Summary of Recent Reports on Ranked Choice Voting

Alan Parry, PhD
Assoc. Professor, Mathematics
Utah Valley University

John Kidd, PhD
Assist. Professor, Statistics
Utah Valley University

Addison Stott
Research Intern

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Introduction

In this brief summary, we describe the contents of two reports by the authors, namely, *An Evaluation of the Ranked Choice Voting Pilot in Utah* (Kidd & Parry, 2024) and *Addressing Concerns About Instant Runoff Voting* (Parry & Kidd, 2024). The purpose of the first report is to statistically analyze the results of a survey from Y2 Analytics that gauges Utah voters' reaction to Utah's ongoing ranked choice voting (RCV) pilot. The purpose of the second report is to address general concerns about instant runoff voting as well as concerns brought up by the recent technical report by Jiri Navratil and Warren Smith (Navratil & Smith, 2022). We employ mathematics to respond to these concerns and present several mathematical properties of plurality voting and instant runoff voting (IRV) as well as the properties of two other voting methods for comparison, ranked pairs (RP) and score voting (SV).

We summarize each paper individually. Then we include a short description of other considerations about ranked choice voting that these reports did not directly address. Finally, we conclude with a discussion of the implications of these reports.

## Summary of an Evaluation of the Ranked Choice Voting Pilot in Utah

In this section, we summarize the authors' report *An Evaluation of the Ranked Choice Voting Pilot in Utah* (Kidd & Parry, 2024). This report presents a statistical analysis of the results of two recent surveys performed by Y2 Analytics gauging Utah voters' reaction to Utah's ongoing ranked choice voting (RCV) pilot. The surveys were conducted in 2021 and 2023 from likely and confirmed voters, with a non-exclusive focus on those that participated in RCV.

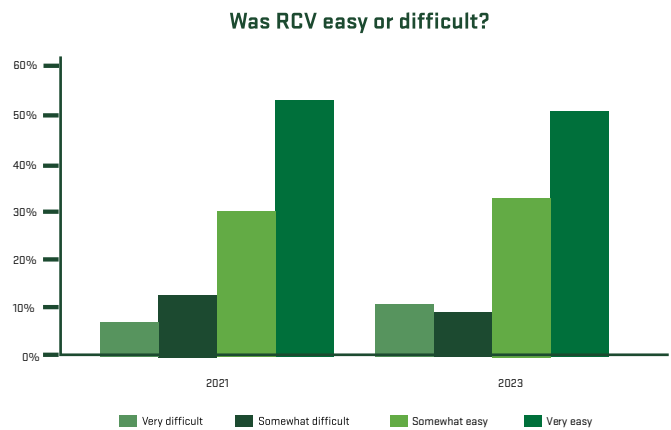In our analysis of the survey, we found the following.

- About the same number of Utah voters prefer single-vote plurality as those that prefer RCV. It is statistically unlikely that either group includes a majority of voters.
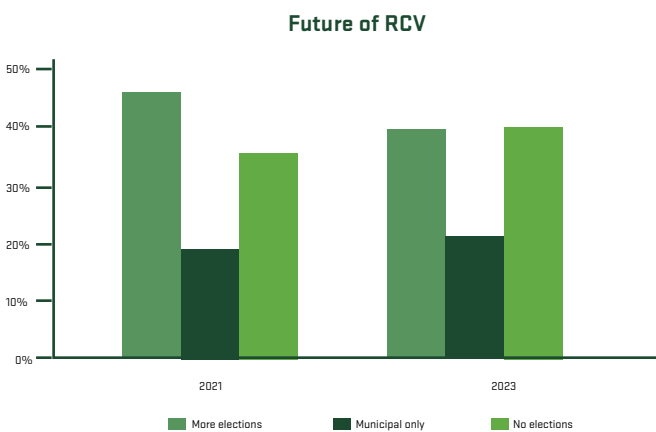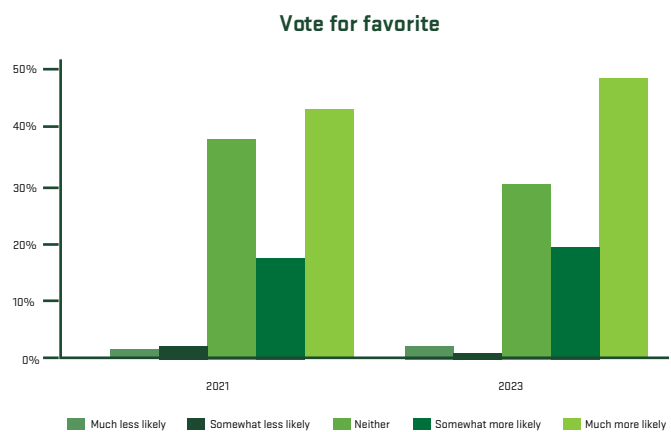
- A majority of Utah voters enjoyed using RCV.

Enjoyed RCV
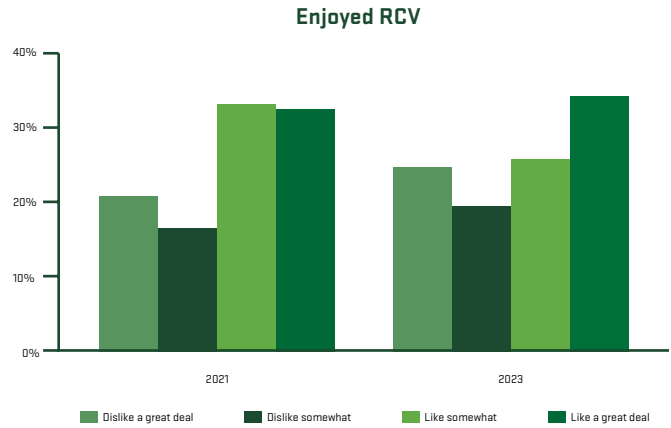
- More than 75% of Utah voters found RCV easy to use.

Was RCV easy or difficult?

- A majority of Utah voters were more likely to vote for their preferred candidate using RCV.

Future of RCV

Vote for favorite

- A majority of Utah voters want RCV to continue in Utah in at least local elections.

We also conclude from the survey that over 80% of Utah voters are confident that their votes are counted accurately and that their local elections produce fair outcomes.

Confidence that ballot will be counted accurately

Confidence in fair election outcomes
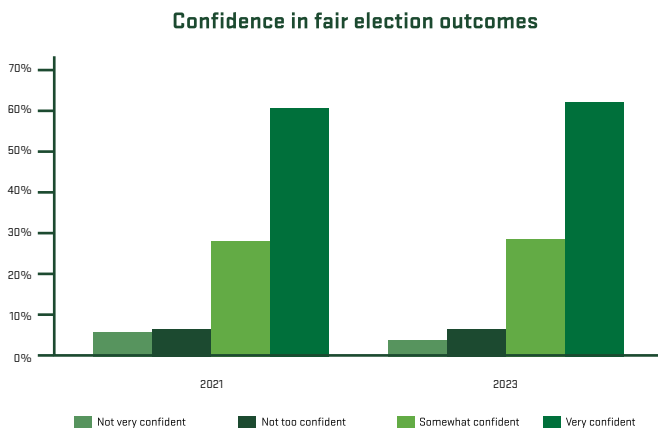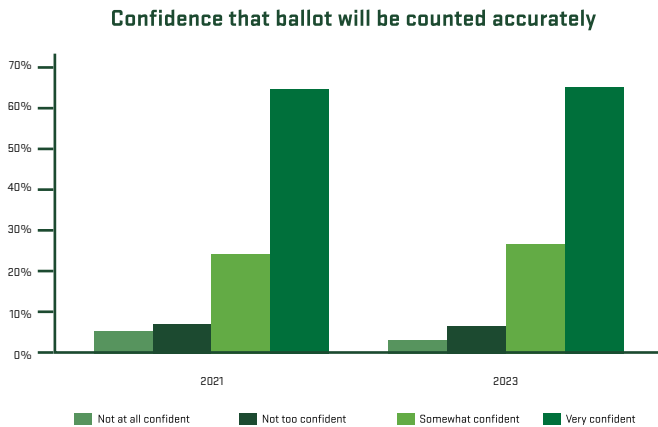
We note a few limitations to the survey. First, the survey employs weights to get its sample as close to a representative random sample as possible. The unweighted survey results are the direct survey results without modification, while the weighted survey results are modified by scaling the sizes of various demographics so that the sizes are more representative of Utah's population, which hopefully provides a more accurate picture of what Utahns think about the RCV pilot. However, more data and research are needed to verify whether these weights actually achieved this and provided a representative sample of the population of Utah. Second, the surveys indicate that there were notable differences between voter opinion in 2021 and voter opinion in 2023. Two or three election cycles are not enough time for voters and can-

didates to optimize their behavior and opinions about a voting method. Thus, the opinions of voters may continue to shift over time. Neither these surveys nor the current opinion of the public may be a perfectly accurate representation of where the public's views will eventually settle about the use of RCV.

Both of these limitations require more data and more research to overcome. As such, more surveys need to be done, more data collected, and more analyses performed to truly understand the effect of RCV in Utah and the public's reaction to it.

Summary of Addressing Concerns about Instant Runoff Voting

In this section, we summarize the authors' report *Addressing Concerns About Instant Runoff Voting* (Parry & Kidd, 2024). This report discusses concerns about instant runoff voting (IRV) that have arisen about how IRV behaves in both theory and practice. To address these concerns, we also describe some of the mathematics of voting.

Game theory, the branch of mathematics that studies how "players" make decisions, is applied to voting. By so doing, we can analyze the effects of various voting methods.

- The **purpose of voting** is to accurately determine the collective opinion of the people about which candidate is preferred.
- The **goal of an election method** is to accomplish that purpose while incentivizing honest voting and civil elections.

We should judge the utility of a voting method on how well it satisfies the purpose of voting and achieves the goals of an election method.

We consider several fairness criteria that are important in evaluating whether an election method satisfies the purpose of voting and achieves the goal of an election method. There criteria include

- **The Majority Criterion**—If a majority of voters rates the same candidate first, then that candidate wins.
- **The Condorcet Winner Criterion**—If a candidate beats every other candidate head-to-head, then that candidate wins.
- **The Condorcet Loser Criterion**—If a candidate loses to every other candidate head-to-head, then the method cannot select that candidate as the winner.
- **The Clone Invariance Criterion**—If two candidates are clones (politically speaking), then neither candidate affects the other candidate's ability to win.
- **The Monotonicity Criterion**—A candidate cannot be harmed by voters increasing their support for the candidate.
- **The Strategy-proof Criterion**—A voter cannot improve their satisfaction with the results of the election by strategically voting; that is, a voter's best outcome is always obtained by submitting an honest ballot.

- **The Independence of Irrelevant Alternatives Criterion**—Whether an election method determines that one candidate is preferred to another is not affected by the presence of a third candidate in the election. This is effectively immunity to all kinds of spoiler candidates.

Voting methods include two parts—(1) a voter opinion data collection method (the ballot), and (2) a voter opinion data interpretation method (how those ballots are interpreted to produce a winner). The types of ballots are varied, but the three types mentioned in this report are

- **Single Choice Ballot**—A ballot where each voter is only allowed to select a single candidate that they most prefer.
- **Ranked Choice Ballot**—A ballot where each voter rank-orders all candidates according to their individual preferences for each candidate.
- **Score Ballot**—A ballot where voters provide a score for each candidate on some scale (e.g., from 1 to 9).

We consider several voter opinion interpretation methods for comparison. These include

- **Plurality Voting**—Plurality voting can be done with a single choice ballot or a ranked choice ballot. The candidate with the largest number of first choice votes is the winner.
- **Instant Runoff Voting (IRV)**—IRV uses a ranked choice ballot. The winning candidate is decided in a round-by-round manner. In each round, if no candidate has a majority of first-place support (of the candidates remaining), then the candidate with the least first place support is eliminated and the votes for that candidate are reallocated according to the voter's next choice. This continues until a candidate has a majority of the votes in that round.
- **Ranked Pairs (RP)**—RP uses a ranked choice ballot. Every possible pair of candidates are compared in a simulated "pairwise runoff" using the ranked ballots to determine which one each voter would vote for in each runoff. The runoffs are ordered according to margin of victory from largest to smallest. Each runoff's communicated collective preference is locked in as we go down the order, including any implied collective preferences. Information from larger margins of victory is prioritized over smaller margins of victory. This resolves any "rock, paper, scissors" situations in the collective preferences.
- **Score Voting (SV)**—SV uses a score ballot. The candidate with the highest average score is declared the winner. This is also known as range voting.

We compare these voting methods on which fairness criteria they satisfy. For the above criteria, this results in Table 1 on the next page where a checkmark indicates that that method satisfies the fairness criterion, and an X indicates that it does not.

	Voting Method			
Criterion	Plurality	Instant Runoff	Ranked Pairs	Score Voting
Majority	✓	✓	✓	✗
Condorcet Winner	✗	✗	✓	✗
Condorcet Loser	✗	✓	✓	✗
Clone Invariance	✗	✓	✓	✓
Monotonicity	✓	✗	✓	✓
Strategy-proof	✗	✗	✗	✗
Independence of Irrelevant Alternatives	✗	✗	✗	✗

Table 1. This table indicates which of several fairness criteria the four voting methods of plurality, IRV, RP, and SV satisfy. A checkmark indicates that that method satisfies that criterion, while an X indicates that it does not.

We also address several general concerns about IRV as well as specific concerns brought up in a recent technical report by Jiri Navratil and Warren Smith (Navratil & Smith, 2022). We also compare these concerns to how well plurality fares on the same topic. We conclude that

- IRV ballot error rates are generally small and are unlikely to affect the outcome of an election.
- IRV is immune to the main type of spoiler that plurality is susceptible to but is susceptible to other kinds of spoiler candidates.
- IRV fails the Condorcet Winner Criterion but satisfies the Condorcet Loser Criterion. Plurality fails both Condorcet criteria.
- IRV fails the Monotonicity Criterion while plurality satisfies it.
- Both IRV and plurality cause strategic voting, as do all voting methods. IRV appears superior to plurality at minimizing strategic voting.
- IRV can result in different outcomes than plurality.
- IRV does not throw out ballots but uses them until there is no longer any relevant information left on them.
- IRV elects a majority winner among those voters that indicated that they wanted to have a say between the candidates

remaining in the final round. No other majority makes sense to require.

- Voters can ensure that IRV always elects a majority winner among all votes cast if they all fill out a complete ranking.
- IRV fails the Participation Criterion, as do most voting methods. The Participation Criterion will not affect how voters choose to vote because to use it strategically requires information that is not available until after the election. Thus, IRV's failure of this criterion is not concerning.
- IRV, like all voting methods including plurality, falls victim to some voting paradoxes. Balancing the paradoxes to which an election system is susceptible with that system's potential benefits is the key question in determining which system to use.

Overall, in our experience, IRV is generally considered mathematically superior to plurality, which is widely considered to be mathematically one of the worst ways to vote. Continuing to explore IRV also has the advantage that it continues the conversation of improving our society's election method in general. There are other methods of voting, including voting that use a ranked choice ballot, that are mathematically superior to both plurality and IRV, and such methods should also be considered in the conversation of improving our democracy.

This report also contains an Appendix that delves more carefully into some of the mathematical considerations involved in understanding voting. There we describe in more detail various fairness criteria and two important mathematical theorems about whether voting methods can satisfy all of them.

Other Aspects of Ranked Choice Voting in Utah

There are other considerations besides what we have discussed so far in determining whether we should use ranked choice voting (RCV). Some of these include whether using RCV reduces costs and how using RCV affects the competitiveness of races which may be partially measured by the rate at which incumbents are reelected.

Potential cost-saving aspects of RCV are dependent upon the implementation. Some cost items have been addressed previously by other institutions (See Monson, 2022, and Sylvester & Erickson, 2022 for more information.) From the data currently available in Utah about the cost of elections, it is difficult to determine the cost-saving effects of the RCV pilot in Utah. As such, more data and research need to be done.

For incumbent reelection rates, some preliminary data includes the following. In 2023, 13 incumbents ran in races with more than 2 candidates that utilized RCV. Of those 13, 9 (69.2%) were reelected. We only have data from 2023 since data for 2021 has been difficult to find. As such, making conclusions about general trends and patterns is not advised. Additional time and data would be needed to see the effect on reelection rates.

Both of these items provide potential avenues for future research on RCV in Utah if RCV continues to be an available option in Utah.

Conclusion

Perhaps the main findings of these reports are that Utahns generally like using RCV and that mathematically RCV is superior to plurality voting. Moreover, three election cycles are not enough time to fully realize the impact of RCV on voter behavior, candidate behavior, and many other considerations. This is because it takes considerably longer than that for a new voting system to start to alter how we vote and campaign; that is, it takes longer than that for voters and candidates to optimize their behavior within those rules. As such, if understanding how RCV affects democracy in Utah is important, it seems advisable that RCV continue to be an option for municipalities in Utah to use in their elections.

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Satisfied with the method for the election

Tone of the election

Instructions were clear

Importance of a majority
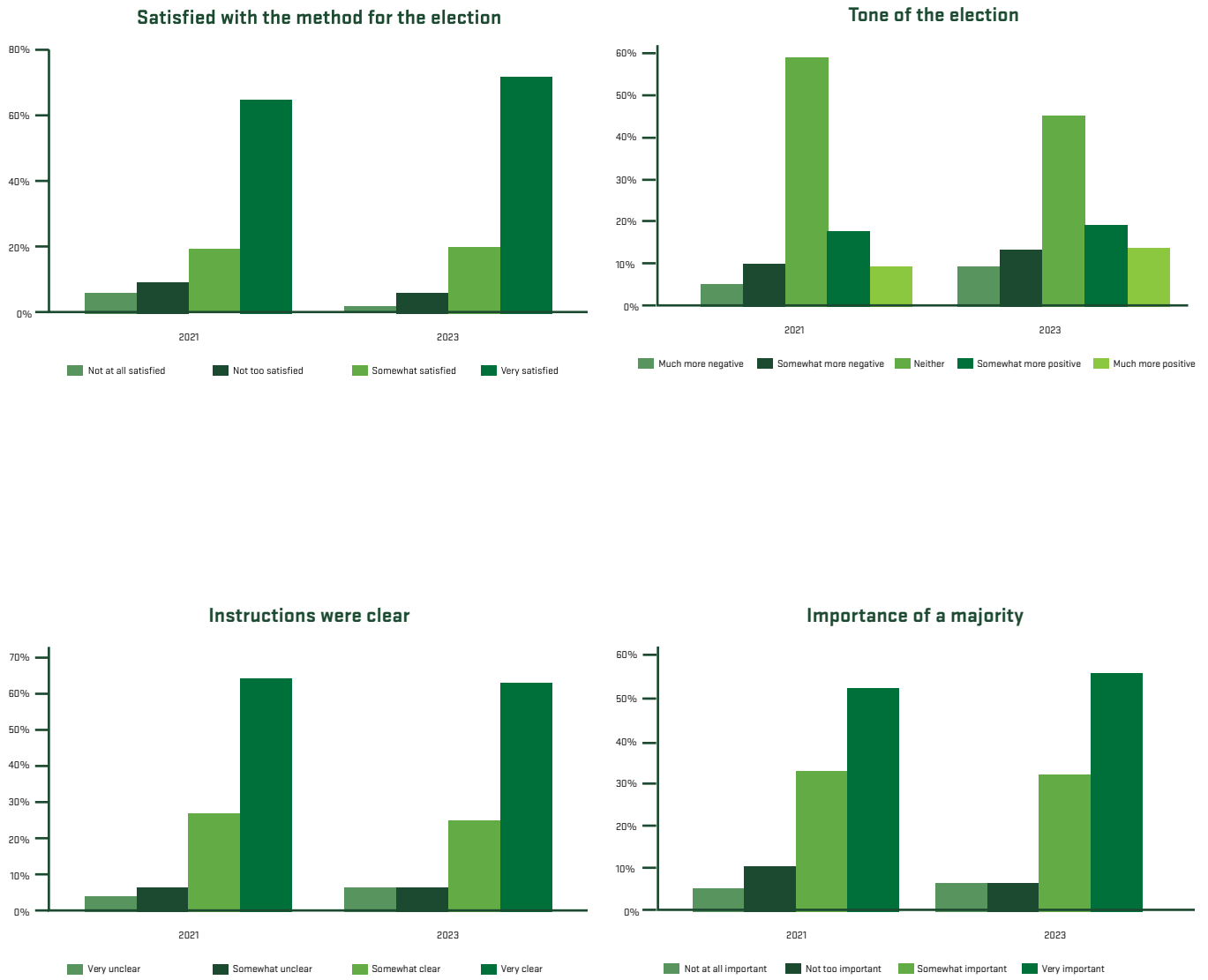
Figure 1. Graphs of various results from the Y2 Analytics surveys.