

# Recount in Dade County? A Statistical Analysis

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## 1 Summary

A precinct-level statistical analysis of Miami-Dade County, Florida, shows the following.

- If the hand-count of ballots is completed, Vice-President Gore is expected to gain 254 votes relative to Governor Bush. This includes both the 157 votes from the existing hand-count of 135 precincts, plus an additional net 97 votes from a hand-count of the remaining 655 precincts.
- A 95% confidence interval for the net gain is [172, 336].
- A 95% confidence interval for the net gain from the uncounted 655 precincts is [15, 179].

This analysis is a precinct-by-precinct analysis. It is based on the following statistical assumptions.

- The hand-count will yield new votes from the undervotes, the latter as reported by the first machine count of the ballots.
- Voters and Undervoters in individual precincts are random draws from the distribution of voters in their precincts.
- The canvassing board will use the same criterion to assess ballots as they did in their hand-count of the first 135 precincts.
- The canvassing board assesses ballots with error.
- This “error rate” is constant across precincts and candidates. Our estimate of this rate is 8%.

## 2 Analysis

The methodology is essentially identical to that outlined in my paper “A NonParametric Analysis of UnderVotes in the Palm Beach Presidential Vote: Implications of a Recount,” (see <http://www.ssc.wisc.edu/~bhansen/vote/vote.html>) with the important exception that the probability of assessment error is added.

In precinct  $i$ , let  $P_i$  denote the proportion of votes which are cast for a particular candidate, let  $U_i$  be the number of undervotes, and let  $C_i$  be the number of undervotes counted by the canvassing board for the candidate. Let  $r$  be the “yield rate” – the percentage of undervotes that are found hand-readable in the hand recount. Let  $q$  be the “error rate” – the probability that the canvassing board makes an error when assessing a ballot which has been found to be hand-readable.

To estimate the yield rate  $r$ , we observe that in the hand-count of the initial 135 precincts, there was a yield of 417 votes (287 for Gore and 130 for Bush) out of 2030 undervotes. This implies a yield rate of  $417/2030 = 0.205$ , or 20.5%.

We now calculate the error rate  $q$ . Assuming that  $q$  is independent of the precinct and candidate, we see that

$$C_i = U_i P_i (1 - q)r + U_i (1 - P_i)qr.$$

Summing over precincts and solving for  $q$ , we find

$$q = \frac{\sum_{i=1}^n C_i - \sum_{i=1}^n U_i P_i r}{\sum_{i=1}^n U_i r - 2 \sum_{i=1}^n U_i P_i r}.$$

Using data from the 135 precincts in Dade County which have been hand-recounted, we replace  $P_i$  by the observed proportion of total votes for the candidates and use the estimate  $r = .205$  discussed above. This yields  $q = 0.08$  or 8%. This is the rate we use for this analysis, and ignore uncertainty in its estimation and out-of-sample prediction.

Next, we calculate the forecasted votes for the 655 precincts which were not hand-counted. To do this, we calculate the percentage of votes for Vice-President Gore and Governor Bush as reported in the machine count, and then use the above formula to compute the probability that the hand-counters will assess the ballots for each candidate.

As a test case, we can apply this method to the initial 135 precincts. This is only a crude assessment, since the error rate is calculated from this data. For these precincts, our method backcasts a net gain for Gore of 192 votes, with a 95% confidence interval of [150, 235], embracing the actual number of 157. If the error rate is assumed to be zero, then the backcast would have been 229 with an interval of [185, 273] which is inconsistent with the observed value. The introduction of the error rate reduces the gain for Gore by reducing the percentage of votes assessed in his favor. This improves the performance of the forecasting method and improves its reliability.

It is also helpful to compare our forecasts with those produced by Christopher Carroll and H. Peyton Young (<http://www.econ.jhu.edu/people/ccarroll/carroll.html>) which was written before the aborted hand count. Carroll and Young had forecast a net gain for Gore of 126 votes. The only difference with my method was that they effectively set  $q = 0$  (no assessment error), and more importantly used a yield rate of 7%. Otherwise, our point forecasts are based on the same formulae. Our confidence intervals are different, as those reported here take several sources of uncertainty into account.