element_text(size=12),
        plot.margin = margin(5.5, 5.5, 5.5, 25)) +
  geom_errorbar(aes(ymin = post_2.5, ymax = post_97.5, width = 0.4), col = "#F8766D") +
  geom_vline(xintercept = c(5.5, 6.5, 9.5, 11.5), col = "blue") +
  geom_hline(yintercept = 0, col = "red") +
  annotate(geom = "text", x = 3, y = 0.95, label = "Flood\nRisk",
           col = "blue", size = 4.5) +
  scale_x_discrete(labels = c("Flood PC 1", "Flood PC 2", "Flood PC 3", "Flood PC 4", "Flood PC 5",
                              "Uninsured",
                              "Pollution PC 1", "Pollution PC 2", "Pollution PC 3",
                              "Maximum Temperature", "Maximum Humidity",
                              "Smoking")) + ggtitle("95% Credible Intervals, Asthma, Stratified on All 
  geom_point(data = beta_inference_df_strat1[-1, ], col = "#00BFC4") + # strat 1
  geom_errorbar(data = beta_inference_df_strat1[-1, ], aes(ymin = post_2.5, ymax = post_97.5, width = 0
  scale_color_manual(name = "Strata",
                     values = c("#F8766D", "#00BFC4"),
                     drop = FALSE)

p
```



```
ggsave(here("figures/final_figures/sensitivity_analysis/high_ver/CASTHMA_CI_rpls.pdf"),
       plot = p, device = "pdf",
       width = 8, height = 6, units = "in")
```

CAR model results, Poor Mental Health Stratified on RPL_THEMES

```
load(here("modeling_files/sensitivity_analysis/high_ver/all_census_tract_MHLTH.RData"))
```

```
beta_samples_matrix <- rbind(chain1$samples$beta, chain2$samples$beta, chain3$samples$beta)

colnames(beta_samples_matrix) <- names_high_ver_strat
```

```
beta_inference <- round(t(apply(beta_samples_matrix, 2, quantile, c(0.5, 0.025, 0.975))),5)

pc_idx <- c(2:6,
            nrow(beta_inference)/2 + 2:6)

# flipping the inference results according to the flipped PCs
beta_inference[pc_idx, ] <- post_flip(beta_inference[pc_idx, ], pc2flip)

beta_inference
```

```
##                                  50%     2.5%    97.5%
## strat0:Intercept            14.15585 14.14308 14.16837
## strat0:flood_risk_pc1        0.00113 -0.01249  0.01475
## strat0:flood_risk_pc2        0.02344  0.00790  0.03916
## strat0:flood_risk_pc3      -0.02298 -0.03448 -0.01134
## strat0:flood_risk_pc4      -0.01701 -0.02851 -0.00550
## strat0:flood_risk_pc5       0.01329  0.00216  0.02438
## strat0:EP_UNINSUR           0.01692 -0.00214  0.03568
## strat0:pollute_conc_pc1     0.64630  0.60630  0.68556
## strat0:pollute_conc_pc2     0.37457  0.31812  0.43235
## strat0:pollute_conc_pc3    -0.50947 -0.56299 -0.45550
## strat0:tmmx                 0.04020 -0.05026  0.13362
## strat0:rmax                -0.08843 -0.15589 -0.02246
## strat0:Data_Value_CSMOKING  3.32387  3.30258  3.34525
## strat1:Intercept           14.34788 14.33714 14.35867
## strat1:flood_risk_pc1       0.00462 -0.00862  0.01779
## strat1:flood_risk_pc2      -0.01646 -0.03071 -0.00202
## strat1:flood_risk_pc3      -0.00316 -0.01488  0.00849
## strat1:flood_risk_pc4      -0.00547 -0.01553  0.00466
## strat1:flood_risk_pc5       0.00478 -0.00519  0.01470
## strat1:EP_UNINSUR           0.04682  0.03428  0.05936
## strat1:pollute_conc_pc1     0.68369  0.64246  0.72287
## strat1:pollute_conc_pc2     0.38404  0.32843  0.44126
## strat1:pollute_conc_pc3    -0.48958 -0.54394 -0.43530
## strat1:tmmx                 0.08863 -0.00238  0.18225
## strat1:rmax                -0.09650 -0.16409 -0.03086
## strat1:Data_Value_CSMOKING  3.28635  3.27032  3.30240
```

```
saveRDS(beta_inference, file = here("modeling_files/sensitivity_analysis/high_ver/beta_inference_files/
```

List of significant beta coefficients:

```
row.names(beta_inference)[sign(beta_inference[, 2]) == sign(beta_inference[, 3])]
```

```
##  [1] "strat0:Intercept"           "strat0:flood_risk_pc2"
##  [3] "strat0:flood_risk_pc3"      "strat0:flood_risk_pc4"
##  [5] "strat0:flood_risk_pc5"      "strat0:pollute_conc_pc1"
##  [7] "strat0:pollute_conc_pc2"    "strat0:pollute_conc_pc3"
##  [9] "strat0:rmax"                "strat0:Data_Value_CSMOKING"
## [11] "strat1:Intercept"           "strat1:flood_risk_pc2"
## [13] "strat1:EP_UNINSUR"          "strat1:pollute_conc_pc1"
## [15] "strat1:pollute_conc_pc2"    "strat1:pollute_conc_pc3"
## [17] "strat1:rmax"                "strat1:Data_Value_CSMOKING"
```

Credible Interval plots for the coefficients, in ggplot

```
# first, process the beta_inference matrix in a form ggplot can understand
beta_inference_df <- as.data.frame(beta_inference)
beta_inference_df <- mutate(beta_inference_df, var_name = row.names(beta_inference_df))
beta_inference_df <- rename(beta_inference_df,
                            post_median = `50%`,
                            post_2.5 = `2.5%`,
                            post_97.5 = `97.5%`)
beta_inference_df$var_name <- substring(beta_inference_df$var_name, first = 8)
beta_inference_df$var_name <- factor(beta_inference_df$var_name,
                                     levels = unique(beta_inference_df$var_name))
beta_inference_df$strat <- factor(c(rep("Low SV", (nrow(beta_inference_df)/2)),
                                       rep("High SV", (nrow(beta_inference_df)/2))), levels = c("Low SV
```

Splitting up the beta coefficients for each strata

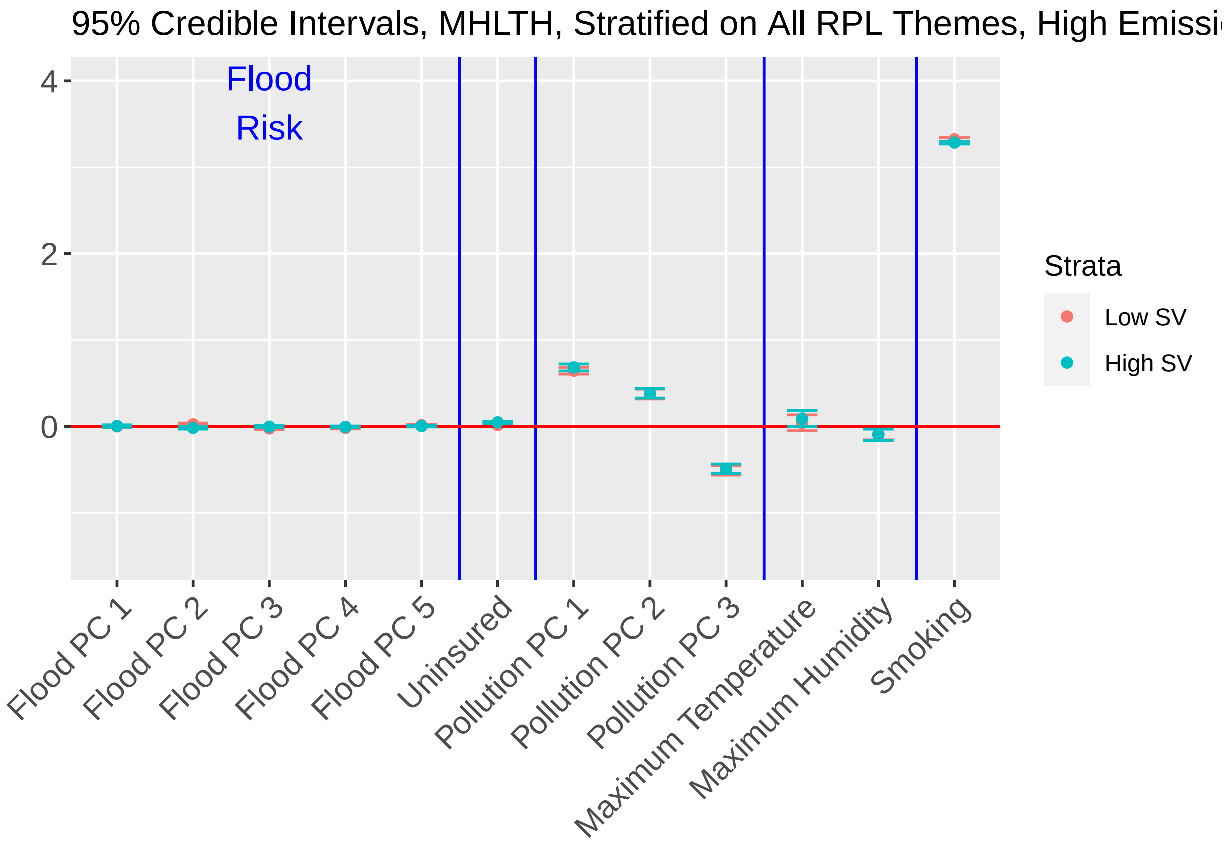
```
beta_inference_df_strat0 <- beta_inference_df[1:(nrow(beta_inference_df)/2),]

beta_inference_df_strat1 <- beta_inference_df[(nrow(beta_inference_df)/2 + 1):nrow(beta_inference_df),]
```

Note: The intercept for both strata is not included.

```
p <- ggplot(beta_inference_df_strat0[-1, ], aes(x = var_name, y = post_median, color = strat)) +
  geom_point() +
  ylim(c(-1.5, 4)) +
  theme(axis.text.x = element_text(angle = 45, vjust = 1, hjust=1), axis.title.x = element_blank(), axi
        axis.text=element_text(size=12),
        plot.margin = margin(5.5, 5.5, 5.5, 25)) +
  geom_errorbar(aes(ymin = post_2.5, ymax = post_97.5, width = 0.4), col = "#F8766D") +
  geom_vline(xintercept = c(5.5, 6.5, 9.5, 11.5), col = "blue") +
  geom_hline(yintercept = 0, col = "red") +
  annotate(geom = "text", x = 3, y = 3.75, label = "Flood\nRisk",
           col = "blue", size = 4.5) +
  scale_x_discrete(labels = c("Flood PC 1", "Flood PC 2", "Flood PC 3", "Flood PC 4", "Flood PC 5",
                              "Uninsured",
                              "Pollution PC 1", "Pollution PC 2", "Pollution PC 3",
                              "Maximum Temperature", "Maximum Humidity",
                              "Smoking")) + ggtitle("95% Credible Intervals, MHLTH, Stratified on All R
  geom_point(data = beta_inference_df_strat1[-1, ], col = "#00BFC4") + # strat 1
  geom_errorbar(data = beta_inference_df_strat1[-1, ], aes(ymin = post_2.5, ymax = post_97.5, width = 0
  scale_color_manual(name = "Strata",
                     values = c("#F8766D", "#00BFC4"),
                     drop = FALSE)

p
```



```
ggsave(here("figures/final_figures/sensitivity_analysis/high_ver/MHLTH_CI_rpls.pdf"),
       plot = p, device = "pdf",
       width = 8, height = 6, units = "in")
```