Gerrymandering Metrics

```
library(tidyverse)
```

```
── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0
──
✔ dplyr     1.1.4     ✔ readr     2.1.5
✔ forcats   1.0.1     ✔ stringr   1.5.2
✔ ggplot2   4.0.0     ✔ tibble    3.3.0
✔ lubridate 1.9.4     ✔ tidyr     1.3.1
✔ purrr     1.1.0
── Conflicts ────────────────────────────────────────── tidyverse_conflicts()
──
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()    masks stats::lag()
ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all
conflicts to become errors
```

```
clean <- read_csv("data/g24_sov_by_g24_svprec_clean.csv")
```

```
Rows: 51123 Columns: 76
── Column specification
────────────────────────────────────────────────────────
Delimiter: ","
chr (49): FIPS, SVPREC, SVPREC_KEY, ELECTION, GEO_TYPE, ASSAIP01,
ASSDEM01, ...
dbl (27): COUNTY, ADDIST, CDDIST, SDDIST, BEDIST, TOTREG, DEMREG, REPREG,
AI...

ℹ Use `spec()` to retrieve the full column specification for this data.
ℹ Specify the column types or set `show_col_types = FALSE` to quiet this
message.
```

2024 Election Results and the 2024 District Map

```
district_votes_2024 <- clean |>
  mutate(
    dem1 = replace_na(as.numeric(CNGDEM01), 0),
    dem2 = replace_na(as.numeric(CNGDEM02), 0),
    rep1 = replace_na(as.numeric(CNGREP01), 0),
    rep2 = replace_na(as.numeric(CNGREP02), 0),
```

```
    dem_votes = dem1 + dem2,
    rep_votes = rep1 + rep2
  ) |>
  group_by(CDDIST) |>
  summarise(
    total_dem = sum(dem_votes),
    total_rep = sum(rep_votes),
    total_two_party = total_dem + total_rep,
    dem_share = total_dem / total_two_party,
    .groups = "drop"
  )
```

```
Warning: There were 4 warnings in `mutate()`.
The first warning was:
ℹ In argument: `dem1 = replace_na(as.numeric(CNGDEM01), 0)`.
Caused by warning in `replace_na()`:
! NAs introduced by coercion
ℹ Run `dplyr::last_dplyr_warnings()` to see the 3 remaining warnings.
```

```
district_votes_2024
```

```
# A tibble: 53 × 5
   CDDIST total_dem total_rep total_two_party dem_share
    <dbl>     <dbl>     <dbl>           <dbl>     <dbl>
 1      0  54707782  35374877        90082659     0.607
 2      1    110472    208150          318622     0.347
 3      2    272384    106407          378791     0.719
 4      3    187960    233895          421855     0.446
 5      4    227321    114644          341965     0.665
 6      5    134467    214223          348690     0.386
 7      6    165386    121625          287011     0.576
 8      7    197361     98273          295634     0.668
 9      8    201756     70932          272688     0.740
10      9    130093    121006          251099     0.518
# ℹ 43 more rows
```

```
mean_dem <- mean(district_votes_2024$dem_share)
median_dem <- median(district_votes_2024$dem_share)
mean_median_score_2024 <- mean_dem - median_dem
mean_median_score_2024
```

```
[1] -0.01162013
```

```r
wasted_votes <- function(vA, vB) {
  total <- vA + vB
  threshold <- floor(total / 2) + 1

  if (vA > vB) {
    wasted_A <- vA - threshold
    wasted_B <- vB
  } else {
    wasted_A <- vA
    wasted_B <- vB - threshold
  }

  c(A = wasted_A, B = wasted_B)
}

waste_df <- district_votes_2024 |>
  rowwise() |>
  mutate(
    waste = list(wasted_votes(total_dem, total_rep)),
    wasted_dem = waste["A"],
    wasted_rep = waste["B"]
  ) |>
  ungroup()

total_wasted_dem <- sum(waste_df$wasted_dem)
total_wasted_rep <- sum(waste_df$wasted_rep)
efficiency_gap_2024 <- (total_wasted_dem - total_wasted_rep) /
                       sum(district_votes_2024$total_two_party)

efficiency_gap_2024
```

```
[1] -0.2576805
```

2024 Election Results and the proposed 2025 District Map

```r
library(tidyverse)
library(readr)

ab604_votes <- read_csv("data/district_votes_2024_under_ab604.csv")
```

```
Rows: 52 Columns: 5
── Column specification
────────────────────────────────────────────────────────
Delimiter: ","
chr (1): DISTRICT
dbl (4): dem_votes, rep_votes, total_two_party, dem_share
```

```
ℹ Use `spec()` to retrieve the full column specification for this data.
ℹ Specify the column types or set `show_col_types = FALSE` to quiet this
message.
```

```
ab604_votes
```

```
# A tibble: 52 × 5
   DISTRICT dem_votes rep_votes total_two_party dem_share
   <chr>        <dbl>     <dbl>           <dbl>     <dbl>
 1 01         252630.   230082.         482713.     0.523
 2 02         327415.   303132.         630547.     0.519
 3 03         206640.   195614.         402254.     0.514
 4 04         214196.   163606.         377802.     0.567
 5 05         235364.   330737.         566100.     0.416
 6 06         177363.   154598.         331961.     0.534
 7 07         194160.   152272.         346432.     0.560
 8 08         230286.   119332.         349618.     0.659
 9 09         169808.   119462.         289270.     0.587
10 10         252544.   131217.         383761.     0.658
# ℹ 42 more rows
```

```
mean_dem_ab604 <- mean(ab604_votes$dem_share)
median_dem_ab604 <- median(ab604_votes$dem_share)

mean_median_score_ab604 <- mean_dem_ab604 - median_dem_ab604
mean_median_score_ab604
```

```
[1] 0.02440191
```

```
wasted_votes <- function(vA, vB) {
  total <- vA + vB
  threshold <- floor(total / 2) + 1

  if (vA > vB) {
    wasted_A <- vA - threshold
    wasted_B <- vB
  } else {
    wasted_A <- vA
    wasted_B <- vB - threshold
  }

  c(A = wasted_A, B = wasted_B)
}
```

```
waste_ab604 <- ab604_votes |>
  rowwise() |>
  mutate(
    waste = list(wasted_votes(dem_votes, rep_votes)),
    wasted_dem = waste["A"],
    wasted_rep = waste["B"]
  ) |>
  ungroup()

total_wasted_dem_ab604 <- sum(waste_ab604$wasted_dem)
total_wasted_rep_ab604 <- sum(waste_ab604$wasted_rep)

efficiency_gap_ab604 <- (total_wasted_dem_ab604 -
                          total_wasted_rep_ab604) /
                         sum(ab604_votes$total_two_party)

efficiency_gap_ab604
```

```
[1] -0.1878595
```