



Election Auditing Methods Answer Three Questions

What election audit sample size would detect, to a desired confidence level, the smallest amount of vote miscount which would result in an incorrect election outcome?

Given the discrepancies found in an election audit, should we certify the election or expand the audit and what confidence level is there that the election outcome is correct?

What procedures are required to make election outcomes publicly verifiably accurate?

Research on Election Audits that Officials Need To Know

Arel Cordero, David Wagner, and David Dill, *The Role of Dice in Election Audits* (June 29, 2006)

<http://www.cs.berkeley.edu/~daw/papers/dice-wote06.pdf>

Kathy Dopp and Frank Stenger, *The Election Integrity Audit* (September 25, 2006)

<http://electionarchive.org/ucvAnalysis/US/paper-audits/ElectionIntegrityAudit.pdf>

Dopp, *Fool Me Once: Checking Vote Count Integrity*, (March 3, 2007)

<http://electionarchive.org/ucvAnalysis/US/paper-audits/TierElectionAuditEval.pdf>

Dopp, *Federal Election Audit Costs*, (March 21 2007)

<http://electionarchive.org/ucvAnalysis/US/paper-audits/FederalAuditCosts.pdf>

Javed Aslam, Raluca Popa, and Ronald Rivest, *On Estimating The Size and Confidence of a Statistical Audit* (August 6, 2007) <http://people.csail.mit.edu/rivest/AslamPopaRivest-OnEstimatingTheSizeAndConfidenceOfAStatisticalAudit.pdf> and slides by Popa

<http://people.csail.mit.edu/rivest/AslamPopaRivest-OnEstimatingTheSizeAndConfidenceOfAStatisticalAudit.ppt>

<http://people.csail.mit.edu/rivest/AslamPopaRivest-OnEstimatingTheSizeAndConfidenceOfAStatisticalAudit.ppt>

<http://people.csail.mit.edu/rivest/AslamPopaRivest-OnEstimatingTheSizeAndConfidenceOfAStatisticalAudit.ppt>

Philip B. Stark, *Conservative Statistical Post-Election Audits* (October 16, 2007)

Dopp's *Preliminary Analysis of Stark's* paper (October 27, 2007)

<http://statistics.berkeley.edu/~stark/Preprints/conservativeElectionAudits07.pdf>

<http://electionarchive.org/ucvAnalysis/US/paper-audits/Corrections2PhillipStark.pdf>

* * Dopp, *History of Confidence Election Auditing Development (1975 to 2007) & Overview of Election Auditing Fundamentals* (October 22, 2007) <http://electionarchive.org/ucvAnalysis/US/paper-audits/History-of-Election-Auditing-Development.pdf>

<http://electionarchive.org/ucvAnalysis/US/paper-audits/History-of-Election-Auditing-Development.pdf>

<http://electionarchive.org/ucvAnalysis/US/paper-audits/History-of-Election-Auditing-Development.pdf>

Legislative Language for Election Auditing

Dopp and Joycelynn Straight, *Legislative Vote Count Audit Proposal*, (May 2006, updated

November 2006) <http://electionarchive.org/ucvAnalysis/US/paper-audits/VoteCountAudit-UT.pdf>

New Jersey Election Audit Legislative Proposal (June 5, 2007) p. 19 – 25 [note: This proposal has some procedural weaknesses that would allow the audit to be manipulated.]

http://www.njappleseed.net/entity_pdfs/175.pdf

Dopp, *Amendment Suggestions for the Senate Ballot Integrity Act of 2007 (S1487)*, (September

2007) <http://electionmathematics.org/em-legislation/S1487Amendments.pdf>

An easy-to-use, understandable election auditing manual is needed with pictures, forms, simple step-by-step instructions, and spreadsheet and/or program tool-kits for lay persons.

Eight Steps for Conducting Confidence-Level Election Audits

1. Release a public report of unofficial machine counts including the number of ballots cast within each auditable vote count and the vote counts “for” or “against” any issue, judge, or candidate – including Election Day, early, mail-in, and provisional counts.¹
2. For confidence-level election audits, use the auditable report from step one to
 - a. determine the minimum number of auditable vote counts which could wrongly alter election outcomes², and
 - b. use the amount found in step 2a to calculate a 99% confidence audit sample size using trial-and-test, the Aslam-Popa-Rivest estimate, or the exact Dopp-Stenger numerical method.³
3. Publicly select the random sample of auditable vote counts from the reported counts in step one.
4. Conduct the publicly observable manual counts of voter-verified paper ballots in the sample.
5. Compare the manual counts with the auditable report of machine counts from step one.
6. Investigate the discrepancies, make all possible corrections to the unofficial results, evaluate the discrepancies between manual and machine counts using the Dopp and/or Stark methods to decide whether or not to certify the results or to expand the manual count, possibly to a full hand count (steps 3 – 6 may have to be repeated until the race can be certified with confidence).
7. Publicly release the official election results and the results of the audits, including the amount and type of discrepancies and any actions taken to resolve or explain discrepancies between the initial unofficial counts, the manual audits, and the official certified results.
8. Certify the election results or call for another election for any races left in doubt (this would only be necessary if sufficient numbers of voter-verified paper ballots were missing or damaged).

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Bios: Dopp founded US Count Votes, DBA NEDA, a nonprofit group of primarily volunteer mathematicians and statisticians concerned about election integrity, in response to anomalous Florida 2004 vote patterns; mathematically proved that the attempts to dismiss the exit poll evidence of vote miscount in the 2004 presidential election were incorrect; and with Ron Baiman derived new methods to evaluate exit poll discrepancies for consistency with vote miscount or exit poll response bias.⁴ Dopp's analyses of the 2004 presidential election results, with NEDA's statistician volunteers, were cited by Representative John Conyers, Mark Crispin Miller, and Robert F. Kennedy. Dopp's focus has been election auditing methods since summer 2006. The Dopp-Stenger “confidence level” election auditing calculation method was used in the Cuyahoga County Ohio Collaborative Election Audit, and Dopp's graphical method for evaluating election audits was touted in Verified Voting's election auditing paper.⁵



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¹ Election records necessary to verify the integrity of the audit must also be publicly available, and the public must have oversight over and be able to verify security procedures for paper ballots and election records.

² Experts debate over details of the methods to do this. The options that a State uses affect both the size of the initial audit sample and the rest of the audit procedures. Note: If your state does not use confidence audits you can still calculate the probabilities for your audit sample to detect vote fraud for particular races. Audit sample sizes calculated on the county-level give higher confidence.

³ These calculations can be done with a spreadsheet tool.

⁴ See “*Mathematical Proof that Election Sciences Institute's Test to Rule Out Vote Fraud Is Logically Incorrect*” <http://electionarchive.org/ucvAnalysis/US/exit-polls/ESI/ESI-hypothesis-illogical.pdf> and “*Vote Miscounts or Exit Poll Error? New Mathematical Function for Analyzing Exit Poll Discrepancy*” <http://electionarchive.org/ucvAnalysis/US/Exit-Poll-Analysis.pdf> and “*2004 Presidential Election – Compendium of Attempts to Dismiss ‘Vote Fraud’*” <http://electionarchive.org/ucvAnalysis/US/IncorrectElectionDataAnalysis-06.pdf>

⁵ Verified Voting did not attribute the method it touted and used in 5 of its 8 charts to Dopp's earlier March work which it replicated.