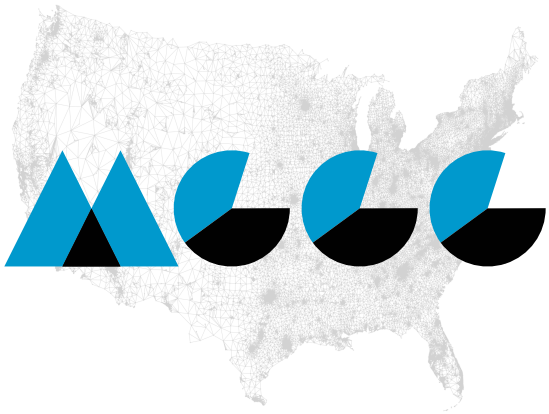
# Analysis of Election Systems for the Wenatchee School District



MGGG Redistricting Lab

## Contents



## Contributors

Amy Becker, Dara Gold, Brad Souders and Thomas Weighill contributed to the data collection and preparation, data analysis, and writing of this report.

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# 1 Introduction

The Wenatchee School District (hereafter, the School District) had 42,698 residents as of the 2010 Census. Table 1 shows the demographic breakdown of the school district by total population, Voting Age Population (VAP), Citizen Voting Age Population (CVAP), and Students enrolled in Wenatchee School District. Wenatchee has one sizable minority group: Latino residents constitute 18.1% of CVAP, 21.8% of VAP and 27.4% of total population. We use the term POC (people of color) to refer to residents who are Hispanic or have selected a non-White race in the Census (or both). In total the POC share of CVAP is 22.7%. The distribution of POC residents across the district is show in Figure 1.

The Wenatchee School Board is a 5-member board elected at large. Board members serve 4-year terms. Candidates running for the board run for specific open seats, but do not represent specific *zones* or subregions of the school district. This means the POC-preferred candidates can be "fenced out": if voting is racially polarized then White-preferred candidates can win all 5 positions. Figure 2 shows the current Wenatchee school board with one member of color, Maria Iñiguez, who was appointed to the board in 2020. In fact in the past decade, three POC board members have been *appointed*, but no POC candidates have won contested elections[1]. Although POC voters currently have representation on the board, at-large plurality systems are notoriously bad for reliable, sustained minority representation.

We emphasize that these school board members who are themselves people of color may not necessarily have been the candidates preferred by POC voters. POC candidates of choice can come from any racial or ethnic group. In the absence of accurate voter preference data, we use the School Board's racial makeup as an imperfect proxy for representation. Furthermore, we know that no community votes as a monolith, and we take care to consider a range of candidate support and voting polarization levels in this report.

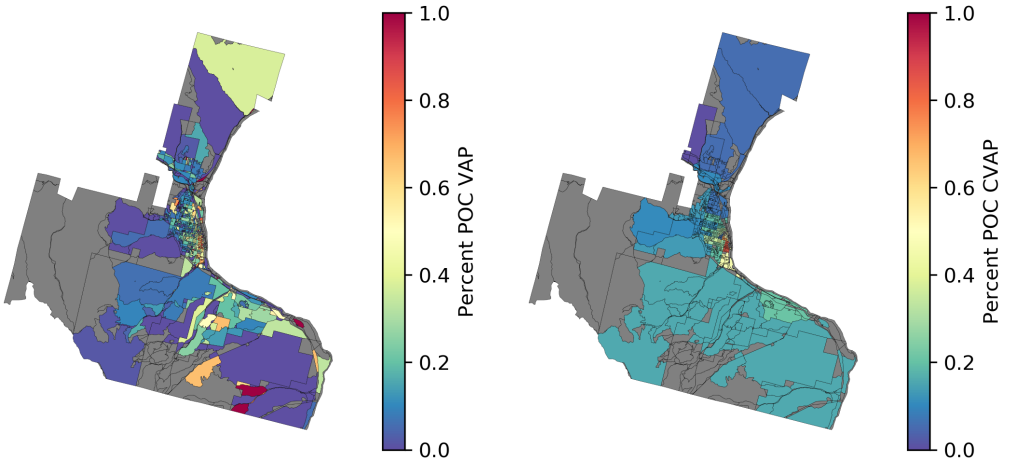
One way to provide more minority opportunity on the school board would be to use a traditional districted system, or one in which board members represent one zone and voting is restricted to zone residents. Alternatively, a switch to school-district-wide Ranked Choice Voting (RCV), in which multiple candidates are ranked on each ballot, can promote more proportional representation for minority voters given adequate turnout and candidate availability.

In this report we consider two alternative options: (1) traditional districted elections and (2) ranked choice voting.

[1] Longstanding board member Jesús Hernández ran unopposed in 2011 and 2015 before resigning in 2016.

| Race | Share of Population | Share of VAP | Share of Total CVAP | Share of Students |
|---|---|---|---|---|
| White | 68.6% | 74.6% | 77.3% | 44.8% |
| Latino | 27.4% | 21.8% | 18.1% | 51.2% |
| Other | 4.0% | 3.6% | 4.6% | 4.0% |
| **Total People** | **42,698** | **31,620** | **31,282** | **7,815** |

**Table 1.** Total population, Voting Age Population (VAP) and Citizen Voting Age Population (CVAP) by race in the Wenatchee school district. Total population and VAP data is from the 2010 Census, and CVAP data is from the 2018 ACS 5-year rolling average. Student demographics are from the US News and World Report school district profiles: https://www.usnews.com/education/k12/washington/districts/wenatchee-school-district-112103




POC-VAP POC-CVAP

**Figure 1.** POC-VAP and POC-CVAP by block in the Wenatchee School District. Note that CVAP by race is disaggregated to blocks from the block group level (the smallest unit for which this data is available). This process requires assumptions to be made about how the CVAP is distributed across the block group that likely differ from the true, unknown, geographic distribution of CVAP.

**Figure 2.** Wenatchee School Board as of of October 2020: Dr. Michele Sandberg, Laura Jaecks, Julie Norton, Maria Iñiguez, and Martin Barron

# 2 Districted Analysis

First, we consider traditional districted elections for the School Board. While a cohesive minority group may be too small to elect a candidate of choice in a school-district-wide, at-large election, they may be geographically distributed in such a way as to make up a large share of a local zone, allowing them to elect their candidate of choice.

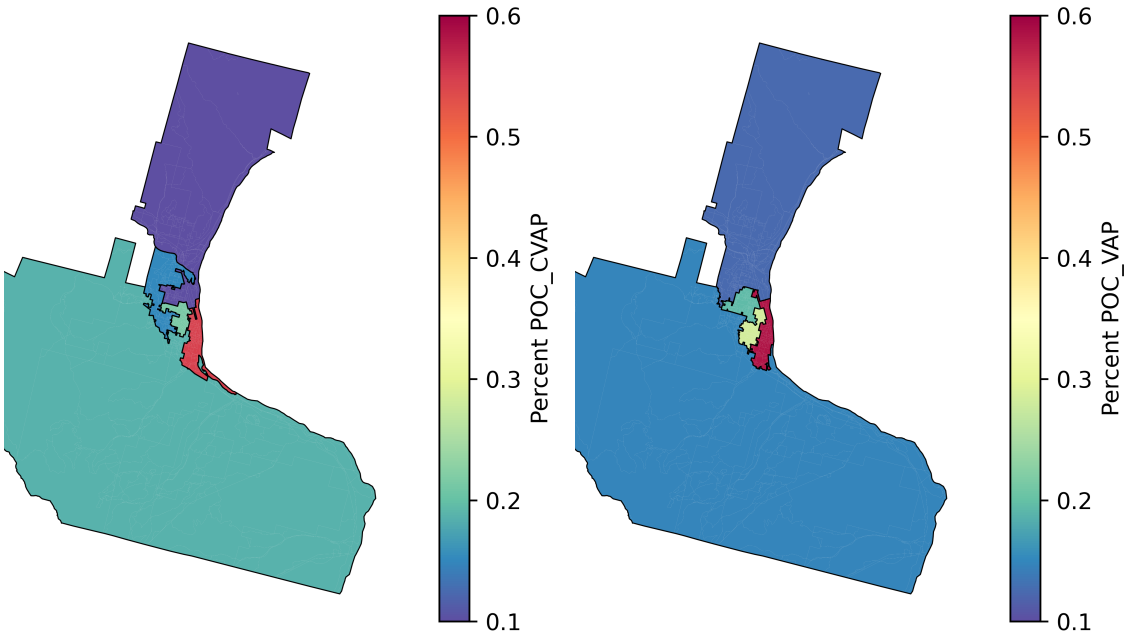
In this section we evaluate 5-member boards (i.e. the current board size) elected instead by a districted system. We generated a large collection of districting plans with the goal of identifying maps with high-percentage-minority zones. To do this, we ran 100,000 steps of a ReCom[2] Markov chain, which takes into account only contiguity, compactness, and population deviation. We allowed zones to deviate by no more than 5% from the ideal population, in accordance with legal standards for local zones.

Proposed plans that satisfied these basic constraints were probabilistically accepted for inclusion in our *ensemble*, or collection of alternative plans, with a probability depending on their largest minority zone (the zone with the highest POC share of total CVAP): If a newly proposed plan's highest-proportion minority zone had a higher POC share than that of its predecessor plan's, it had a very *high* probability of being included, but if its highest-proportion POC zone had a lower POC-share, it had a very *low* probability of being included. This probabilistic inclusion created a *guided* chain run that targeted plans with concentrated POC zones. These heuristic optimization techniques are quite successful in identifying strong plans, but are not guaranteed to identify the *best possible* plans (finding such a *global optimum* is often computationally intractable).

Figure 3 shows the best plans found by these techniques. The highest percentage POC-CVAP zone found was 54.6%. (When instead targeting plans with high POC-VAP, we were able to find plans with zone POC-VAP as high as 58.3%). With reasonable POC turnout and voter cohesion such a zone would likely perform for POC voters even without high levels of White *crossover voting* (i.e. White voters' support for POC-preferred candidates). This would likely be a more sustainable way of securing POC-representation on the School Board than the current at-large system.

However, even if the lines are carefully drawn to capture population patterns at one moment in time, movement of population over the course of a decennial Census cycle makes the performance less secure in the future.

[2] https://mggg.org/uploads/ReCom.pdf




Plan with 54.6% POC-CVAP Zone

Plan with 58.3% POC-VAP Zone

**Figure 3.** Results of techniques targeting identification of zones with high POC-CVAP and POC-VAP. These techniques identified plans with zone POC-CVAP as high as 54.6% and plans with zone POC-VAP as high as 58.3%.

# 3 Ranked Choice Voting (RCV) Analysis

As an alternative to a districted system, we consider the prospects for ranked choice voting (RCV) to elect the Wenatchee School Board. If a standard single-transferable vote system with $m = 5$ seats were implemented, then the threshold for election would be $\frac{1}{m+1} = \frac{1}{6} = 16.7\%$ of the votes. In other words, in this RCV system, any candidate who is the first choice of 16.7% of the voting population would be immediately elected to the School Board, and someone can easily be elected with just 10-15% of the first-place votes if they are frequently ranked second or third by enough voters. Since 22.7% of CVAP (and 25.4% of VAP) is POC, RCV is likely to provide more consistent opportunity to elect POC-preferred candidates.

Because RCV is not currently used for many elections in the Pacific Northwest[3], we are not able to estimate RCV outcomes using ranking data from past elections. Instead, our analysis must use models of ranked choice voting behavior to simulate how RCV *could* perform in various scenarios.

## 3.1 Models and voting scenarios

We use four different models to estimate minority representation under ranked choice voting for POC voters in the School District. All four models take a simple input consisting of three values: (1) the support from POC voters for POC candidates, (2) the support from White voters for POC candidates and (3) POC share of total CVAP. The Plackett-Luce (PL) and Bradley-Terry (BT) models rely on classical probabilistic forms of ranking, using what is called a Dirichlet distribution to allocate support to candidates within each group. The Alternating Crossover (AC) and Cambridge Sampler (CS) models are newly designed for this analysis. For these, we use estimated probabilities for whether voters will rank a White or POC candidate first, then rely on specific assumptions on how the rest of the ballot will be completed. The AC model assumes that voters are either bloc voters or alternate in their support. For instance, a POC voter may vote CCCWWW, ranking all candidates of color above all White candidates, or else WCWCWC. The CS model uses ballot data from a decade's worth of ranked choice city council ballots in Cambridge, MA. Each voter's first choice is filled in with support estimates, and then their subsequent ballot is drawn at random from the observed ballot types in Cambridge.

We also consider five scenarios of how voters divide their support among White and POC candidates.

- **Scenario A: Unanimous Order.** All voters agree on who are the strongest candidates in each group.
- **Scenario B: POC vary POC.** POC voters vary preferences among POC candidates.
- **Scenario C: All Vary Order.** No agreement on strongest candidates.
- **Scenario D: White Vary Order.** White voters don't agree on strongest candidates.
- **Scenario E: Generic.** All levels of agreement equally likely.

Finally, we consider the effect of candidate availability by comparing two different candidate pools.

[3]To date, the only known election to use RCV in the Pacific Northwest was the November 2020 County Commissioner race in Benton County, Oregon (https://www.oregonrcv.org/rcv-in-oregon/benton-county/).

- **Balanced Pool:** 5 POC candidates and 5 White candidates run for office
- **Unbalanced Pool:** 3 POC candidates and 5 White candidates run for office

These RCV models require estimates for the rate at which POC and White voters support POC candidates. Typically, we would want to use local single-winner elections to estimate these levels of support. However, precise estimates (with a high degree of confidence) are not always available—especially for jurisdictions with low turnout and a small number of precincts. We consider four hypothetical levels of polarization: **Category 1 Polarization**, where the support from POC and White voters for POC candidates is 95% and 5% respectively, **Category 2 Polarization**, where the support from POC and White voters for POC candidates is 90% and 20% respectively, **Category 3 Polarization**, where the support from POC and White voters for POC candidates is 75% and 20% respectively, and **Category 4 Polarization**, where the support from POC and White voters for POC candidates is 60% and 40% respectively.

Finally, the RCV models require estimates for the proportions of POC and White voters. We use CVAP for these values. That is, we assume that the proportion of POC voters is roughly equivalent to the proportion of POC citizens of voting age, namely 22.7%. These estimates make the implicit assumption that voter turnout is comparable for White and POC voters, which might not reflect actual voting behaviors. We note that substantially different turnout rates for White and POC voters may affect the following model results.

## 3.2 Results

For every combination of model, scenario, and candidate pool, we simulate 100 ranked choice elections, count how many POC candidates are elected in each trial, and compute the average across elections. The results are reported in Table 2 below.

Across all model scenarios, polarization categories and candidate pools, POC-preferred candidates are shut out in only four cases: Scenario C with the Cambridge Sampler (CS) under polarization Categories 1, 2, and 3 for the balanced candidate pool and only under Category 1 Polarization for the unbalanced candidate pool. Recall these cases represent little or modest support for POC candidates from White crossover voters, 7 (for balanced) and 3 (for unbalanced) POC candidates running, and no consensus on which of these candidates are the strongest[4].

Otherwise results across the board are promising: we typically expect 1-2 POC candidates to be elected. A higher number of POC winners are predicted in Category 4 Polarization cases due to higher support from White voters. Note that several of these outcomes would be supra-proportional for Wenatchee's 22.7% (of CVAP) POC population.

However, we emphasize that the support estimates used here are hypothetical values that are an imperfect reflection of local voting behavior in the school district.

[4]We can observe that the Cambridge sampler has the greatest variability over the voter behavior scenarios. This is because it is drawn from actual votes, and they display a high frequency of "bullet voting," in which the voter selects only one candidate and leaves the rest of the ballot blank. Bullet voting can nullify the proportionality effects of ranked choice because the ballot is quickly exhausted, with nowhere to transfer the vote.

| Category 1 Polarization (POC: 95%, W: 5%) | 5 At-Large RCV; Unbalanced Pool | | | | | |
|---|---|---|---|---|---|---|
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 1.6 | 1.5 | 1.0 | 1.0 | 1.2 |
| | BT | 1.5 | 1.4 | 1.0 | 1.0 | 1.1 |
| | AC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| | CS | 2.0 | 2.0 | 0.1 | 1.0 | 1.3 |
| | 5 At-Large RCV; Balanced Pool | | | | | |
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 1.4 | 1.5 | 1.0 | 1.0 | 1.1 |
| | BT | 1.5 | 1.5 | 1.0 | 1.0 | 1.1 |
| | AC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| | CS | 2.0 | 2.0 | 0.0 | 1.0 | 1.2 |

| Category 2 Polarization (POC: 90%, W: 20%) | 5 At-Large RCV; Unbalanced Pool | | | | | |
|---|---|---|---|---|---|---|
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 2.0 | 2.1 | 1.9 | 1.7 | 1.9 |
| | BT | 1.9 | 2.0 | 1.6 | 1.5 | 1.8 |
| | AC | 2.0 | 2.0 | 1.1 | 1.0 | 1.5 |
| | CS | 2.0 | 2.0 | 1.9 | 1.0 | 1.7 |
| | 5 At-Large RCV; Balanced Pool | | | | | |
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 2.1 | 2.2 | 1.6 | 1.5 | 2.0 |
| | BT | 2.1 | 2.0 | 1.4 | 1.3 | 1.7 |
| | AC | 2.0 | 2.0 | 1.0 | 1.0 | 1.5 |
| | CS | 2.0 | 2.0 | 0.0 | 1.0 | 1.2 |

| Category 3 Polarization (POC: 75%, W: 20%) | 5 At-Large RCV; Unbalanced Pool | | | | | |
|---|---|---|---|---|---|---|
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 1.9 | 1.9 | 1.7 | 1.7 | 1.8 |
| | BT | 1.9 | 1.9 | 1.6 | 1.4 | 1.8 |
| | AC | 1.9 | 2.0 | 1.0 | 1.0 | 1.5 |
| | CS | 2.0 | 2.0 | 1.0 | 1.0 | 1.5 |
| | 5 At-Large RCV; Balanced Pool | | | | | |
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 2.1 | 2.0 | 1.4 | 1.4 | 1.7 |
| | BT | 2.1 | 2.0 | 1.3 | 1.2 | 1.7 |
| | AC | 1.9 | 2.0 | 1.0 | 1.0 | 1.5 |
| | CS | 2.0 | 2.0 | 0.0 | 1.0 | 1.2 |

| Category 4 Polarization (POC: 60%, W: 40%) | 5 At-Large RCV; Unbalanced Pool | | | | | |
|---|---|---|---|---|---|---|
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 2.1 | 2.1 | 2.3 | 2.2 | 2.1 |
| | BT | 2.2 | 2.1 | 2.4 | 2.2 | 2.2 |
| | AC | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| | CS | 2.0 | 2.0 | 3.0 | 2.5 | 2.4 |
| | 5 At-Large RCV; Balanced Pool | | | | | |
| | | Scenario A | Scenario B | Scenario C | Scenario D | Scenario E |
| | PL | 2.4 | 2.5 | 2.1 | 2.1 | 2.2 |
| | BT | 2.4 | 2.4 | 2.2 | 2.1 | 2.3 |
| | AC | 2.0 | 2.0 | 1.0 | 1.0 | 1.5 |
| | CS | 2.0 | 2.0 | 0.8 | 1.0 | 1.5 |

**Table 2.** Using POC CVAP, this table shows the expected number of POC-preferred candidates elected under ranked choice to fill 5 seats in the Wenatchee School Board.

# 4 Conclusion

In this report we evaluated two alternative systems to elect the Wenatchee School Board, whose 5 members are currently elected via at-large plurality voting. Our results are summarized in Figure 4. This summary compares the predicted number of seats that POC-preferred candidates could reasonably secure under each voting system. For reference, Figure 4 also shows the number of current seats held by board members who are themselves people of color, as an imperfect proxy for POC voter representation on the School Board.

Recently, POC representation on the board has only been met by appointments, rather than elections. Although the board currently has one POC member, at-large systems can notoriously lead to “fence outs" for POC voters. We analyzed two alternative voting systems: a traditional districted system and RCV. Both alternatives show a high likelihood of more sustained POC-representation, with RCV potentially offering supra-proportional representation in some cases.

We considered a districted system that still has 5 seats, but in which voting is restricted to residents within the candidate’s zones. We were able to find districting plans with zone POC-CVAP as high as 54.6% and plans with POC-VAP as high as 58.3%. Such a zone would be likely to provide an opportunity for POC voters to elect their candidate of choice without having to rely on support from White voters. We were only able to identify plans with one such POC-opportunity zone and we conclude that a districted system would likely provide POC electoral opportunity for one seat on the School Board.

On the other hand, our ranked choice analysis suggests that, whether voting is highly polarized or follows more moderate patterns, an RCV election system could enable POC voters in the Wenatchee School District to elect 1-2 candidates of choice to the school board. In fact, the POC share of overall population is 31.4%, so the proportional share of a five-member school board is roughly 1.6 seats. Under most models and scenarios considered here, ranked choice would secure an expectation that approaches or even exceeds this proportion.

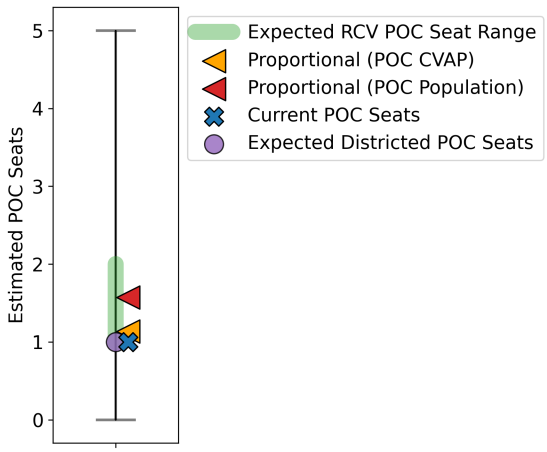



**Figure 4.** Summary of expected POC seat shares for alternative voting systems.