Evidence-Based Elections and Risk-Limiting Audits

Emerging Election Technologies Enhancing Integrity, Transparency, and Confidence
AAAS Annual Meeting

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3 March 2023

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Half of Republicans say Biden won because of a 'rigged' election: Reuters/Ipsos poll

(Reuters) - About half of all Republicans believe President Donald Trump "rightfully won" the U.S. election but that it was stolen from him by widespread voter fraud that favored Democratic President-elect Joe Biden, according to a new Reuters/Ipsos opinion poll.

The Nov. 13-17 opinion poll showed that Trump's open defiance of Biden's victory in both the popular vote and Electoral College appears to be affecting the public's confidence in American democracy, especially among Republicans.
Evidence-Based Elections

PB. Stark and D.A. Wagner

Abstract—We propose an algorithm to combat improvements in certifying voting equipment and conducting elections. We argue that elections should be conducted in a way that captures meaningful evidence that the voting equipment actually reflects the will of the voters. Our approach, which we call a "meaningful paper trail," can be implemented in a combination of code and human oversight. We suggest that this mechanism would provide a meaningful paper trail that can be used to verify the election results.

EVIDENCE-BASED ELECTIONS: CREATE A MEANINGFUL PAPER TRAIL, THEN AUDIT

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CITE AS: 4 GEO. L. TECH. REV. 523 (2020)

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Abstract

Elections seem simple—are they just about counting? But they have a unique, challenging combination of security and privacy requirements. The stakes are high, the context is adversarial; the election-equipment needs to be convinced that the results are correct; and the secrecy of the ballot must be ensured. They also have practical constraints: time is of the essence, and voting systems need to be affordable and maintainable, as well as usable by voters, election officials, and poll workers. It is thus not surprising that voting is a rich research area spanning theory, applied cryptography, practical systems analysis, usable security, and statistics. Election integrity involves two key concepts: convincing evidence that outcomes are correct and privacy, which amounts to convincing assurance that there is no evidence about how any given person voted. These are obviously in tension. We examine how current systems walk this tightrope.
Evidence-Based elections (Stark & Wagner, 2012)

- Elections should provide *affirmative* public evidence that reported winners really won, not just report who won.
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- Elections should provide *affirmative* public evidence that reported winners really won, not just report who won.
- Procedure-based versus evidence-based
EBE: trustworthy paper + risk-limiting audits

RLA: any procedure w/ a known maximum chance of not correcting the reported outcome if it’s wrong & never changes correct outcomes.
**EBE: trustworthy paper + risk-limiting audits**

*RLA:* any procedure w/ a known maximum chance of not correcting the reported outcome if it’s wrong & never changes correct outcomes.

*Risk limit:* max chance of *not* correcting reported outcome if it’s wrong, no matter why it’s wrong.
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RLA corrects wrong outcomes via a full hand count of trustworthy paper trail.
Implementing Risk-Limiting Post-Election Audits in California

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Abstract

Risk-limiting post-election audits limit the chance of certifying an electoral outcome if the outcome is not what a full hand count would show. Building on previous work [18, 17, 20, 21, 11], we report pilot risk-limiting audits in four elections during 2008 in three California counties: one during the February 2008 Primary Election in Marin County and three during the November 2008 General Elections in Marin, Santa Cruz and Yolo Counties. We explain what makes an audit risk-limiting and how existing and proposed laws fall short. We discuss the differences among our four pilot audits. We identify challenges to practical, efficient risk-limiting audits and conclude that current approaches are too complex to be used routinely on a large scale. One important logistical bottleneck is the difficulty of exporting data from commercial election management systems in a format amenable to audit calculations. Finally, we propose a bare-bones risk-limiting audit that is less efficient than these pilot audits, but avoids many practical problems.
Elections should be conducted with human-readable paper ballots. Paper ballots form a body of evidence that is not subject to manipulation by faulty software or hardware and that can be used to audit and verify the results of an election. Human-readable paper ballots may be marked by hand or by machine (using a ballot-marking device), and they may be counted by hand or by machine (using an optical scanner), the report says. Voters should have an opportunity to review and confirm their selections before depositing the ballot for tabulation. Voting machines that do not provide the capacity for independent auditing – i.e., machines that do not produce a printout of a voter’s selections that can be verified by the voter and used in audits – should be removed from service as soon as possible.

States should mandate a specific type of audit known as a “risk-limiting” audit prior to the certification of election results. By examining a statistically appropriate random sample of paper ballots, risk-limiting audits can determine with a high level of confidence whether a reported election outcome reflects a correct tabulation.
• Pilots starting in 2008 in California; now ~60 in ~16 states.


• Laws (of varying quality) in CA, CO, CT, GA, NV, NJ, OH, OR, RI, TX, VA, WA

• SHANGRLA (2020): unifies broad variety of sampling plans, audits of plurality, multi-winner plurality, supermajority, approval, IRV/RCV, D’Hondt, Hamiltonian, Borda, STARVote, all scoring rules
Can’t limit risk w/o trustworthy vote records. GIGO
- ~20% of U.S. votes aren’t recorded on paper
- many jurisdictions lack physical security, ballot accounting, pollbook reconciliation, secure chain of custody, rigorous canvass
- reliance on universal-use BMDS:
  - HMPB records what voters did
  - Machine-marked ballots (BMD) records what machines did
  - BMD printout cannot provide affirmative evidence outcomes are correct
- auditing a contest provides no evidence about other contests
- *Cargo-cult audits*: go through some of the motions of an RLA but don’t actually limit the risk of certifying wrong outcomes (GA 2020, 2022)
- some experts blur distinction btw *fault detection* & *affirmative evidence*: like checking for signs of forced entry vs. checking whether anything is missing.
- RLAs of trustworthy paper check whether anything is missing. RLA procedures applied to untrustworthy paper just look for signs of forced entry.
Evidence-Based Elections: 5 C’s

- Voters *CREATE* complete, durable, verified, trustworthy audit trail.
- LEO *CARES FOR* the audit trail adequately to ensure it remains complete and accurate.
- Verifiable audit *CONFIRMS* integrity of paper trail, *CHECKS* reported results against the paper & *CORRECTS* wrong outcomes