Post-Election Audit Basics

Arlene Ash

Boston U School of Medicine

ASA Chair of Subcommittee on Electoral Integrity

Why Audit?

- Be sure that the winner won
- Find common sources of recurrent errors (so that they can be fixed – will they?)
- Deter fraud (needs **appropriate** follow-up)
- Assure the public that the process is fair

- Do “all of the above” efficiently

How To Audit

- Don’t “reinvent the wheel”
- Statisticians and auditors know how to
  - Examine “large enough” random samples + a few “high interest” units (designated by the loser)
  - Follow good protocols; evolve better ones
- Work with “elections people” to create practical practices to ensure Statistically Accurate, Fair and Efficient (SAFE) audits

Key Concepts

- Sample “whole units” (that are as small as possible consistent with voter confidentiality)
  - Precincts, machines, batches …
- Compare manual vs. machine counts
- Good confidence about who won does not depend on “percentage” of units audited
  - Does the soup taste right?
    - Can’t tell from one drop
    - A tablespoon should be enough – even from a large pot (if well-stirred)
- Need to look at “enough” units
  - Requires more when the race is close

Statistical Power

- Power = the probability that (if the outcome were wrong) we would find a problem in the audit
- Typically, races are not close and small audits have high power
- Very close races
  - Are very rare
  - Require large audits (maybe even 100%)

SAFE Sample Selection

- Audit precincts with visible problems, regardless
- Calculate minimum number of apparently-OK precincts that must have (“invisible”) corrupt counts to flip the election (Bmin)
- Calculate how many apparently-OK precincts you must randomly select to make it extremely likely that you will find at least one corrupt one
  - Requires more when precinct size varies
- Randomly select and audit this many precincts
- If no problems found, outcome is certified

Federal Elections (2002-2006) Total Hand-Counted Votes by Type of Audit

	Tiered 3-5-10%	3%	5%	10%	99% power	95% power
At least 95% power	88.2%	85.2%	88.0%	92.7%	100%	100%
Less than 50% power	3.7%	5.0%	4.1%	1.4%	-	-
Audit size (millions)	20.5	15.3	19.4	57.6	23.0	19.0

Bottom line: High statistical power in all elections is a feasible goal