exploration (7 variables selection)

2025-11-06

```r
install.packages("haven")
```

```
##
## The downloaded binary packages are in
##  /var/folders/g_/ljm_0wb9519gm4d8zgwd_s300000gn/T//RtmpW8RZzp/downloaded_packages
```

```r
library(haven)

gss <- read_dta("/Users/joyqu/Desktop/PLSC/GSS2024.dta")
```

```r
head(gss)
```

```
## # A tibble: 6 x 813
##   year         id wrkstat hrs1        hrs2        evwork      wrkslf  occ10
##   <dbl+lbl> <dbl> <dbl+l> <dbl+lbl>   <dbl+lbl>   <dbl+lbl>   <dbl+l> <dbl+lbl>
## 1 2024          1 1 [wor~    43       NA(i) [iap] NA(i) [iap] 2 [som~  230 [edu~
## 2 2024          2 5 [ret~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~  800 [acc~
## 3 2024          3 5 [ret~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~  430 [man~
## 4 2024          4 2 [wor~    20       NA(i) [iap] NA(i) [iap] 2 [som~ 4760 [ret~
## 5 2024          5 5 [ret~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~ 5860 [off~
## 6 2024          6 4 [une~ NA(i) [iap] NA(i) [iap] NA(i) [iap] 1 [sel~ 4000 [che~
## # i 805 more variables: prestg10 <dbl+lbl>, prestg105plus <dbl+lbl>,
## #   indus10 <dbl+lbl>, marital <dbl+lbl>, martype <dbl+lbl>, divorce <dbl+lbl>,
## #   widowed <dbl+lbl>, spwrksta <dbl+lbl>, sphrs1 <dbl+lbl>, sphrs2 <dbl+lbl>,
## #   spevwork <dbl+lbl>, cowrksta <dbl+lbl>, cowrkslf <dbl+lbl>,
## #   coevwork <dbl+lbl>, cohrs1 <dbl+lbl>, cohrs2 <dbl+lbl>, spwrkslf <dbl+lbl>,
## #   spocc10 <dbl+lbl>, sppres10 <dbl+lbl>, sppres105plus <dbl+lbl>,
## #   spind10 <dbl+lbl>, coocc10 <dbl+lbl>, coind10 <dbl+lbl>, ...
```

```r
dim(gss)
```

```
## [1] 3309  813
```

```r
library(dplyr)
```

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

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
library(tidyr)
head(gss)
```

```
## # A tibble: 6 x 813
##   year          id wrkstat hrs1        hrs2        evwork      wrkslf  occ10
##   <dbl+lbl> <dbl> <dbl+l> <dbl+lbl>   <dbl+lbl>   <dbl+lbl>   <dbl+l> <dbl+lbl>
## 1 2024           1 1 [wor~    43       NA(i) [iap] NA(i) [iap] 2 [som~  230 [edu~
## 2 2024           2 5 [ret~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~  800 [acc~
## 3 2024           3 5 [ret~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~  430 [man~
## 4 2024           4 2 [wor~    20       NA(i) [iap] NA(i) [iap] 2 [som~ 4760 [ret~
## 5 2024           5 5 [ret~ NA(i) [iap] NA(i) [iap]     1 [yes] 2 [som~ 5860 [off~
## 6 2024           6 4 [une~ NA(i) [iap] NA(i) [iap] NA(i) [iap] 1 [sel~ 4000 [che~
## # i 805 more variables: prestg10 <dbl+lbl>, prestg105plus <dbl+lbl>,
## #   indus10 <dbl+lbl>, marital <dbl+lbl>, martype <dbl+lbl>, divorce <dbl+lbl>,
## #   widowed <dbl+lbl>, spwrksta <dbl+lbl>, sphrs1 <dbl+lbl>, sphrs2 <dbl+lbl>,
## #   spevwork <dbl+lbl>, cowrksta <dbl+lbl>, cowrkslf <dbl+lbl>,
## #   coevwork <dbl+lbl>, cohrs1 <dbl+lbl>, cohrs2 <dbl+lbl>, spwrkslf <dbl+lbl>,
## #   spocc10 <dbl+lbl>, sppres10 <dbl+lbl>, sppres105plus <dbl+lbl>,
## #   spind10 <dbl+lbl>, coocc10 <dbl+lbl>, coind10 <dbl+lbl>, ...
```

```
# Keep only needed variables
gss_clean <- gss %>%
  select(polviews, age, educ, race, sex, occ10, region, marital) %>%
  # remove "Don't Know / NA / Refused / No answer"
  filter(!polviews %in% c(8, 9),     # GSS missing codes for polviews
         !is.na(polviews)) %>%
  # Convert categorical vars to factors
  mutate(
    polviews = as.integer(polviews),         # 1=ext lib ... 7=ext cons
    race = factor(race),
    sex = factor(sex),
    occ10 = factor(occ10),
    region = factor(region),
    marital = factor(marital)
  )
head(gss_clean)
```

```
## # A tibble: 6 x 8
##   polviews age       educ                     race  sex   occ10 region marital
##      <int> <dbl+lbl> <dbl+lbl>                <fct> <fct> <fct> <fct>  <fct>
## 1        4 33        16 [4 years of college] 2     1     230   1      5
## 2        3 64        16 [4 years of college] 1     1     800   1      5
## 3        1 69        14 [2 years of college] 1     2     430   1      1
## 4        4 70        13 [1 year of college]  1     2     5860  1      3
## 5        2 48        13 [1 year of college]  1     2     9640  1      1
## 6        4 30        14 [2 years of college] 1     2     3600  1      3
```

```
set.seed(123)   # makes the sample reproducible

sample100 <- gss_clean %>%
  drop_na() %>%        # removes any row with ANY missing value
  sample_n(100)

head(sample100)
```

```
## # A tibble: 6 x 8
##   polviews age       educ                     race  sex   occ10 region marital
##      <int> <dbl+lbl> <dbl+lbl>                <fct> <fct> <fct> <fct>  <fct>
```

```
## 1        4 67        16 [4 years of college] 1     1     1740  4      5
## 2        5 56        14 [2 years of college] 3     2     50    4      3
## 3        6 33        14 [2 years of college] 1     2     7750  2      5
## 4        3 24        16 [4 years of college] 1     2     2550  1      5
## 5        3 46        14 [2 years of college] 1     2     5610  4      1
## 6        4 25        12 [12th grade]         1     1     6440  3      5
```

```r
sample100_nolabel <- sample100 %>%
  select(-polviews)      # remove the numeric ideology variable
head(sample100_nolabel)
```

```
## # A tibble: 6 x 7
##   age       educ                     race  sex   occ10 region marital
##   <dbl+lbl> <dbl+lbl>                <fct> <fct> <fct> <fct>  <fct>
## 1 67        16 [4 years of college] 1     1     1740  4      5
## 2 56        14 [2 years of college] 3     2     50    4      3
## 3 33        14 [2 years of college] 1     2     7750  2      5
## 4 24        16 [4 years of college] 1     2     2550  1      5
## 5 46        14 [2 years of college] 1     2     5610  4      1
## 6 25        12 [12th grade]         1     1     6440  3      5
```

```r
write.csv(sample100_nolabel, "gss_sample_100_unlabeled.csv", row.names = FALSE)
```

```r
var <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_var_predictions.csv")
head(var)
```

```
##   age educ race sex occ10 region marital pred_polview
## 1  67   16    1   1  1740      4       5            5
## 2  56   14    3   2    50      4       3            4
## 3  33   14    1   2  7750      2       5            4
## 4  24   16    1   2  2550      1       5            2
## 5  46   14    1   2  5610      4       1            5
## 6  25   12    1   1  6440      3       5            5
```

```r
# Extract variables
y_true <- as.numeric(sample100$polviews)
y_pred <- as.numeric(var$pred_polview)

# Compute metrics
MAE <- mean(abs(y_true - y_pred))
MSE <- mean((y_true - y_pred)^2)
Accuracy <- mean(y_true == y_pred)
Within1 <- mean(abs(y_true - y_pred) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 1.4
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 3.04
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 15 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 66 %
```

```r
narrative <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_narrative_predictions.csv")
head(narrative)
```

```
##   id
## 1  1
## 2  2
## 3  3
## 4  4
## 5  5
## 6  6
##
## 1                                                            He is 67, a man in the West who values i
## 2 She is 56 years old, she has settled into a steady rhythm in the West, where routines give structur
## 3                                     At 33, this woman in the Midwest balances work, personal commit
## 4              She is 24, a woman living in the Northeast, still shaping her path in work and life. C
## 5          She is 46 years old, she has settled into a steady rhythm in the West, where routines give
## 6                                                  He is 25, a man living in the South, still shaping
##   pred_polview_narr
## 1                5
## 2                4
## 3                5
## 4                3
## 5                5
## 6                5
```

```r
# Extract variables
y_true <- as.numeric(sample100$polviews)
y_pred <- as.numeric(narrative$pred_polview_narr)

# Compute metrics
MAE <- mean(abs(y_true - y_pred))
MSE <- mean((y_true - y_pred)^2)
Accuracy <- mean(y_true == y_pred)
Within1 <- mean(abs(y_true - y_pred) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 1.32
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 2.72
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 18 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 67 %
```

```r
library(dplyr)
library(readr)
library(caret)    # for confusionMatrix
```

```
## Loading required package: ggplot2
```

```
## Loading required package: lattice
```

```r
library(MLmetrics)  # for f1
```

```
##
## Attaching package: 'MLmetrics'

## The following objects are masked from 'package:caret':
##
##     MAE, RMSE

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

```r
library(purrr)
```

```
##
## Attaching package: 'purrr'

## The following object is masked from 'package:caret':
##
##     lift
```

```r
library(dplyr)

df <- sample100 %>%
  mutate(row_id = row_number()) %>%
  select(
    row_id,
    POLVIEWS_TRUE = polviews,
    age, sex, race, educ, marital, occ10, region   # <- keep whatever predictors you want
  ) %>%
  inner_join(
    var %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_var = pred_polview),
    by = "row_id"
  ) %>%
  inner_join(
    narrative %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_narr = pred_polview_narr),
    by = "row_id"
  )
```

```r
library(dplyr)
f1_macro <- function(true, pred) {
  true <- as.character(true)
  pred <- as.character(pred)

  f1_scores <- sapply(unique(true), function(cls) {
    MLmetrics::F1_Score(
      y_pred = pred == cls,
      y_true = true == cls
    )
  })
  mean(f1_scores, na.rm = TRUE)
}
```

```r
f1_weighted <- function(true, pred) {
  true <- as.character(true)
  pred <- as.character(pred)

  classes <- unique(true)
  weights <- prop.table(table(true))

  f1_scores <- sapply(classes, function(cls) {
    MLmetrics::F1_Score(
      y_pred = pred == cls,
      y_true = true == cls
    )
  })

  sum(f1_scores * weights[names(f1_scores)], na.rm = TRUE)
}

# 1. Build df and KEEP ALL predictors from sample100
df <- sample100 %>%
  mutate(row_id = row_number()) %>%
  select(
    row_id,
    POLVIEWS_TRUE = polviews,
    # keep ALL predictors here:
    age,
    sex,
    race,
    educ,
    marital,
    occ10,
    region
  ) %>%
  inner_join(
    var %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_var = pred_polview),
    by = "row_id"
  ) %>%
  inner_join(
    narrative %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_narr = pred_polview_narr),
    by = "row_id"
  )

df <- df %>%
  mutate(
    # Factor version for F1
    POLVIEWS_TRUE_fac = factor(POLVIEWS_TRUE),
    pred_var_fac      = factor(pred_var,  levels = levels(POLVIEWS_TRUE_fac)),
    pred_narr_fac     = factor(pred_narr, levels = levels(POLVIEWS_TRUE_fac)),

    # Numeric version for bias / error
```

```r
    polviews_num = as.numeric(as.character(POLVIEWS_TRUE)),
    pred_var_num = as.numeric(as.character(pred_var)),
    pred_narr_num = as.numeric(as.character(pred_narr)),

    # Signed errors
    error_var  = pred_var_num  - polviews_num,
    error_narr = pred_narr_num - polviews_num
  )
results <- tibble(
  Model = c("Variable Model", "Narrative Model"),
  Macro_F1 = c(
    f1_macro(df$POLVIEWS_TRUE_fac, df$pred_var_fac),
    f1_macro(df$POLVIEWS_TRUE_fac, df$pred_narr_fac)
  ),
  Weighted_F1 = c(
    f1_weighted(df$POLVIEWS_TRUE_fac, df$pred_var_fac),
    f1_weighted(df$POLVIEWS_TRUE_fac, df$pred_narr_fac)
  )
)

print(results)
```

```
## # A tibble: 2 x 3
##   Model           Macro_F1 Weighted_F1
##   <chr>              <dbl>       <dbl>
## 1 Variable Model     0.841       0.784
## 2 Narrative Model    0.831       0.749
```

```r
mislabeled_comparison <- df %>%
  mutate(
    # Wrong / right flags
    var_wrong  = pred_var  != POLVIEWS_TRUE,
    narr_wrong = pred_narr != POLVIEWS_TRUE,

    # Case types with only two models
    case_type = case_when(
      var_wrong  & !narr_wrong ~ "Only Variable Model Wrong",
      !var_wrong & narr_wrong  ~ "Only Narrative Model Wrong",
      var_wrong  & narr_wrong  ~ "Both Wrong",
      TRUE                     ~ "Both Correct"
    ),

    # Differences vs true (numeric scale 1-7)
    diff_var  = as.numeric(pred_var)  - as.numeric(POLVIEWS_TRUE),
    diff_narr = as.numeric(pred_narr) - as.numeric(POLVIEWS_TRUE),

    # Bias direction for each model (only label as too lib/con if it's wrong)
    bias_var = dplyr::case_when(
      !var_wrong        ~ "Correct",
      diff_var  > 0     ~ "Too Conservative",
      diff_var  < 0     ~ "Too Liberal",
      TRUE              ~ NA_character_
    ),
    bias_narr = dplyr::case_when(
```

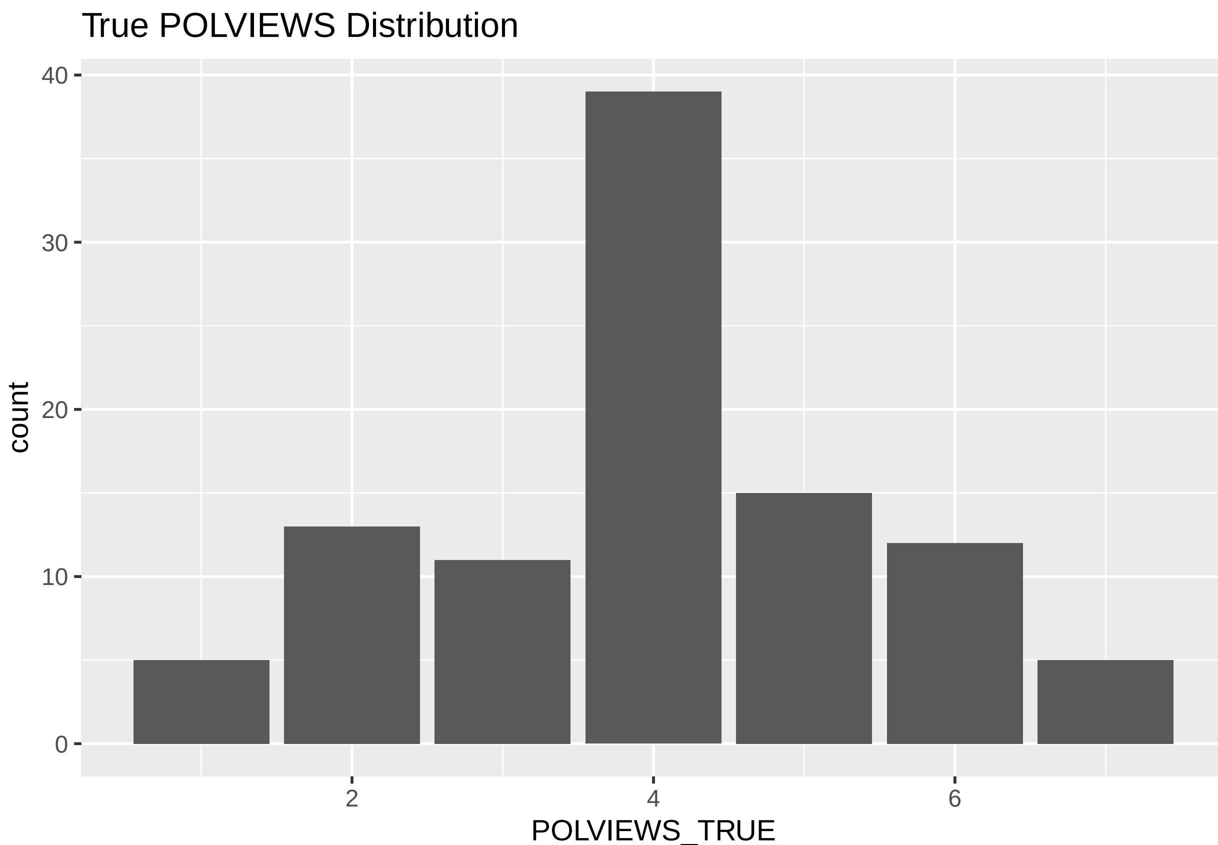
```r
      !narr_wrong        ~ "Correct",
      diff_narr  > 0     ~ "Too Conservative",
      diff_narr  < 0     ~ "Too Liberal",
      TRUE               ~ NA_character_
    )
  ) %>%
  select(
    row_id, POLVIEWS_TRUE,
    pred_var, pred_narr,
    var_wrong, narr_wrong,
    case_type,
    bias_var, bias_narr
  )

# Save to CSV
write.csv(mislabeled_comparison,
          "mislabeled_cases_comparison.csv",
          row.names = FALSE)
```

```r
bias_table <- mislabeled_comparison %>%
  select(bias_var, bias_narr) %>%
  tidyr::pivot_longer(
    cols      = everything(),
    names_to  = "model",
    values_to = "bias"
  ) %>%
  dplyr::filter(bias != "Correct") %>%   # only mislabeled cases
  dplyr::group_by(model, bias) %>%
  dplyr::summarise(count = dplyr::n(), .groups = "drop_last") %>%
  dplyr::mutate(
    percent = count / sum(count) * 100
  ) %>%
  dplyr::ungroup() %>%
  dplyr::mutate(
    model = dplyr::recode(
      model,
      bias_var  = "Variable Model",
      bias_narr = "Narrative Model"
    )
  ) %>%
  dplyr::arrange(model, bias)
bias_table
```

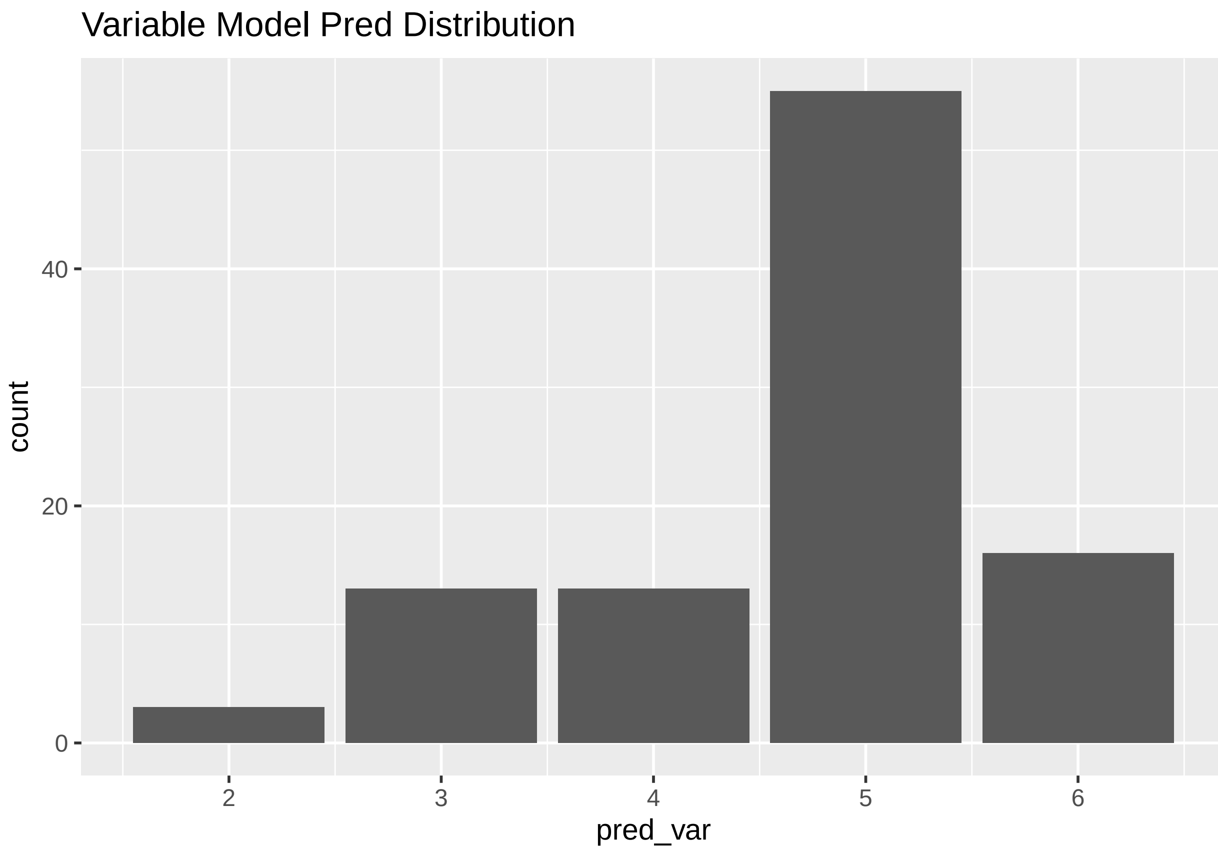
```
## # A tibble: 4 x 4
##   model           bias             count percent
##   <chr>           <chr>            <int>   <dbl>
## 1 Narrative Model Too Conservative    57    69.5
## 2 Narrative Model Too Liberal         25    30.5
## 3 Variable Model  Too Conservative    58    68.2
## 4 Variable Model  Too Liberal         27    31.8
```

```r
#true polviews distribution
library(ggplot2)

ggplot(df, aes(x = POLVIEWS_TRUE)) +
```

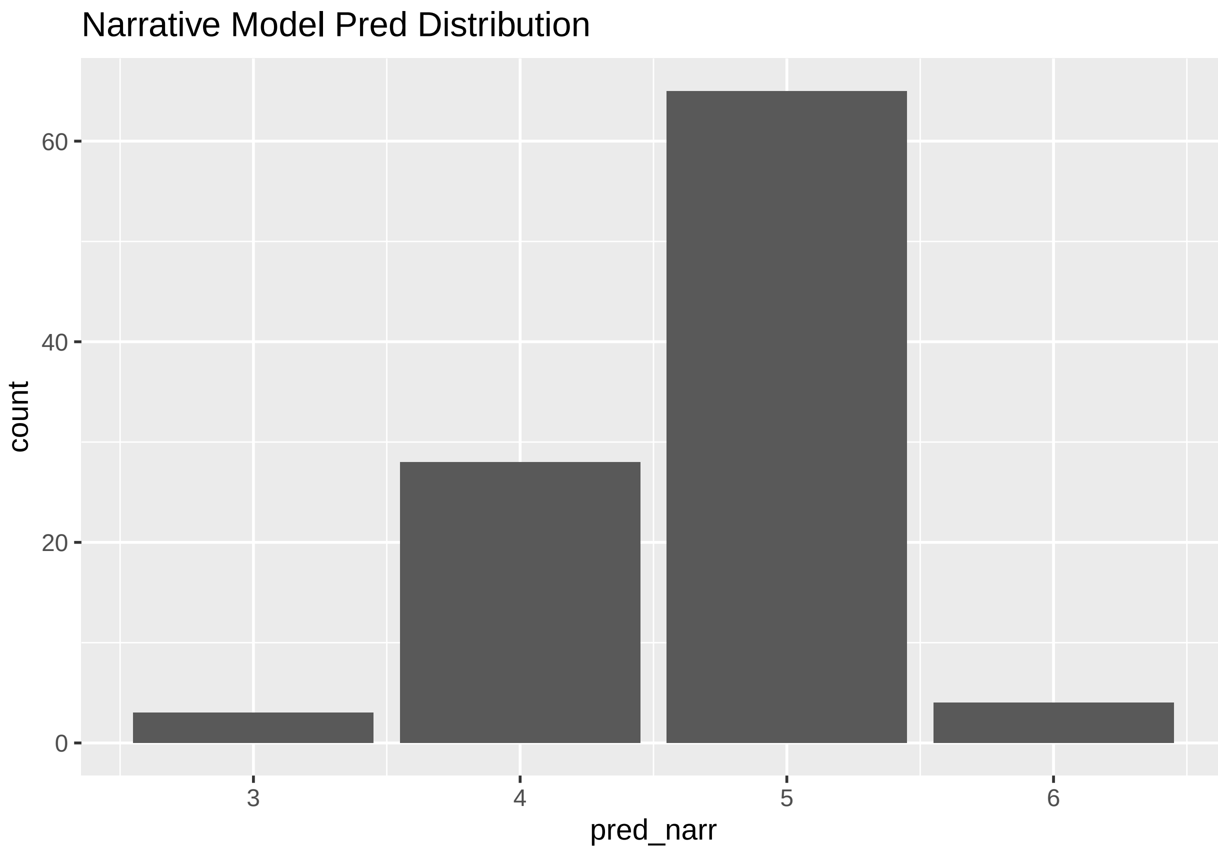
```
  geom_bar() +
  ggtitle("True POLVIEWS Distribution")
```




```
ggplot(df, aes(x = pred_var)) +
  geom_bar() +
  ggtitle("Variable Model Pred Distribution")
```




```
ggplot(df, aes(x = pred_narr)) +
  geom_bar() +
  ggtitle("Narrative Model Pred Distribution")
```




```r
library(dplyr)

df <- df %>%
  mutate(
    POLVIEWS_TRUE = as.numeric(as.character(POLVIEWS_TRUE)),
    pred_var      = as.numeric(as.character(pred_var)),
    pred_narr     = as.numeric(as.character(pred_narr))
  )
df <- df %>%
  mutate(
    error_var  = pred_var  - POLVIEWS_TRUE,
    error_narr = pred_narr - POLVIEWS_TRUE
  )

summary(df$error_var)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   -3.00   -1.00    1.00    0.66    2.00    5.00
```

```r
summary(df$error_narr)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   -2.00   -0.25    1.00    0.68    2.00    4.00
```

```r
mean(df$error_var,  na.rm = TRUE)  # > 0 => too conservative on average
```

```
## [1] 0.66
```

```r
mean(df$error_narr, na.rm = TRUE)
```

```
## [1] 0.68
```

```r
bias_by_predictor <- function(data, predictor) {
  data %>%
    group_by({{ predictor }}) %>%
    summarise(
      n = n(),
      mean_error_var  = mean(error_var, na.rm = TRUE),
      mean_error_narr = mean(error_narr, na.rm = TRUE),

      prop_too_cons_var = mean(error_var  > 0, na.rm = TRUE),
      prop_too_lib_var  = mean(error_var  < 0, na.rm = TRUE),

      prop_too_cons_narr = mean(error_narr > 0, na.rm = TRUE),
      prop_too_lib_narr  = mean(error_narr < 0, na.rm = TRUE)
    ) %>%
    arrange(desc(mean_error_var))
}
bias_by_predictor(df, age)
```

```
## # A tibble: 50 x 8
##      age     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1 79        1           4               3                 1                 0
##  2 49        2           3               2.5               1                 0
##  3 73        1           3               3                 1                 0
##  4 76        1           3               2                 1                 0
##  5 82        1           3               2                 1                 0
##  6 83        4           2.75            2                 1                 0
##  7 74        1           2               1                 1                 0
##  8 58        4           1.75            1.5               0.75              0
##  9 70        3           1.67            0.667             1                 0
## 10 63        5           1.6             1.4               0.8               0.2
## # i 40 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df, sex)
```

```
## # A tibble: 2 x 8
##   sex       n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 2        47          0.723           0.681             0.532            0.277
## 2 1        53          0.604           0.679             0.623            0.264
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df, race)
```

```
## # A tibble: 3 x 8
##   race      n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 2        13          0.846           1.31              0.692            0.231
## 2 1        77          0.727           0.584             0.597            0.234
## 3 3        10         -0.1             0.6               0.3              0.6
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df, educ)
```

```
## # A tibble: 14 x 8
##    educ                          n mean_error_var mean_error_narr prop_too_cons_var
##    <dbl+lbl>                 <int>          <dbl>           <dbl>             <dbl>
##  1 20 [8 or more years o~        2          4               3                 1
##  2 19 [7 years of colleg~        1          3               3                 1
##  3 13 [1 year of college]        6          1.5             1.33              0.667
##  4 15 [3 years of colleg~        2          1               1                 1
##  5 16 [4 years of colleg~       26          0.923           0.577             0.654
##  6 12 [12th grade]              21          0.667           0.714             0.619
##  7 14 [2 years of colleg~       20          0.55            0.85              0.65
##  8  6 [6th grade]                1          0               1                 0
##  9 11 [11th grade]               1          0               1                 0
## 10 18 [6 years of colleg~        7          0               0                 0.429
## 11 17 [5 years of colleg~        9         -0.111           0.222             0.333
## 12 10 [10th grade]               2         -0.5             0                 0
## 13  9 [9th grade]                1         -1              -1                 0
## 14  0 [no formal schooli~        1         -2              -1                 0
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df, marital)
```

```
## # A tibble: 4 x 8
##   marital     n mean_error_var mean_error_narr prop_too_cons_var
##   <fct>   <int>          <dbl>           <dbl>             <dbl>
## 1 2           8         1.62            1                  0.75
## 2 1          44         0.841           0.5                0.636
## 3 3          16         0.812           0.625              0.625
## 4 5          32         0.0938          0.875              0.438
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df, occ10)
```

```
## # A tibble: 73 x 8
##    occ10     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1 2200      1              5             4                   1                0
##  2 5120      1              4             3                   1                0
##  3 9620      1              4             4                   1                0
##  4 710       2              3             2.5                 1                0
##  5 735       1              3             2                   1                0
##  6 1460      1              3             3                   1                0
##  7 3645      1              3             2                   1                0
##  8 5600      1              3             3                   1                0
##  9 5820      1              3             3                   1                0
## 10 1050      1              2             1                   1                0
## # i 63 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df, region)
```

```
## # A tibble: 4 x 8
##   region     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
```

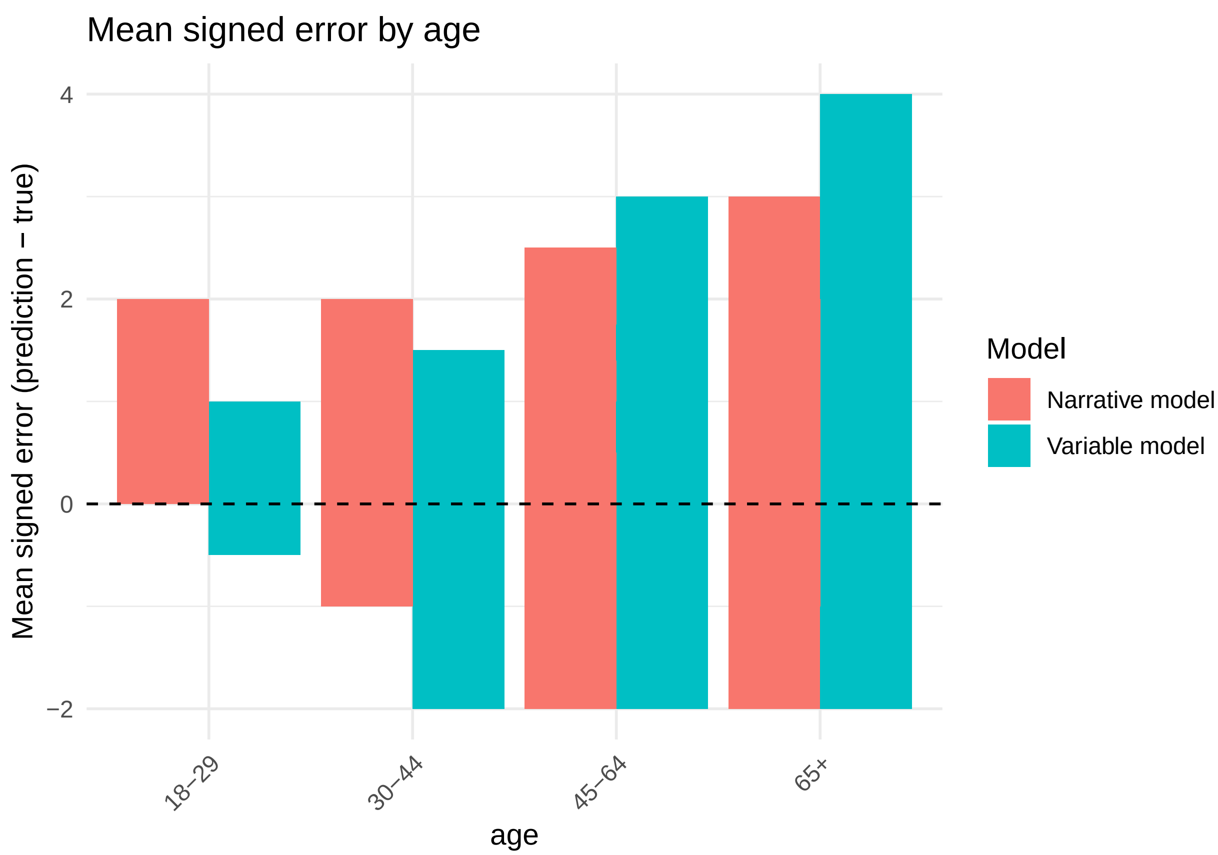
```
##   <fct>  <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 3         37          1.05            0.811             0.595            0.189
## 2 2         24          0.667           0.625             0.583            0.292
## 3 1         12          0.583           0.75              0.667            0.25
## 4 4         27          0.148           0.519             0.519            0.370
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```
#when mean error > 0, this predictor is more conservative on average
#prop_too_cons_var: proportion of cases where variable model is too conservative
```

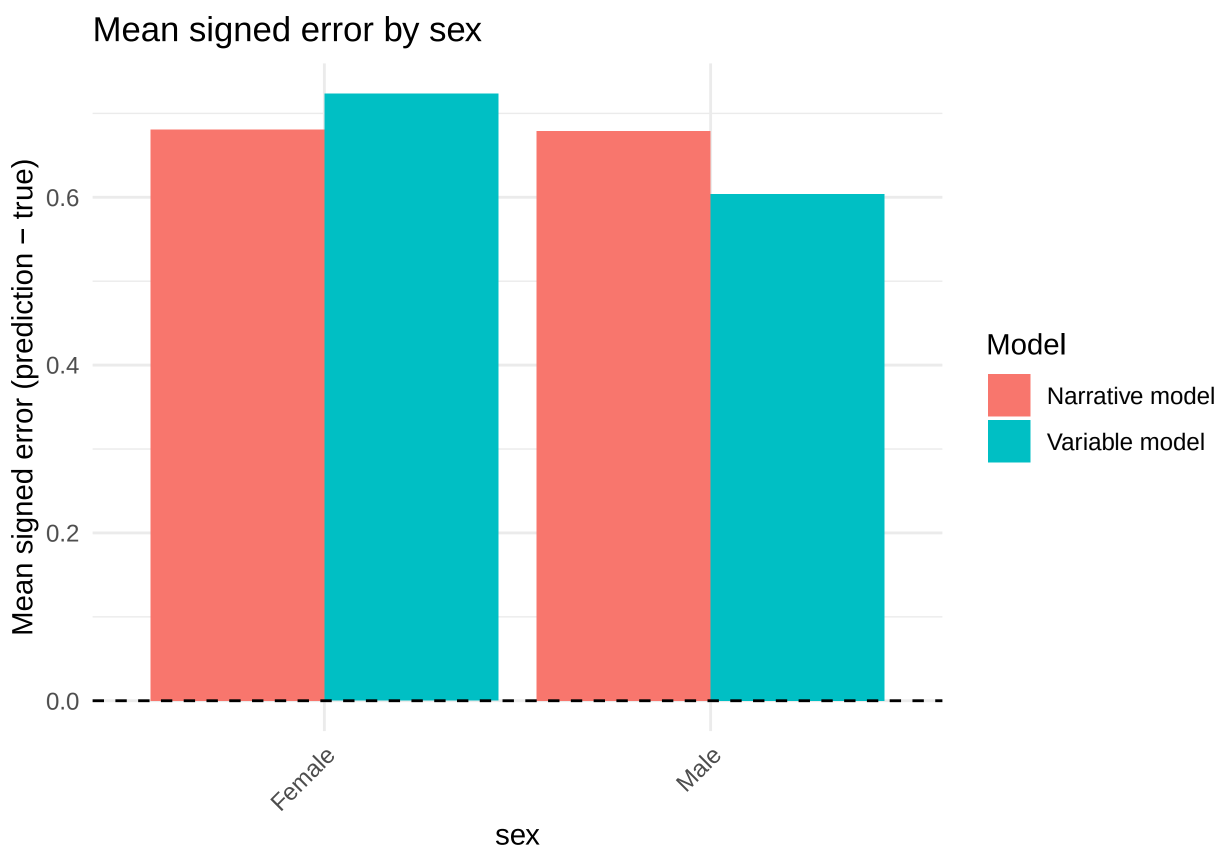
```
df$occ10 <- as.numeric(as.character(df$occ10))

label_maps <- list(

  # ---- Gender ----
  sex = c(
    "1" = "Male",
    "2" = "Female"
  ),

  # ---- Race ----
  race = c(
    "1" = "White",
    "2" = "Black",
    "3" = "Other"
  ),

  # ---- Marital Status ----
  marital = c(
    "1" = "Married",
    "2" = "Widowed",
    "3" = "Divorced",
    "4" = "Separated",
    "5" = "Never married"
  ),

  # ---- Region: your custom 1-4 mapping ----
  region = c(
    "1" = "Northeast",
    "2" = "Midwest",
    "3" = "South",
    "4" = "West"
  ),

  # ---- OCC10 major category mapping ----
  # We'll assign labels based on ranges inside the function
  occ10 = c(
    "0010-0950" = "Management/Professional",
    "1000-1240" = "Service",
    "1300-1965" = "Sales/Office",
    "2000-3955" = "Construction/Maintenance",
    "4000-5940" = "Production/Transportation",
    "5950-9750" = "Military"
  )
)
```

```r
map_occ10 <- function(code) {
  if (is.na(code)) return(NA_character_)
  if (code >= 10   & code <= 950)   return("Management/Professional")
  if (code >= 1000 & code <= 1240)  return("Service")
  if (code >= 1300 & code <= 1965)  return("Sales/Office")
  if (code >= 2000 & code <= 3955)  return("Construction/Maintenance")
  if (code >= 4000 & code <= 5940)  return("Production/Transportation")
  if (code >= 5950 & code <= 9830)  return("Military")
  return(NA_character_)
}
bucket_age <- function(a) {
  dplyr::case_when(
    is.na(a)          ~ NA_character_,
    a < 30            ~ "18-29",
    a >= 30 & a < 45  ~ "30-44",
    a >= 45 & a < 65  ~ "45-64",
    a >= 65           ~ "65+",
    TRUE ~ NA_character_
  )
}

plot_mean_error_by_predictor <- function(data, predictor) {

  pred_sym  <- rlang::ensym(predictor)
  pred_name <- rlang::as_name(pred_sym)

  summary_df <- data %>%
    dplyr::group_by(!!pred_sym) %>%
    dplyr::summarise(
      n = dplyr::n(),
      mean_error_var  = mean(error_var,  na.rm = TRUE),
      mean_error_narr = mean(error_narr, na.rm = TRUE),
      .groups = "drop"
    ) %>%
    tidyr::pivot_longer(
      cols = c(mean_error_var, mean_error_narr),
      names_to = "model",
      values_to = "mean_error"
    ) %>%
    dplyr::mutate(
      model = dplyr::recode(
        model,
        mean_error_var  = "Variable model",
        mean_error_narr = "Narrative model"
      )
    )

  # Now add human-readable labels
  if (pred_name == "occ10") {

    summary_df <- summary_df %>%
      dplyr::mutate(
        predictor_label = vapply(.data[[pred_name]], map_occ10, character(1))
```

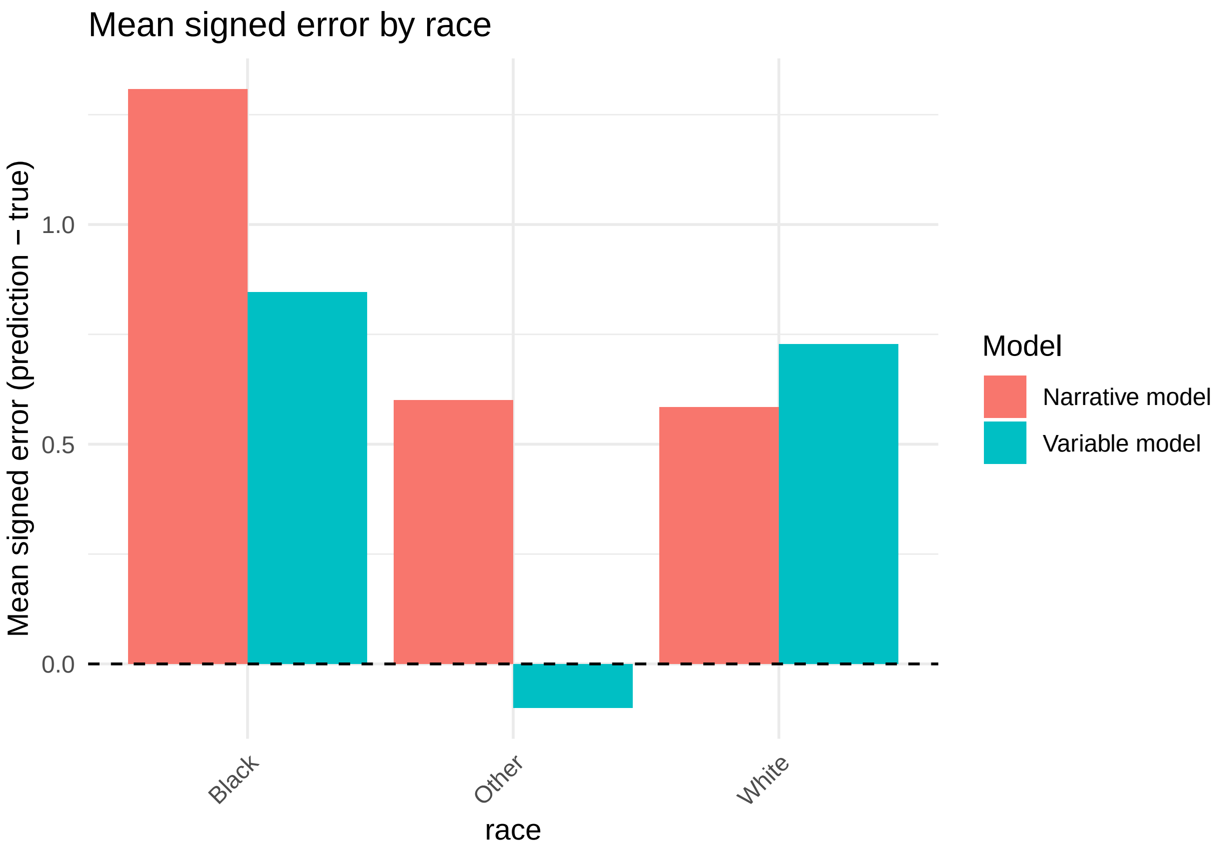
```r
      )

  } else if (pred_name == "age") {

    # use age buckets instead of raw ages
    summary_df <- summary_df %>%
      dplyr::mutate(
        predictor_label = bucket_age(.data[[pred_name]])
      )
  } else if (pred_name == "educ") {

    summary_df <- summary_df %>%
      dplyr::mutate(
        predictor_label = factor(
          as.numeric(.data[[pred_name]]),
          levels = sort(unique(as.numeric(.data[[pred_name]])))
        )
      )

  } else if (pred_name %in% names(label_maps)) {

    map_vec <- label_maps[[pred_name]]

    summary_df <- summary_df %>%
      dplyr::mutate(
        predictor_label = map_vec[as.character(.data[[pred_name]])]
      )

  } else {

    summary_df <- summary_df %>%
      dplyr::mutate(
        predictor_label = as.character(.data[[pred_name]])
      )
  }

  ggplot(summary_df,
         aes(x = predictor_label,
             y = mean_error,
             fill = model)) +
    geom_col(position = "dodge") +
    geom_hline(yintercept = 0, linetype = "dashed") +
    labs(
      title = paste("Mean signed error by", pred_name),
      x = pred_name,
      y = "Mean signed error (prediction - true)",
      fill = "Model"
    ) +
    theme_minimal() +
    theme(axis.text.x = element_text(angle = 45, hjust = 1))
}

plot_mean_error_by_predictor(df, age)
```



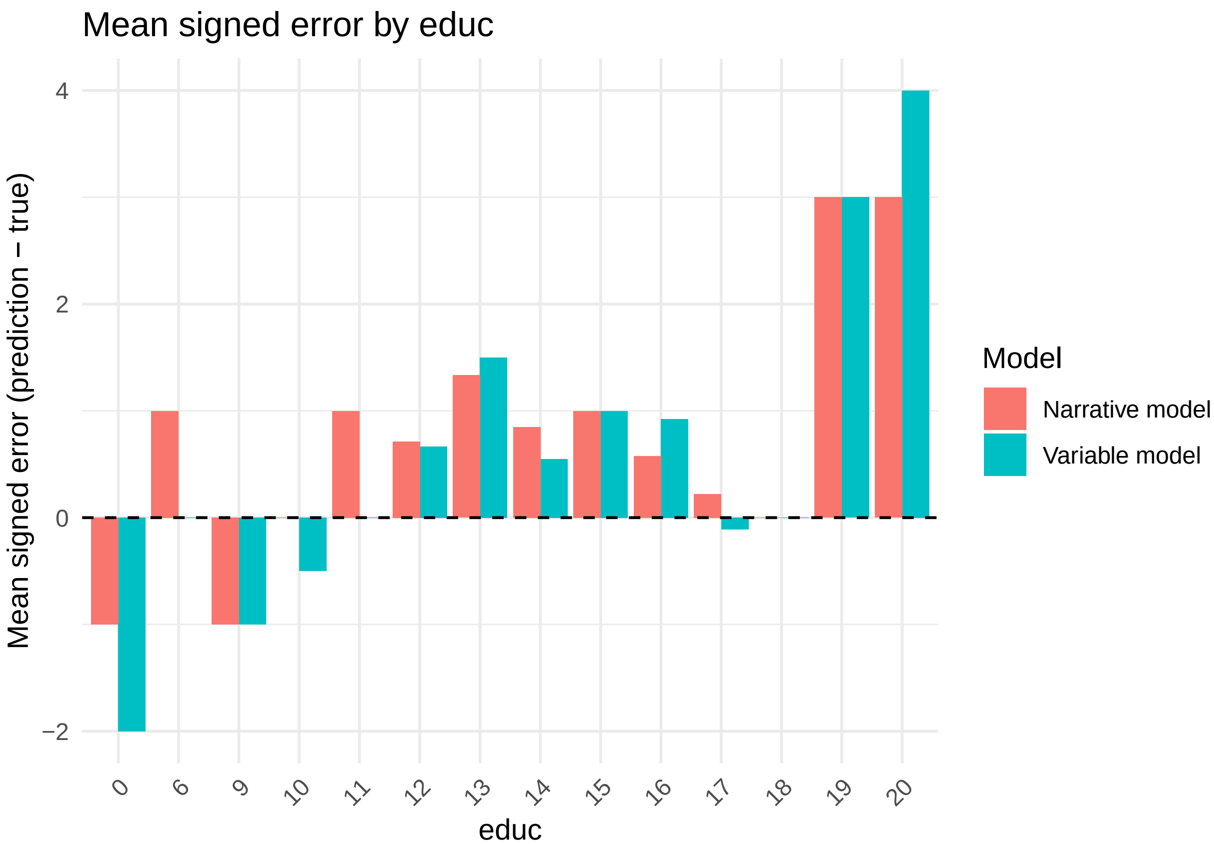

```r
plot_mean_error_by_predictor(df, sex)
```



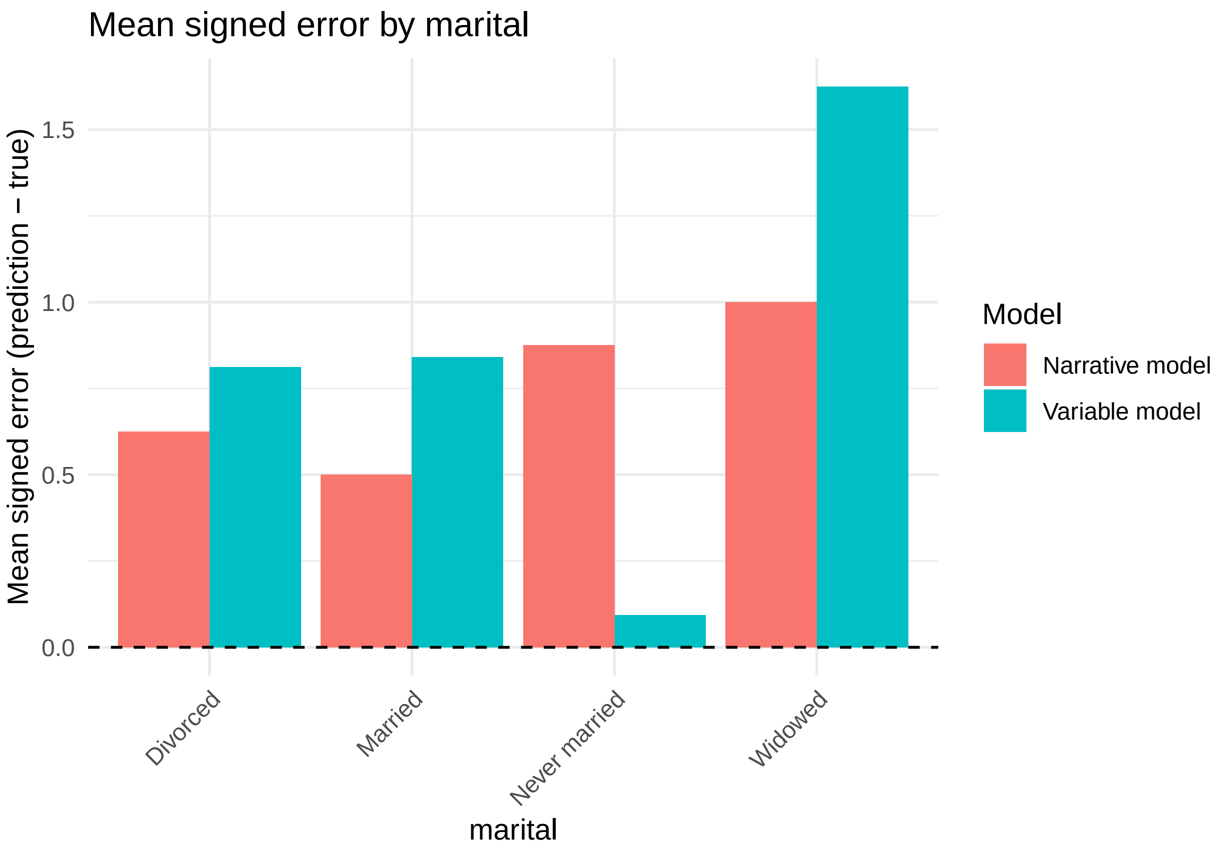

```
plot_mean_error_by_predictor(df, race)
```



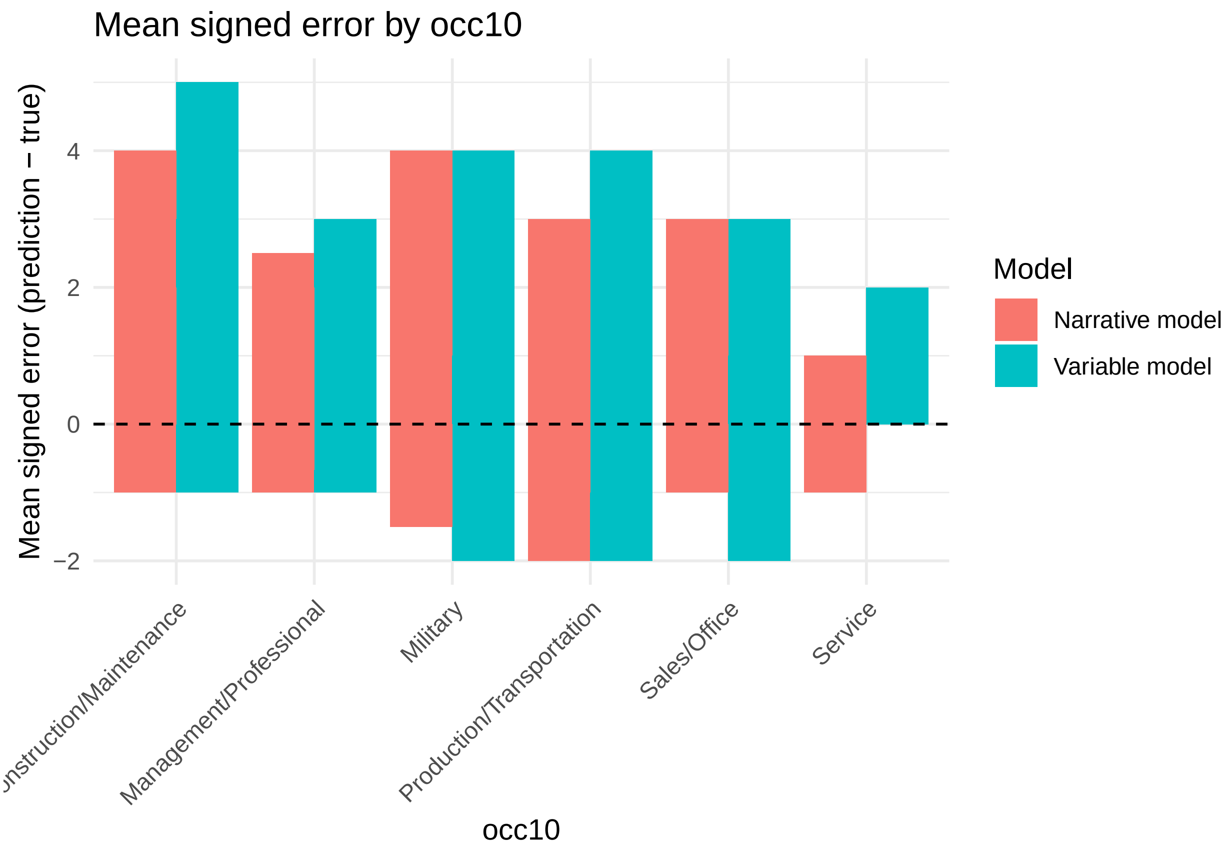

```
plot_mean_error_by_predictor(df, educ)
```



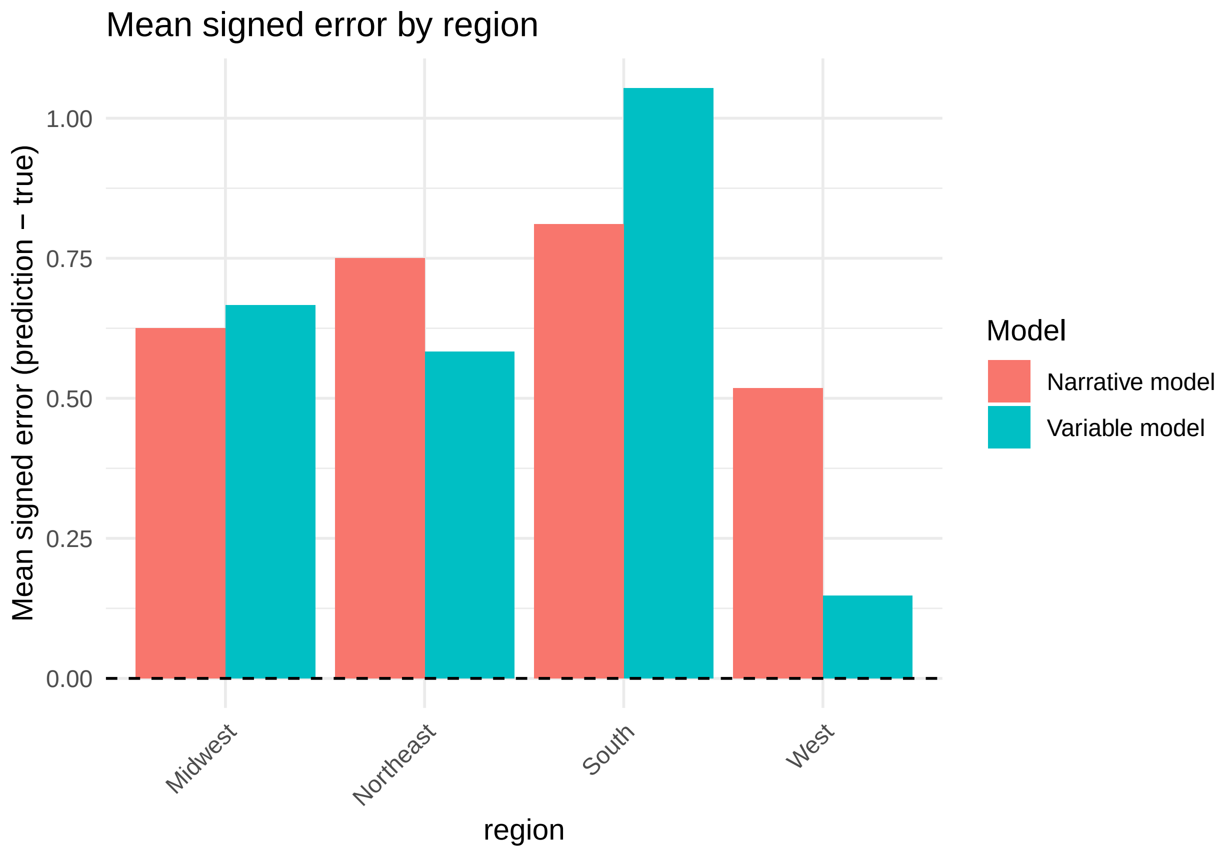

```
plot_mean_error_by_predictor(df, marital)
```




```
plot_mean_error_by_predictor(df, occ10)
```




```
plot_mean_error_by_predictor(df, region)
```




```
#collapse POLVIEWS into two categories: conservative or not conservative
sample100_binary <- sample100 %>%
  mutate(
    polviews_binary = case_when(
      polviews %in% c(1, 2, 3, 4) ~ 0,    # Not conservative
      polviews %in% c(5, 6, 7) ~ 1,    # Conservative
    )
  ) %>%
  filter(!is.na(polviews_binary))
head(sample100_binary)
```

```
## # A tibble: 6 x 9
##   polviews age       educ       race  sex   occ10 region marital polviews_binary
##      <int> <dbl+lbl> <dbl+lbl> <fct> <fct> <fct> <fct>  <fct>             <dbl>
## 1        4 67        16 [4 yea~ 1     1     1740  4      5                     0
## 2        5 56        14 [2 yea~ 3     2     50    4      3                     1
## 3        6 33        14 [2 yea~ 1     2     7750  2      5                     1
## 4        3 24        16 [4 yea~ 1     2     2550  1      5                     0
## 5        3 46        14 [2 yea~ 1     2     5610  4      1                     0
## 6        4 25        12 [12th ~ 1     1     6440  3      5                     0
```

```
sample100_nolabel_bin <- sample100_binary %>%
  select(-polviews_binary) %>% # remove the binary ideology variable)
  select(-polviews) # remove the numeric ideology variable


head(sample100_nolabel_bin)
```

```
## # A tibble: 6 x 7
##   age       educ                      race  sex   occ10 region marital
##   <dbl+lbl> <dbl+lbl>                 <fct> <fct> <fct> <fct>  <fct>
## 1 67        16 [4 years of college] 1     1     1740  4      5
## 2 56        14 [2 years of college] 3     2     50    4      3
## 3 33        14 [2 years of college] 1     2     7750  2      5
## 4 24        16 [4 years of college] 1     2     2550  1      5
## 5 46        14 [2 years of college] 1     2     5610  4      1
## 6 25        12 [12th grade]         1     1     6440  3      5
```

```
write.csv(sample100_nolabel_bin, "gss_sample_100_unlabeled_bin.csv", row.names = FALSE)
```

```
var_bin <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_var_predictions_bin.csv")
head(var_bin)
```

```
##   age educ race sex occ10 region marital pred_polview
## 1  67   16    1   1  1740      4       5            1
## 2  56   14    3   2    50      4       3            0
## 3  33   14    1   2  7750      2       5            0
## 4  24   16    1   2  2550      1       5            0
## 5  46   14    1   2  5610      4       1            0
## 6  25   12    1   1  6440      3       5            1
```

```
# Extract variables
y_true_bin <- as.numeric(sample100_binary$polviews_binary)
y_pred_bin <- as.numeric(var_bin$pred_polview)

# Compute metrics
MAE <- mean(abs(y_true_bin - y_pred_bin))
MSE <- mean((y_true_bin - y_pred_bin)^2)
Accuracy <- mean(y_true_bin == y_pred_bin)
Within1 <- mean(abs(y_true_bin - y_pred_bin) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.53
```

```
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 0.53
```

```
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 47 %
```

```
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 100 %
```

```
narrative_bin <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_narrative_predictions_bin.csv")
head(narrative_bin)
```

```
##   id
## 1  1
## 2  2
## 3  3
## 4  4
## 5  5
## 6  6
```

```
##
## 1                                                            He is 67, a man in the West who values i
## 2 She is 56 years old, she has settled into a steady rhythm in the West, where routines give structu
## 3                                     At 33, this woman in the Midwest balances work, personal commi
## 4              She is 24, a woman living in the Northeast, still shaping her path in work and life. 
## 5          She is 46 years old, she has settled into a steady rhythm in the West, where routines giv
## 6                                                   He is 25, a man living in the South, still shapin
##   pred_polview_narr
## 1                 1
## 2                 1
## 3                 1
## 4                 0
## 5                 1
## 6                 1
```

```r
# Extract variables
y_true_bin <- as.numeric(sample100_binary$polviews_binary)
y_pred_bin <- as.numeric(narrative_bin$pred_polview_narr)

# Compute metrics
MAE <- mean(abs(y_true_bin - y_pred_bin))
MSE <- mean((y_true_bin - y_pred_bin)^2)
Accuracy <- mean(y_true_bin == y_pred_bin)
Within1 <- mean(abs(y_true_bin - y_pred_bin) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.61
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 0.61
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 39 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 100 %
```

```r
df_bin <- sample100_binary %>%
  mutate(row_id = row_number()) %>%
  select(
    row_id,
    POLVIEWS_TRUE = polviews_binary,
    age, sex, race, educ, marital, occ10, region   # <- keep whatever predictors you want
  ) %>%
  inner_join(
    var_bin %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_var = pred_polview),
    by = "row_id"
  ) %>%
  inner_join(
    narrative_bin %>%
      mutate(row_id = row_number()) %>%
```

```r
      select(row_id, pred_narr = pred_polview_narr),
    by = "row_id"
  )
head(df_bin)
```

```
## # A tibble: 6 x 11
##   row_id POLVIEWS_TRUE age    sex   race  educ     marital occ10 region pred_var
##    <int>         <dbl> <dbl+> <fct> <fct> <dbl+lb> <fct>   <fct> <fct>     <int>
## 1      1             0 67     1     1     16 [4 y~ 5       1740  4             1
## 2      2             1 56     2     3     14 [2 y~ 3       50    4             0
## 3      3             1 33     2     1     14 [2 y~ 5       7750  2             0
## 4      4             0 24     2     1     16 [4 y~ 5       2550  1             0
## 5      5             0 46     2     1     14 [2 y~ 1       5610  4             0
## 6      6             0 25     1     1     12 [12t~ 5       6440  3             1
## # i 1 more variable: pred_narr <int>
```

```r
df_bin <- df_bin %>%
  mutate(
    # Factor version for F1
    POLVIEWS_TRUE_fac = factor(POLVIEWS_TRUE),
    pred_var_fac      = factor(pred_var,  levels = levels(POLVIEWS_TRUE_fac)),
    pred_narr_fac     = factor(pred_narr, levels = levels(POLVIEWS_TRUE_fac)),

    # Numeric version for bias / error
    polviews_num = as.numeric(as.character(POLVIEWS_TRUE)),
    pred_var_num = as.numeric(as.character(pred_var)),
    pred_narr_num = as.numeric(as.character(pred_narr)),

    # Signed errors
    error_var   = pred_var_num  - polviews_num,
    error_narr = pred_narr_num - polviews_num
  )
results <- tibble(
  Model = c("Variable Model", "Narrative Model"),
  Macro_F1 = c(
    f1_macro(df_bin$POLVIEWS_TRUE_fac, df_bin$pred_var_fac),
    f1_macro(df_bin$POLVIEWS_TRUE_fac, df_bin$pred_narr_fac)
  ),
  Weighted_F1 = c(
    f1_weighted(df_bin$POLVIEWS_TRUE_fac, df_bin$pred_var_fac),
    f1_weighted(df_bin$POLVIEWS_TRUE_fac, df_bin$pred_narr_fac)
  )
)

print(results)
```

```
## # A tibble: 2 x 3
##   Model           Macro_F1 Weighted_F1
##   <chr>              <dbl>       <dbl>
## 1 Variable Model     0.467       0.454
## 2 Narrative Model    0.385       0.405
```

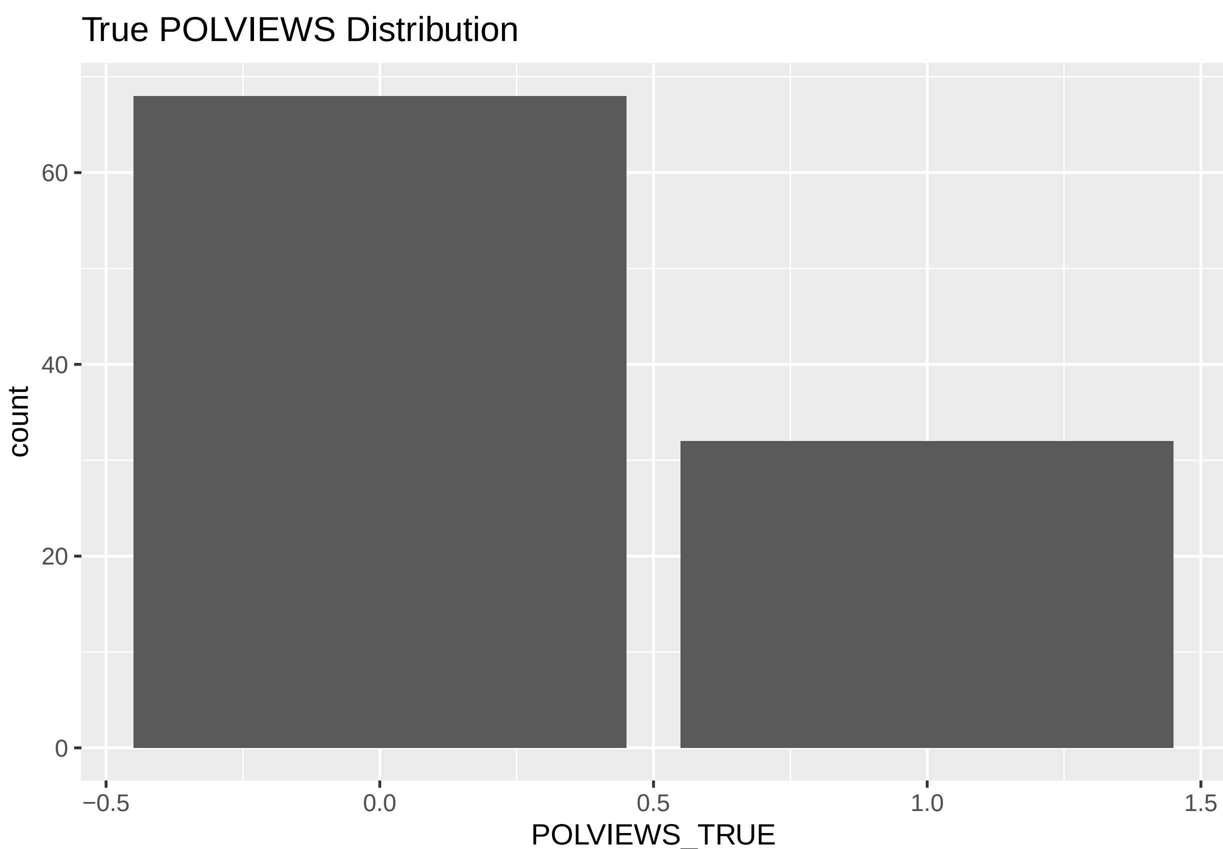
```r
mislabeled_comparison <- df_bin %>%
  mutate(
    # Wrong / right flags
```

```r
    var_wrong  = pred_var  != POLVIEWS_TRUE,
    narr_wrong = pred_narr != POLVIEWS_TRUE,

    # Case types with only two models
    case_type = case_when(
      var_wrong  & !narr_wrong ~ "Only Variable Model Wrong",
      !var_wrong & narr_wrong  ~ "Only Narrative Model Wrong",
      var_wrong  & narr_wrong  ~ "Both Wrong",
      TRUE                     ~ "Both Correct"
    ),

    # Differences vs true (numeric scale 1-7)
    diff_var  = as.numeric(pred_var)  - as.numeric(POLVIEWS_TRUE),
    diff_narr = as.numeric(pred_narr) - as.numeric(POLVIEWS_TRUE),

    # Bias direction for each model (only label as too lib/con if it's wrong)
    bias_var = dplyr::case_when(
      !var_wrong         ~ "Correct",
      diff_var  > 0      ~ "Too Conservative",
      diff_var  < 0      ~ "Too Liberal",
      TRUE               ~ NA_character_
    ),
    bias_narr = dplyr::case_when(
      !narr_wrong        ~ "Correct",
      diff_narr  > 0     ~ "Too Conservative",
      diff_narr  < 0     ~ "Too Liberal",
      TRUE               ~ NA_character_
    )
  ) %>%
  select(
    row_id, POLVIEWS_TRUE,
    pred_var, pred_narr,
    var_wrong, narr_wrong,
    case_type,
    bias_var, bias_narr
  )

# Save to CSV
write.csv(mislabeled_comparison,
          "mislabeled_cases_comparison_bin.csv",
          row.names = FALSE)

bias_table <- mislabeled_comparison %>%
  select(bias_var, bias_narr) %>%
  tidyr::pivot_longer(
    cols      = everything(),
    names_to  = "model",
    values_to = "bias"
  ) %>%
  dplyr::filter(bias != "Correct") %>%   # only mislabeled cases
  dplyr::group_by(model, bias) %>%
  dplyr::summarise(count = dplyr::n(), .groups = "drop_last") %>%
  dplyr::mutate(
```

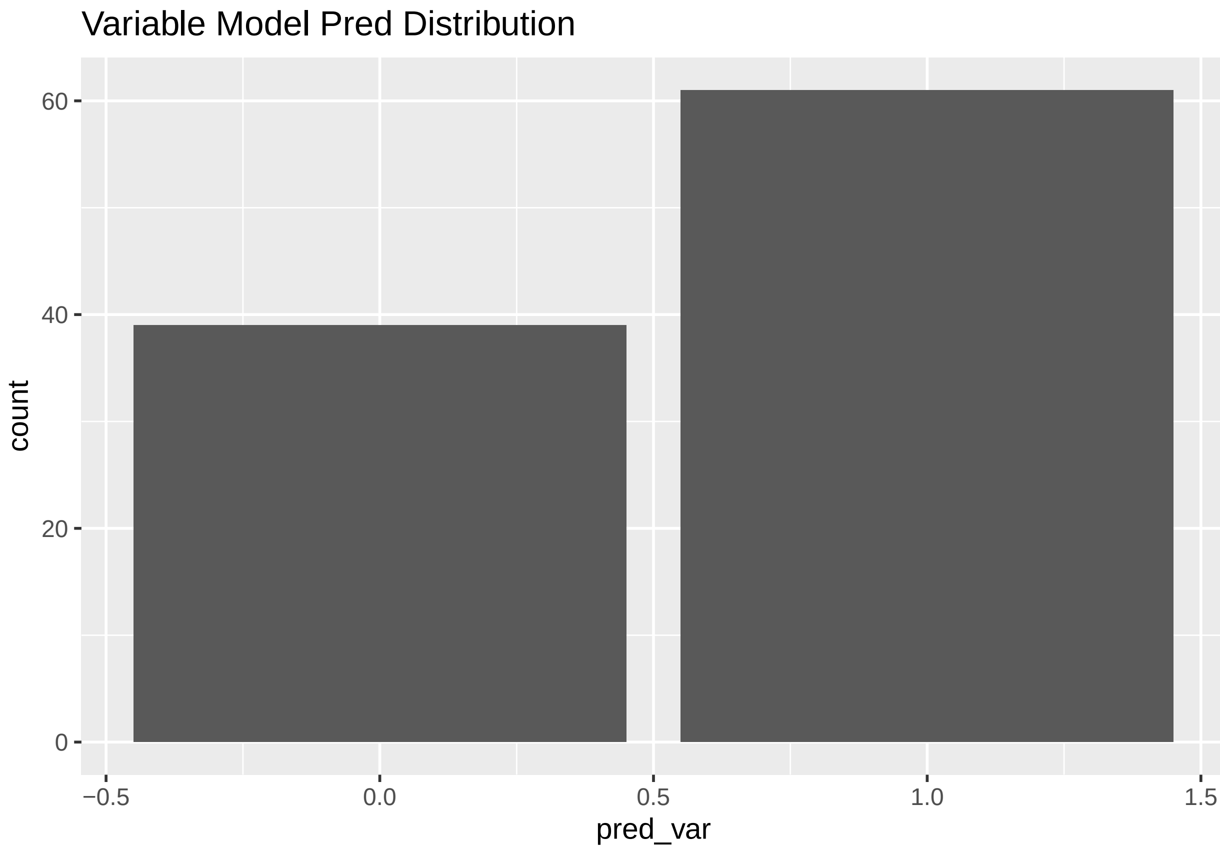
```r
    percent = count / sum(count) * 100
  ) %>%
  dplyr::ungroup() %>%
  dplyr::mutate(
    model = dplyr::recode(
      model,
      bias_var  = "Variable Model",
      bias_narr = "Narrative Model"
    )
  ) %>%
  dplyr::arrange(model, bias)
bias_table
```

```
## # A tibble: 4 x 4
##   model           bias              count percent
##   <chr>           <chr>             <int>   <dbl>
## 1 Narrative Model Too Conservative     53    86.9
## 2 Narrative Model Too Liberal           8    13.1
## 3 Variable Model  Too Conservative     41    77.4
## 4 Variable Model  Too Liberal          12    22.6
```

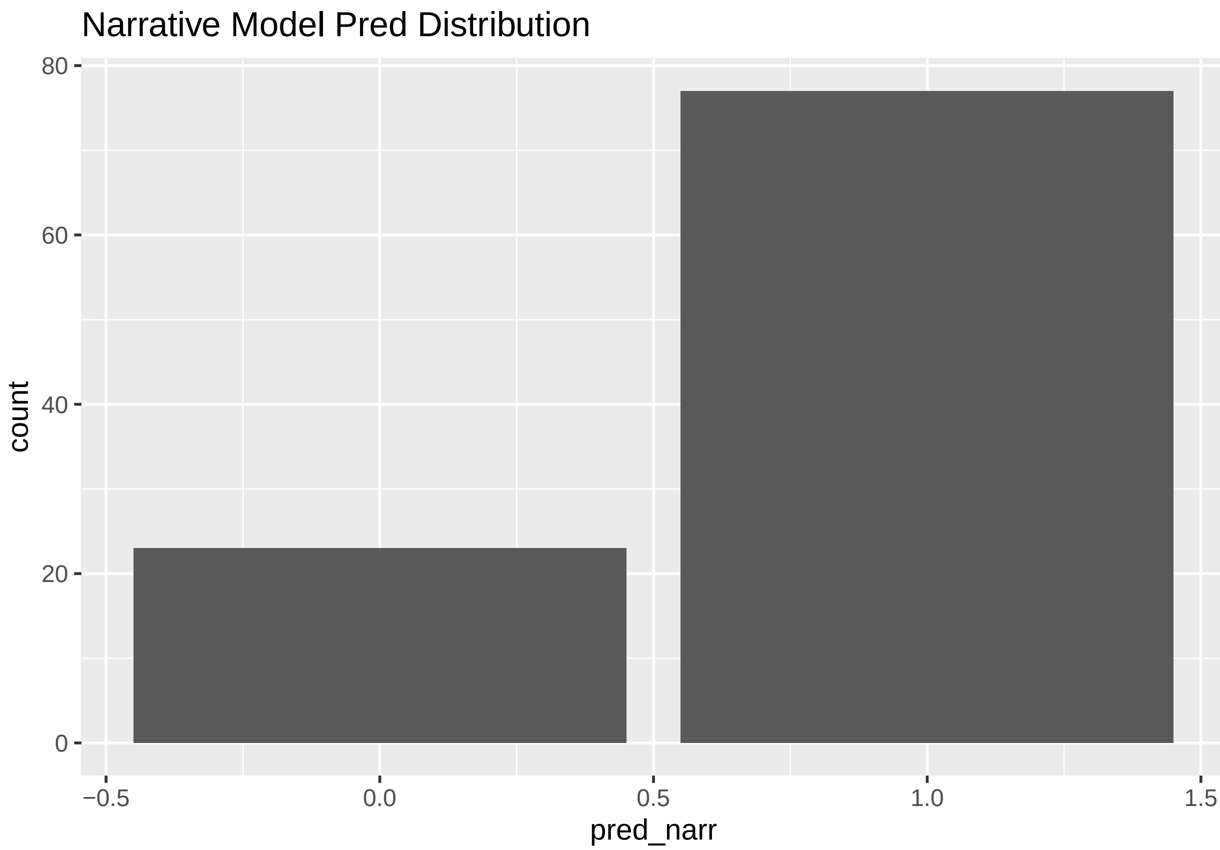
```r
#true polviews distribution

ggplot(df_bin, aes(x = POLVIEWS_TRUE)) +
  geom_bar() +
  ggtitle("True POLVIEWS Distribution")
```



```r
ggplot(df_bin, aes(x = pred_var)) +
  geom_bar() +
  ggtitle("Variable Model Pred Distribution")
```




```r
ggplot(df_bin, aes(x = pred_narr)) +
  geom_bar() +
  ggtitle("Narrative Model Pred Distribution")
```




```r
df_bin$occ10 <- as.numeric(as.character(df_bin$occ10))
bias_by_predictor(df_bin, age)
```

```
## # A tibble: 50 x 8
##      age     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1 21        1              1               1                 1                0
##  2 25        2              1               1                 1                0
##  3 31        1              1               1                 1                0
##  4 39        1              1               1                 1                0
##  5 55        1              1               1                 1                0
##  6 61        1              1               1                 1                0
##  7 67        2              1               1                 1                0
##  8 73        1              1               1                 1                0
##  9 74        1              1               1                 1                0
## 10 76        1              1               1                 1                0
## # i 40 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_bin, sex)
```

```
## # A tibble: 2 x 8
##   sex       n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 1        53          0.302           0.491             0.396           0.0943
## 2 2        47          0.277           0.404             0.426           0.149
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_bin, race)
```

```
## # A tibble: 3 x 8
##   race      n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 1        77          0.364           0.442             0.468            0.104
## 2 2        13          0.231           0.615             0.231            0
## 3 3        10         -0.2             0.3               0.2              0.4
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_bin, educ)
```

```
## # A tibble: 14 x 8
##    educ                        n mean_error_var mean_error_narr prop_too_cons_var
##    <dbl+lbl>               <int>          <dbl>           <dbl>             <dbl>
##  1 15 [3 years of colleg~     2          1               1                 1
##  2 19 [7 years of colleg~     1          1               1                 1
##  3 20 [8 or more years o~     2          1               1                 1
##  4 13 [1 year of college]     6          0.667           0.833             0.667
##  5 12 [12th grade]           21          0.571           0.762             0.571
##  6 16 [4 years of colleg~    26          0.346           0.269             0.423
##  7 14 [2 years of colleg~    20          0.2             0.65              0.35
##  8  6 [6th grade]             1          0               1                 0
##  9  9 [9th grade]             1          0               0                 0
## 10 10 [10th grade]            2          0               0.5               0
## 11 11 [11th grade]            1          0               1                 0
## 12 17 [5 years of colleg~     9         -0.222          -0.111             0.222
## 13 18 [6 years of colleg~     7         -0.286          -0.429             0
## 14  0 [no formal schooli~     1         -1               0                 0
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_bin, marital)
```

```
## # A tibble: 4 x 8
##   marital     n mean_error_var mean_error_narr prop_too_cons_var
##   <fct>   <int>          <dbl>           <dbl>             <dbl>
## 1 2           8         0.625            0.5               0.75
## 2 3          16         0.375            0.5               0.5
## 3 1          44         0.341            0.364             0.432
## 4 5          32         0.0938           0.531             0.25
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_bin, occ10)
```

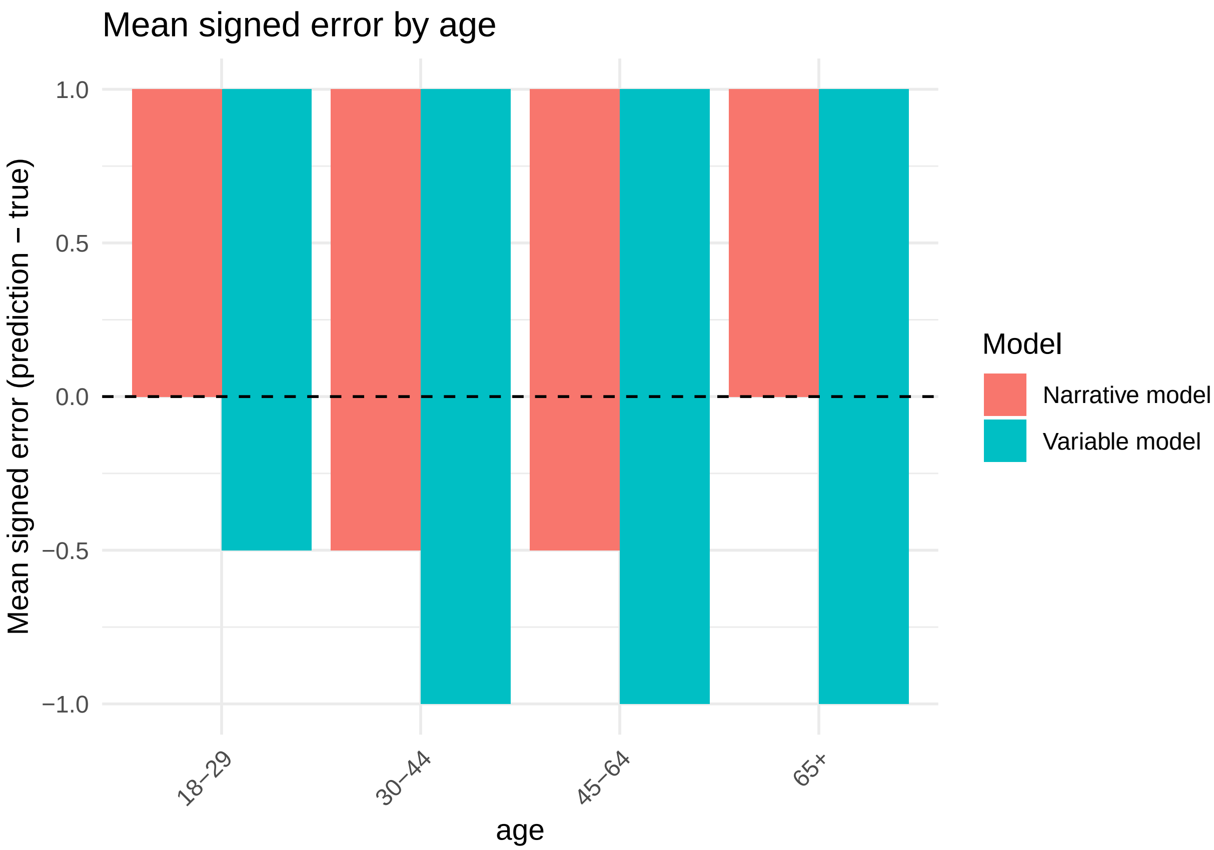
```
## # A tibble: 73 x 8
##    occ10     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1    20     1              1               1                 1                0
##  2   120     1              1               0                 1                0
##  3   710     2              1               1                 1                0
##  4  1106     1              1               1                 1                0
##  5  1460     1              1               1                 1                0
##  6  1740     1              1               1                 1                0
##  7  2145     1              1               1                 1                0
```

```
## 8   2200     1            1              1               1              0
## 9   3600     2            1              1               1              0
## 10  3850     3            1              1               1              0
## # i 63 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

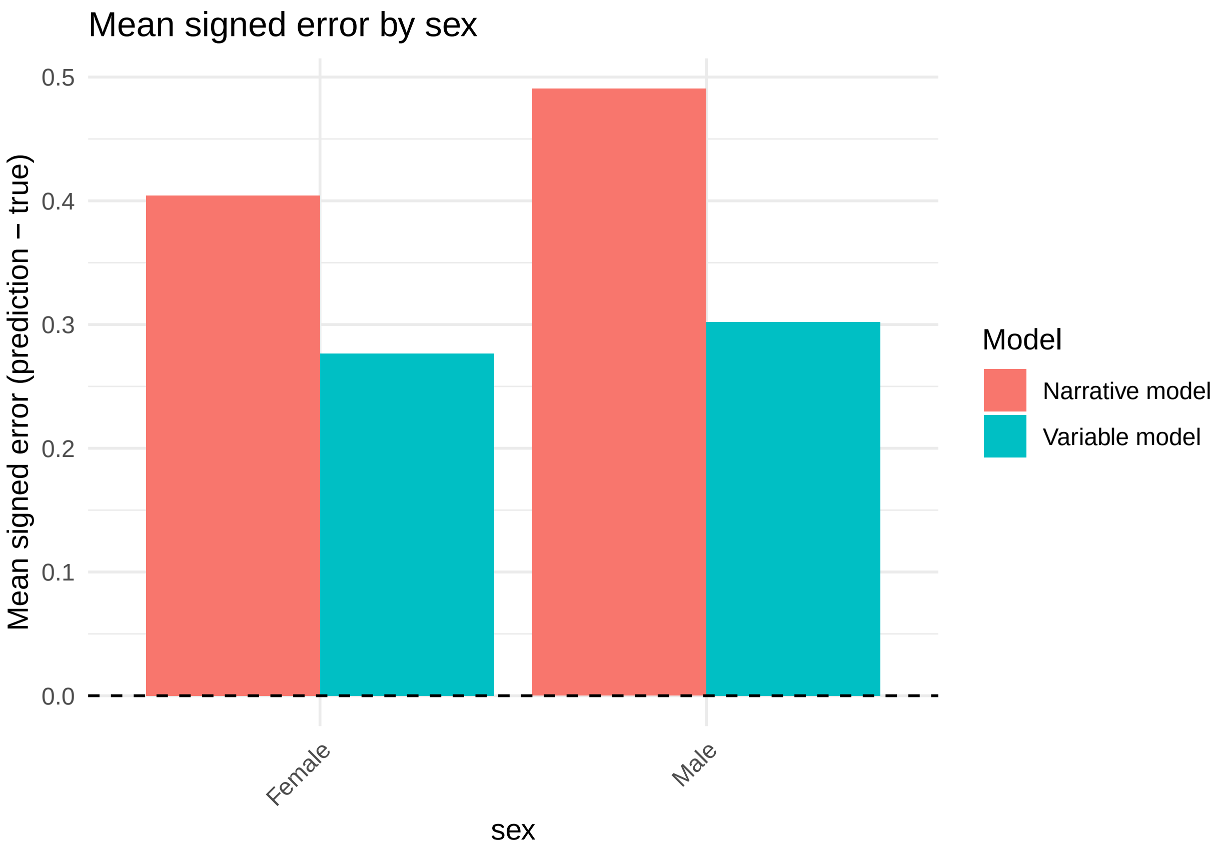
```
bias_by_predictor(df_bin, region)
```

```
## # A tibble: 4 x 8
##   region     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct>  <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 3         37          0.486           0.486             0.541           0.0541
## 2 2         24          0.333           0.458             0.417           0.0833
## 3 1         12          0.25            0.333             0.333           0.0833
## 4 4         27          0               0.444             0.259           0.259
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```
plot_mean_error_by_predictor(df_bin, age)
```

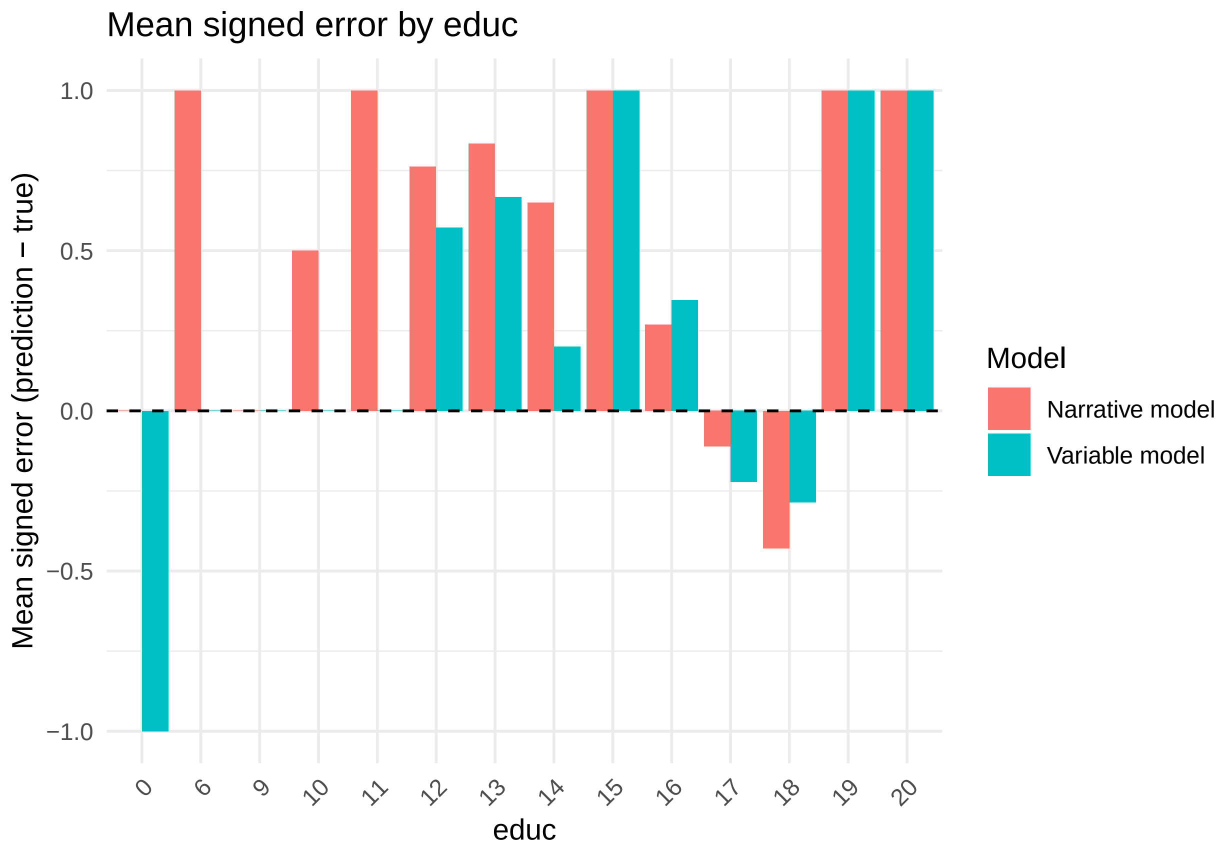



```
plot_mean_error_by_predictor(df_bin, sex)
```

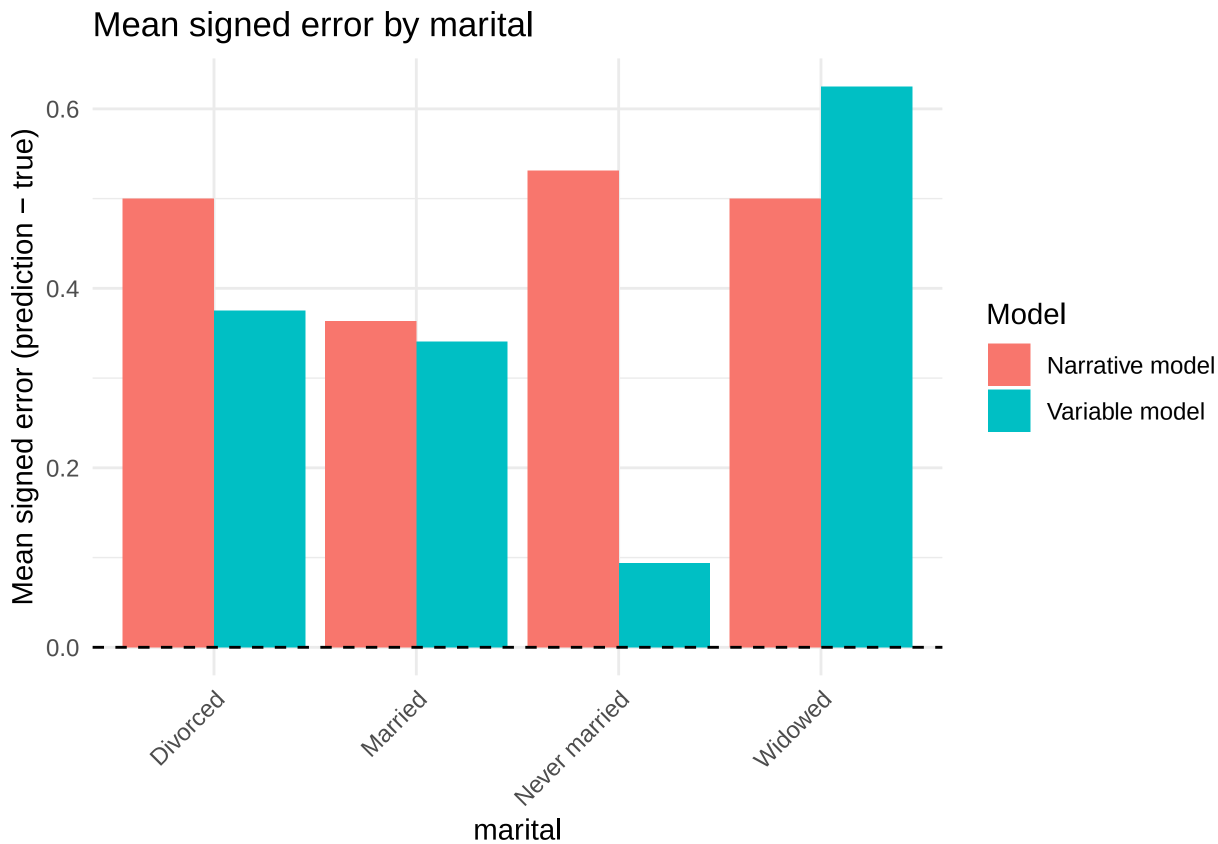



```r
plot_mean_error_by_predictor(df_bin, race)
```

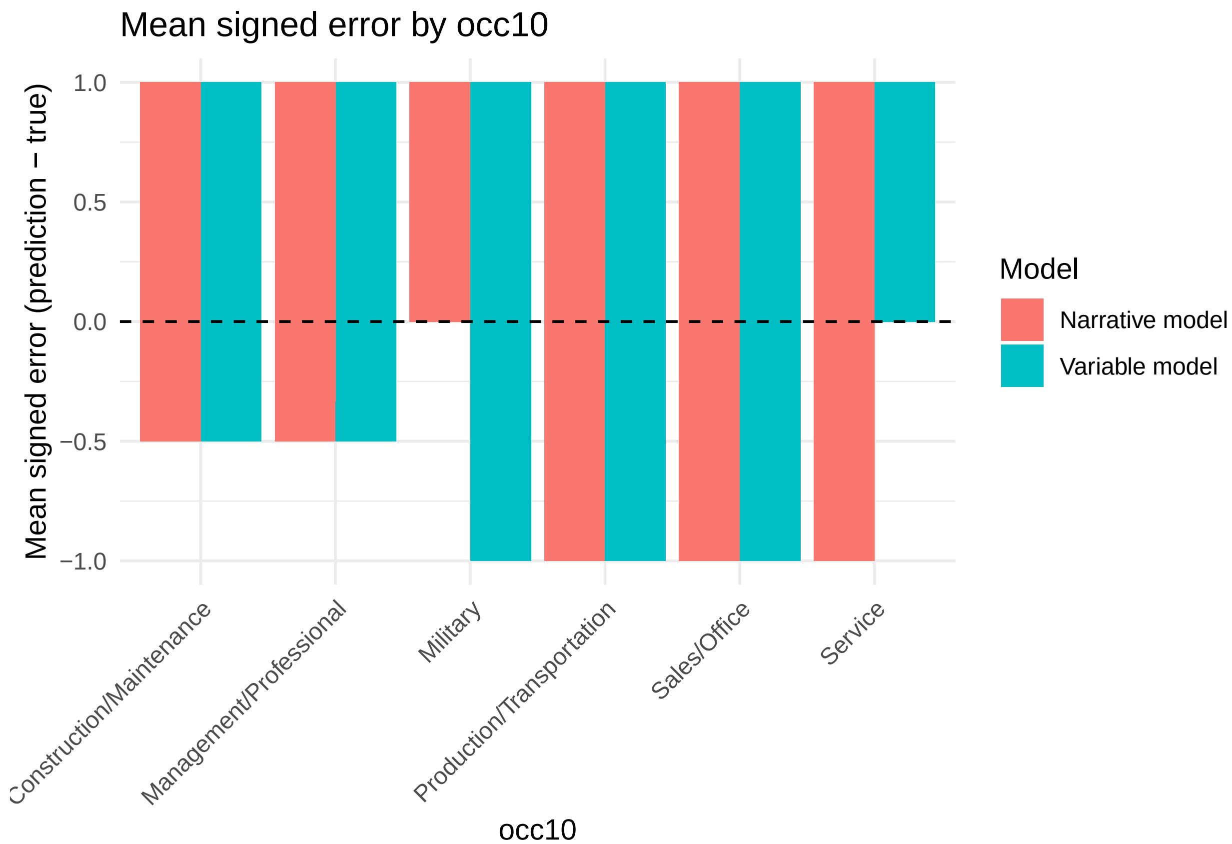

```
plot_mean_error_by_predictor(df_bin, educ)
```



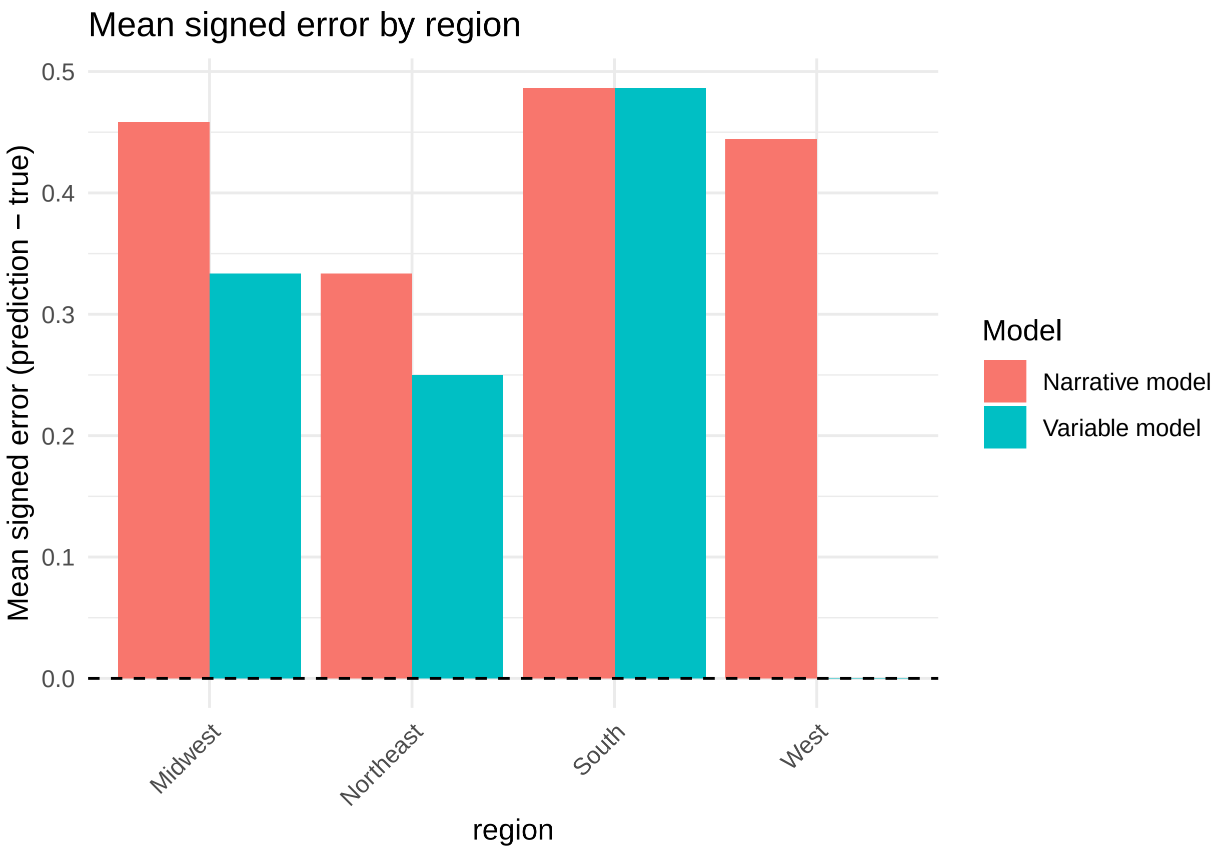

```
plot_mean_error_by_predictor(df_bin, marital)
```




```
plot_mean_error_by_predictor(df_bin, occ10)
```




```
plot_mean_error_by_predictor(df_bin, region)
```




```
#collapse POLVIEWS into three categories: 1 = Liberal, 2 = Moderate, 3 = Conservative
sample100_3 <- sample100 %>%
  mutate(
    polviews_3 = case_when(
      polviews %in% c(1, 2, 3) ~ 1,    # liberal
      polviews %in% c(4) ~ 2,    # moderate
      polviews %in% c(5, 6, 7) ~ 3     # conservative
    )
  ) %>%
  filter(!is.na(polviews_3))
head(sample100_3)
```

```
## # A tibble: 6 x 9
##   polviews age       educ            race  sex   occ10 region marital polviews_3
##      <int> <dbl+lbl> <dbl+lbl>       <fct> <fct> <fct> <fct>  <fct>        <dbl>
## 1        4 67        16 [4 years of~ 1     1     1740  4      5                2
## 2        5 56        14 [2 years of~ 3     2     50    4      3                3
## 3        6 33        14 [2 years of~ 1     2     7750  2      5                3
## 4        3 24        16 [4 years of~ 1     2     2550  1      5                1
## 5        3 46        14 [2 years of~ 1     2     5610  4      1                1
## 6        4 25        12 [12th grade] 1     1     6440  3      5                2
```

```
sample100_nolabel_3 <- sample100_3 %>%
  select(-polviews_3) %>% # remove the binary ideology variable)
  select(-polviews) # remove the numeric ideology variable


head(sample100_nolabel_3)
```

```
## # A tibble: 6 x 7
##   age       educ                      race  sex   occ10 region marital
##   <dbl+lbl> <dbl+lbl>                 <fct> <fct> <fct> <fct>  <fct>
## 1 67        16 [4 years of college] 1     1     1740  4      5
## 2 56        14 [2 years of college] 3     2     50    4      3
## 3 33        14 [2 years of college] 1     2     7750  2      5
## 4 24        16 [4 years of college] 1     2     2550  1      5
## 5 46        14 [2 years of college] 1     2     5610  4      1
## 6 25        12 [12th grade]         1     1     6440  3      5
```

```r
write.csv(sample100_nolabel_3, "gss_sample_100_unlabeled_3.csv", row.names = FALSE)
```

```r
var_3 <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_var_predictions_3.csv")
head(var_3)
```

```
##   age educ race sex occ10 region marital pred_polview
## 1  67   16    1   1  1740      4       5            2
## 2  56   14    3   2    50      4       3            2
## 3  33   14    1   2  7750      2       5            2
## 4  24   16    1   2  2550      1       5            1
## 5  46   14    1   2  5610      4       1            2
## 6  25   12    1   1  6440      3       5            2
```

```r
# Extract variables
y_true_3 <- as.numeric(sample100_3$polviews_3)
y_pred_3 <- as.numeric(var_3$pred_polview)

# Compute metrics
MAE <- mean(abs(y_true_3 - y_pred_3))
MSE <- mean((y_true_3 - y_pred_3)^2)
Accuracy <- mean(y_true_3 == y_pred_3)
Within1 <- mean(abs(y_true_3 - y_pred_3) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.75
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 1.03
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 39 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 86 %
```

```r
narrative_3 <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_narrative_predictions_3.csv")
head(narrative_3)
```

```
##   id
## 1  1
## 2  2
## 3  3
## 4  4
```

```
## 5  5
## 6  6
##
## 1                                                               He is 67, a man in the West who values i
## 2 She is 56 years old, she has settled into a steady rhythm in the West, where routines give structu
## 3                                             At 33, this woman in the Midwest balances work, personal commi
## 4              She is 24, a woman living in the Northeast, still shaping her path in work and life. (
## 5          She is 46 years old, she has settled into a steady rhythm in the West, where routines giv
## 6                                                          He is 25, a man living in the South, still shapin
##   pred_polview_narr
## 1                 2
## 2                 2
## 3                 2
## 4                 2
## 5                 2
## 6                 3
```

```r
# Extract variables
y_true_3 <- as.numeric(sample100_3$polviews_3)
y_pred_3 <- as.numeric(narrative_3$pred_polview_narr)

# Compute metrics
MAE <- mean(abs(y_true_3 - y_pred_3))
MSE <- mean((y_true_3 - y_pred_3)^2)
Accuracy <- mean(y_true_3 == y_pred_3)
Within1 <- mean(abs(y_true_3 - y_pred_3) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.58
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 0.66
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 46 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 96 %
```

```r
df_3 <- sample100_3 %>%
  mutate(row_id = row_number()) %>%
  select(
    row_id,
    POLVIEWS_TRUE = polviews_3,
    age, sex, race, educ, marital, occ10, region   # <- keep whatever predictors you want
  ) %>%
  inner_join(
    var_3 %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_var = pred_polview),
    by = "row_id"
  ) %>%
  inner_join(
```

```r
    narrative_3 %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_narr = pred_polview_narr),
    by = "row_id"
  )
head(df_3)
```

```
## # A tibble: 6 x 11
##   row_id POLVIEWS_TRUE age    sex   race  educ      marital occ10 region pred_var
##    <int>         <dbl> <dbl+> <fct> <fct> <dbl+lb> <fct>   <fct> <fct>     <int>
## 1      1             2 67     1     1     16 [4 y~ 5       1740  4             2
## 2      2             3 56     2     3     14 [2 y~ 3       50    4             2
## 3      3             3 33     2     1     14 [2 y~ 5       7750  2             2
## 4      4             1 24     2     1     16 [4 y~ 5       2550  1             1
## 5      5             1 46     2     1     14 [2 y~ 1       5610  4             2
## 6      6             2 25     1     1     12 [12t~ 5       6440  3             2
## # i 1 more variable: pred_narr <int>
```

```r
df_3 <- df_3 %>%
  mutate(
    # Factor version for F1
    POLVIEWS_TRUE_fac = factor(POLVIEWS_TRUE),
    pred_var_fac      = factor(pred_var,  levels = levels(POLVIEWS_TRUE_fac)),
    pred_narr_fac     = factor(pred_narr, levels = levels(POLVIEWS_TRUE_fac)),

    # Numeric version for bias / error
    polviews_num = as.numeric(as.character(POLVIEWS_TRUE)),
    pred_var_num = as.numeric(as.character(pred_var)),
    pred_narr_num = as.numeric(as.character(pred_narr)),

    # Signed errors
    error_var  = pred_var_num  - polviews_num,
    error_narr = pred_narr_num - polviews_num
  )
results <- tibble(
  Model = c("Variable Model", "Narrative Model"),
  Macro_F1 = c(
    f1_macro(df_3$POLVIEWS_TRUE_fac, df_3$pred_var_fac),
    f1_macro(df_3$POLVIEWS_TRUE_fac, df_3$pred_narr_fac)
  ),
  Weighted_F1 = c(
    f1_weighted(df_3$POLVIEWS_TRUE_fac, df_3$pred_var_fac),
    f1_weighted(df_3$POLVIEWS_TRUE_fac, df_3$pred_narr_fac)
  )
)

print(results)
```

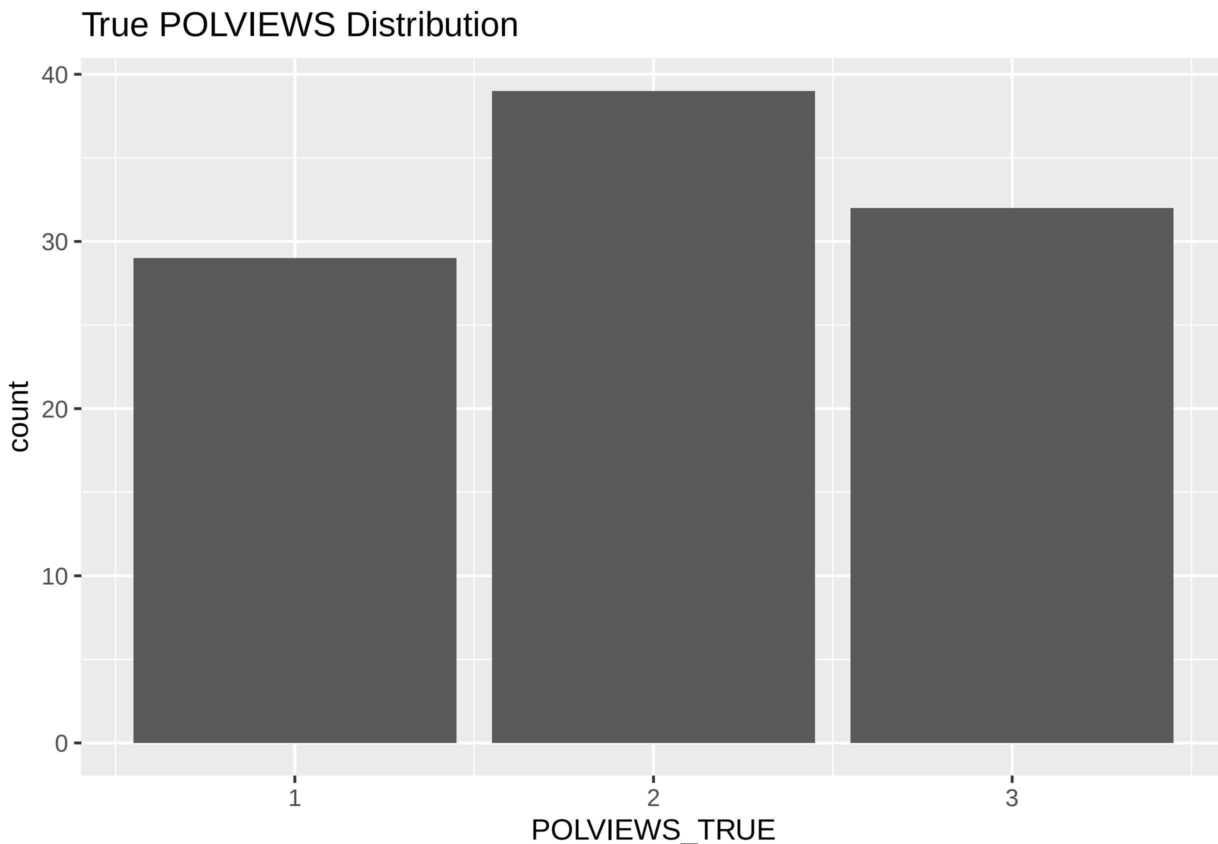
```
## # A tibble: 2 x 3
##   Model           Macro_F1 Weighted_F1
##   <chr>              <dbl>       <dbl>
## 1 Variable Model     0.689       0.682
## 2 Narrative Model    0.678       0.654
```

```r
mislabeled_comparison <- df_3 %>%
  mutate(
    # Wrong / right flags
    var_wrong  = pred_var  != POLVIEWS_TRUE,
    narr_wrong = pred_narr != POLVIEWS_TRUE,

    # Case types with only two models
    case_type = case_when(
      var_wrong  & !narr_wrong ~ "Only Variable Model Wrong",
      !var_wrong & narr_wrong  ~ "Only Narrative Model Wrong",
      var_wrong  & narr_wrong  ~ "Both Wrong",
      TRUE                     ~ "Both Correct"
    ),

    # Differences vs true (numeric scale 1-7)
    diff_var  = as.numeric(pred_var)  - as.numeric(POLVIEWS_TRUE),
    diff_narr = as.numeric(pred_narr) - as.numeric(POLVIEWS_TRUE),

    # Bias direction for each model (only label as too lib/con if it's wrong)
    bias_var = dplyr::case_when(
      !var_wrong         ~ "Correct",
      diff_var  > 0      ~ "Too Conservative",
      diff_var  < 0      ~ "Too Liberal",
      TRUE               ~ NA_character_
    ),
    bias_narr = dplyr::case_when(
      !narr_wrong        ~ "Correct",
      diff_narr  > 0     ~ "Too Conservative",
      diff_narr  < 0     ~ "Too Liberal",
      TRUE               ~ NA_character_
    )
  ) %>%
  select(
    row_id, POLVIEWS_TRUE,
    pred_var, pred_narr,
    var_wrong, narr_wrong,
    case_type,
    bias_var, bias_narr
  )

# Save to CSV
write.csv(mislabeled_comparison,
          "mislabeled_cases_comparison_3.csv",
          row.names = FALSE)

bias_table <- mislabeled_comparison %>%
  select(bias_var, bias_narr) %>%
  tidyr::pivot_longer(
    cols      = everything(),
    names_to  = "model",
    values_to = "bias"
  ) %>%
  dplyr::filter(bias != "Correct") %>%   # only mislabeled cases
```

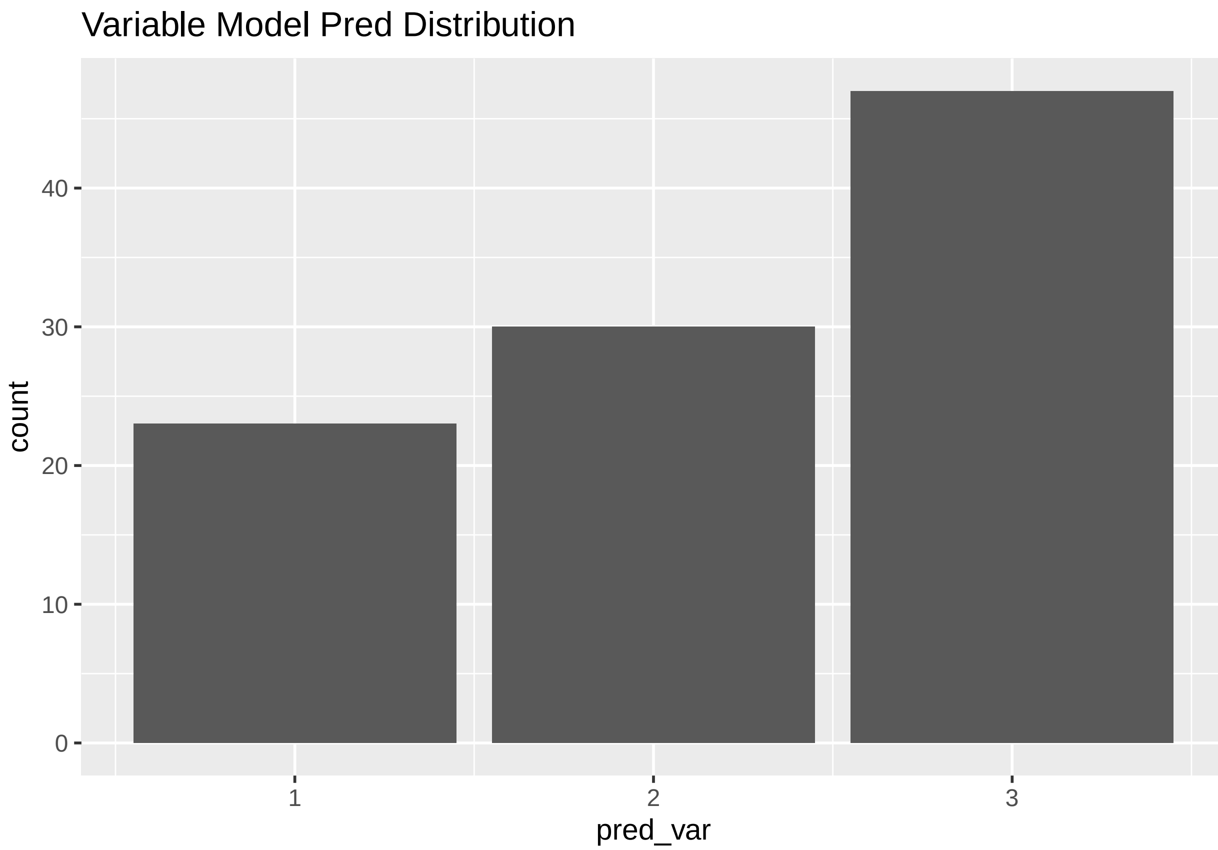
```r
  dplyr::group_by(model, bias) %>%
  dplyr::summarise(count = dplyr::n(), .groups = "drop_last") %>%
  dplyr::mutate(
    percent = count / sum(count) * 100
  ) %>%
  dplyr::ungroup() %>%
  dplyr::mutate(
    model = dplyr::recode(
      model,
      bias_var  = "Variable Model",
      bias_narr = "Narrative Model"
    )
  ) %>%
  dplyr::arrange(model, bias)
bias_table
```

```
## # A tibble: 4 x 4
##   model           bias             count percent
##   <chr>           <chr>            <int>   <dbl>
## 1 Narrative Model Too Conservative    33    61.1
## 2 Narrative Model Too Liberal         21    38.9
## 3 Variable Model  Too Conservative    37    60.7
## 4 Variable Model  Too Liberal         24    39.3
```

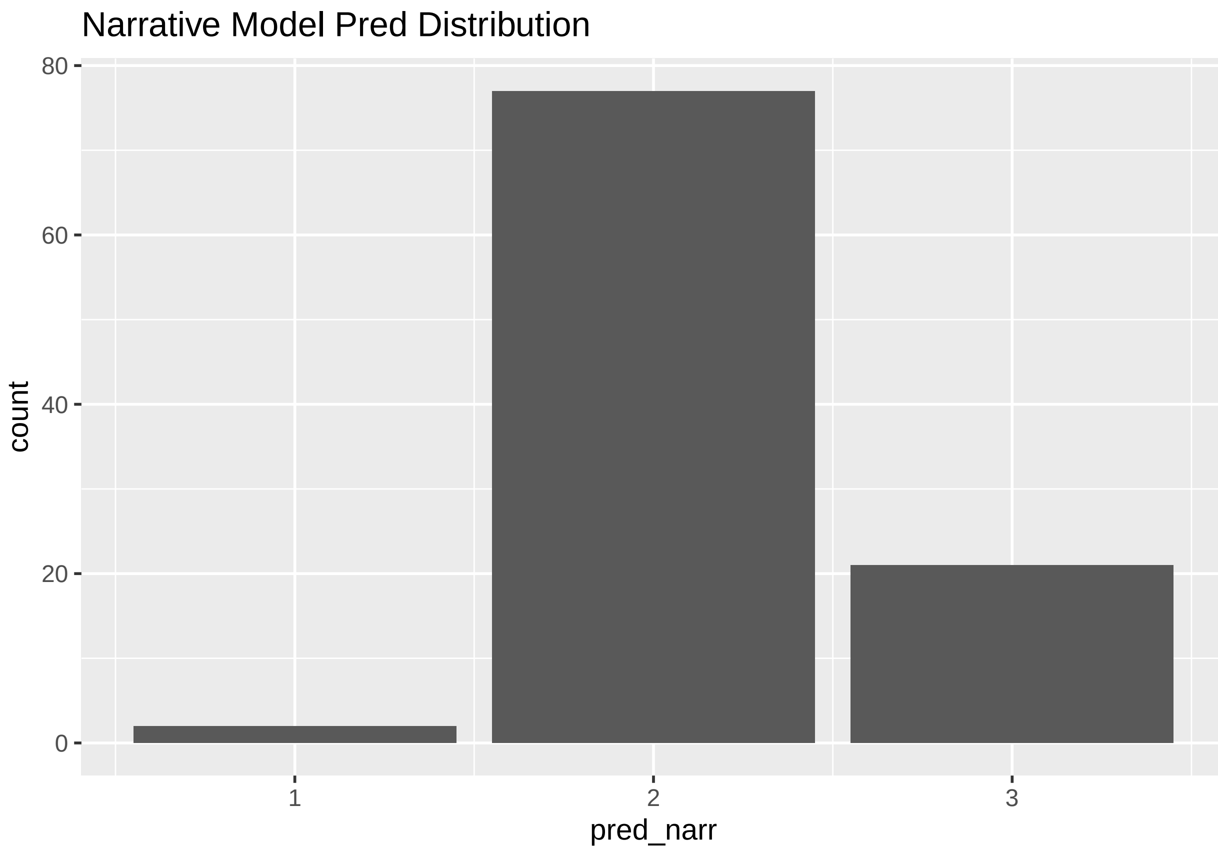
```r
#true polviews distribution

ggplot(df_3, aes(x = POLVIEWS_TRUE)) +
  geom_bar() +
  ggtitle("True POLVIEWS Distribution")
```




```
ggplot(df_3, aes(x = pred_var)) +
  geom_bar() +
  ggtitle("Variable Model Pred Distribution")
```




```r
ggplot(df_3, aes(x = pred_narr)) +
  geom_bar() +
  ggtitle("Narrative Model Pred Distribution")
```




```r
df_3$occ10 <- as.numeric(as.character(df_3$occ10))
bias_by_predictor(df_3, age)
```

```
## # A tibble: 50 x 8
##      age     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1 73        1            2             1                     1                0
##  2 76        1            2             1                     1                0
##  3 79        1            2             1                     1                0
##  4 82        1            2             1                     1                0
##  5 49        2            1.5           1                     1                0
##  6 83        4            1.5           0.75                  1                0
##  7 39        1            1             0                     1                0
##  8 46        2            1             0.5                   1                0
##  9 47        1            1             1                     1                0
## 10 55        1            1             0                     1                0
## # i 40 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_3, sex)
```

```
## # A tibble: 2 x 8
##   sex       n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 2        47          0.234          0.0851             0.383            0.234
## 2 1        53          0.189          0.226              0.358            0.245
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_3, race)
```

```
## # A tibble: 3 x 8
##   race      n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 1        77         0.351            0.117             0.416            0.182
## 2 2        13        -0.0769           0.615             0.231            0.308
## 3 3        10        -0.5             -0.1               0.2              0.6
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_3, educ)
```

```
## # A tibble: 14 x 8
##    educ                         n mean_error_var mean_error_narr prop_too_cons_var
##    <dbl+lbl>                <int>          <dbl>           <dbl>             <dbl>
##  1 19 [7 years of colleg~     1          2               1                 1
##  2 20 [8 or more years o~     2          2               1                 1
##  3 15 [3 years of colleg~     2          0.5             0                 0.5
##  4 16 [4 years of colleg~    26          0.385           0.115             0.423
##  5 13 [1 year of college]     6          0.333           0.667             0.5
##  6 12 [12th grade]           21          0.286           0.238             0.429
##  7 14 [2 years of colleg~    20          0.2             0.15              0.4
##  8  9 [9th grade]             1          0               0                 0
##  9 10 [10th grade]            2          0               0                 0
## 10 17 [5 years of colleg~     9         -0.111          -0.111             0.222
## 11 18 [6 years of colleg~     7         -0.571          -0.143             0
## 12  0 [no formal schooli~     1         -1               0                 0
## 13  6 [6th grade]             1         -1               0                 0
## 14 11 [11th grade]            1         -1               0                 0
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_3, marital)
```

```
## # A tibble: 4 x 8
##   marital     n mean_error_var mean_error_narr prop_too_cons_var
##   <fct>   <int>          <dbl>           <dbl>             <dbl>
## 1 2           8          0.875          0.375             0.75
## 2 3          16          0.5            0.125             0.5
## 3 1          44          0.409          0.0227            0.455
## 4 5          32         -0.375          0.312             0.0938
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_3, occ10)
```

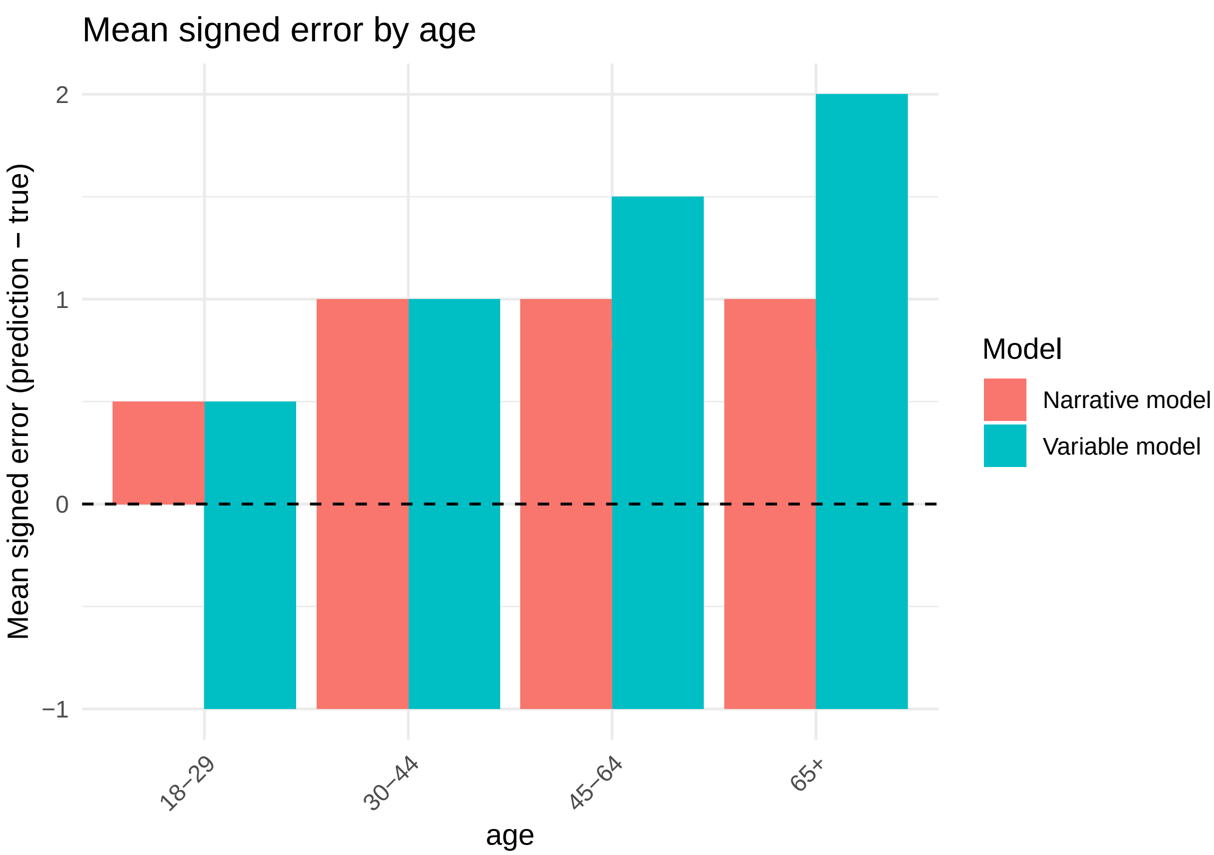
```
## # A tibble: 73 x 8
##    occ10     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1   710     2              2               1                 1                0
##  2  1460     1              2               1                 1                0
##  3  2200     1              2               1                 1                0
##  4  5120     1              2               1                 1                0
##  5  5600     1              2               1                 1                0
##  6  5820     1              2               1                 1                0
##  7  8750     1              2               2                 1                0
```

```
## 8 9620 1 2 2 1 0
## 9 20 1 1 0 1 0
## 10 735 1 1 1 1 0
## # i 63 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

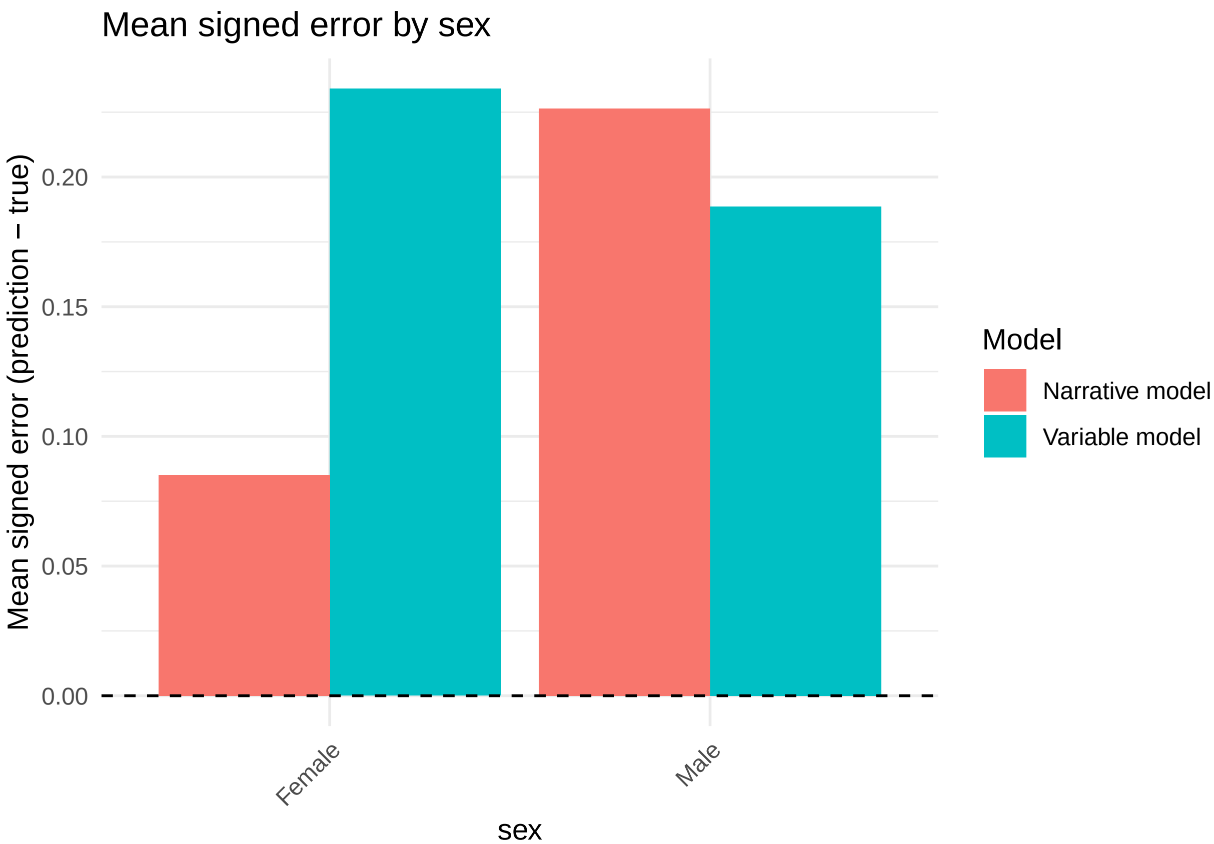
```r
bias_by_predictor(df_3, region)
```

```
## # A tibble: 4 x 8
##   region     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct>  <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 2         24          0.417          0.167              0.417            0.125
## 2 3         37          0.324          0.189              0.378            0.216
## 3 1         12          0.25           0.25               0.333            0.167
## 4 4         27         -0.148          0.0741             0.333            0.407
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
plot_mean_error_by_predictor(df_3, age)
```

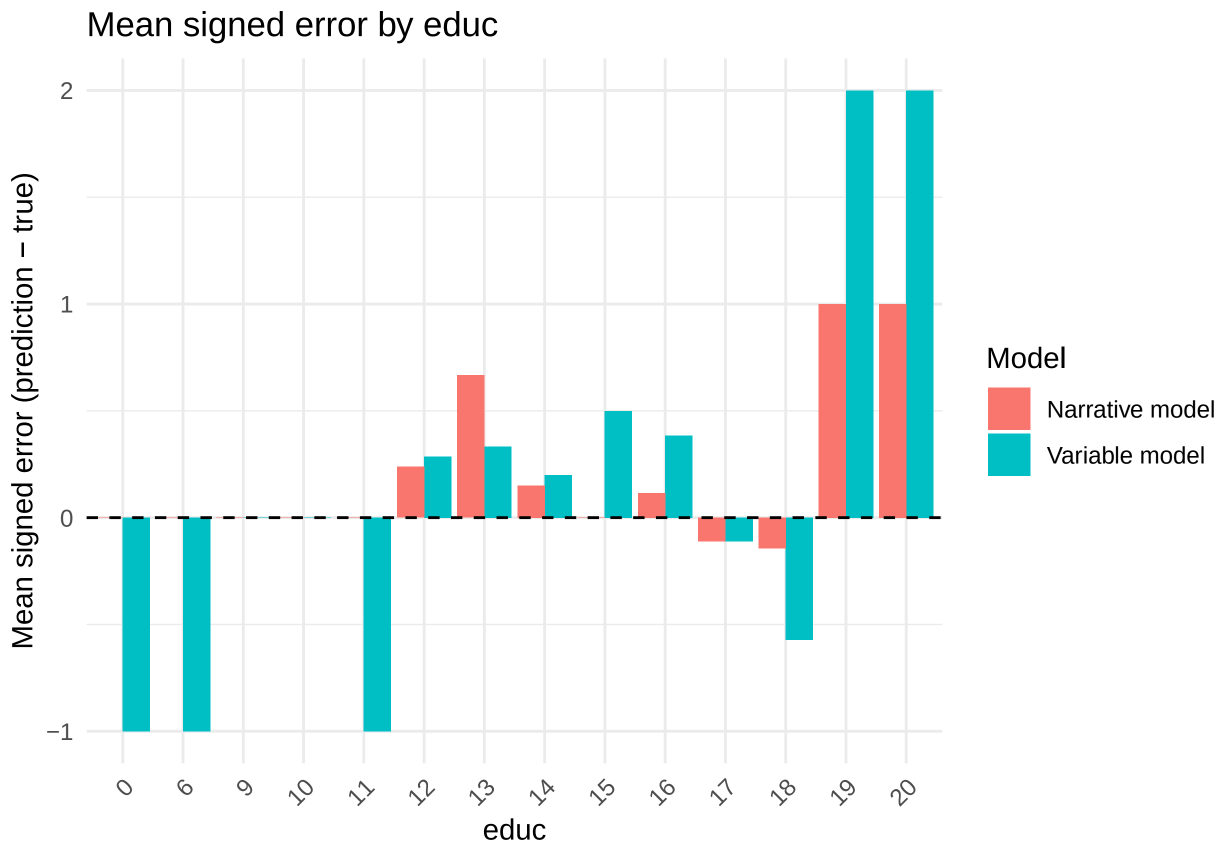



```r
plot_mean_error_by_predictor(df_3, sex)
```

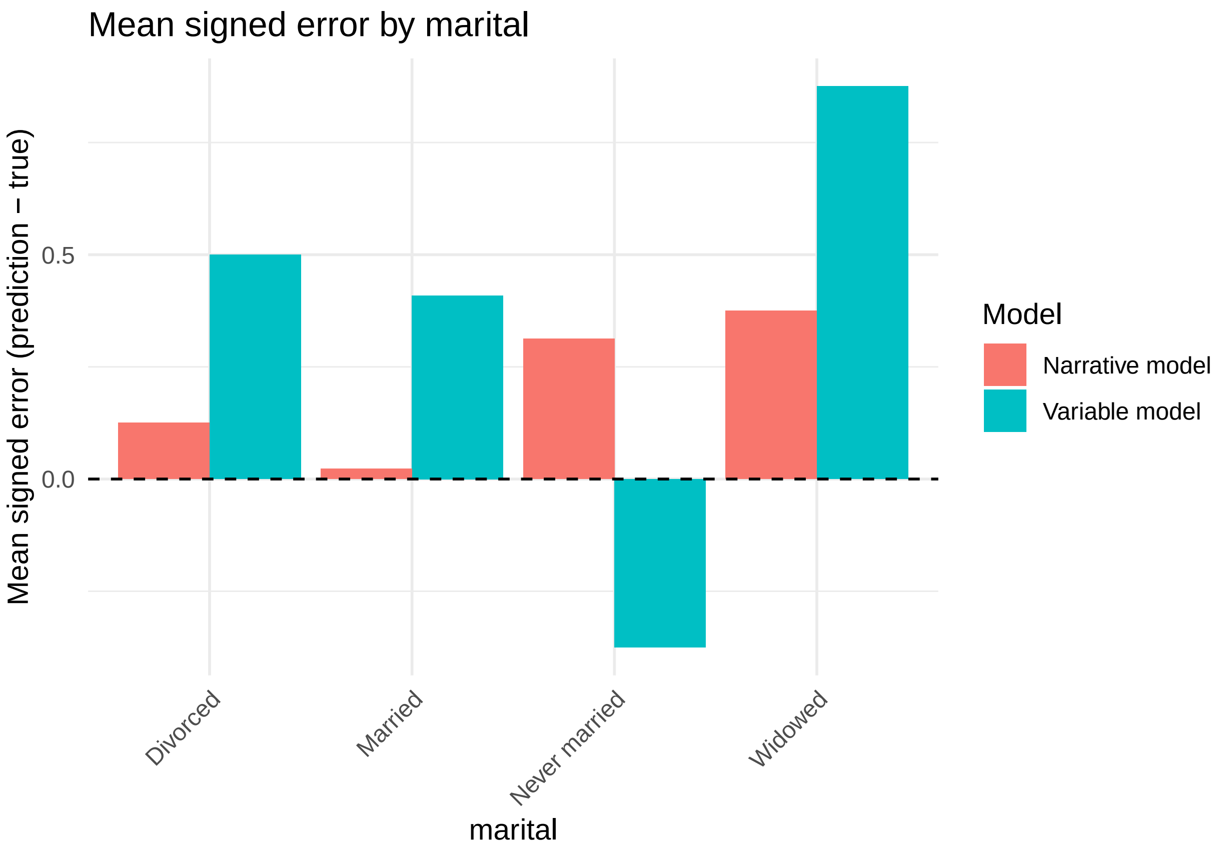



```r
plot_mean_error_by_predictor(df_3, race)
```

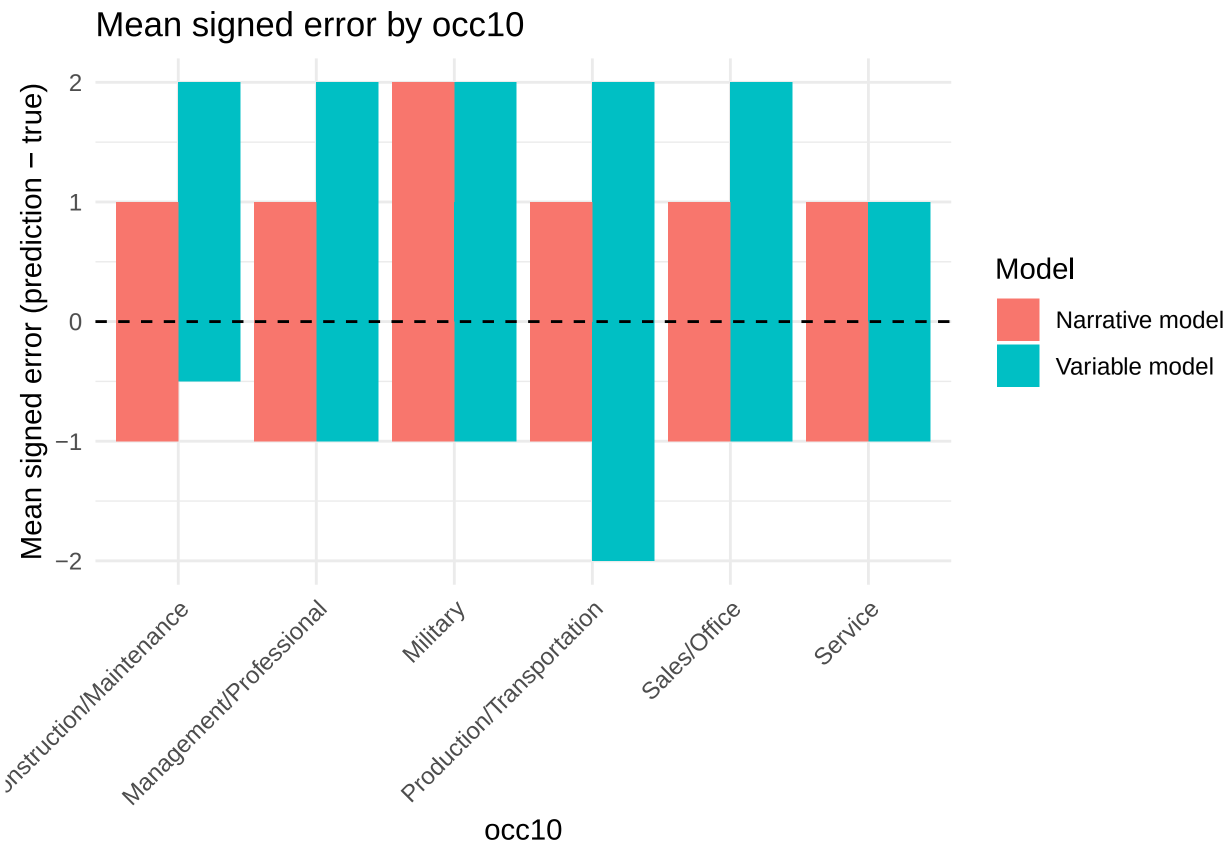

```
plot_mean_error_by_predictor(df_3, educ)
```




```
plot_mean_error_by_predictor(df_3, marital)
```




```
plot_mean_error_by_predictor(df_3, occ10)
```




```
plot_mean_error_by_predictor(df_3, region)
```


```
#collapse POLVIEWS into four categories:
sample100_4 <- sample100 %>%
  mutate(
    polviews_4= case_when(
      polviews %in% c(1, 2) ~ 1,    # extremely liberal
      polviews %in% c(3) ~ 2,    # slightly liberal
      polviews %in% c(4) ~ 3,     # moderate
      polviews %in% c(5, 6, 7) ~ 4     # conservative
    )
  ) %>%
  filter(!is.na(polviews_4))
head(sample100_4)
```

```
## # A tibble: 6 x 9
##   polviews age        educ             race  sex   occ10 region marital polviews_4
##      <int> <dbl+lbl> <dbl+lbl>         <fct> <fct> <fct> <fct>  <fct>        <dbl>
## 1        4 67        16 [4 years of~ 1     1     1740  4      5                3
## 2        5 56        14 [2 years of~ 3     2     50    4      3                4
## 3        6 33        14 [2 years of~ 1     2     7750  2      5                4
## 4        3 24        16 [4 years of~ 1     2     2550  1      5                2
## 5        3 46        14 [2 years of~ 1     2     5610  4      1                2
## 6        4 25        12 [12th grade] 1     1     6440  3      5                3
```

```
sample100_nolabel_4 <- sample100_4 %>%
  select(-polviews_4) %>% # remove the ideology variable)
  select(-polviews) # remove the numeric ideology variable
```

```r
head(sample100_nolabel_4)
```

```
## # A tibble: 6 x 7
##   age       educ                        race  sex   occ10 region marital
##   <dbl+lbl> <dbl+lbl>                   <fct> <fct> <fct> <fct>  <fct>
## 1 67        16 [4 years of college] 1     1     1740  4      5
## 2 56        14 [2 years of college] 3     2     50    4      3
## 3 33        14 [2 years of college] 1     2     7750  2      5
## 4 24        16 [4 years of college] 1     2     2550  1      5
## 5 46        14 [2 years of college] 1     2     5610  4      1
## 6 25        12 [12th grade]             1     1     6440  3      5
```

```r
write.csv(sample100_nolabel_4, "gss_sample_100_unlabeled_4.csv", row.names = FALSE)
```

```r
var_4 <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_var_predictions_4.csv")
head(var_4)
```

```
##   age educ race sex occ10 region marital pred_polview
## 1  67   16    1   1  1740      4       5            3
## 2  56   14    3   2    50      4       3            3
## 3  33   14    1   2  7750      2       5            3
## 4  24   16    1   2  2550      1       5            2
## 5  46   14    1   2  5610      4       1            3
## 6  25   12    1   1  6440      3       5            3
```

```r
# Extract variables
y_true_4 <- as.numeric(sample100_4$polviews_4)
y_pred_4 <- as.numeric(var_4$pred_polview)

# Compute metrics
MAE <- mean(abs(y_true_4 - y_pred_4))
MSE <- mean((y_true_4 - y_pred_4)^2)
Accuracy <- mean(y_true_4 == y_pred_4)
Within1 <- mean(abs(y_true_4 - y_pred_4) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.95
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 1.71
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 35 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 78 %
```

```r
narrative_4 <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_narrative_predictions_4.csv")
head(narrative_4)
```

```
##   id
## 1  1
## 2  2
## 3  3
```

```
## 4  4
## 5  5
## 6  6
##
## 1                                                              He is 67, a man in the West who values i
## 2 She is 56 years old, she has settled into a steady rhythm in the West, where routines give structu
## 3                                              At 33, this woman in the Midwest balances work, personal commi
## 4                 She is 24, a woman living in the Northeast, still shaping her path in work and life. (
## 5             She is 46 years old, she has settled into a steady rhythm in the West, where routines giv
## 6                                                          He is 25, a man living in the South, still shaping
##   pred_polview_narr
## 1                 3
## 2                 3
## 3                 4
## 4                 2
## 5                 3
## 6                 4
```

```r
# Extract variables
y_true_4 <- as.numeric(sample100_4$polviews_4)
y_pred_4 <- as.numeric(narrative_4$pred_polview_narr)

# Compute metrics
MAE <- mean(abs(y_true_4 - y_pred_4))
MSE <- mean((y_true_4 - y_pred_4)^2)
Accuracy <- mean(y_true_4 == y_pred_4)
Within1 <- mean(abs(y_true_4 - y_pred_4) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.83
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 1.47
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 44 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 78 %
```

```r
df_4 <- sample100_4 %>%
  mutate(row_id = row_number()) %>%
  select(
    row_id,
    POLVIEWS_TRUE = polviews_4,
    age, sex, race, educ, marital, occ10, region   # <- keep whatever predictors you want
  ) %>%
  inner_join(
    var_4 %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_var = pred_polview),
    by = "row_id"
  ) %>%
```

```r
  inner_join(
    narrative_4 %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_narr = pred_polview_narr),
    by = "row_id"
  )
head(df_4)
```

```
## # A tibble: 6 x 11
##   row_id POLVIEWS_TRUE age    sex   race  educ     marital occ10 region pred_var
##    <int>         <dbl> <dbl+> <fct> <fct> <dbl+lb> <fct>   <fct> <fct>     <int>
## 1      1             3 67     1     1     16 [4 y~ 5       1740  4             3
## 2      2             4 56     2     3     14 [2 y~ 3       50    4             3
## 3      3             4 33     2     1     14 [2 y~ 5       7750  2             3
## 4      4             2 24     2     1     16 [4 y~ 5       2550  1             2
## 5      5             2 46     2     1     14 [2 y~ 1       5610  4             3
## 6      6             3 25     1     1     12 [12t~ 5       6440  3             3
## # i 1 more variable: pred_narr <int>
```

```r
df_4 <- df_4 %>%
  mutate(
    # Factor version for F1
    POLVIEWS_TRUE_fac = factor(POLVIEWS_TRUE),
    pred_var_fac      = factor(pred_var,  levels = levels(POLVIEWS_TRUE_fac)),
    pred_narr_fac     = factor(pred_narr, levels = levels(POLVIEWS_TRUE_fac)),

    # Numeric version for bias / error
    polviews_num = as.numeric(as.character(POLVIEWS_TRUE)),
    pred_var_num = as.numeric(as.character(pred_var)),
    pred_narr_num = as.numeric(as.character(pred_narr)),

    # Signed errors
    error_var  = pred_var_num  - polviews_num,
    error_narr = pred_narr_num - polviews_num
  )
results <- tibble(
  Model = c("Variable Model", "Narrative Model"),
  Macro_F1 = c(
    f1_macro(df_4$POLVIEWS_TRUE_fac, df_4$pred_var_fac),
    f1_macro(df_4$POLVIEWS_TRUE_fac, df_4$pred_narr_fac)
  ),
  Weighted_F1 = c(
    f1_weighted(df_4$POLVIEWS_TRUE_fac, df_4$pred_var_fac),
    f1_weighted(df_4$POLVIEWS_TRUE_fac, df_4$pred_narr_fac)
  )
)

print(results)
```

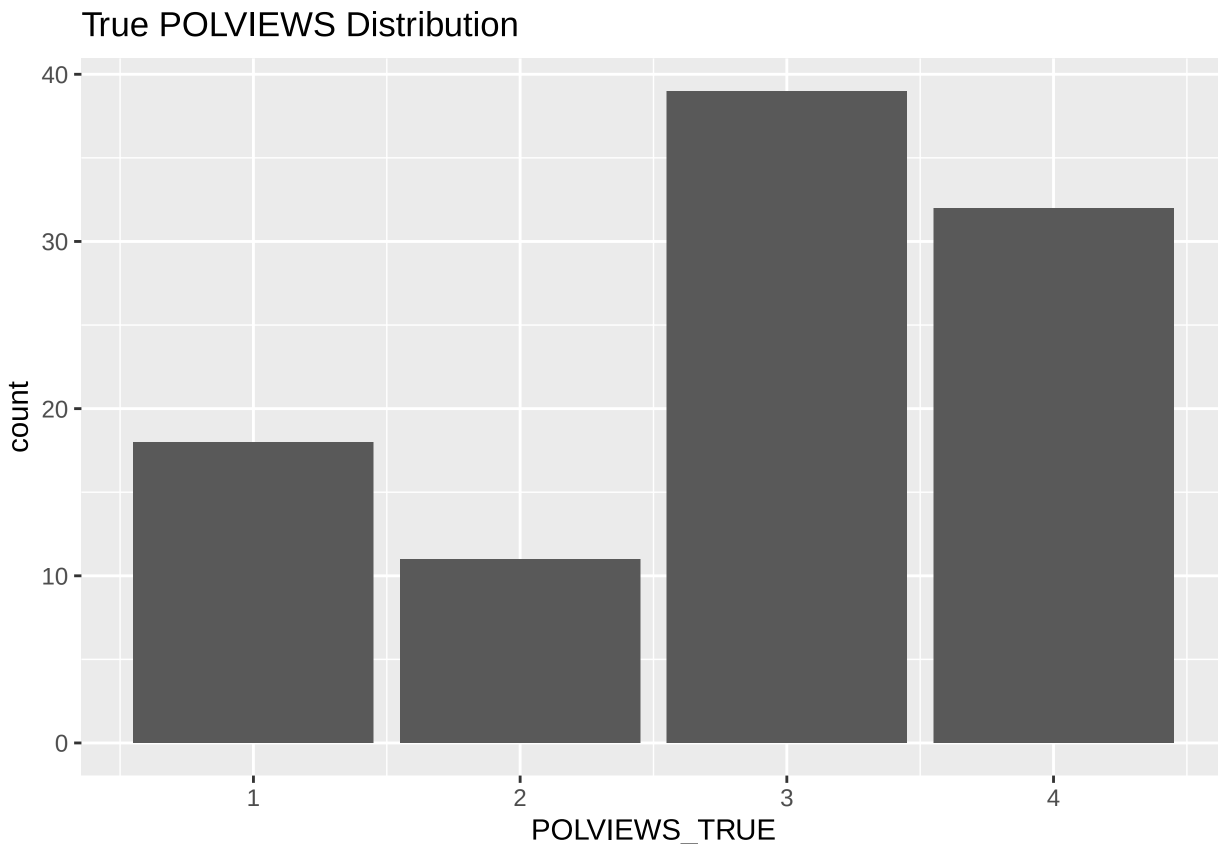
```
## # A tibble: 2 x 3
##   Model           Macro_F1 Weighted_F1
##   <chr>              <dbl>       <dbl>
## 1 Variable Model     0.765       0.726
## 2 Narrative Model    0.778       0.711
```

```r
mislabeled_comparison <- df_4 %>%
  mutate(
    # Wrong / right flags
    var_wrong  = pred_var  != POLVIEWS_TRUE,
    narr_wrong = pred_narr != POLVIEWS_TRUE,

    # Case types with only two models
    case_type = case_when(
      var_wrong  & !narr_wrong ~ "Only Variable Model Wrong",
      !var_wrong & narr_wrong  ~ "Only Narrative Model Wrong",
      var_wrong  & narr_wrong  ~ "Both Wrong",
      TRUE                     ~ "Both Correct"
    ),

    # Differences vs true (numeric scale 1-7)
    diff_var  = as.numeric(pred_var)  - as.numeric(POLVIEWS_TRUE),
    diff_narr = as.numeric(pred_narr) - as.numeric(POLVIEWS_TRUE),

    # Bias direction for each model (only label as too lib/con if it's wrong)
    bias_var = dplyr::case_when(
      !var_wrong         ~ "Correct",
      diff_var  > 0      ~ "Too Conservative",
      diff_var  < 0      ~ "Too Liberal",
      TRUE               ~ NA_character_
    ),
    bias_narr = dplyr::case_when(
      !narr_wrong        ~ "Correct",
      diff_narr  > 0     ~ "Too Conservative",
      diff_narr  < 0     ~ "Too Liberal",
      TRUE               ~ NA_character_
    )
  ) %>%
  select(
    row_id, POLVIEWS_TRUE,
    pred_var, pred_narr,
    var_wrong, narr_wrong,
    case_type,
    bias_var, bias_narr
  )

# Save to CSV
write.csv(mislabeled_comparison,
          "mislabeled_cases_comparison_4.csv",
          row.names = FALSE)

bias_table <- mislabeled_comparison %>%
  select(bias_var, bias_narr) %>%
  tidyr::pivot_longer(
    cols      = everything(),
    names_to  = "model",
    values_to = "bias"
  ) %>%
  dplyr::filter(bias != "Correct") %>%   # only mislabeled cases
```

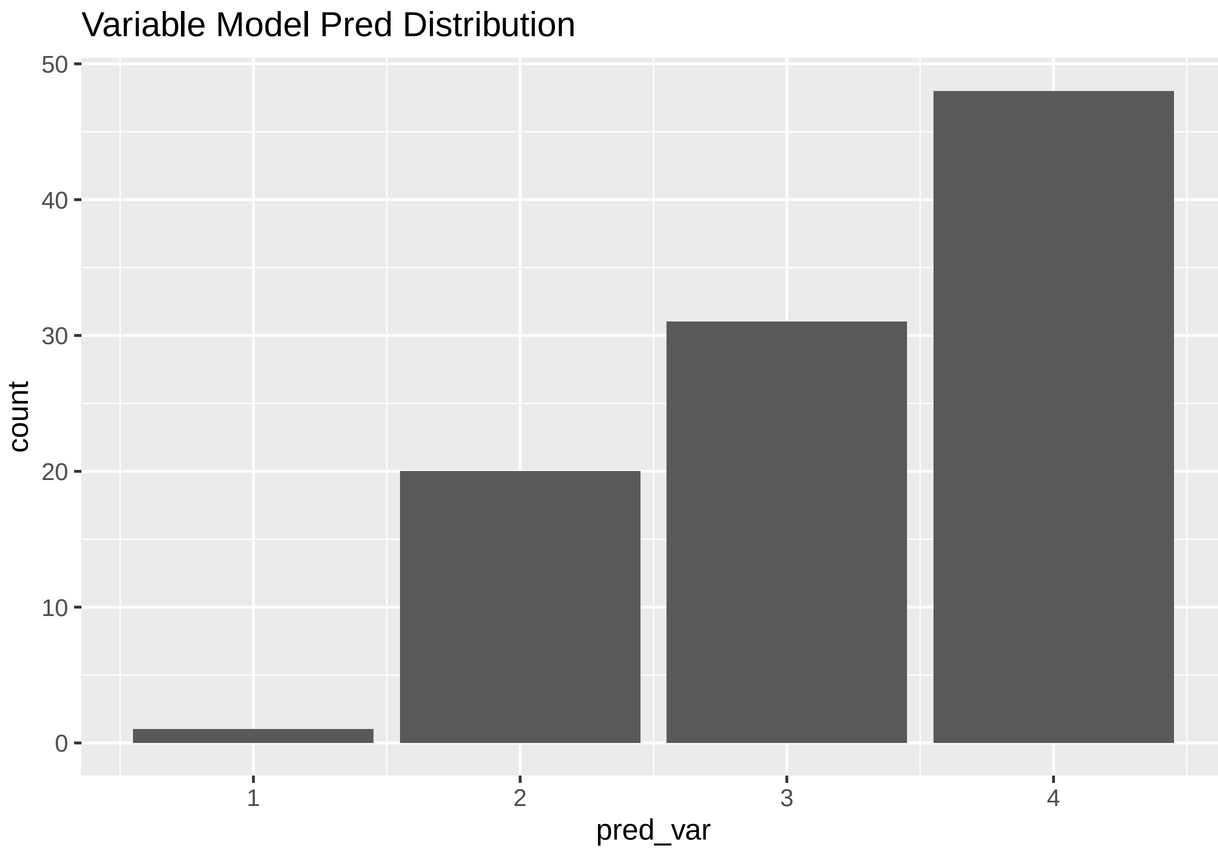
```r
  dplyr::group_by(model, bias) %>%
  dplyr::summarise(count = dplyr::n(), .groups = "drop_last") %>%
  dplyr::mutate(
    percent = count / sum(count) * 100
  ) %>%
  dplyr::ungroup() %>%
  dplyr::mutate(
    model = dplyr::recode(
      model,
      bias_var  = "Variable Model",
      bias_narr = "Narrative Model"
    )
  ) %>%
  dplyr::arrange(model, bias)
bias_table
```

```
## # A tibble: 4 x 4
##   model           bias              count percent
##   <chr>           <chr>             <int>   <dbl>
## 1 Narrative Model Too Conservative     41    73.2
## 2 Narrative Model Too Liberal          15    26.8
## 3 Variable Model  Too Conservative     44    67.7
## 4 Variable Model  Too Liberal          21    32.3
```

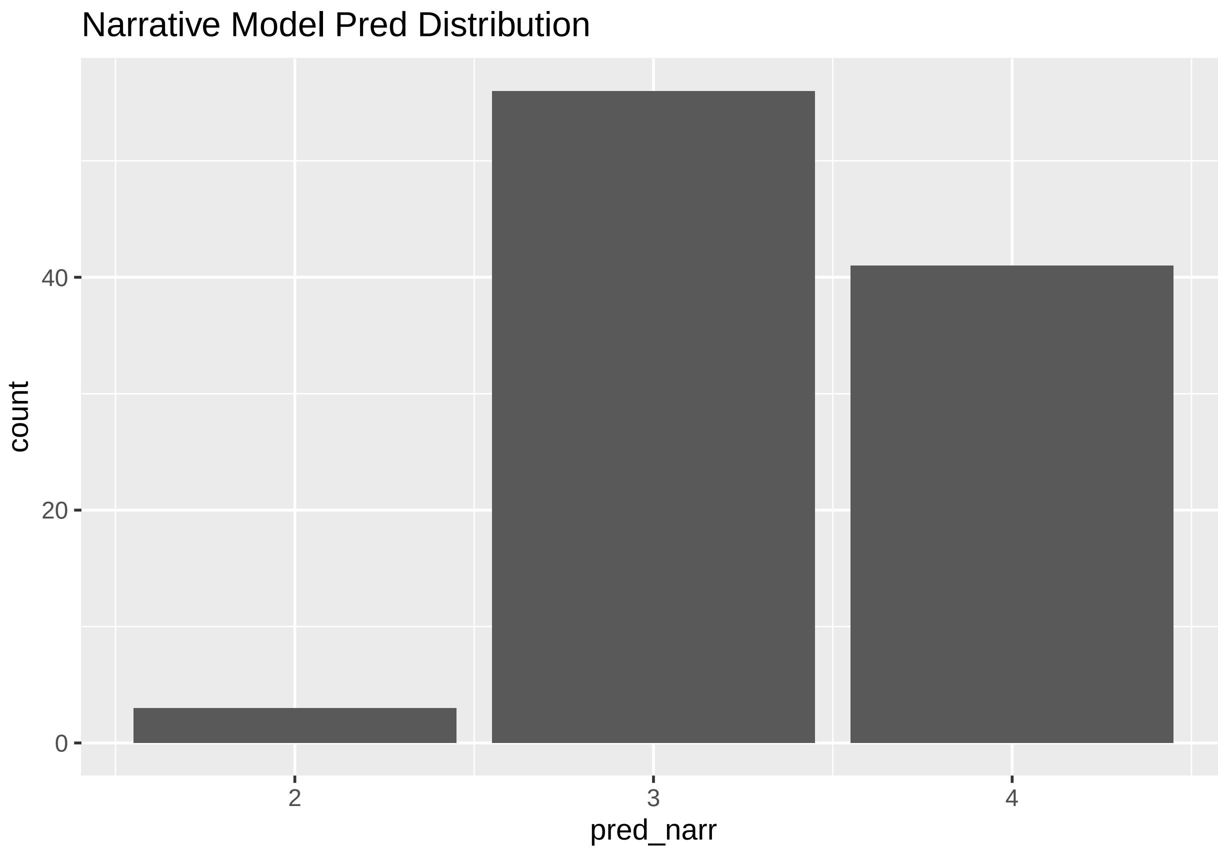
```r
#true polviews distribution

ggplot(df_4, aes(x = POLVIEWS_TRUE)) +
  geom_bar() +
  ggtitle("True POLVIEWS Distribution")
```




```r
ggplot(df_4, aes(x = pred_var)) +
  geom_bar() +
  ggtitle("Variable Model Pred Distribution")
```




```r
ggplot(df_4, aes(x = pred_narr)) +
  geom_bar() +
  ggtitle("Narrative Model Pred Distribution")
```




```r
df_4$occ10 <- as.numeric(as.character(df_4$occ10))
bias_by_predictor(df_4, age)
```

```
## # A tibble: 50 x 8
##      age     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1 73        1            3               2                 1                0
##  2 79        1            3               3                 1                0
##  3 49        2            2.5             2.5               1                0
##  4 76        1            2               1                 1                0
##  5 82        1            2               2                 1                0
##  6 83        4            2               1.25              1                0
##  7 58        4            1.5             0.75              0.75             0.25
##  8 63        5            1.4             1.4               0.8              0
##  9 39        1            1               0                 1                0
## 10 40        2            1               2                 1                0
## # i 40 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_4, sex)
```

```
## # A tibble: 2 x 8
##   sex       n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 2        47          0.468           0.574             0.447            0.191
## 2 1        53          0.358           0.491             0.434            0.226
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_4, race)
```

```
## # A tibble: 3 x 8
##   race      n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 1        77          0.506           0.468             0.442            0.156
## 2 2        13          0.385           1                 0.538            0.231
## 3 3        10         -0.3             0.4               0.3              0.6
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_4, educ)
```

```
## # A tibble: 14 x 8
##    educ                          n mean_error_var mean_error_narr prop_too_cons_var
##    <dbl+lbl>                 <int>          <dbl>           <dbl>             <dbl>
##  1 19 [7 years of colleg~        1          3               2                 1
##  2 20 [8 or more years o~        2          2.5             2                 1
##  3 13 [1 year of college]        6          1               1.33              0.667
##  4 16 [4 years of colleg~       26          0.615           0.423             0.5
##  5 15 [3 years of colleg~        2          0.5             0.5               0.5
##  6 12 [12th grade]              21          0.476           0.571             0.429
##  7 14 [2 years of colleg~       20          0.25            0.55              0.4
##  8  6 [6th grade]                1          0               0                 0
##  9  9 [9th grade]                1          0               0                 0
## 10 10 [10th grade]               2          0               0.5               0
## 11 18 [6 years of colleg~        7         -0.143           0.286             0.429
## 12 17 [5 years of colleg~        9         -0.222           0.111             0.333
## 13  0 [no formal schooli~        1         -1               0                 0
## 14 11 [11th grade]               1         -1               0                 0
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_4, marital)
```

```
## # A tibble: 4 x 8
##   marital     n mean_error_var mean_error_narr prop_too_cons_var
##   <fct>   <int>          <dbl>           <dbl>             <dbl>
## 1 2           8         1.25            0.875             0.75
## 2 3          16         0.688           0.688             0.5
## 3 1          44         0.523           0.386             0.477
## 4 5          32        -0.0938          0.562             0.281
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_4, occ10)
```

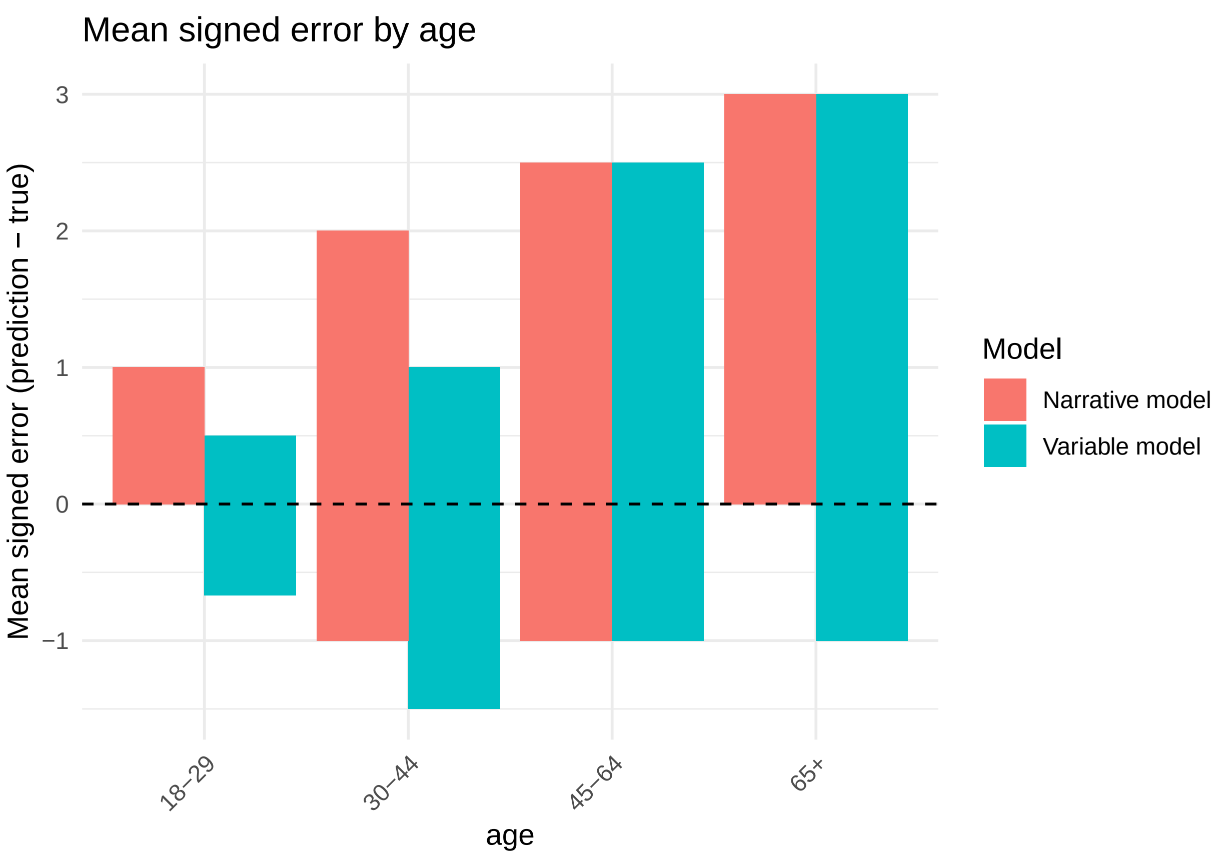
```
## # A tibble: 73 x 8
##    occ10     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1  1460     1            3               2                   1                0
##  2  2200     1            3               2                   1                0
##  3  5120     1            3               3                   1                0
##  4  5600     1            3               2                   1                0
##  5  5820     1            3               2                   1                0
##  6  9620     1            3               3                   1                0
##  7   710     2            2.5             1.5                 1                0
```

```
## 8   735     1             2              2                  1               0
## 9   3320    1             2              2                  1               0
## 10  3645    1             2              2                  1               0
## # i 63 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

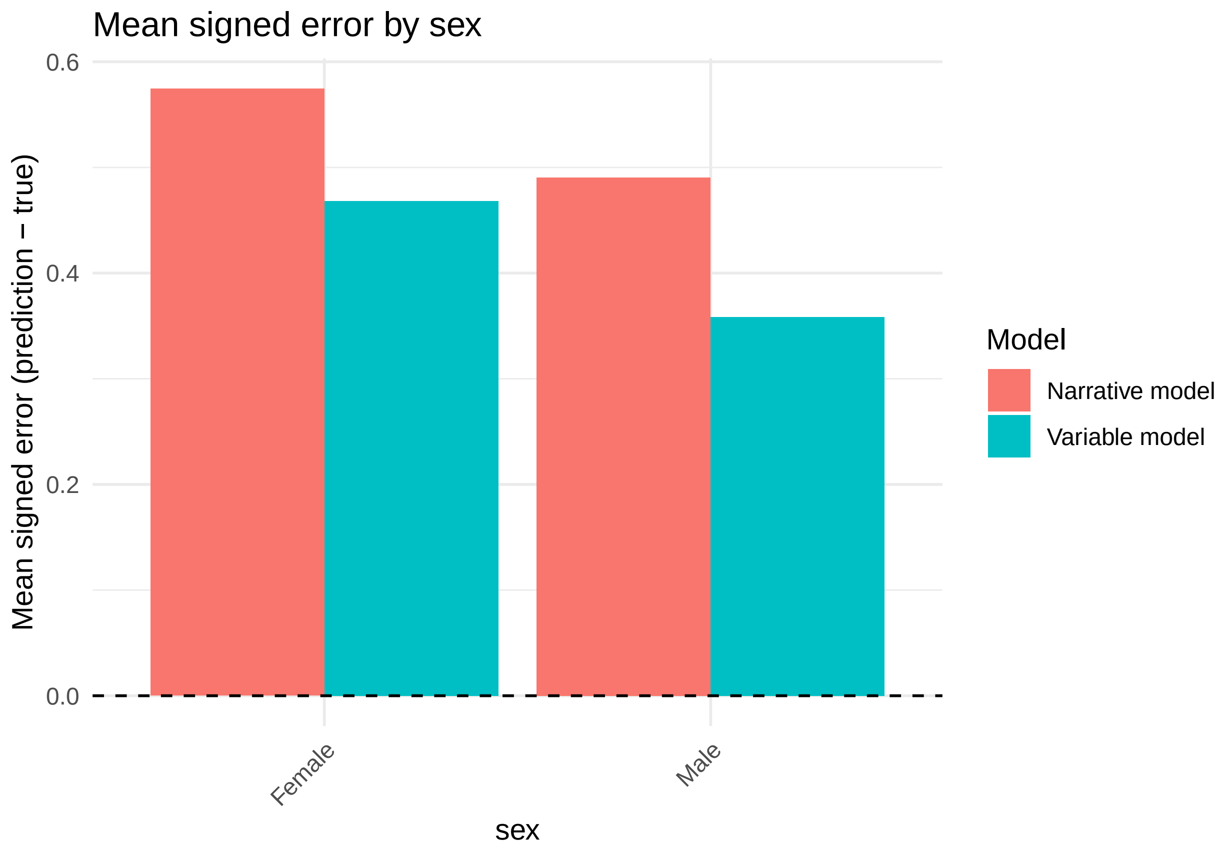
```
bias_by_predictor(df_4, region)
```

```
## # A tibble: 4 x 8
##   region     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct>  <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 1         12          0.667           0.5               0.583           0.0833
## 2 2         24          0.625           0.667             0.417           0.125
## 3 3         37          0.541           0.595             0.432           0.135
## 4 4         27         -0.0741          0.333             0.407           0.444
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```
plot_mean_error_by_predictor(df_4, age)
```

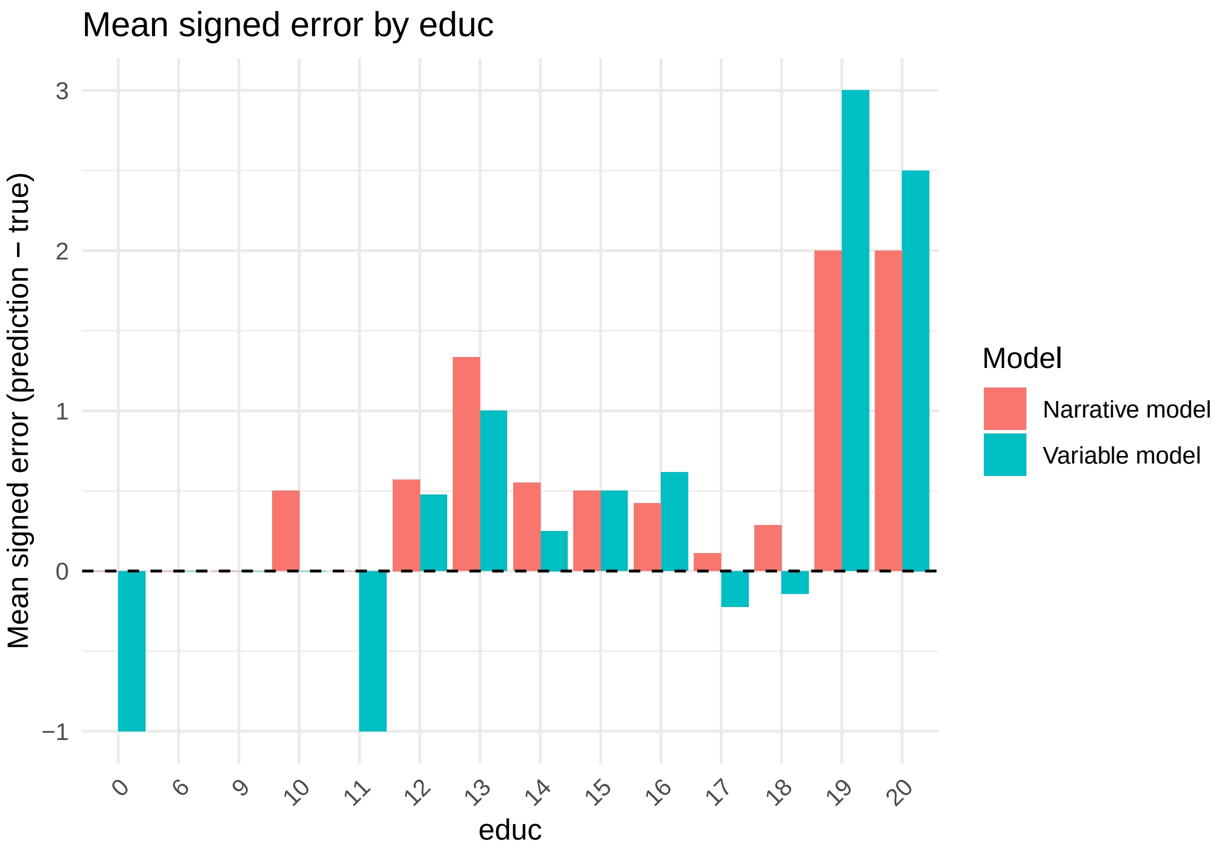



```
plot_mean_error_by_predictor(df_4, sex)
```

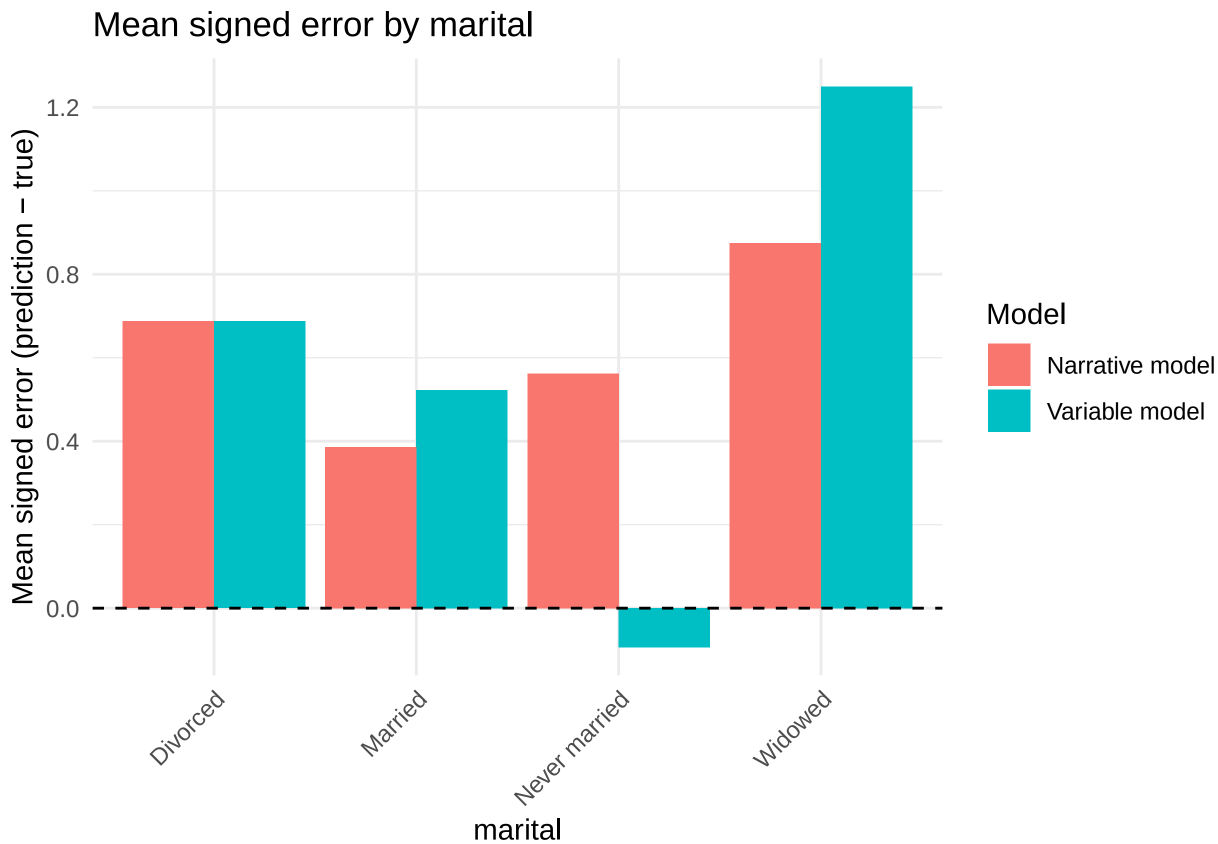



```
plot_mean_error_by_predictor(df_4, race)
```

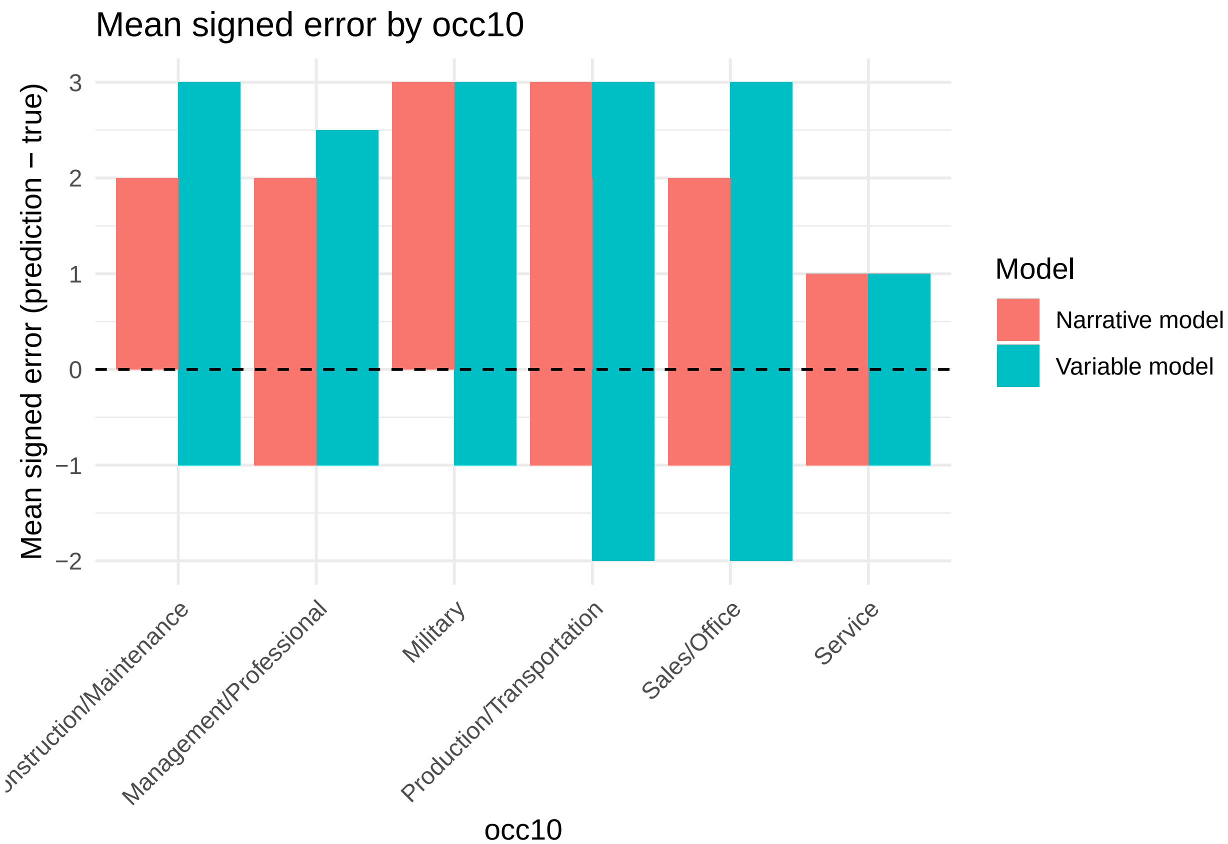

```
plot_mean_error_by_predictor(df_4, educ)
```



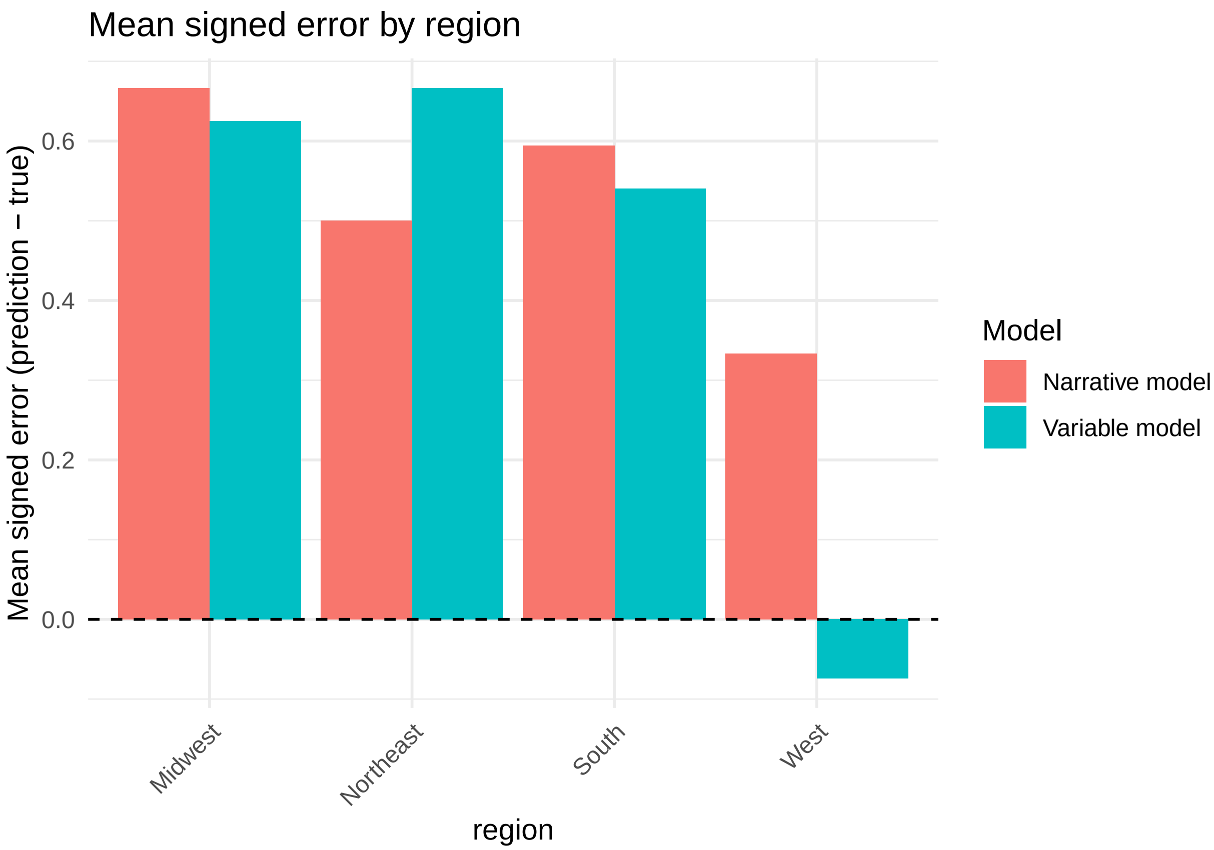

```
plot_mean_error_by_predictor(df_4, marital)
```




```
plot_mean_error_by_predictor(df_4, occ10)
```




```
plot_mean_error_by_predictor(df_4, region)
```




```
#collapse POLVIEWS into five categories
sample100_5 <- sample100 %>%
  mutate(
    polviews_5= case_when(
      polviews %in% c(1) ~ 1,    # extremely liberal
      polviews %in% c(2,3) ~ 2,    #  liberal
      polviews %in% c(4) ~ 3,     # moderate
      polviews %in% c(5,6) ~ 4,     # conservative
      polviews %in% c(7) ~ 5    # extremely conservative
    )
  ) %>%
  filter(!is.na(polviews_5))
head(sample100_5)
```

```
## # A tibble: 6 x 9
##   polviews age       educ            race  sex   occ10 region marital polviews_5
##      <int> <dbl+lbl> <dbl+lbl>       <fct> <fct> <fct> <fct>  <fct>        <dbl>
## 1        4 67        16 [4 years of~ 1     1     1740  4      5                3
## 2        5 56        14 [2 years of~ 3     2     50    4      3                4
## 3        6 33        14 [2 years of~ 1     2     7750  2      5                4
## 4        3 24        16 [4 years of~ 1     2     2550  1      5                2
## 5        3 46        14 [2 years of~ 1     2     5610  4      1                2
## 6        4 25        12 [12th grade] 1     1     6440  3      5                3
```

```
sample100_nolabel_5 <- sample100_5 %>%
  select(-polviews_5) %>% # remove the ideology variable)
  select(-polviews) # remove the numeric ideology variable
```

```r
head(sample100_nolabel_5)
```

```
## # A tibble: 6 x 7
##   age       educ                       race  sex   occ10 region marital
##   <dbl+lbl> <dbl+lbl>                  <fct> <fct> <fct> <fct>  <fct>
## 1 67        16 [4 years of college] 1     1     1740  4      5
## 2 56        14 [2 years of college] 3     2     50    4      3
## 3 33        14 [2 years of college] 1     2     7750  2      5
## 4 24        16 [4 years of college] 1     2     2550  1      5
## 5 46        14 [2 years of college] 1     2     5610  4      1
## 6 25        12 [12th grade]         1     1     6440  3      5
```

```r
write.csv(sample100_nolabel_5, "gss_sample_100_unlabeled_5.csv", row.names = FALSE)
```

```r
var_5 <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_var_predictions_5.csv")
head(var_5)
```

```
##   age educ race sex occ10 region marital pred_polview
## 1  67   16    1   1  1740      4       5            3
## 2  56   14    3   2    50      4       3            3
## 3  33   14    1   2  7750      2       5            3
## 4  24   16    1   2  2550      1       5            2
## 5  46   14    1   2  5610      4       1            3
## 6  25   12    1   1  6440      3       5            4
```

```r
# Extract variables
y_true_5 <- as.numeric(sample100_5$polviews_5)
y_pred_5 <- as.numeric(var_5$pred_polview)

# Compute metrics
MAE <- mean(abs(y_true_5 - y_pred_5))
MSE <- mean((y_true_5 - y_pred_5)^2)
Accuracy <- mean(y_true_5 == y_pred_5)
Within1 <- mean(abs(y_true_5 - y_pred_5) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.89
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 1.43
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 35 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 79 %
```

```r
narrative_5 <- read.csv("/Users/joyqu/Desktop/PLSC/gss_gpt5_narrative_predictions_5.csv")
head(narrative_5)
```

```
##   id
## 1  1
## 2  2
## 3  3
```

```
## 4  4
## 5  5
## 6  6
##
## 1                                                          He is 67, a man in the West who values i
## 2 She is 56 years old, she has settled into a steady rhythm in the West, where routines give structu
## 3                                      At 33, this woman in the Midwest balances work, personal commi
## 4                 She is 24, a woman living in the Northeast, still shaping her path in work and life. (
## 5             She is 46 years old, she has settled into a steady rhythm in the West, where routines giv
## 6                                                     He is 25, a man living in the South, still shaping
##   pred_polview_narr
## 1                 3
## 2                 3
## 3                 4
## 4                 2
## 5                 3
## 6                 4
```

```r
# Extract variables
y_true_5 <- as.numeric(sample100_5$polviews_5)
y_pred_5 <- as.numeric(narrative_5$pred_polview_narr)

# Compute metrics
MAE <- mean(abs(y_true_5 - y_pred_5))
MSE <- mean((y_true_5 - y_pred_5)^2)
Accuracy <- mean(y_true_5 == y_pred_5)
Within1 <- mean(abs(y_true_5 - y_pred_5) <= 1)

cat("Mean Absolute Error:", MAE, "\n")
```

```
## Mean Absolute Error: 0.81
```

```r
cat("Mean Squared Error:", MSE, "\n")
```

```
## Mean Squared Error: 1.23
```

```r
cat("Exact Match Accuracy:", round(Accuracy*100, 1), "%\n")
```

```
## Exact Match Accuracy: 38 %
```

```r
cat("Within ±1 Accuracy:", round(Within1*100, 1), "%\n")
```

```
## Within ±1 Accuracy: 83 %
```

```r
df_5 <- sample100_5 %>%
  mutate(row_id = row_number()) %>%
  select(
    row_id,
    POLVIEWS_TRUE = polviews_5,
    age, sex, race, educ, marital, occ10, region   # <- keep whatever predictors you want
  ) %>%
  inner_join(
    var_5 %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_var = pred_polview),
    by = "row_id"
  ) %>%
```

```r
  inner_join(
    narrative_5 %>%
      mutate(row_id = row_number()) %>%
      select(row_id, pred_narr = pred_polview_narr),
    by = "row_id"
  )
head(df_5)
```

```
## # A tibble: 6 x 11
##   row_id POLVIEWS_TRUE age    sex   race  educ      marital occ10 region pred_var
##    <int>         <dbl> <dbl+> <fct> <fct> <dbl+lb> <fct>   <fct> <fct>     <int>
## 1      1             3 67     1     1     16 [4 y~ 5       1740  4             3
## 2      2             4 56     2     3     14 [2 y~ 3       50    4             3
## 3      3             4 33     2     1     14 [2 y~ 5       7750  2             3
## 4      4             2 24     2     1     16 [4 y~ 5       2550  1             2
## 5      5             2 46     2     1     14 [2 y~ 1       5610  4             3
## 6      6             3 25     1     1     12 [12t~ 5       6440  3             4
## # i 1 more variable: pred_narr <int>
```

```r
df_5 <- df_5 %>%
  mutate(
    # Factor version for F1
    POLVIEWS_TRUE_fac = factor(POLVIEWS_TRUE),
    pred_var_fac      = factor(pred_var,  levels = levels(POLVIEWS_TRUE_fac)),
    pred_narr_fac     = factor(pred_narr, levels = levels(POLVIEWS_TRUE_fac)),

    # Numeric version for bias / error
    polviews_num = as.numeric(as.character(POLVIEWS_TRUE)),
    pred_var_num = as.numeric(as.character(pred_var)),
    pred_narr_num = as.numeric(as.character(pred_narr)),

    # Signed errors
    error_var  = pred_var_num  - polviews_num,
    error_narr = pred_narr_num - polviews_num
  )
results <- tibble(
  Model = c("Variable Model", "Narrative Model"),
  Macro_F1 = c(
    f1_macro(df_5$POLVIEWS_TRUE_fac, df_5$pred_var_fac),
    f1_macro(df_5$POLVIEWS_TRUE_fac, df_5$pred_narr_fac)
  ),
  Weighted_F1 = c(
    f1_weighted(df_5$POLVIEWS_TRUE_fac, df_5$pred_var_fac),
    f1_weighted(df_5$POLVIEWS_TRUE_fac, df_5$pred_narr_fac)
  )
)

print(results)
```

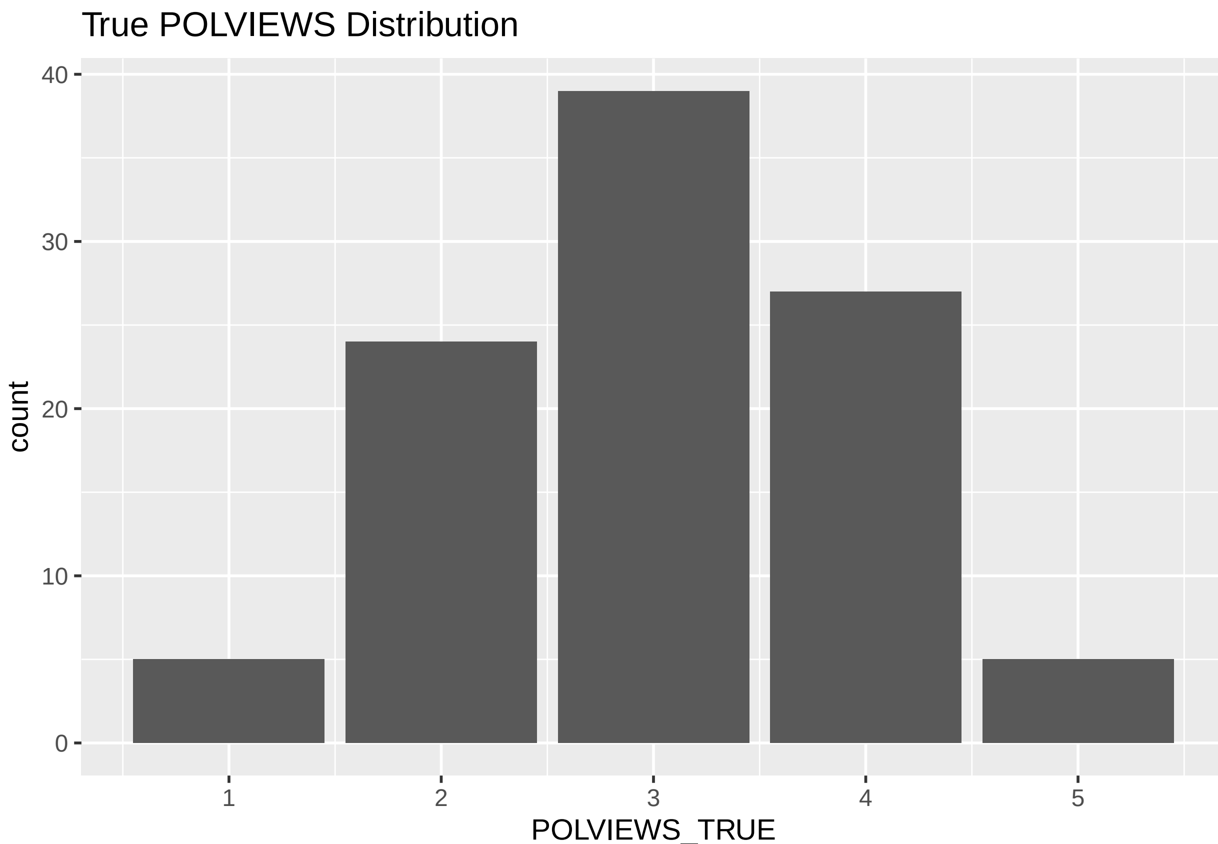
```
## # A tibble: 2 x 3
##   Model           Macro_F1 Weighted_F1
##   <chr>              <dbl>       <dbl>
## 1 Variable Model     0.805       0.712
## 2 Narrative Model    0.810       0.713
```

```r
mislabeled_comparison <- df_5 %>%
  mutate(
    # Wrong / right flags
    var_wrong  = pred_var  != POLVIEWS_TRUE,
    narr_wrong = pred_narr != POLVIEWS_TRUE,

    # Case types with only two models
    case_type = case_when(
      var_wrong  & !narr_wrong ~ "Only Variable Model Wrong",
      !var_wrong & narr_wrong  ~ "Only Narrative Model Wrong",
      var_wrong  & narr_wrong  ~ "Both Wrong",
      TRUE                     ~ "Both Correct"
    ),

    # Differences vs true (numeric scale 1-7)
    diff_var  = as.numeric(pred_var)  - as.numeric(POLVIEWS_TRUE),
    diff_narr = as.numeric(pred_narr) - as.numeric(POLVIEWS_TRUE),

    # Bias direction for each model (only label as too lib/con if it's wrong)
    bias_var = dplyr::case_when(
      !var_wrong         ~ "Correct",
      diff_var  > 0      ~ "Too Conservative",
      diff_var  < 0      ~ "Too Liberal",
      TRUE               ~ NA_character_
    ),
    bias_narr = dplyr::case_when(
      !narr_wrong        ~ "Correct",
      diff_narr  > 0     ~ "Too Conservative",
      diff_narr  < 0     ~ "Too Liberal",
      TRUE               ~ NA_character_
    )
  ) %>%
  select(
    row_id, POLVIEWS_TRUE,
    pred_var, pred_narr,
    var_wrong, narr_wrong,
    case_type,
    bias_var, bias_narr
  )

# Save to CSV
write.csv(mislabeled_comparison,
          "mislabeled_cases_comparison_5.csv",
          row.names = FALSE)

bias_table <- mislabeled_comparison %>%
  select(bias_var, bias_narr) %>%
  tidyr::pivot_longer(
    cols      = everything(),
    names_to  = "model",
    values_to = "bias"
  ) %>%
  dplyr::filter(bias != "Correct") %>%   # only mislabeled cases
```

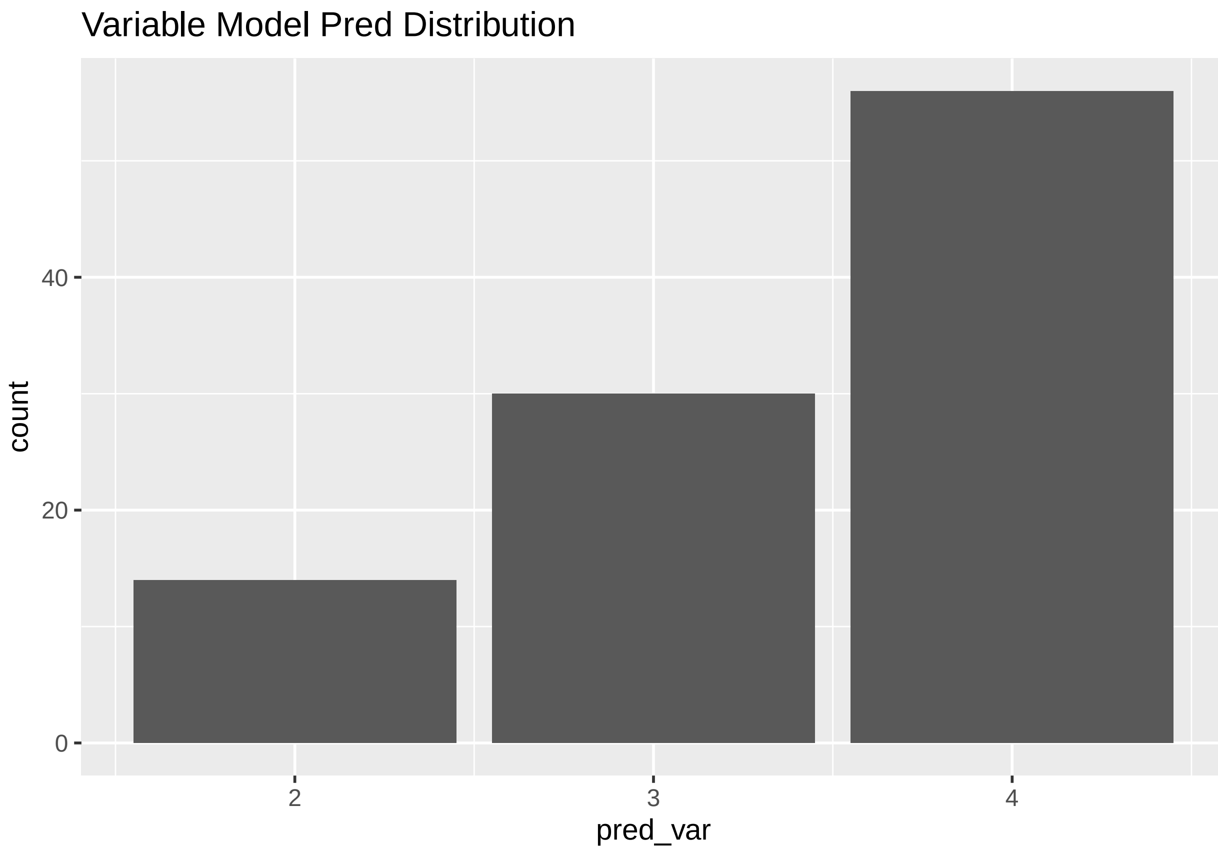
```r
  dplyr::group_by(model, bias) %>%
  dplyr::summarise(count = dplyr::n(), .groups = "drop_last") %>%
  dplyr::mutate(
    percent = count / sum(count) * 100
  ) %>%
  dplyr::ungroup() %>%
  dplyr::mutate(
    model = dplyr::recode(
      model,
      bias_var  = "Variable Model",
      bias_narr = "Narrative Model"
    )
  ) %>%
  dplyr::arrange(model, bias)
bias_table
```

```
## # A tibble: 4 x 4
##   model           bias             count percent
##   <chr>           <chr>            <int>   <dbl>
## 1 Narrative Model Too Conservative    45    72.6
## 2 Narrative Model Too Liberal         17    27.4
## 3 Variable Model  Too Conservative    47    72.3
## 4 Variable Model  Too Liberal         18    27.7
```

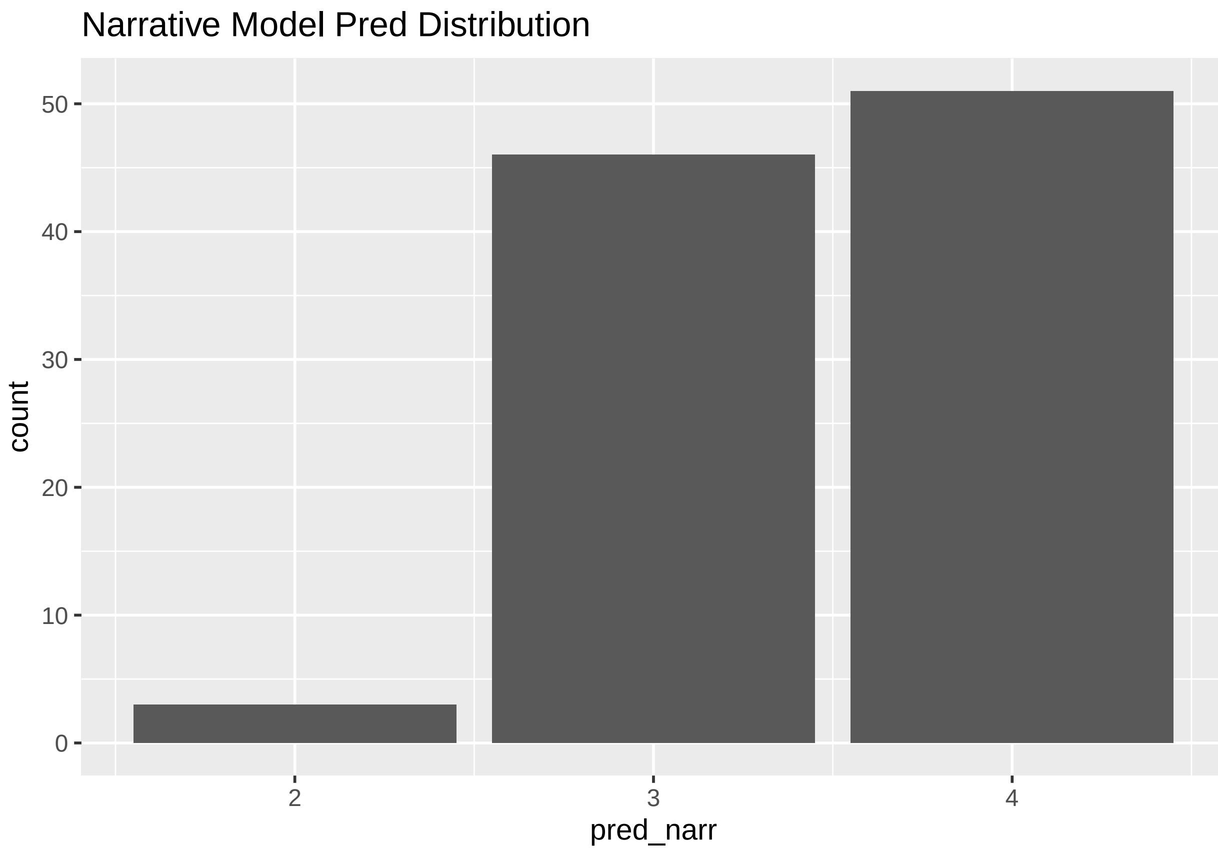
```r
#true polviews distribution

ggplot(df_5, aes(x = POLVIEWS_TRUE)) +
  geom_bar() +
  ggtitle("True POLVIEWS Distribution")
```




```r
ggplot(df_5, aes(x = pred_var)) +
  geom_bar() +
  ggtitle("Variable Model Pred Distribution")
```




```
ggplot(df_5, aes(x = pred_narr)) +
  geom_bar() +
  ggtitle("Narrative Model Pred Distribution")
```




```
df_5$occ10 <- as.numeric(as.character(df_5$occ10))
bias_by_predictor(df_5, age)
```

```
## # A tibble: 50 x 8
##      age       n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1 73        1           2               2                 1                 0
##  2 76        1           2               2                 1                 0
##  3 79        1           2               2                 1                 0
##  4 82        1           2               2                 1                 0
##  5 83        4           1.75            1                 1                 0
##  6 29        2           1.5             1                 1                 0
##  7 49        2           1.5             1.5               1                 0
##  8 63        5           1.2             1.4               0.8               0
##  9 25        2           1               0.5               1                 0
## 10 31        1           1               1                 1                 0
## # i 40 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```
bias_by_predictor(df_5, sex)
```

```
## # A tibble: 2 x 8
##   sex       n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 2        47          0.426           0.426             0.468            0.170
## 2 1        53          0.358           0.472             0.472            0.189
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_5, race)
```

```
## # A tibble: 3 x 8
##   race      n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct> <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 1        77          0.506           0.403             0.519            0.143
## 2 2        13          0.308           0.846             0.385            0.154
## 3 3        10         -0.4             0.3               0.2              0.5
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_5, educ)
```

```
## # A tibble: 14 x 8
##    educ                          n mean_error_var mean_error_narr prop_too_cons_var
##    <dbl+lbl>                 <int>          <dbl>           <dbl>             <dbl>
##  1 20 [8 or more years o~     2          2.5             2                 1
##  2 19 [7 years of colleg~     1          2               1                 1
##  3  6 [6th grade]             1          1               0                 1
##  4 15 [3 years of colleg~     2          1               0.5               1
##  5 13 [1 year of college]     6          0.667           1                 0.667
##  6 12 [12th grade]           21          0.524           0.619             0.524
##  7 16 [4 years of colleg~    26          0.462           0.269             0.462
##  8 14 [2 years of colleg~    20          0.35            0.55              0.5
##  9  9 [9th grade]             1          0               0                 0
## 10 10 [10th grade]            2          0               0.5               0
## 11 11 [11th grade]            1          0               0                 0
## 12 18 [6 years of colleg~     7          0               0.143             0.286
## 13 17 [5 years of colleg~     9         -0.333           0.111             0.222
## 14  0 [no formal schooli~     1         -2              -1                 0
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_5, marital)
```

```
## # A tibble: 4 x 8
##   marital     n mean_error_var mean_error_narr prop_too_cons_var
##   <fct>   <int>          <dbl>           <dbl>             <dbl>
## 1 2           8         1               0.875             0.75
## 2 3          16         0.625           0.625             0.625
## 3 1          44         0.432           0.295             0.5
## 4 5          32         0.0625          0.469             0.281
## # i 3 more variables: prop_too_lib_var <dbl>, prop_too_cons_narr <dbl>,
## #   prop_too_lib_narr <dbl>
```

```r
bias_by_predictor(df_5, occ10)
```

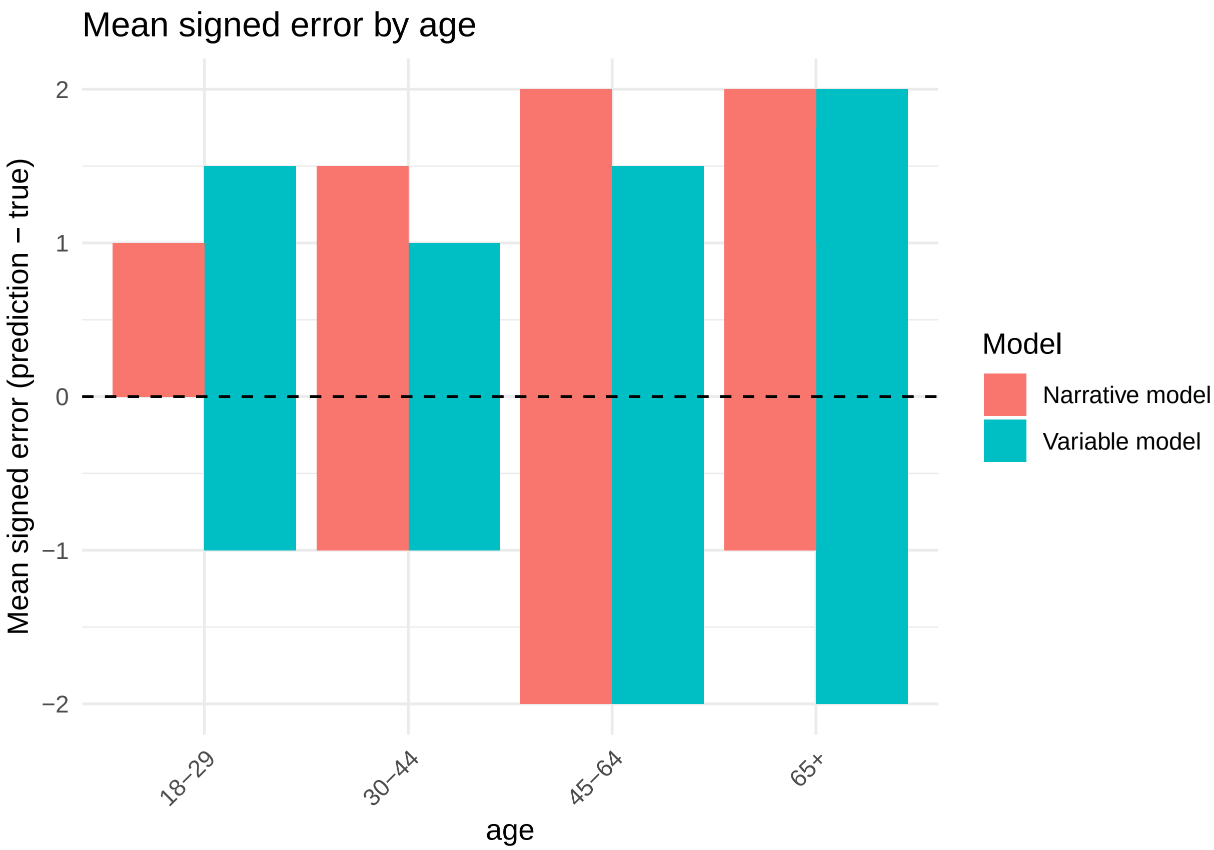
```
## # A tibble: 73 x 8
##    occ10     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##    <dbl> <int>          <dbl>           <dbl>             <dbl>            <dbl>
##  1  2200     1              3             2                   1                0
##  2  9620     1              3             3                   1                0
##  3   710     2              2             1.5                 1                0
##  4   735     1              2             1                   1                0
##  5  1460     1              2             1                   1                0
##  6  5120     1              2             2                   1                0
##  7  5600     1              2             2                   1                0
```

```
##   8   5820      1              2             2                  1                0
##   9   8750      1              2             2                  1                0
## 10   9350      1              2             2                  1                0
## # i 63 more rows
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

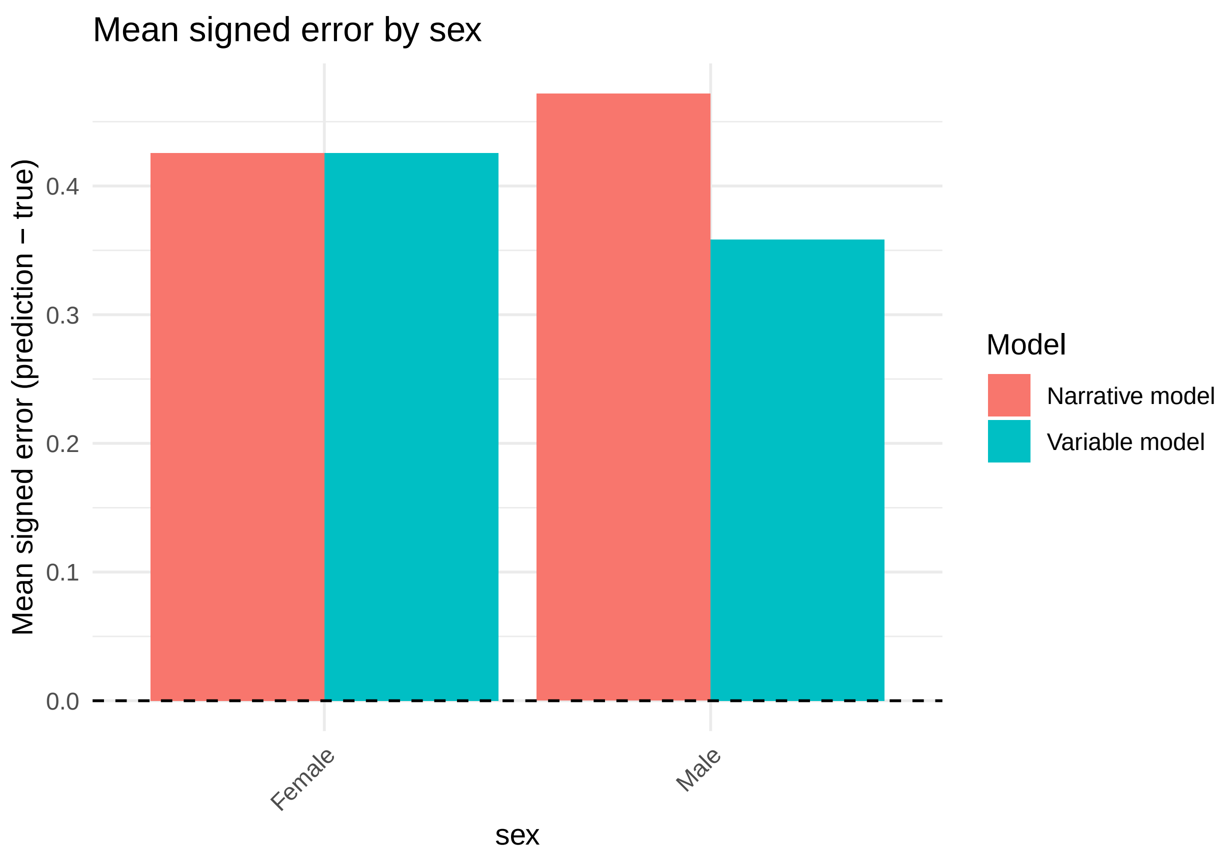
```
bias_by_predictor(df_5, region)
```

```
## # A tibble: 4 x 8
##   region     n mean_error_var mean_error_narr prop_too_cons_var prop_too_lib_var
##   <fct>  <int>          <dbl>           <dbl>             <dbl>            <dbl>
## 1 2         24          0.625           0.5               0.5             0.125
## 2 3         37          0.595           0.595             0.486           0.135
## 3 1         12          0.5             0.25              0.583           0.0833
## 4 4         27         -0.148           0.296             0.370           0.333
## # i 2 more variables: prop_too_cons_narr <dbl>, prop_too_lib_narr <dbl>
```

```
plot_mean_error_by_predictor(df_5, age)
```

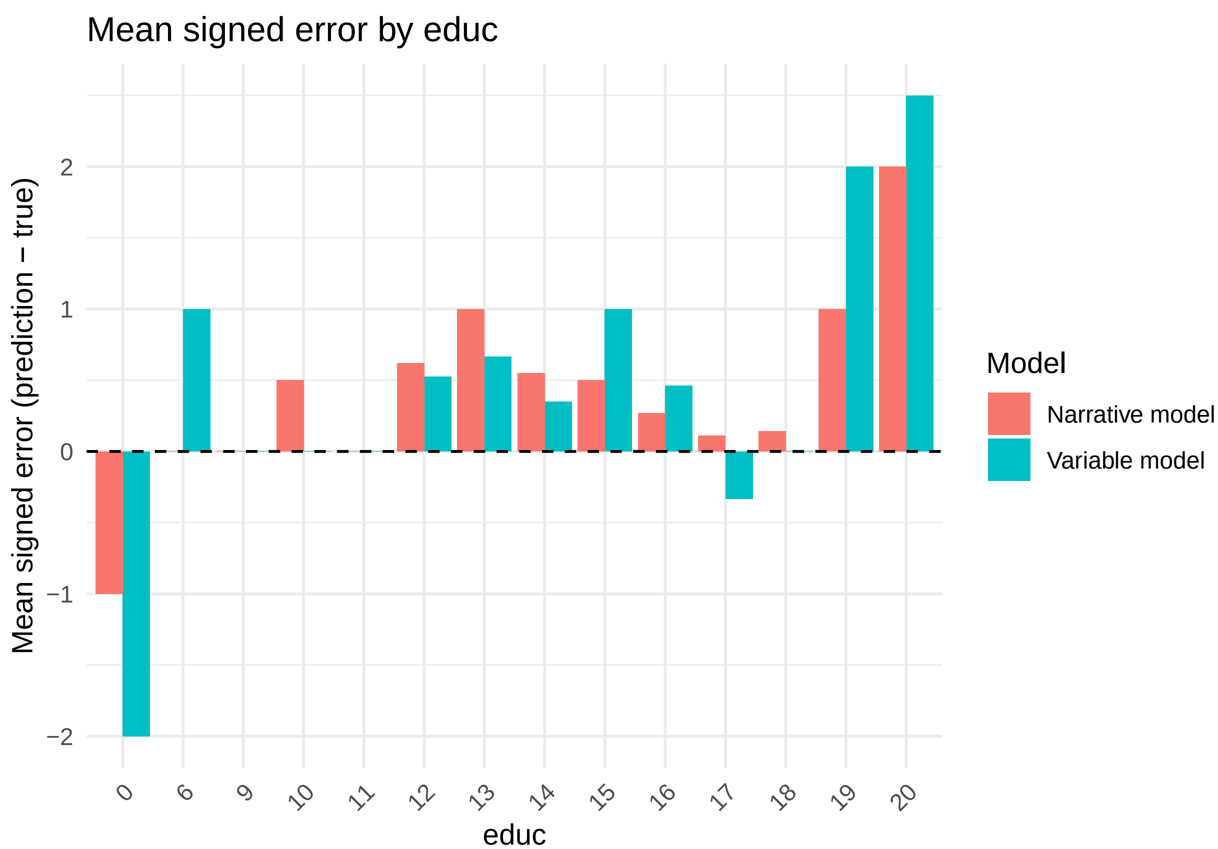



```
plot_mean_error_by_predictor(df_5, sex)
```

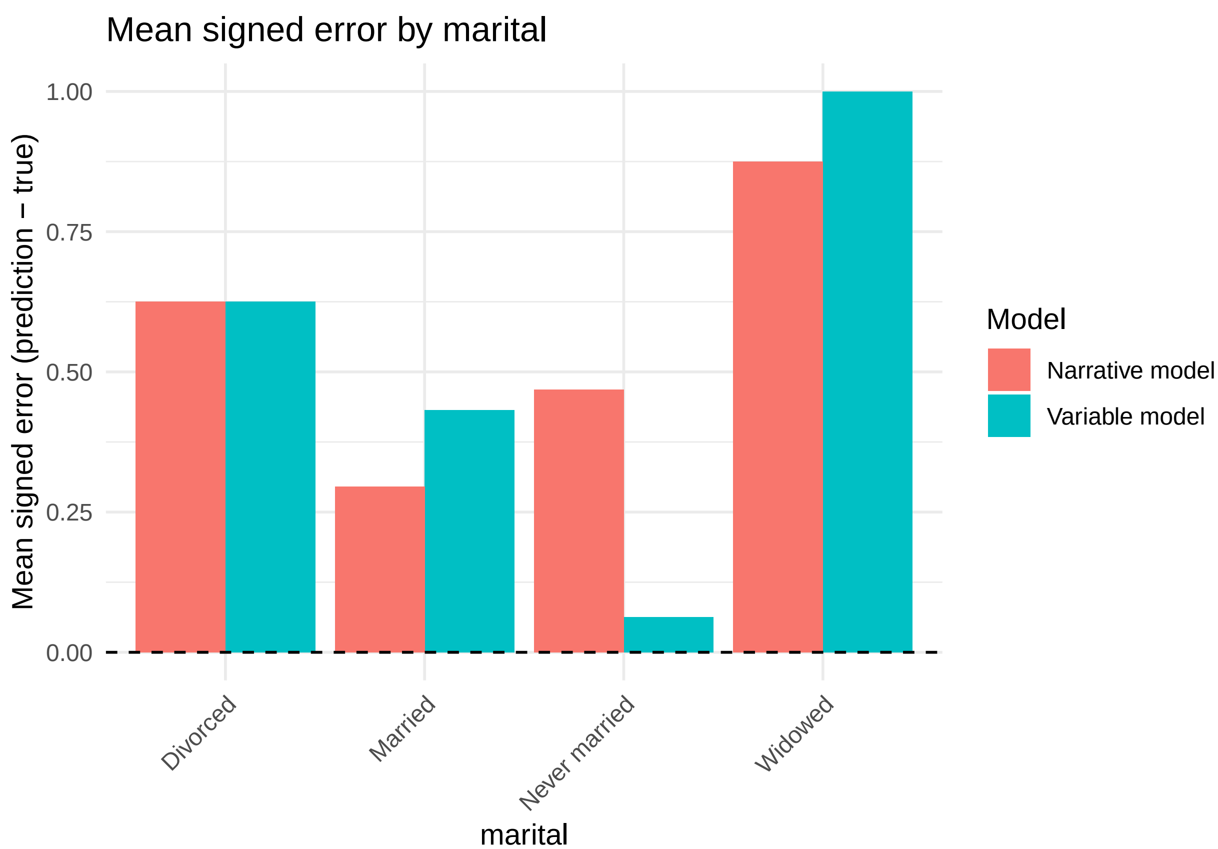



```r
plot_mean_error_by_predictor(df_5, race)
```

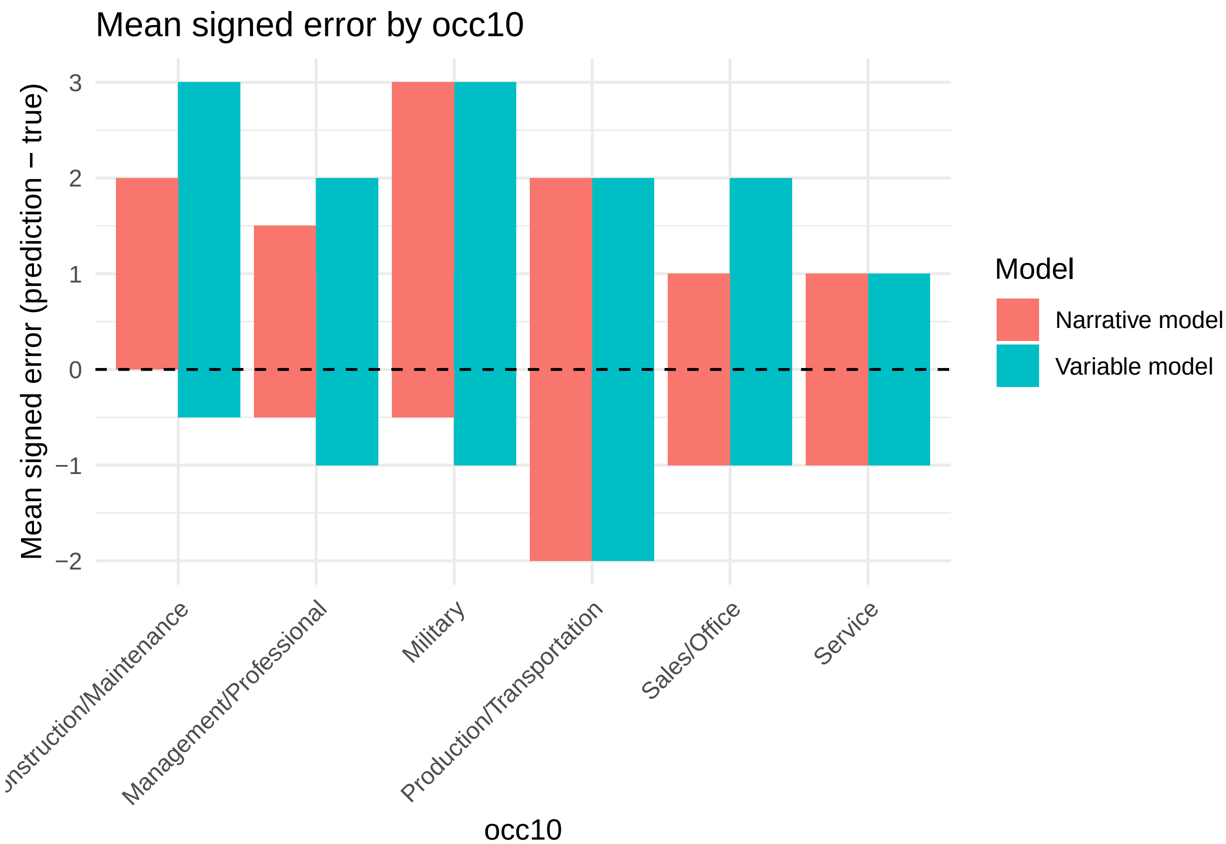

```
plot_mean_error_by_predictor(df_5, educ)
```




```
plot_mean_error_by_predictor(df_5, marital)
```




```
plot_mean_error_by_predictor(df_5, occ10)
```




```
plot_mean_error_by_predictor(df_5, region)
```

Mean signed error by region
Mean signed error (prediction − true)
0.6
0.4
0.2
0.0
Midwest
Northeast
South
West
region
Model
Narrative model
Variable model