Close Enough for Government [to] Work

Philip B. Stark

Department of Statistics
University of California, Berkeley

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Verified Voting
Palo Alto, California

[Election Leak] [CNN: DC hack]
Things to keep in mind

The difference between theory and practice is smaller in theory than it is in practice. (Various)

The purpose of elections is to convince the losers that they lost. (D. Wallach)

The purpose of election audits is to convince rational people that the losers lost. (PBS)
Grand jury has its hands full with Saguache election case, by Troy Hooper

A disputed election in south-central Colorado is now in the hands of a grand jury that is reviewing allegations that the clerk and other officials committed crimes when they tallied the votes.

... 

Officials in Saguache County stand accused of more than 30 misdemeanors.

The Colorado Independent, 25 March 2011,

http://coloradoindependent.com/80819/grand-jury-has-its-hands-full-with-saguache-election-case
Waukesha County, WI: Oops!

Wisconsin Election Surprise: David Prosser Gains 7,500 Votes After ‘Human Error’ In Waukesha County, by Amanda Terkel

There were 3,456 missing votes for Democratic-backed challenger JoAnne Kloppenburg and 11,059 for incumbent GOP-backed Justice David Prosser. Kloppenburg has previously been beating Prosser by just 200 votes of the roughly 1.5 million cast statewide.

“The spreadsheet . . . inadvertently was not saved.”

HUFFINGTON POST, 7 APRIL 2011,

NC GOP leader: Touchscreen voting machines have programming flaw, by Michael Biesecker

The chairman of the N.C. Republican Party alleged Thursday that a programming flaw with touchscreen voting machines used for early voting in 36 counties is causing votes intended for GOP candidates to be counted for Democrats.

Serious Error in Diebold Voting Software Caused Lost Ballots in California County, by Kim Zetter

Election officials in a small county in California discovered by chance last week that the tabulation software they used to tally votes in this year's general election dropped 197 paper ballots from the totals at one precinct. The system's audit log also appears to have deleted any sign that the ballots had ever been recorded.

California Elections Code § 15360

[T]he official conducting the election shall conduct a public manual tally of the ballots tabulated by those devices, including absent voters’ ballots, cast in 1 percent of the precincts chosen at random by the elections official . . .

The official conducting the election shall include a report on the results of the 1 percent manual tally in the certification of the official canvass of the vote. This report shall identify any discrepancies between the machine count and the manual tally and a description of how each of these discrepancies was resolved . . .
What should audits do?

Pro forma audits
Most audit laws have no clear goal: “count and stop,” or “count and explain discrepancies.”

Compliance vs. materiality audits
Compliance: Were proper procedures followed? (e.g., secure chain of custody?)
Materiality: Did any errors that occurred despite compliance matter?

Effective materiality audit
Correct the outcome if it is wrong.
Can require counting the entire audit trail by hand.
California AB 2023 (Saldaña, sponsored by SoS Bowen)

(b)(3) “Risk-limiting audit” means a manual tally employing a statistical method that ensures a large, predetermined minimum chance of requiring a full manual tally whenever a full manual tally would show an electoral outcome that differs from the outcome reported by the vote tabulating device for the audited contest. A risk-limiting audit shall begin with a hand tally of the votes in one or more audit units and shall continue to hand tally votes in additional audit units until there is strong statistical evidence that the electoral outcome is correct. In the event that counting additional audit units does not provide strong statistical evidence that the electoral outcome is correct, the audit shall continue until there has been a full manual tally to determine the correct electoral outcome of the audited contest.

Unanimous bipartisan support in both houses.
11 counties committed to pilots; 20 interested.

Verified Voting helped draft AB 2023 and endorsed it.
**Strongly Software-Independent Voting System**

A voting system is strongly software-independent if an undetected error or change to its software cannot produce an undetected change in the outcome, and we can find the correct outcome without re-running the election.

**Risk-limiting Audit**

Large, known chance of a full hand count if the outcome is wrong, thereby correcting the outcome.

Risk is maximum chance of failing to correct an apparent outcome that is wrong, no matter what caused the outcome to be wrong.
New (Big?) Idea

Resilient Canvass Framework

Known minimum chance that the overall system (human, hardware, software, procedures) gives the correct election outcome.

Combine a strongly software-independent voting system with a compliance audit and a risk-limiting audit.
Risk-Limiting Audits in California

Marin County (February 2008; November 2008, 2009)
Orange County (March 2011)
Yolo County (November 2008, 2009)
Santa Cruz County (November 2008)
Monterey County (next week!)

Measures requiring super-majority, simple measures, multi-candidate contests, vote-for-\( n \) contests.

Contest sizes ranged from about 200 ballots to 121,000 ballots.
Counting burden ranged from 32 ballots to 7,000 ballots.
Cost per audited ballot ranged from nil to about $0.55.
2008 Yolo County, CA Measure W Audit
Scary news  Legislation  Goal of auditing  Big Ideas  Pilot audits  Ballot-level audits  Conclusions
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<tr>
<th>Scary news</th>
<th>Legislation</th>
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**Goal of auditing**

**Big Ideas**

**Pilot audits**

**Ballot-level audits**

**Conclusions**

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**TALLY SHEET**

**NUMBER OF VOTES CAST FOR EACH CANDIDATE**

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<td>153</td>
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**Sign Certificate on Front Cover**
2011 Orange County, first audit under AB 2023
commercial development adopted?

☐ Yes
☐ No

Contest: Vote for 1
commercial development adopted?

- Yes
- No

Contest: Vote for 1
Batch size matters

100 bags of 100 jelly beans, various flavors. What fraction are coconut?

Compare pulling a bag at random to stirring all the beans together in a big pot and sampling 100 beans.

Vote-tabulation errors are like coconut jelly beans. Less information in checking bags of beans—or batches of ballots—than in checking the same number drawn individually from the “pot.”

Yolo County Measure P, November 2009: For 10% risk limit, initial sample 6 batches, 1,437 ballots (11.33%).

Could have gotten 10% risk limit by checking 6 individual ballots (less than 0.05%).
Orange County Statutory Audit

Votes in one precinct counted by hand. No errors found.

Chance the 1% audit would find no errors even if the outcome is wrong could be over 88%.

The error rate in the sample says little about the error rate in the whole contest because the batch is large: One bag might have no coconut jelly beans, even though the rest have many.
Orange County Audits: Costs

Statutory Audit: $257.68
Scales as the size of the contest: a contest twice as large would cost about twice as much to audit.

AB 2023 risk-limiting audit (10% risk): $483.79 (not including my time or airfare)
Would have cost essentially the same for any contest with the same percentage margin, no matter how large the contest.

Only have to taste a teaspoon of soup to tell if the soup is too salty, no matter how big the pot—if it’s stirred well.
Advantages of ballot-level RLA

Like sampling jelly beans from a big pot, instead of sampling bags of jelly beans.

- cheap (if technology supports it—working with vendors)
- fast and observable
- easy computations
- easy to explain

Tested in Yolo and Orange; next week in Monterey.

Expect to audit multi-jurisdictional contest in 2012.

Hope to have ballot-level audits in at least 5 California jurisdictions in 2012.

Secret sauce: have to associate individual CVRs with ballots.
Role of Verified Voting

- Promotes good ideas; defends against bad ones
- Becoming the definitive clearinghouse for state and national audit-related information, including law, pending legislation, and best practices
- Helps draft state and federal legislation (including AB 2023)
- Endorses good legislation and procedures that improve reliability and transparency (including AB 2023 and risk-limiting audits).
- Has provided volunteers to observe and help with pilot audits.
- Has helped me travel to conferences to develop, refine, and promote effective, efficient election audits (to secretaries of state, elections officials, election integrity advocates, computer scientists, voting equipment vendors, ...).