A Critique of Verified Voting's "Percentage-based versus SAFE Vote Tabulation Auditing: A Graphic Comparison"

and The Brennan Center's "Post-Election Audits: Restoring Trust in Elections"
http://electionarchive.org/ucvInfo/US/audits/SAFE-Auditing-July-26-Final.pdf
http://www.brennancenter.org/dynamic/subpages/download_file_50228.pdf

For brevity, the authors of the above paper, put out by Verified Voting, are referred to as "SAFE" Authors. Significant revisions of this paper were lost when a file became unreadable, and I have not yet restored it from a printed version.

The "SAFE" Election Audit is Simply Re-Packaged "Confidence-level" Election Audit Calculation Methods Developed Earlier

- **The language in Verified Voting's "SAFE" paper leads a casual reader to believe that the authors are presenting new methods that the authors developed themselves.**[i] Yet "SAFE's" authors are describing others' prior work for the most part. (Although the "SAFE" authors do present one new method for estimating the minimum number of precincts which could wrongly alter an election outcome in an appendix – the authors' new formula is unnecessary; they fail to provide any theoretical derivation or empirical data to support its use; and the formula given for their own original work is incorrect because it has parentheses in the wrong place, giving impossible results[ii].)

- The **title** of VV's paper "Percentage-based versus SAFE Vote Tabulation Auditing: A Graphic Comparison"
  - **Failure to Cite: Yet, the graphical method of evaluating election audits was developed and publicly presented by Dopp in March 2007 paper**[iii]. Verified Voting's "SAFE" authors fail to cite Kathy Dopp's paper which 4 months earlier, known to the VV authors, publicly released the method that their paper touts in its title and uses on p. 2, 8, 10, 13, and 15 in Figures 1, 2, 4, 7, 8.
  - **"SAFE" audits is just another name for 'fixed probability" or "confidence level" election audits** that have been recommended by other authors[iv] since July 2006, and even back as far as 1978 by Roy Saltman, and were recently required by the California Secretary of State.

- **The authors fail to mention that Dopp and Stenger derived precise correct numerical method**s[v], **for the quantities that the authors provide estimates for**:
  - Calculating the exact minimum number of precincts that could wrongly alter an election outcome. This is a necessary first step in the calculation of "confidence level" audits.
  - Calculating the exact sample sizes for "confidence level" election audits. The formula the SAFE authors recommend as "the" "SAFE" audit is an accurate, but not a precise, estimate of the audit amount that Dopp and Stenger provided the calculation method for in "The Election Integrity Audit" September 2006.[1] Aslam, Popa, and Rivest created the accurate

[1] http://electionarchive.org/ucvAnalysis/US/paper-audits/ElectionIntegrityAudit.pdf

estimate for calculating the sample size that the authors discuss in the text and present in their appendix.[2]

"SAFE's" Authors Give Two Incorrect Election Auditing Formulas:

When writing formulas parentheses must be in the correct places because calculated values are entirely different if parentheses are incorrectly placed. By putting parentheses in the wrong places within the only two formulas this paper gives, anyone using these formulas for calculating election audits would get the wrong answers that make no sense.

"SAFE" Authors Give Incorrect Formula for Calculating "Confidence-Level" Audit Sizes

- The authors incorrectly copied the formula of Aslam, Popa, and Rivest for calculating election audit sample sizes.[vi]

"SAFE" Authors Give Incorrect Formula for Estimating the Amount of Vote Miscount that Could Wrongly Alter an Election Outcome.

- The authors new formula for estimating the minimum amount of corrupt precincts based on a previous Ohio election is incorrect.[vii]

SAFE's Authors Recommend Using Incorrect Calculation Methods

LOGIC PROOF THAT THE METHOD DOPP RECOMMENDs FOR CALCULATING ELECTION AUDITS HANDLES UNDERVOTES CORRECTLY BUT THE STANISLEVIC METHOD RECOMMENDED BY VERIFIED VOTING AND THE BRENNAN CENTER DOES NOT

An algebraic proof is not possible here for the same reason that Stenger and Dopp used a numerical, rather than an algebraic, solution to the problem of exactly determining (to the correct integer value of auditable vote count units) the minimum election audit sample size required to achieve at least a desired probability for detecting outcome-altering vote miscount. It is the same reason that Aslam, Popa, and Rivest found a formula to estimate the solution, rather than solving the problem algebraically. I.e. there is probably not an algebraic proof due to the complexity of the probability equations, so we settle for a logic proof.

PROOF:

Assertion: These calculations include the number of under-votes/over-votes in the calculations from the very start so under-votes are handled accurately because if

B = # cast ballots,
U = # undervotes,
W = #votes for winner,
R = #votes for the runner-up

[2] http://people.csail.mit.edu/rivest/AslamPopaRivest-OnEstimatingTheSizeAndConfidenceOfAStatisticalAudit.pdf

M=margin %

for simplicity sake, assume only two candidates.

B = U+W+R

M = (W-R)/(U+W+R) i.e. difference btwn leading candidates out of total ballots cast.

It is obvious that the above calculations take into account undervotes. The formula includes the under-votes/over-votes, unlike Stanislevic's formulas for both margins and for calculating the minimum number of precincts which could alter an election outcome.

Another illustration for why the Dopp method works for calculating under-votes is seen by comparing it to Stanislevic's method which is promoted by Verified Voting and the Brennan Center.

According to Stanislevic, margins are calculated as follows:

M = (W-R)/(W+R) i.e. difference between leading candidates out of total votes counted.

compare his calculation with mine for the rate of miscount that could alter an outcome (overall) where MLU is the constant assumed max level of undetectability

Dopp's Result < Stanislevic Result

i.e.
(W-R)/[(U+W+R)*2MLU] < (W-R)/[(W+R)*2MLU]

Because Stanislevic's calculation to obtain the number of precincts which could overturn an election do not include the number of undervotes/overvotes, as he insisted to Dopp several times in email that it should not, and continues to recommend in all his papers, Stanislevic's result for the minimum number of precincts that could alter an election outcome is larger than the correct calculation; and therefore his election audit sample size is smaller than a correct calculation in all cases where there are sufficient miscounted undervotes to overturn an election outcome.

Therefore Stanislevic's election audit sample size is insufficient to detect outcome-altering miscount whenever undervotes have been the cause of overturning an election outcome.

SAFE authors recommend calculations which Would Result in Insufficient Audit Amounts (even if correct formulas were used)

- Recommend using the number of votes, rather than the number of ballots as a base for calculations. This method gives insufficient election audit sample sizes whenever there are a large number of under-votes and over-votes
- Table 1, p. 17

SAFE's Authors Make Poor Recommendation for Legislative Language

- Logically Incomplete and Insufficient

- Make Overly Specific Recommendations for Legislative Language Which Does Not Permit Flexibility for Developing New Election Audit Methodology When More Auditable Voting Equipment is Developed and Prohibits Precise Accuracy. I.e. Recommends a specific formula for legislation that would remove the ability to use more accurate methods which are less administratively burdensome for election audit sample sizes. Specifies using a formula in legislation would force jurisdictions to use estimates, rather than exact minimum sample size needed to achieve a desired confidence level

SAFE's Authors Use Misnomers

– names constants needed for the calculations in a way that is misleading of what they are and confounds the concepts of confidence level election audits with the very different concept of polls.

- WPM = "within precinct miscount" is a misnomer in more than one way …
- SAFE = "statistically accurate, fair and efficient". "Statistically accurate" is a misnomer which applies to polls whose samples try to predict the correct election results, not to election audits whose purpose is to detect any outcome-altering miscount. What audits need to be is verifiable, random, scientific, sufficient, public, and efficient.

SAFE's Authors Make Logically Incorrect Statements

- Description of hacker switching just "a few votes"
- Talks about the "accuracy of an estimate.." on p. 5 Election audits are not designed to predict election results, but are designed to uncover errors in election results.

SAFE's Authors Make Inaccurate, Imprecise, and Misleading Statements

- Eg. 1
- Eg. 2
- Eg. 3
- Eg. 4

The only New Method the authors Recommend for doing an intermediary calculation – does not provide sufficient data to support the case to use it and does not provide any mathematical derivation to support its use –

Estimating the Minimum number of precincts required to switch an election outcome that. May be specific to …

SAFE's Authors are Uninformative and Obfuscates –

- Fails to give precise and correct election audit calculations
- Fails to provide the numerical method for exactly calculating how many precincts could be used to wrongly switch the election outcome that is available and precisely described in Dopp/Stenger paper (although Stanislevic does provide a spreadsheet for doing it.)
- Fails to derive or justify its only new formula or to tell how to derive it so that it could be derived for specific individual jurisdictions and be more justifiably employed.

What is good about Verified Voting's "SAFE" election auditing paper?

- It cogently describes and gives examples of why fixed percentage (of total vote counts) audits are not consistently effective and can be very ineffective
- It supports confidence level audits

- Howard Stanislevic provides an excel spreadsheet that if used with different input data than Stanislevic recommends, may correctly calculate confidence level election audit sample sizes (Check for rounding errors first).

When people represent themselves as authoring or developing others' work, they often do not get the concepts or facts completely straight – as happened with this paper by Verified Voting. We think that this kind of promotion of oneself in such a crucially important field as the integrity of elections is very unfortunate. While we respect the vast majority of the work of Verified Voting and agree with most of their positions, we believe that Verified Voting has allowed itself to be misled by some of the SAFE authors.

Endnotes:

About two of the authors:

Mark Lindeman – prior responses to his papers attacking the exit poll evidence of vote miscount. Mark Lindeman has made a habit of using illogical sophistry, pervasive unsubstantiated denigration, and mischaracterization to wrongly attack the ubiquitous evidence of vote miscount in the 2004 U.S. presidential election. See Response to Lindeman's Response to "Mathematical Proof that Election Science Institute's Test to Rule Out Vote Fraud is Logically Invalid" http://electionarchive.org/ucvAnalysis/US/exit-polls/ESI/Mark-Lindeman-Response.pdf and "2004 Presidential Election – Compendium of Attempts to Dismiss "Vote Fraud" http://electionarchive.org/ucvAnalysis/US/IncorrectElectionDataAnalysis-06.pdf for some of Lindeman's previous wrongful attempts to dismiss the evidence of outcome-altering vote miscount in the 2004 U.S. Presidential Election.

Howard Stanislevic – Has made a habit of rediscovering and replicating the election auditing work of Kathy Dopp and within a few weeks to a few months after Dopp publicly releases her work, virtually always neglecting to properly cite Dopp's work (See our paper "History of Election Auditing"); and usually making unfortunate recommendations for calculations.[viii] Mention how his own method for calculating audit sample sizes were off (look through old emails)? Mention his disingenuous previous email response re. tiered election audits where he ignored. Mention specifically requesting that he cite my March paper, and they refused – Make note of all the corrections I asked him previously to make to the paper which they did not make.

The Brennan Center – Lauds the incorrect and unethical work of Verified Voting's Stanislevic paper; and has made a habit of putting out unscientific and sometimes incorrect and questionable work on election auditing which seems designed more as a political tool to push for particular legislation than to accurately make the best recommendations, and making questionable recommendations on election auditing.

[i] For instance "we" is used 62 times in Verified Voting's "SAFE audit" paper, including phrases like "we determine…." and "we show…" rather than letting the readers know that they are describing methods that were previously derived by other authors and not by themselves. The "SAFE" authors neglect to mention that their paper describes and justifies election audit methods that were developed by others. i.e. Dopp and Stenger provided the exact solution method for and Aslam, Popa, and Rivest found the accurate formula for estimating, the calculations that the Verified Voting group are recommending.

[ii] Insert counter-example here using the formula given by the authors.

[iii] "Fool Me Once: Checking Vote Count Integrity" http://electionarchive.org/ucvAnalysis/US/paper-audits/TierElectionAuditEval.pdf

[iv] Dopp in July 2006; Dopp and Stenger in August 2006; Ron Rivest in September and November 2006; Aslam, Popa, & Rivest in ??

[v] September 2006, "The Election Integrity Audit" Dopp & Stenger, http://electionarchive.org/ucvAnalysis/US/paper-audits/ElectionIntegrityAudit.pdf

[vi] The Verified Voting authors give Aslam, Popa, and Rivest's formula as $\left\lceil \left(N - \frac{B-1}{2} \right) \cdot \left(1 - \exp(\ln(1-P)/B) \right) \right\rceil$

However the correct formula is $\left\lceil \left(N - \frac{B-1}{2} \right) \cdot \left(1 - \exp(\ln((1-P)/B)) \right) \right\rceil$

In both cases, if anyone tried to apply the formulas given by the authors, the incorrect placement of parentheses (in red) would result in incorrect calculated values.

[vii] The authors give the formula Bmin = ceiling(B / log10 (1 / (B / N)) + 1)
However the correct formula must obviously be Bmin = ceiling(B / log10 (1 / (B / N) + 1))
Note the correction in where the parenthesis (in red) is found.

[viii] List here some of the Stanislevic articles and papers where he neglects to properly cite Dopp's previous works.