Analysis of Election Systems for the Tukwila, WA School District

MGGG Redistricting Lab

Contents

Contributors

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

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1 Introduction

Tukwila School District (hereafter, the School District) had 18,038 residents as of the 2010 Census. Table 1 shows the demographic breakdown of the district by total population, Voting Age Population (VAP), Citizen Voting Age Population (CVAP), and Students enrolled in Tukwila School District. The district has three sizable minority groups: Latino residents (who constitute 15.84% of VAP and 7.80% of CVAP), Asian residents (who constitute 17.80% of VAP and 18.66% of CVAP), and Black residents (who constitute 17.42% of VAP and 16.98% of CVAP). 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 52.81%. The distribution of POC residents across the School District is shown in Figure 1.

The School District is divided into 5 zones called *Director-Districts*, each of which is represented by one School Board Director (see Figure 1). School Board Directors serve 4 year terms and must live in the Director-District they represent. However voters from the entire district vote in *all* School Board elections, not just for their own Director-District seat.

Even though POC residents maintain a large majority of the district's total population and a slight majority of the district's CVAP, analysis shows that POC voters in the Tukwila School District have lower turnout rates than White voters–especially in the odd-year elections in which the School Board's races are held. In particular these turnout discrepancies can cause White voters to outnumber POC voters across the district. This means the POC-preferred candidates can be "fenced out": if voting is racially polarized then White-preferred candidates can win all 5 seats. Figure 2 shows the current members of the Board, which includes one member of color, who, notably, was appointed rather than elected to the School Board.

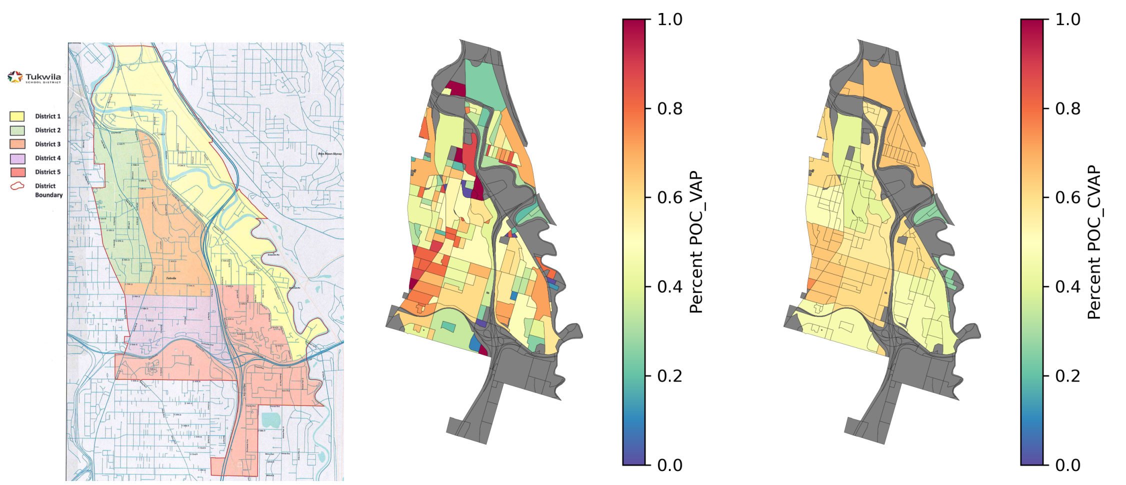
We emphasize that board members who are themselves people of color may not necessarily have been the candidates preferred by POC voters. POC candidates of choice can come from any racial or ethnic group. In the absence of accurate voter preference data, we use the School Board's racial makeup as an imperfect 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 potential way to provide more consistent minority opportunity on the School Board would be to use a traditional districted system, or one in which board members still represent one Director-District, but voting is restricted only to residents of that Director-District. Alternatively, a switch to 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) districted (instead of district-wide) elections with new Director-District boundaries, and (2) ranked choice voting.

Race	Share of Total Population	Share of VAP	Share of CVAP	Share of Students
White	36.69%	41.88%	47.19%	12.5%
Latino	18.79%	15.84%	7.80%	28.9%
Asian	18.18%	17.80%	18.66%	27.1%
Black	17.86%	17.42%	16.98%	20.3%
Other	8.48%	7.06%	9.34%	11.2%
Total People	**18,038**	**13,613**	**11,516**	**3,046**

Table 1. Total population, Voting Age Population (VAP) and Citizen Voting Age Population (CVAP) by race in the Tukwila 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/tukwila-school-district-106456



Director-Districts POC-VAP POC-CVAP

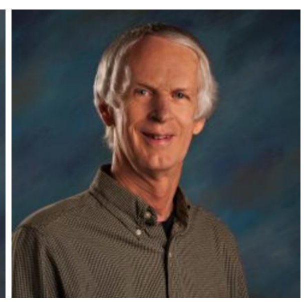
Figure 1. Current Director-Districts (as of February 2021) along with POC-VAP and POC-CVAP by block in the Tukwila School District. Note that CVAP by race is disaggregated to blocks from the block group level (the smallest unit for which this data is available). This process requires assumptions to be made about how the CVAP is distributed across the block group that likely differ from the true, unknown, geographic distribution of CVAP.

(a) Tracy Russell, Director-District 1

(b) Reverend Jan Bolerjack, Director-District 2

(c) Bridgette Agpaoa Ryder, Director-District 3

(d) Edna Morris, Director-District 4



(e) Dave Larson, Director-District 5

Figure 2. The Tukwila School Board as of April 2021. Each board member represents one of five Director-Districts, but are elected district-wide.

2 Districted Analysis

First, we consider traditional districted elections for the School Board. That is, replacing the current system by re-drawing Director-District boundaries and limiting the vote for each Director-District to its own residents. The discrepancy in voter turnout means that such a Director-District would need to be at least 56-58% POC-CVAP in order to have majority POC voters. While low voter turnout rates may inhibit POC opportunity to elect a candidate of choice in a school-district-wide, at-large election, POC voters may be geographically distributed in such a way as to make up a large enough share of a local Director-District, 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-POC-CVAP Director-Districts. To do this, we ran 100,000 steps of a ReCom[1] Markov chain, which takes into account only contiguity, compactness, and population deviation. We allowed Director-Districts to deviate by no more than 5% from the ideal population, in accordance with legal standards for local Director-Districts.

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 the distribution of POC-CVAP% across Director-Districts (the POC share of total CVAP in each Director-District in the plan). In particular we aimed to identify plans that maximized both the number of high-POC-CVAP Director-Districts as well as how high the POC-CVAP% is for these high-POC-CVAP Director-Districts: If a newly proposed plan had a larger number of high-POC-CVAP Director-Districts or had Director-Districts with higher POC-CVAP% than its predecessor plan, it had a very *high* probability of being included, but if it had fewer high-POC-CVAP Director-Districts and lower POC-CVAP% it had a very *low* probability of being included. This probabilistic inclusion created a *guided* chain run that targeted plans with concentrated POC Director-Districts. 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).

Ultimately our techniques sought plans that struck a balance between maximizing the number of high-POC-CVAP Director-Districts and the POC-CVAP% of those districts: seeking Director-Districts with too high of a POC-CVAP% may effectively pack POC voters into a few Director-Districts and prevent a higher number of opportunity districts from being drawn, whereas seeking too many opportunity Director-Districts may require reducing the POC-CVAP% so low that the districts won't actually provide reliable opportunity for the POC voters in them.

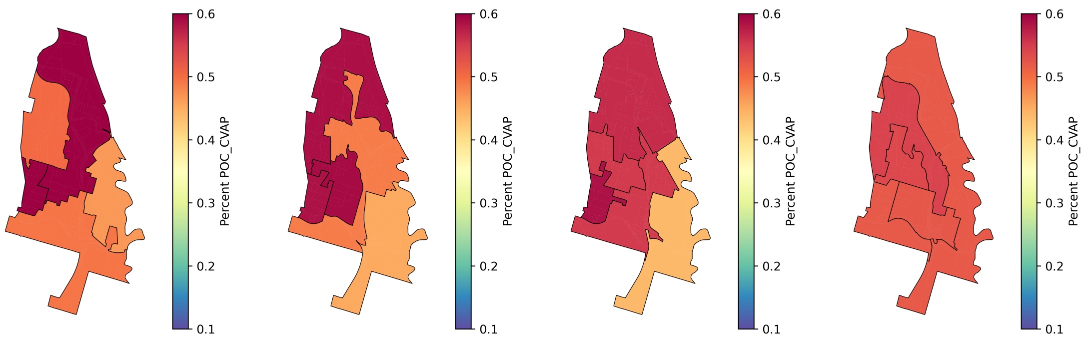
Figures 3 and 4 show several promising plans found by these techniques. When targeting plans with high POC-CVAP Director-Districts, we were able to find plans with 2 Director-Districts with POC-CVAP at least 60.9%, plans with 3 Director-Districts with POC-CVAP at least 58.6%, plans with 4 Director-Districts with POC-CVAP at least 55.3%, and plans with 5 Director-Districts with POC-CVAP at least 52.1%. When instead targeting plans with high POC-VAP (rather than high POC-CVAP), we were able to find plans with 3 Director-Districts with POC-VAP at least 63.1%, plans with 4 Director-Districts with POC-VAP at least 58.9%, and plans with 5 Director-Districts with POC-VAP at least 56.7%.

Because CVAP better captures actual eligible voting populations, and voter turnout discrepan-

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

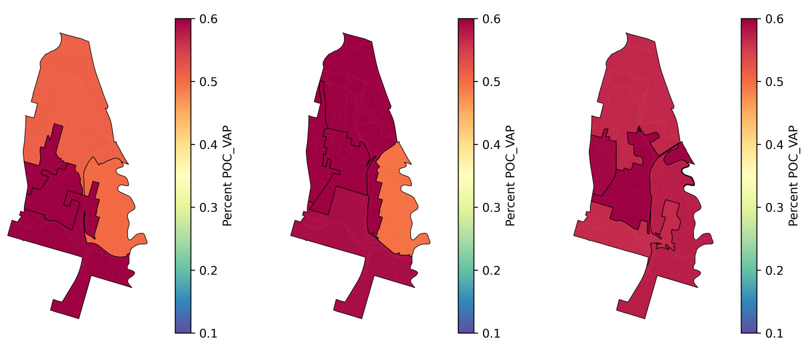
cies would likely require a Director-District to have at least 56-58% POC-CVAP in order to have majority POC voters, switching to districted elections would allow plans to be drawn with 2-3 majority POC-voter Director-Districts. With reasonable POC turnout and voter cohesion such Director-Districts would 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.



(a) 2 Director-Districts with POC-CVAP ≥**60.9%**
(b) 3 Director-Districts with POC-CVAP ≥**58.6%**
(c) 4 Director-Districts with POC-CVAP ≥**55.3%**
(d) 5 Director-Districts with POC-CVAP ≥**52.1%**

Figure 3. Results of techniques targeting identification of Director-Districts with high POC-CVAP.



(a) 3 Director-Districts with POC-VAP ≥**63.1%**
(b) 4 Director-Districts with POC-VAP ≥**58.9%**
(c) 5 Director-Districts with POC-VAP ≥**56.7%**

Figure 4. Results of techniques targeting identification of Director-Districts with high POC-VAP.

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 Tukwila 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 52.81% of CVAP (and 58.12% of VAP) is POC, RCV is likely to provide more consistent opportunity to elect POC-preferred candidates than the current at-large system.

Because RCV is not currently used for many elections in the Pacific Northwest[2], 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 voters. 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.

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

[2]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/`).

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 consider two different estimates for these proportions. First we use **Unadjusted POC-CVAP**. That is, we assume that the proportion of POC voters is roughly equivalent to the proportion of POC citizens of voting age, namely 52.81%. This estimate makes the implicit assumption that voter turnout is comparable for White and POC voters, which we have found does not reflect actual voting behaviors in Tukwila School District. As an alternative estimate, we use **Turnout-adjusted POC-CVAP**, addressing the concern that substantially different turnout rates for White and POC voters affect the model results. After assessing discrepancies in voting behavior during odd-year elections (i.e. those in which Tukwila School Board races are currently held), we use 44.4% as our Turnout-adjusted POC-CVAP estimate.

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 Tables 2 and 3 below.

Across all model scenarios, polarization categories, and candidate pools, there are only a few cases in which POC-preferred candidates are predicted to secure fewer than two seats. Most of these cases (including the two lowest estimates of 0.9 POC seats) occur in Scenario C with balanced candidate pools for the Cambridge Sampler (CS). Recall these cases represent 5 POC candidates running and no consensus on which of these candidates are the strongest[3].

Otherwise results across the board are promising: we typically expect 2-3 POC candidates to be elected using Unadjusted POC-CVAP voter proportion estimate and 2-2.5 POC candidates to be elected using the Turnout-adjusted POC-CVAP voter proportion estimate. 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.

[3] 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		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
Category 1 Polarization (POC: 95.0%, W: 5.0%)	**5 At-Large RCV; Balanced Pool**					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.6	3.0	2.9	2.5	2.8
	BT	2.8	3.0	3.0	2.8	3.0
	AC	3.0	3.0	3.0	3.0	3.0
	CS	2.0	3.0	2.2	2.0	2.3
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.4	2.8	2.8	2.3	2.5
	BT	2.4	2.9	2.9	2.3	2.7
	AC	3.0	3.0	3.0	3.0	3.0
	CS	2.0	3.0	3.0	2.0	2.5
Category 2 Polarization (POC: 90.0%, W: 20.0%)	**5 At-Large RCV; Balanced Pool**					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.8	3.1	3.0	2.6	2.9
	BT	2.8	3.0	3.0	2.6	3.0
	AC	3.0	3.0	3.0	3.0	3.0
	CS	2.0	3.0	3.1	2.0	2.5
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.6	2.9	2.9	2.4	2.6
	BT	2.5	2.9	2.9	2.3	2.7
	AC	3.0	3.0	3.0	3.0	3.0
	CS	2.0	3.0	3.0	2.0	2.5
Category 3 Polarization (POC: 75.0%, W: 20.0%)	**5 At-Large RCV; Balanced Pool**					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.4	2.7	2.3	2.2	2.5
	BT	2.4	2.6	2.5	2.1	2.4
	AC	2.0	3.0	2.5	2.0	2.4
	CS	2.0	2.8	1.6	2.0	2.1
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.1	2.6	2.5	2.2	2.4
	BT	2.1	2.5	2.4	1.9	2.4
	AC	2.0	3.0	3.0	2.0	2.5
	CS	2.0	3.0	3.0	2.0	2.5
Category 4 Polarization (POC: 60.0%, W: 40.0%)	**5 At-Large RCV; Balanced Pool**					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.5	2.8	2.5	2.4	2.6
	BT	2.5	2.6	2.6	2.3	2.6
	AC	2.0	3.0	2.9	2.0	2.5
	CS	2.0	2.5	1.9	2.0	2.1
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.4	2.5	2.5	2.2	2.3
	BT	2.3	2.5	2.6	2.4	2.4
	AC	2.0	3.0	3.0	2.0	2.5
	CS	2.0	3.0	3.0	2.6	2.7

Table 2. Using **Unadjusted POC-CVAP (52.81%)**, this table shows the expected number of POC-preferred candidates elected under ranked choice to fill 5 seats on the School Board.

Category	5 At-Large RCV; Balanced Pool					
Category 1 Polarization (POC: 95.0%, W: 5.0%)		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.1	2.3	2.0	2.0	2.0
	BT	2.1	2.1	2.0	2.0	2.0
	AC	2.0	2.0	2.0	2.0	2.0
	CS	2.0	3.0	0.9	2.0	2.0
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.0	2.2	2.0	2.0	2.1
	BT	2.0	2.1	2.0	1.9	2.1
	AC	2.0	2.0	2.0	2.0	2.0
	CS	2.0	3.0	3.0	2.0	2.5
Category 2 Polarization (POC: 90.0%, W: 20.0%)	5 At-Large RCV; Balanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.6	2.8	2.5	2.4	2.6
	BT	2.6	2.6	2.2	2.1	2.3
	AC	2.0	3.0	2.2	2.0	2.3
	CS	2.0	2.7	2.0	2.0	2.2
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.4	2.7	2.7	2.2	2.5
	BT	2.3	2.6	2.1	2.1	2.3
	AC	2.0	3.0	3.0	2.0	2.5
	CS	2.0	3.0	3.0	2.0	2.5
Category 3 Polarization (POC: 75.0%, W: 20.0%)	5 At-Large RCV; Balanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.3	2.5	2.0	1.9	2.1
	BT	2.2	2.4	2.1	1.9	2.2
	AC	2.0	2.1	2.0	2.0	2.0
	CS	2.0	2.0	0.9	1.9	1.7
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.2	2.4	2.2	2.0	2.1
	BT	2.2	2.3	2.2	1.8	2.2
	AC	2.0	2.6	2.0	2.0	2.2
	CS	2.0	3.0	3.0	2.0	2.5
Category 4 Polarization (POC: 60.0%, W: 40.0%)	5 At-Large RCV; Balanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.5	2.5	2.5	2.3	2.5
	BT	2.5	2.6	2.5	2.3	2.5
	AC	2.0	3.0	2.0	2.0	2.3
	CS	2.0	2.0	1.6	2.0	1.9
	5 At-Large RCV; Unbalanced Pool					
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
	PL	2.2	2.5	2.5	2.3	2.5
	BT	2.3	2.3	2.6	2.2	2.4
	AC	2.0	3.0	3.0	2.0	2.5
	CS	2.0	3.0	3.0	2.5	2.6

Table 3. Using **Turnout-adjusted POC-CVAP (44.4%)**, this table shows the expected number of POC-preferred candidates elected under ranked choice to fill 5 seats on the School Board.

4 Conclusion

In this report, we estimated the opportunity for POC voters to elect candidates of choice under two different voting systems: districted and RCV. These results are summarized in Figure 5. For reference, Figure 5 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.

We considered a districted system that still has 5 Director-Districts, but in which voting is restricted to each Director-District. If the Director-District boundaries are re-drawn we are able to find plans with 4 Director-Districts with at least 55.3% POC-CVAP, plans with 3 Director-Districts with at least 58.6% POC-CVAP, and plans with 2 Director-Districts with at least 60.9% POC-CVAP. Because turnout discrepancies in Tukwila School District likely require POC-CVAP% as high as 56-58% in order to have a majority POC voting proportion, we conclude that a districted system could secure 2-3 Director-Districts in which POC voters have consistent opportunity to elect candidates of choice, even without having to rely on a high degree of White crossover voting.

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 Tukwila School District to elect 2-2.5 candidates of choice to the school board. The POC share of overall population is 63.31%, so the proportional share of a five-member school board is roughly 3.2 seats. Under all models and scenarios considered here, ranked choice would secure an expectation that falls short of this proportion, but is still expected to offer considerably more reliable opportunity for POC voters than the current at-large system.

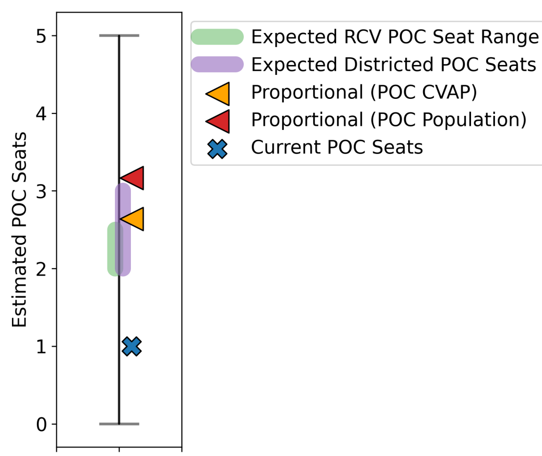


Figure 5. Summary of expected POC seat shares for alternative voting systems.