The Will of the People: How we vote and why it matters

Jeanne N. Clelland University of Colorado, Boulder

Voting Rights Data Institute Tufts University

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This talk is NOT about:

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This talk is NOT about:

• Redistricting

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- Redistricting
- The Electoral College vs. the popular vote

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- Voter Access

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• Elections where exactly one candidate must be selected

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- Redistricting
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- Election integrity

This talk IS about:

- Elections where exactly one candidate must be selected
- How election procedures affect outcomes, sometimes in surprising ways

Why have elections?

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"The will of the people shall be the basis of the authority of government; this will shall be expressed in periodic and genuine elections which shall be by universal and equal suffrage and shall be held by secret vote or by equivalent free voting procedures."

 United Nations Universal Declaration of Human Rights, Article 21, December 1948

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How do we vote?

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The classic system: Majority rules

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The classic system: Majority rules

The simplest elections feature a choice between two candidates, ${\cal A}$ and ${\cal B}.$

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The classic system: Majority rules

The simplest elections feature a choice between two candidates, A and B.

In this case, the procedure is straightforward: Every voter votes for their preferred candidate, and the candidate with the most votes wins.

But as soon as there are 3 or more candidates, the situation gets more complicated! The most common voting systems in this case are:

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• **Plurality voting:** Whichever candidate gets the most votes wins, even if their vote total is less than 50%.

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But as soon as there are 3 or more candidates, the situation gets more complicated! The most common voting systems in this case are:

- **Plurality voting:** Whichever candidate gets the most votes wins, even if their vote total is less than 50%.
- Runoff elections: If no candidate wins more than 50% of the vote, a second election is held between the two candidates with the two largest vote totals in the original election.

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Even with just these two possibilities, different procedures may produce different results.

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Simple example: Suppose that 60% of the population likes both candidates A and B about equally, and dislikes candidate C. Meanwhile, the other 40% of the population prefers C and dislikes both A and B.

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Simple example: Suppose that 60% of the population likes both candidates A and B about equally, and dislikes candidate C. Meanwhile, the other 40% of the population prefers C and dislikes both A and B.

The initial election produces the following results:

A: 32%, B: 28%, C: 40%.

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The initial election produces the following results:

A: 32%, B: 28%, C: 40%.

With a plurality vote, C wins. But in a runoff election between A and C, most of B's voters prefer A, and A wins.

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Slightly more complicated example: Suppose that:

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Slightly more complicated example: Suppose that:

• 36% of the population strongly favors A, thinks B would be a reasonable second choice, and HATES C.

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Slightly more complicated example: Suppose that:

- 36% of the population strongly favors A, thinks B would be a reasonable second choice, and HATES C.
- 34% of the population strongly favors C, thinks B would be a reasonable second choice, and HATES A.
- 30% of the population strongly favors B and strongly dislikes both A and C, but about 2/3 of them prefer C vs. A as a second choice.

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Slightly more complicated example: Suppose that:

- 36% of the population strongly favors A, thinks B would be a reasonable second choice, and HATES C.
- 34% of the population strongly favors C, thinks B would be a reasonable second choice, and HATES A.
- 30% of the population strongly favors B and strongly dislikes both A and C, but about 2/3 of them prefer C vs. A as a second choice.

With a plurality vote, A wins with 36% of the vote. In a runoff election between A and C, C wins with 54% of the vote.

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- 30% of the population strongly favors B and strongly dislikes both A and C, but about 2/3 of them prefer C vs. A as a second choice.

With a plurality vote, A wins with 36% of the vote. In a runoff election between A and C, C wins with 54% of the vote.

But a strong case could be made that candidate B comes closest to representing "the will of the people."

This is not a theoretical problem!

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• Party primary elections often have a large number of candidates. Some states and municipalities have runoffs for primary elections — and some don't! — but either way, voters' ability to express their preferences is very limited, and the outcome can leave most voters feeling dissatisfied.

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- Party primary elections often have a large number of candidates. Some states and municipalities have runoffs for primary elections and some don't! but either way, voters' ability to express their preferences is very limited, and the outcome can leave most voters feeling dissatisfied.
- General elections are almost always decided by plurality vote, and minor party candidates can easily play the role of spoiler.

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- Party primary elections often have a large number of candidates. Some states and municipalities have runoffs for primary elections and some don't! but either way, voters' ability to express their preferences is very limited, and the outcome can leave most voters feeling dissatisfied.
- General elections are almost always decided by plurality vote, and minor party candidates can easily play the role of spoiler.
 - 1992 Presidential election: Clinton 43%, Bush 38%, Perot
 19%
 - 2000 Presidential election in Florida: Bush 48.85%, Gore 48.84%, Nader 1.6%

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Another weakness of this system is that, as in the example above, primary elections are often won by more extreme candidates who inspire strong opinions in both directions, while candidates who might be the second or third choice of most voters are eliminated from consideration. Another weakness of this system is that, as in the example above, primary elections are often won by more extreme candidates who inspire strong opinions in both directions, while candidates who might be the second or third choice of most voters are eliminated from consideration.

For this reason, many attempts have been made to tweak the rules in order to improve the chances of electing more moderate candidates in primary elections, who it is hoped will fare better in the subsequent general elections.

Variations on the system

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Blanket primary: In this system, voters may select one candidate for each office without regard to party; for instance, a voter might select a Democratic candidate for governor and a Republican candidate for senator.

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In the traditional version, the candidates for each office *in each party* with the highest numbers of votes advance to the general election as their party's nominee.

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This system was used in Washington, California, and Alaska until the year 2000, when the Supreme Court ruled it unconstitutional in *California Democratic Party v. Jones* because it forced political parties to endorse candidates against their will.

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Nonpartisan blanket primary, a.k.a. "Jungle primary": In this system, all candidates for each office run against each other at once in the primary election, without regard to party affiliation. The top two candidates, regardless of party affiliation, advance to the general election. Nonpartisan blanket primary, a.k.a. "Jungle primary": In this system, all candidates for each office run against each other at once in the primary election, without regard to party affiliation. The top two candidates, regardless of party affiliation, advance to the general election.

This system is currently in use for all statewide primaries except presidential primaries in Washington and California. A similar, but slightly different, system is also used in Louisiana.

The idea is to promote the election of more moderate candidates, as candidates must appeal to members of both parties. It intentionally allows two members of the same party to advance to the general election, where members of the opposite party are likely to prefer the more moderate candidate. The idea is to promote the election of more moderate candidates, as candidates must appeal to members of both parties. It intentionally allows two members of the same party to advance to the general election, where members of the opposite party are likely to prefer the more moderate candidate.

However, this can also occur when a party with minority support runs fewer candidates than the majority party and so has less vote-splitting between candidates.

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For example, in Washington's 2016 election for state treasurer, the primary results were as follows:

Candidate	Party	Vote percentage
Davidson	R	25.09%
Waite	R	23.33%
Liias	D	20.36%
Comerford	D	17.97%
Fisken	D	13.24%

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Democrats received 51.57% of the primary vote but were shut out of the general election.

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Is there a better way?

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As you might imagine, this is not a new problem!

The obvious shortcoming of these standard voting systems is that voters are only allowed to provide partial information about their preferences: Each voter can vote for only one candidate and cannot say anything about their preferences among the rest.

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The obvious shortcoming of these standard voting systems is that voters are only allowed to provide partial information about their preferences: Each voter can vote for only one candidate and cannot say anything about their preferences among the rest.

Many alternate systems have been proposed over the years in order to allow voters to express more nuanced opinions.

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- Each voter ranks the list of candidates in order of their preference.
- For each ballot, N points are given to the 1st place candidate, N 1 points to the 2nd place candidate, etc., down to 1 point for the last-place candidate.
 (Alternatively, points may range from N 1 down to 0.)

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 (Alternatively, points may range from N 1 down to 0.)
- After all points are tallied, the candidate with the most points wins.

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In our example from before, the ballots might be cast as follows. (For simplicity, assume there are exactly 100 voters.)

Ordered preferences	Votes
(A, B, C)	36
(C, B, A)	34
(B, C, A)	20
(B, A, C)	10

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Candidate	Total points
A	$(36 \times 3) + (34 \times 1) + (20 \times 1) + (10 \times 2) = 182$
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В	$(36 \times 2) + (34 \times 2) + (20 \times 3) + (10 \times 3) = 230$
C	

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So with this system, B wins — despite coming in last place in the plurality vote!

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The Borda count was used by the French Academy of Sciences to elect its members for about two decades, until Napoleon Bonaparte imposed his own voting method in 1801.

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Similar systems were developed independently several times, as far back as 1433, when the German philosopher Nicholas of Cusa proposed it as a method to elect Holy Roman Emperors.

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Similar systems were developed independently several times, as far back as 1433, when the German philosopher Nicholas of Cusa proposed it as a method to elect Holy Roman Emperors.

Today it is used in many academic and private institutions, and (with variations) even in a few political jurisdictions.

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Advantages:

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• Tends to favor candidates who are more broadly acceptable to voters

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- Tends to favor candidates who are more broadly acceptable to voters
- Somewhat less vulnerable to tactical manipulation by strategic ranking than other common methods

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Disadvantages:

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Disadvantages:

• It is possible that a candidate who is the first choice of a majority of voters is not the winner

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- How to count ballots where not all candidates are ranked?

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- Somewhat less vulnerable to tactical manipulation by strategic ranking than other common methods

Disadvantages:

- It is possible that a candidate who is the first choice of a majority of voters is not the winner
- How to count ballots where not all candidates are ranked?
- Highly susceptible to a form of tactical manipulation called *teaming* or *cloning*

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Example: Suppose that there are two factions, the Silvers and the Golds. The Golds are very popular, with about 60% of the voters supporting them. The main candidates are the Gold candidate A and the Silver candidate B.

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In a standard election between these two candidates—or even a plurality election including one or two candidates with about 1% or 2% support each—A would win with more than 50% of the vote.

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In a standard election between these two candidates—or even a plurality election including one or two candidates with about 1% or 2% support each—A would win with more than 50% of the vote.

Now say that the Silvers decide to run a second, much less popular candidate C, who will receive about 10% of the Silver vote. Then the ballots might be cast as follows. (Again, assume there are 100 voters.)

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Ordered preferences	Votes
(A, B, C)	54
(A, C, B)	6
(B,C,A)	36
(C, B, A)	4

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Candidate	Total points
A	
В	
C	

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Ordered preferences	Votes
(A, B, C)	54
(A, C, B)	6
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Candidate	Total points
A	$(54 \times 3) + (6 \times 3) + (36 \times 1) + (4 \times 1) = 220$
В	
C	

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В	$(54 \times 2) + (6 \times 1) + (36 \times 3) + (4 \times 2) = 230$
C	$(54 \times 1) + (6 \times 2) + (36 \times 2) + (4 \times 3) = 150$

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В	$(54 \times 2) + (6 \times 1) + (36 \times 3) + (4 \times 2) = 230$
C	$(54 \times 1) + (6 \times 2) + (36 \times 2) + (4 \times 3) = 150$

Even though C takes votes *away* from B, the mere presence of C in the election allows B to defeat A.

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Also known as "instant runoff voting," "preferential voting," or "transferable vote."

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Also known as "instant runoff voting," "preferential voting," or "transferable vote."

This algorithm was proposed in 1871 by the American architect William Robert Ware:

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This algorithm was proposed in 1871 by the American architect William Robert Ware:

• Each voter ranks the list of candidates in order of their preference.

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- In the second round, all ballots whose 1st place candidate has been eliminated are reassigned to their 2nd place candidates.
- The procedure is repeated until some candidate has at least 50% of the vote, and then that candidate wins the election.

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With 4 or more candidates, this system can produce different results from a standard runoff election.

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- RCV has been used for nationwide elections in Australia since 1918.
- In the U.K., the Labour Party and the Liberal Democrats use RCV to elect party leaders.
- Several U.S. cities (e.g., San Francisco, Minneapolis, and Portland, Maine) use RCV in mayoral elections.

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• In 2016, voters in Maine approved a referendum to implement ranked-choice voting for statewide elections. The state Supreme Court first ruled that this system violated the state constitution, but then reversed itself in April 2018. It was used for the first time **this week** in Maine's primary election.

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- Maine voters also affirmed this week (55% to 45%) that the state will continue using RCV, effective immediately.

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Advantages:

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Advantages:

• Reduces the impact of "spoiler" candidates, while still allowing voters to show support for minor candidates without "wasting" their vote

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- Easy to explain to voters, legislators, judges
- Relatively resistant to tactical manipulation by strategic ranking
- May inspire more positive campaigning, as candidates aim to become voters' second and third choices instead of attacking their opponents

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Disadvantages:

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- It is possible that a candidate who would win all head-to-head contests among the candidates may not win the election

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A cautionary tale: The 2009 Burlington, VT mayoral election

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A cautionary tale: The 2009 Burlington, VT mayoral election

The 2009 mayoral election of Burlington, VT was conducted by RCV and featured 3 main candidates:

- Kurt Wright (Republican)
- 2 Andy Montroll (Democrat)
- **3** Bob Kiss (Progressive, and the incumbent)

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Excluding minor candidates who did not affect the vote, the ballot count was as follows:

Ranking	Votes	Ranking	Votes	Ranking	Votes
(M, K, W)	1332	(K, M, W)	2043	(W, M, K)	1513
(M, W, K)	767	(K, W, M)	371	(W, K, M)	495
(M)	455	(K)	568	(W)	1289

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Second round tally: Kiss 4314, Wright 4064. So Kiss is elected.

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But Montroll was eliminated in the first round!

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Incidentally, a Borda count (assuming ties for candidates not ranked) gives Montroll 18,425.5, Kiss 17,496, Wright 17,076.5.

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Aftermath: in 2010, Burlington repealed RCV by a vote of 52% to 48%.

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Each voter votes for as many candidates as they choose, with no ranking of candidates, and the candidate with the most votes wins.

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• Approval voting has been used since the mid-1980's by the American Mathematical Society and the Mathematical Association of America in their elections.

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- Approval voting has been used since the mid-1980's by the American Mathematical Society and the Mathematical Association of America in their elections.
- Approval voting is used for internal elections by the Green Party in Texas and Ohio, the Libertarian Party in Texas, and the U.S. Modern Whig Party.

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Disadvantages:

- Highly vulnerable to tactical manipulation by, e.g., only voting for one candidate (where it essentially reduces to plurality voting if enough voters do this)
- It is possible that the winning candidate still has less than 50% approval, and so lacks a perceived mandate

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The Will of the People: How we vote and why it mat

In 1785, the French Mathematician Marquis Nicolas de Condorcet published a treatise called *Essay on the Application* of *Analysis to the Probability of Majority Decisions*, which includes the following major ideas:

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• Condorcet's jury theorem: If each member of a voting group is more likely than not to make a correct decision, then the probability that the highest vote of the group is the correct decision increases as the number of group members increases.

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- Condorcet's jury theorem: If each member of a voting group is more likely than not to make a correct decision, then the probability that the highest vote of the group is the correct decision increases as the number of group members increases.
- Condorcet's paradox: With 3 or more candidates, majority preferences can become intransitive: The electorate may prefer A to B, B to C, and C to A. (This is called a *Condorcet cycle*.)

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The treatise also outlines the **Condorcet method**, which is designed to simulate all pairwise elections between all candidates.

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For example, the voting procedure in Robert's Rules of Order is a Condorcet method.

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If some candidate would win all pairwise elections with all other candidates, that candidate is called the *Condorcet winner*. (But the existence of Condorcet cycles means that a Condorcet winner may not exist!)

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Condorcet disagreed strongly with Borda's method, because it can fail to elect the Condorcet winner (if there is one).

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So, if all of these methods have problems, could there possibly be a better way that takes all of this into account?

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In his 1951 Ph.D. thesis, Kenneth Arrow proved the following theorem, which helped earn him the 1972 Nobel Prize in Economics:

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Arrow's Theorem: Consider the following conditions on a voting system:

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The only procedure that satisfies these conditions is dictatorship.

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Where do we go from here?

Since we can't have everything, we have to make non-mathematical choices about what factors to prioritize.

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• Simplicity: Is the method transparent to voters, legislatures, and courts?

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- What is politically practical to implement?

Don't let the perfect be the enemy of the good!

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For further reading:

- Donald Saari, Chaotic Elections! A Mathematician Looks at Voting
- Jordan Ellenberg, *How Not to Be Wrong: The Power of Mathematical Thinking*, Chapter 17: "There is no such thing as public opinion"

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