EPR's Count: Detailed Description

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Introduction

The basic justification for Evaluative Proportional Representation (EPR) is to help improve the workings of representative democracies. EPR helps to make it as likely as possible that the electorate will justifiably see the whole legislative body, such as a city council, and each citizen's representative, as responsible, accountable and wise.

Unlike any of the existing voting methods, EPR guarantees that each citizen's vote will continue to count proportionally in the deliberations of the legislative body, such as a city council. Each EPR voter is invited to assess the ideal qualities needed by the office and then to grade as many of the candidates as they might wish as either Excellent (*ideal*), Very Good, Good, Acceptable, or "Reject" (*completely unsuitable*). Each voter can give the same grade to more than one candidate. Each candidate not graded is automatically counted as a "Reject" by that voter. These grades can be counted by anyone who can add and subtract whole numbers, or in seconds by the program provided, EPRv2.r.

EPR's count uses each citizen's vote to select a winner based on the highest possible grade of at least Acceptable that they have given to any candidates. As a result, each citizen is assured that their vote will proportionally continue to count during the deliberations of their legislative body. Except in two cases, the voter's winner will be the candidate who receives the voter's *highest grade* of at least Acceptable. Exception 1: This candidate received too few votes to be elected. Exception 2: This candidate received too many votes (is super popular).

The second exception arises in order to remove the anti-democratic possibility of any winner retaining enough votes to dictate to the legislative body by receiving at least 50% plus one of all the votes. Consequently, our simulated EPR election limits the percent of the votes any super-popular winner can retain to 20%. (For more information, see EPR Figurative Description and Simulated Election Output from EPRv2.r.) This limit results in requiring at least three winners to agree before any majority decision can be made.

Summary of Stages in the Count

Stage 1 of EPR's count tallies how many voters exclusively but provisionally gave their highest grade to each of the candidates.

Stage 2 identifies any candidates that received more than the set percentage limit. Stage 2 transfers all the extra votes that are held by super-popular candidates to non-super popular candidates. A ballot containing a super-popular candidate's extra vote that also awards its remaining highest grade of at least Acceptable to an eligible candidate may be automatically transferred by the algorithm to that candidate. If such a candidate is absent on the ballot, this citizen's vote becomes a proxy vote that during Stage 4 must be publicly transferred by this super-popular candidate to an eligible winner they judge most fit for office.

Stage 3 elects the winners by identifying the target number of candidates who currently hold one of the largest numbers of votes. Next, Stage 3 automatically transfers each ballot currently held by an unelected candidate to the running total of an eligible winner. This process is similar to that for super-popular candidates: Votes are transferred to an eligible candidate who receives a remaining highest grade of at least Acceptable. If such a candidate is absent from the ballot, that voter's ballot automatically becomes a proxy vote that must be publicly transferred to an eligible winner during Stage 4 who is judged most fit for office by the candidate who received this voter's highest grade during Stage 1.[1&3]

Stage 4 transfers all the proxy votes. This starts with the candidate who initially received the largest number of votes in Stage 1 and who now has at least one proxy vote to transfer. It is transferred to an eligible winner she or he judges most fit for office. This is done personally and publicly. This maximizes the probability that only the most qualified winners will benefit from these proxy votes.[1&3]

The total number of votes received by each winner is the *weighted vote* each will use during the deliberations of the legislature. No vote is needlessly wasted. Each citizen is given every appropriate reason to be pleased.

Note: If in the unlikely event that fewer than the target number of winners have received all the votes cast by the electorate by the end of Stage 2, then this smaller number alone are automatically elected. This is because together they have already received each and every citizen's highest or remaining highest grade. Each citizen's vote has been fully counted without any avoidable quantitative or qualitative waste. Each citizen is proportionally represented directly by the winner who had received their vote. In this event, the remainder of Stages 3 and Stage 4 of EPR's count become unnecessary.

However, if a city or state chooses always to require a set number of representatives to be elected, the existing algorithm can be modified to guarantee this (see endnote 2). However, note that any such modification of the program may needlessly cause some citizens' votes to be partly wasted qualitatively.

To summarize, each voter's winner will be the candidate who receives the voter's *highest grade* except in two cases: 1) The candidate received too few votes to be elected; 2) The candidate given this highest grade has received too many votes and this ballot was selected to be transferred. Either of these exceptions require this voter's ballot to be transferred to an eligible remaining candidate on their ballot who has received their remaining highest grade. However, if the algorithm finds that a ballot does not grade an eligible winner in this way, this citizen's vote becomes a proxy vote that must be transferred during Stage 4. It is transferred to the winner judged most fit for office by the candidate on this ballot who received its highest grade in Stage 1. This maximizes the probability that only the most qualified winners will benefit from these transfers.[1&3]

All but Stage 4 of EPR's count can be completed within seconds by the computer program provided in EPRv2.r. That program follows the same more detailed steps described in greater detail below, except where noted.

Full Details of EPR's Count

Stage 1: Discovering the Total Number of Highest Grades Exclusively but Provisionally Counted for Each of All the Candidates

Stage 1 of the count discovers for which candidate each voter's highest grade is exclusively but provisionally received. These totals can only be provisional because some votes may need to be transferred to other candidates as determined in Stages 2 and 3.

At any point in the count, votes *(*grades) are called *affirmed evaluations* when they are provisionally counted within the running total for a particular candidate. Only after all the relevant citizens' votes have been finally distributed among the winners in Stage 4 do these different numbers of affirmed evaluation also become the weighted votes that each winner will have in the council.

Stage 1 starts with a matrix in which each row lists all the grades given to all of the candidates by each of the voters. The name (or code) of each candidate is placed at the top of each column. The code number of each citizen voter is listed on the left of each row. The grade given to each candidate by each voter is listed in his or her row in the column under that candidate.

In this matrix, the six *grades* are given ordinal numbers: 6 = Excellent, 5 = Very Good, 4 = Good, 3 = Acceptable, 2 = Poor, and 1 = Reject. Strictly speaking, these numbers are not cardinal because the grades they represent cannot be summed.

In Stage 1, the count starts with a Bucklin-like[1] process that determines the total number of highest grades awarded by all voting citizens. One grade from each voter is counted exclusively but provisionally for one of the candidates by the end of Stage 1. Only a grade of at least Acceptable may help to elect a candidate. At the beginning of Stage 3, the candidates are elected who have received the largest totals of affirmed evaluations by the end of Stage 2.

Again, only one of the grades awarded by a citizen to each of the candidates can be exclusively and provisionally added to the running total of affirmed evaluations for one of the candidates. This is required by the principle of one-citizen one-vote. As soon as this grade (vote) is provisionally added to the running total of one of the candidates, all the grades which that voter may also have awarded to other candidates on their ballot are provisionally marked as used. They will have no further effect on any grades to be counted for other candidates during the current stage of the count. The one grade that is being used from such a voter is given provisionally to the one candidate whose running total of affirmed evaluations is larger than any of the other candidates, even though other candidates may have been awarded the same grade by the same voter at that point in the count. This choice is justified by the assumption that the candidate who currently has the largest number of equal or higher evaluations is probably the one most qualified for office.[1]

Next, Stage 1 begins the round-by-round task of finding the total number of Excellents (if any) that must be added to the running totals of affirmed evaluations for each candidate.

Round 1 of Stage 1 discovers which of all the candidates has received the largest number of Excellents. Again, this candidate retains these votes exclusively but provisionally, even though some of the ballots counted for this candidate may also have awarded the same grade to other candidates. If at some point in the count two or more candidates are tied with the largest number of affirmed evaluations, the candidate to receive these votes exclusively is determined by lot.

Round 2 of Stage 1 determines which candidate has exclusively received the next highest number of affirmed evaluations. Successive rounds of Stage 1 discover which of all the remaining Excellents are exclusively but provisionally added in turn to the running total of affirmed evaluations for each of the other candidates. When no further Excellents remain among the uncounted ballots, further rounds similarly discover to which candidates' running totals of affirmed evaluations each of the remaining Very Goods, Goods, and Acceptables are added. No grade of Poor or Reject is added to any of these totals.

Given that each candidate might receive any one of the four possible highest grades that could have been added to their running totals from any voters, it could take up to a total number of rounds equal to four times the number of candidates to complete the count in Stage 1.

By the end of Stage 1, only one of the highest grades in each row of the matrix is the grade that has been exclusively but provisionally added to the running total of affirmed evaluations for one of the candidates. The only exception is if a ballot gives no candidate a grade of Acceptable or better. In effect, this citizen has not voted for any candidate.

Stage 2: Avoiding Dictatorship by Transferring All *Extra* Citizens' Votes from any Super-Popular Candidates to other Candidates

If EPR's count were to end with Stage 1, it is unlikely but theoretically possible that in some elections, one of the candidates could receive at least 50% plus one of all the citizens' votes. This would enable such a winner to *dictate* to the council. To avoid this anti-democratic possibility, Stage 2 limits the percentage of all the votes in the council that any super-popular winner may retain, such as the 20% used in our simulated election count.

Therefore, the first step in Stage 2 determines if any candidates have more than the permitted limit of affirmed evaluations. Any candidate's votes that exceed the vote limit are transferred to other eligible candidates. In order to give the fullest possible scope for citizens' ballots to determine which other candidates must receive these extra votes, all the ballots currently counted for such a super-popular candidate must be examined for any that also award a remaining highest grade to an eligible remaining candidate. Each ballot that contains such an extra vote may have to be transferred to the relevant remaining candidate.

If there are fewer or the exact number of such required transferable ballots available, these are automatically transferred respectively to each of the candidates so graded. If there are more such ballots than needed, the particular ballots to help transfer the required number of extra votes must be selected by lot. The candidate order in which all these transferable votes is made is determined by lot.

In addition, each remaining extra vote that cannot be automatically transferred by the algorithm must be publicly transferred as a proxy vote during Stage 4. It must be given to the eligible winner judged most qualified for office by the candidate who received the ballot containing this potential proxy vote during Stage 1.

Stage 3: Winners are Identified, and Citizens' Votes Given to Unelected Candidates Are Transferred to the Winners

First, Stage 3 discovers the target number of winners by identifying the number of candidates who have received the largest number of affirmed evaluations by the end of Stage 2. Any tie between candidates to become one of the winners is decided by lot. (This is how the current program (EPRv2.r) works but the next program will first try to decide any tie by seeing if one of the tied candidates has the highest 'score'. Each score is calculated by summing the set of

ordinal numbers (all the grades) each tied candidate currently holds as if they were cardinal numbers.)

Once the target number of winners has been determined, Stage 3 goes on to discover how all the affirmed evaluations currently held by all the unelected candidates must be transferred to the current running totals of the winners. This is because EPR promises that each citizen's vote will continue to count proportionally in the deliberations of the council.

Starting with the unelected candidate selected by lot, each of the candidate's ballots is examined for a remaining highest grade of at least Acceptable that is awarded to an eligible winner (any ties decided by lot). If found, this vote is transferred to that eligible winner. This process continues for each of the remaining unelected candidates.

When no grade of at least Acceptable for one of the eligible winners is marked on a ballot currently held by an unelected candidate, this ballot automatically becomes this citizen's proxy vote. Each such proxy vote must be transferred during Stage 4 to the eligible winner judged most fit for office by the candidate who initially received this ballot during Stage 1. This maximizes the probability that only the most qualified winners will benefit from these transfers.[1&3]

Stage 4: Transferring any Proxy Votes to Finalize the Number of Weighted Votes each Winner will have in the Council (Legislature).

Note that EPR's program is complete at the end of Stage 3.

Stage 4 is where each proxy vote is personally and publicly transferred to the winner judged most fit for office by the candidate who during State 1 received the ballot containing this potential proxy vote that was discovered in Stage 2 or 3.[3]

As a final result, one vote from each of all the citizens will have been added to the total of affirmed evaluations held by one of the winners. These totals also define the different *weighted vote* that each winner will have in the legislative body such as a council.

This is how EPR gives every citizen every appropriate reason to vote, vote honestly, and to be pleased with the election. At the same time, the voting power of each winner in the council is proportionally increased by the single vote of each relevant elector. No vote is needlessly wasted quantitatively or qualitatively.

END

Endnotes

1. Originally, Bucklin voting was a single-winner voting method. It is named after its promoter, James W. Bucklin. First choice votes are counted first. If one candidate has an absolute majority, that candidate wins. Otherwise, the second choices are added to the first choices, and so on until one candidate has received a majority (see https://www.electology.org/bucklin-voting). EPR uses Bucklin's apparent assumption that, other things being equal, the candidate most qualified for office is probably the one who receives the largest number of highest grades. We also assume that such a candidate will probably be seen by their voters as the candidate most qualified, and if necessary, also most trusted to judge which winner should receive their proxy vote.
2. Following is an explanation of how EPR's algorithm could be modified to guarantee that any target number of representatives will be elected. Some cities or states may require this even though any such modification may needlessly cause some citizens' votes to be partly wasted qualitatively.

   Again, the following modifications to the existing algorithm would apply only in the unlikely event that fewer than the target number of winners had received all the votes by the end of Stage 2:

   First, identify all of the ballots currently held by each of the already elected candidates that also award a remaining highest grade to a remaining candidate who still has not received any affirmed evaluations by the end of Stage 2. Start with the current winner who provisionally held the largest number of affirmed evaluations at the end of Stage 1 (any tie resolved by lot).[1] Automatically transfer one of their ballots chosen by lot to the relevant candidate who currently has no votes. Do the same with a ballot currently held by the winner with the second highest number of affirmed evaluations at the end of Stage 1. Continue such transfers from the third, and fourth, etc. current winners until each of the target number of winners has received at least one vote. If necessary, repeat this chain of one at a time transfers until all the desired number of winners are elected with at least one vote.

   If this procedure fails to elect the target number of winners, the remaining number must be elected by transferring one proxy vote at a time to one of the candidates who still has not received any affirmed evaluations. Again, this last-resort-process must start with the winner who initially received the largest number of affirmed evaluations[1] by the end of Stage 1 (any tie resolved by lot).This process ends when all the target number of winners have been elected with at least one vote.

   Alternatively, the limit can be adjusted to guarantee any minimum number of winners.

   3. Note that this is how the next computer program will work. The current program instead requires the relevant unelected candidate during Stage 4 to decide which eligible winner will receive any of the proxy votes she or he currently holds.