

Statistical Audits—Why Bother?

2007 Post Election Audit Summit
Minneapolis, MN
25–27 October 2007

Philip B. Stark
Department of Statistics
University of California, Berkeley
statistics.berkeley.edu/~stark

Machine (Voting System) Counting

- Want to count votes by machine: saves time and money.
- Machine counts are subject to various kinds of error. (So are hand counts, but they're the gold standard.)
- Counting errors \Rightarrow risk that machines name the wrong winner.

Statistical Audits

Can *limit* and *quantify* that risk.

Could guarantee that, if the election is certified,

either

machines named the right winner

or

a rare event (say, 1 in 100) happened

even if the voting system has hardware or software bugs.

Selecting precincts at random is essential.

Complete procedure says:

- how many precincts to audit initially
- given the discrepancies in the audit sample, whether to certify or expand the audit
- eventually, “certify” or “full recount.”

Ensures chance of certifying wrong winner is at most 1%,
e.g.

How big does a statistical audit have to be?

Varies by *contest*. Depends on:

- desired level of confidence in the outcome, e.g., 99%
- margin in contest:
votes for apparent winner – votes for apparent runner-up
- # precincts in contest, # ballots in each precinct
- discrepancies the audit finds
- possibly, assumptions about max possible miscount by precinct

No flat percentage (other than 100%) always suffices.

Important principles

Sample too small \Rightarrow can be likely that discrepancies in the sample will be small or zero, even if machines named the wrong winner.

No look, no see: absence of evidence is not evidence of absence (of error).

Sample big enough \Rightarrow likely to see big discrepancies in the sample if machines named wrong winner.

Smaller samples \Rightarrow lower confidence.

Larger discrepancies in sample \Rightarrow lower confidence.

Rigorous statistical audit

If it's very likely that the audit would have found larger discrepancies than it did find, had the machines named the wrong winner, certify.

Otherwise, keep counting.

With this approach, if an election is certified, either the correct winner was named, or something very unlikely happened.