Lit Review & Intro

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What is ranked choice voting?

Ranked choice voting (RCV), also known as the alternative vote (AV) or instant-runoff voting (IRV) is an alternative voting method to the first-past-the-post (or "plurality", where the candidate with the most votes wins) system more familiar to American voters. Each voter, instead of choosing their highest preference among a set of candidates for an office, ranks some subset of the candidates in order of preference. This system (or a close variant) is used in Australia, Maine, and municipal elections in San Francisco, CA; Minneapolis, MN; and Cambridge, MA; among others.

The single-winner RCV tabulation algorithm generally proceeds as follows:

1. For each voter, identify their most preferred candidate that has not yet been eliminated. Count up these preferences by candidate.
2. If one candidate has a majority (50% + 1) of the unexhausted votes, they are declared the winner and counting stops.
3. The candidate with the lowest number of votes is eliminated.
4. The ballots counted for that candidate are each transferred to the voter's next choice if one exists, or if one does not exist the ballot is "exhausted" and removed from counting for further rounds.
5. Return to 1.

Most jurisdictions that use RCV have slightly different rules for edge cases and ballot errors, but this algorithm is what distinguishes RCV from other ranked voting systems (i.e. Borda, Condorcet, Contingent). A close variant of RCV is the single transferrable vote (STV) method, which can be used to elect multiple candidates, i.e. for a school board, instead of just one. In fact, RCV is just the single-winner implementation of the standard STV algorithm. In the US, this is used in Cambridge, MA and Minneapolis, MN to elect multi-member offices.

Frequently Used Terms

Below are some definitions for frequently used terms later on. These are not all ubiquitous (for example, "undervote" has another meaning in most voting research), but we define them here for clarity later on.

- *Overvote*: when a voter ranks multiple candidates in the same slot. This slot is typically thrown out entirely in counting, because it's often not possible to determine which candidate was preferred.
- *Undervote*: when a voter does not rank candidates in all of the slots available to them. This is different than other definitions of "undervote", which refer to a voter participating in one election on a ballot but not another one. This is not a problem in counting, and is explicitly allowed in the laws of most jurisdictions.
- *Skipped vote*: when a voter ranks no candidate at slot x, but ranks a candidate at slot $y > x$. This is typically not a problem in counting, but different jurisdictions have different rules about whether a voter's ballot is exhausted at this point or continues on to their next ranked choice.
- *Duplicated vote*: when a voter ranks the same candidate for distinct slots x and y. This is typically not a problem for counting, and the first ranking for the candidate is used.

All of these except for undervotes are really only interpretable as "ballot mistakes": for example, even if a voter truly prefers two candidates equally, the ballot instructions (should) make it clear that ranking them at the same slot is not allowed.

Claims about RCV

There are plenty of arguments both for and against implementing RCV in place of plurality in different jurisdictions (see the literature review), but here we'll focus on evaluating one major argument against it - RCV is harder for voters to participate in than a plurality system. There are two major reasons cited for this:

- The physical design of an RCV ballot is usually more complicated than a plurality ballot, because there has to be a system to encode a more full preference among the candidates than just selecting one candidate
- The process of forming a multi-candidate preference inherently takes more mental energy than just choosing a favorite candidate

The first facet of this argument should be reflected in ballot errors made by voters. Compared to plurality voting, we expect more errors in an RCV ballot just because the ballot is more complicated. There are also more potentials for error in the RCV system generally. The only "errors" in a plurality ballot are incompletely marking a candidate (think incorrect Scantron bubbling, or hanging chads) or overvoting, both of which are potential pitfalls for a ranked choice ballot as well. On top of these, there are the potential errors of duplicated and skipped votes unique to ranked ballots[1].

The second facet should be reflected in incomplete ballots filled out by voters. Given that they understand how to encode their preferences on the ballot, there is still the non-trivial task of forming such a preference. Structurally, some of the factors this incompleteness should vary based on are:

- The number of candidates running for a position
- The number of candidates voters can rank
- The number of seats elected in a given race

This first variable is at the election level (different for every election), the second is at the jurisdiction level, and the third is a mix of both. For a clear example of these differences, consider a 2016 San Francisco Board of Supervisors race (District 3) versus a 2017 Cambridge City Council race.

Factor	San Francisco 2016	Cambridge 2017
Candidates running	2	27
Candidates rankable	2 (Generally, up to 3)	27 (Generally, all)
Seats elected	1	9

[1]These types of errors are not uniform, and some jurisdictions are more forgiving than others about rules for counting these errors. While it may be apparent that a voter who listed the same candidate 3 times (A-A-A) prefers that candidate, a candidate ranking of A-B-A is harder to extract a clear preference from. Skipped votes are where we see the most variance in jurisdiction counting rules: if a voter marks the ballot A-___-B, skipping the second slot, some jurisdictions will ignore the skip and treat B as the voter's second choice, while others will stop counting after A is eliminated (ignoring their vote for B), and others yet will throw out the ballot entirely.