

Explaining Voting System Performance: Do Technology, Training, and Poll Worker Characteristics Matter?

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ABSTRACT

Recent election administration research has investigated the reasons for voters making unintended errors and thus not effectively casting their votes or votes somehow not being recorded as intended. This type of voting system failure is typically measured as the 'residual vote rate' and has been found to vary across election jurisdictions and types of voting technology. This paper examines the role of poll worker characteristics, experience and training to explain that variation across California counties. We hypothesized that differences in poll worker occupational status, experience, training and confidence affect the ability of votes to be cast and tallied without error. Controlling for voter demographics and voting technology, in an analysis of 8550 precincts, we find a mix of results, some that agree with our predictions and some that do not. A poll worker workforce that is younger and experienced will reduce residual vote rates. Hands-on training and providing take home references at training also help reduce error and improve voting system performance. General poll worker confidence either before or after Election Day varies directly with higher residual vote rates, but confidence about the ability to operate or demonstrate equipment is associated with lower residual vote rates. A jurisdiction using optically-scanned paper ballots and longer tenure using the same equipment also help reduce error rates. This is a cautionary tale for election administrators who make critical choices about the human and technical inputs of Election Day.

Introduction

The Presidential Election of 2000 and the passage of the Help America Vote Act of 2002 focused social scientists on the topic of voting technology, and more broadly on the entire voting ‘system.’ While the term ‘system’ is sometimes used as a substitute for a particular voting machine or piece of equipment, it is also used to describe the inter-relation of technology, people, laws, regulations, and administrative practices that work together in the conduct of an election and specifically to record, tally, and report votes. Much work has been done to examine technology in the election process and more and more research is being conducted on the administrative aspects, creating the burgeoning field of ‘election administration research.’ Ansolabehere and Stewart reported in 2005 that technology and voter demographics explain only about 15% of variation in voter error and “60% of the variation is accounted for by the county.”¹ Scholarly attention in this field has been given primarily to activities involving election officials, such as how they are appointed, how they design ballots, how they spend funds, and how they choose among technology options. Research is just beginning on the street-level bureaucrats of Election Day: poll workers.

Poll workers, also called precinct officers, election judges (or some hybrid of those) make up the ‘army of volunteers’ who staff polling places around the country each Election Day, working long hours for varying, but uniformly little pay. They are the guardians, facilitators, policing authorities, and gatekeepers of the in-person voting process nationwide. It is clear that performance of the election system is highly dependent on

¹ The National Task Force on Election Reform in 2001 wrote: “To offer viable solutions, reform proposals must address problems and errors associated with 1) *People* (voters, poll workers, election administrators and staff, vendor personnel, candidates, and the media); 2) *Procedures* (vague and conflicting laws and inconsistent policies); and 3) *Technology* (outdated computer systems, voting equipment and tabulation systems).” (National Task Force, July, 2001, page 21).

these individuals; however, as a group they are, by virtue of the decentralized election administration structure, heterogeneous in terms of occupational status, election experience, training exposure, and confidence. In this paper, we hypothesize that the performance of county-level voting systems, as measured by residual vote rates, can be explained by both the technical equipment used to gather, tally and report votes, the length of time the county (i.e. the voting population) has been using the equipment, and the experience, training, confidence, and occupational status of the counties' poll workers.

Measuring and Explaining Voting System Performance

Shortly after the 2000 Presidential Election, scholars began to use a measure of voting system performance called the 'residual vote rate.' (Ansolabehere and Stewart, 2006; Sinclair and Alvarez, 2004) This metric was defined as "the percentage of ballots cast in an election jurisdiction that did not produce a valid vote in a specific race, most importantly in the top-of-the-ballot race, usually for president or governor." (Alvarez and Antonsson, 2007) The residual vote is the numerator of this ratio, that is the number of ballots cast minus the number of votes for a specific race, and it reflects the number of overvotes (too many marks for the race) and undervotes (no mark recorded for that race). To the extent that these overvotes and undervotes are unintentional, residual vote rate is a good measure of voting system performance. (Brady and Hui, 2006a) The concept of residual vote, also called 'unrecorded votes,' has been used extensively to measure the performance of voting systems across time and across jurisdictions. Early on it was

found to be an especially good measure of voting error with regard to punch card ballots and in presidential races. (Brady, et al, 2001 and Brady 2005a)

The role of technology to explain residual vote rates has been tested extensively. (Ansolabehere and Stewart, 2006; Brady, et al, 2001; Brady, 2004a and 2004b; Brady, 2005a and 2005b; Brady and Hui, 2006a and 2006b; Traugott et al, 2005; Grigg, 2005). In August 2001, the National Commission on Federal Election Reform declared: “The performance of voting systems is affected by several inputs that go beyond the equipment. Some of the most important are ballot design, voter education, and the skill and training of poll workers.” (National Commission, August, 2001, p. 52) The role of race and other demographics in voting ‘error’ was also added to the mix of explanatory factors (Ansolabehere, 2004; Miller, 2005; Sinclair and Alvarez, 2004; Tomz and Van Houweling, 2003; Warf, 2006) Finally, work was done by Kimball (with Kropf in 2005 and 2006) on how ballot design (including content and layout of instructions and layout of candidate names) along with technology and demographics affects ‘unrecorded votes,’ and the effect of straight party voting devices on residual votes. (Kimball, Owens, Keeney, 2002) A missing piece in the scholarship is work on whether the experience and training of poll workers have an impact on residual votes.

The Model

We propose to explain differences in residual vote rates across jurisdictions as a function of voter demographics and ten independent variables related to the voting equipment, the training provided to poll workers, and characteristics of poll workers themselves.

Poll worker age and occupational status

It is widely assumed that most poll workers are elderly women who volunteer out of a sense of duty. In fact, the poll worker workforce in California is quite varied and includes retired men and women as well as individuals in the workforce, students, homemakers, individuals with disabilities, the unemployed, neighbors who like to socialize, multiple generations of families, and those who need the small stipend to supplement their income. (Mac Donald and Glaser 2006; Glaser and Mac Donald 2007)

We hypothesize that as the technology becomes more complex, the older, fully retired poll workers will have a harder time setting up and troubleshooting equipment and demonstrating to voters how to operate machines.

Poll worker election experience

The age of the workers may correlate with the number of years they have served at the polls. Occasionally it is found that some of the longest working individuals actually have the most difficult time adjusting to new procedures and equipment as they have been doing things the same way election after election and therefore resist learning new ways or accepting changes. (Mac Donald and Glaser, 2006; interviews and observations conducted by EARC researchers 2005-2007) However, we predict that having the

experience of working in at least one previous election reduces the error in casting and tallying votes.

Poll Worker preparedness and confidence

Closely related to experience is the workers' confidence that they are prepared for Election Day. When working a first election most workers do not know what to expect, and have difficulty knowing whether they are adequately prepared. Insecurity on Election Day and not having experience in dealing with voters, machines and extraordinary situations that inevitably occur at polling places may add to poll workers making poor decisions or not making decisions at all, thus adding to the potential of error. By the second election, workers can better determine whether they have received the training necessary to assist in the basic running of the polling place, to operate and demonstrate equipment and, and to manage various situations that may arise. A strong feeling of being prepared for Election Day should result in lower voting errors and residual votes, as should the poll workers' post-election assessments of their polling places' performance.

Training quality

Poll worker training can be assessed on many dimensions, including class content, format and materials, teacher style, class size, trainer to trainee ratio, and conduciveness of the classroom to learning, just to name a few. We isolate two very important aspects of training that we believe to be highly related to voting system performance on Election

Day. One, whether the training has a ‘hands-on’ component and two, whether the trainee received reference materials at the training to take home for review before Election Day.

The ability to actually touch and work on the voting equipment that will be used on Election Day is uniformly desired by workers, and very successful in allowing workers to find out where they might run into problems. (Mac Donald and Glaser, 2006; interviews and observations conducted by EARC researchers 2005-2007) In counties that do not have machines, the use of ‘role-play’ techniques in training, such as sitting at a precinct table and processing mock voters is considered to be extremely valuable. A similarly important aspect of training is receiving supplemental reference materials that can be perused at home. At the very least, this could allow the individual to become familiar with a manual so that he/she has the ability to quickly locate answers to questions on Election Day.

Technology and learning

Since 2000, California counties have used a wide variety of voting technologies, including various models built by different companies and everything from punch cards to optically scanned (in precinct and centrally) paper to electronic and touch screen machines. Several counties have changed equipment multiple times since 2000, as they either bought equipment early on that was later decertified or tested various different systems before choosing one on a permanent basis. Most of these final decisions were made by the end of 2006, and in 2007 many counties are being forced to go back or to new paper ballot systems because of political pressure and state administrative directions.

Each type of technology has its own weaknesses and strengths for voters, poll workers, and election officials and can impact unrecorded or residual votes in different ways.

There is also a learning process for voters and poll workers of a county as they become accustomed to a particular technology (when the county has been lucky enough to deploy the same technology over multiple elections) and understand how to mark ballots and operate equipment. (Mac Donald and Glaser, 2006; interviews and observations conducted by EARC researchers 2005-2007.) We hypothesize that the performance of the entire voting system improves over time as experience with one type of voting method accumulates. In June 2006 the counties had voters either use DREs in the precinct or mark optically-scan-able paper ballots. We also predict that this dichotomous distinction between voting methods will affect residual vote rates.

Data Sources

The data for the key explanatory variables come primarily from a survey of poll workers in the Primary Election of 2006 in the State of California. We supplemented the survey results (and developed the above model) with knowledge gained from observations of trainings in twenty-seven counties over a period of two years, interviews with county election administrators in thirty-six counties about their recruitment, training and management of poll workers; and participant observation (actually working as poll workers in various elections) at a total of twenty-seven polling places on four different Election Days in five California counties. Two variables, equipment type and number of elections using the machine, by county, are available through internet resources, and one additional variable, hands-on training, was coded (as a dummy variable, yes=1, no=0)

from data collected through observations and interviews. These explanatory variables are at measured at the county level.

Poll Worker Survey

The survey data were collected from election poll workers who worked at polling places throughout California during the Primary Election of June 6, 2006.² All California counties were offered the opportunity to deploy the survey and subsequently receive individualized results. In the three weeks before the election, the Election Administration Research Center at UC Berkeley (EARC) distributed over 55,000 surveys to twenty-four counties up and down the state;³ each county received enough surveys for every poll worker to complete. The participating counties used a wide variety of voting technology, including different models of precinct-based scanners, centrally scanned paper ballots, and touch screen or other DRE voting machines, made by several different vendors. Within three months after the June 2006 Election, EARC received back approximately 42 percent of the surveys state-wide. Twenty-four county-level datasets were created and then merged into one state-wide file. The dataset consists of 15,408 responses that were coded and entered by eight different individuals. Please see Appendix A for more detail on the survey methodology and the survey instrument.

² This survey was jointly funded by the California Secretary of State's office and the Election Administration Research Center (EARC) at UC Berkeley, and conducted in collaboration with the California Association of Clerks and Election Officials (CACEO), the professional association of California's local election officials.

³ The counties that received surveys were: Alameda, Colusa, Contra Costa, Fresno, Humboldt, Kern, Lassen, Los Angeles, Mariposa, Marin, Monterey, Napa, Nevada, Orange, Riverside, Sacramento, San Bernardino, San Luis Obispo, San Mateo, Santa Cruz, Shasta, Solano, Tuolumne and Yolo.

Demographic and Vote Data

We obtained the precinct level registration (REG) and Statement of Vote (SOV) data from the Statewide Database, a data deposit center for California redistricting datasets housed at the Institute of Governmental Studies, UC Berkeley. However the REG and SOV files do not offer any detailed socio-demographic characteristics of the Census block groups. Key predictors of vote choice, such as education and income, are not available. In order to get a comprehensive array of socio-demographic characteristics of the precincts, we augment our electoral data with the Census Summary File 3. The challenge is that Census Summary File 3 variables are available at the block group level and block groups are imperfectly nested with precincts. To overcome this challenge, using spatial overlay procedure in ArcGIS, we create a conversion file between precinct and block groups. We then weight the SF 3 variables by the share of the precinct area and aggregate their shares up to the precinct. The complete file contains variables from three data sources: REG, SOV and Census SF3.

Data Analysis

Residual Votes

The dependent variable, voting system performance, was measured by calculating, for thirteen of the counties surveyed, the residuals votes for the top-of-the-ticket race (governor) in the 2006 Primary Election. The residual vote rate for each precinct is calculated by the following formula:

$$(\text{total votes} - \text{total votes for all gubernatorial candidates}) / \text{total votes}$$

Demographics play an important role in this equation for the following reason:

Residual vote has two components:

$$\text{Residual (R)} = \text{Intentional (I)} + \text{Unintentional (U) over/undervote}$$

(I) captures the voter's sentiment about the gubernatorial race; i.e. these are people who do not want to vote for a Governor for whatever reason (no interest, no preferred candidate etc.)

(U) captures the functioning of the voting system. Here, voting system can be either quality of poll worker/machine/training of poll worker or combination of these factors.

In our analysis, we are interested in (U). However we observed only (R) and it is unknown how big the size of (U) is relative to (I).

For a presidential race, political scientists argue that (I) is small. Hence (R) is mostly made up of (U), and therefore (R) is a good proxy to assess the performance of the voting system.

With the gubernatorial primary, we observed a larger (R). Because we are unable to isolate the confounding effect of (I) in (R), we added the demographics variables (Z). The idea is that once we condition on (Z), (U) of different counties become identical.

Mathematically, that is

$$U_1|Z=U_2|Z$$

In other words, we control for differences in the characteristics of voters across counties, and assert that what is left unexplained is due to the variation in voting systems.

Therefore, the logic of the model is as follows. Since we know that the residual vote is noisy (i.e. includes both intentional and unintentional residual votes), the equation controls for demographic factors that might be associated with lower information and interest levels. Since some of these variables also relate to the cognitive problems that lead to unintentional error as well as intentional non-voting due to lack of information, we cannot really separate the two. But that is not our main concern. Rather we are interested in whether poll worker characteristics, training or polling equipment account for any significant part of the residual vote rates when these characteristics are controlled for.

Results

We performed an OLS regression to test our model. The analysis was done on 8550 precincts in thirteen counties.

The results from our estimations are displayed in Table 1. As one might expect, precincts with younger individuals with some education had lower residual vote rates. Household income and percent in poverty had no effect on residual vote rates. The education effect was larger for the populations with more people who completed a degree. We include two racial and ethnic variables available from registration data, the percentages of registered Latinos and of Asian/Pacific Islanders. We also include controls for percent foreign born and the percent speaking only English in the household. The results from this cluster of variables show that areas with higher number of Latino and API voters tend to have higher residual vote rates. The proportions of the precincts that are foreign born or speak only English at home do not have any effect on residual vote rates. Lastly we see that residual vote rates are higher where there are more independent or decline to state voters. We would expect that a large portion of intentional residual (non-) votes for Governor would be explained by partisan affiliation; in other words, voters that abstained from voting for Governor were most likely not registered Democratic or Republican. Therefore, including the percent registered Democratic and percent registered Republican is an important control in this model.

Among the variables of interest there are several notable results. First, precincts that relied on higher percentages of retirees tended to have higher residual vote rates, controlling for everything else. On the other hand, precincts that had experienced poll workers had lower residual vote rates. Two aspects of training seemed to reduce residual vote rates, whether many workers received reference materials at the training to take home and whether the county offered hands-on practice during training classes. In terms

of poll worker confidence gained from training, the results were mixed. Oddly, higher confidence in general was associated with higher residual vote rates. However, when asked specifically about preparation from training to operate or demonstrate to voters how to operate the voting machinery, higher ratings on each of these reduced residual vote rates significantly. Poll workers perceptions of how the day went were not at all in sync with voting system performance as measured by residual votes, in fact the workers' positive perception varied directly with poor performance. The number of times the same equipment has been used in the past did help to reduce residual vote rates. The latter point is particularly important because it suggests that changing technology in search of the best solution may introduce a short term increase in the residual vote rate. So for instance, forcing counties in California to abandon their electronic voting for paper ballots may in itself cause voting error due to inexperience with a new voting system. Finally we find higher residual vote rates where DREs are used by all voters as opposed to voting on paper ballots that are optically scanned (either at the precinct or the election office).

Table 1: Multivariate Analyses of Residual Votes in California 2006 Gubernatorial Primary

Variable	Parameter Estimate	Standard Error	t value	Pr > t
Constant	18.56003	1.01376	18.31	<.0001
Voters in Precinct				
Median Household Income	-.00003	.00003	-1.04	.2996
% at or below poverty level	.00273	.00858	.32	.7506
% speak only English at home	-.00206	.01063	-.19	.8460
% Foreign Born	-.00018	.01221	-.01	.9880
% Hispanic	.01907*	.00595	3.20	.0014
% Asian/Pacific Islander	.14554*	.02548	5.71	<.0001
% Male	-.04378*	.01512	-2.90	.0038
% 18-34 yrs old	-.07880*	.00820	-9.61	<.0001
% 35-54 yrs old	.00673	.00647	1.04	.2988
% with some high school education	-.07490*	.01771	-4.23	<.0001
% graduated high school	-.10149*	.01219	-8.32	<.0001
% with some college	-.08035*	.01121	-7.17	<.0001
% with Bachelor degree or higher	-.10440*	.01027	-10.16	<.0001
% registered Dem	-.41060*	.01199	-34.24	<.0001
% registered Rep	-.34120*	.01212	-28.15	<.0001
Poll Workers				
% retired	.94810*	.05316	17.84	<.0001
% worked election before	-18.45992*	1.01705	-18.15	<.0001
% received reference materials at training to take home	-.10453*	.04921	-2.12	.0337
Average Rating of Preparation from Training for Election Day	.79872*	.04938	16.17	<.0001
Average Rating of Preparation from Training to Operate Equipment	-.19903*	.03056	-6.51	<.0001
Average Rating of Preparation from Training to Demonstrate to Voters How to Operate Equipment	-.91723*	.06197	-14.80	<.0001
Average Rating of Election Day Processes at Polling Place	.31397*	.02101	14.95	<.0001
County System				
Hands-on PW training	-.38340*	.02335	-16.42	<.0001
DRE provided for all voters	.49448*	.02684	18.42	<.0001
Number of Elections used June 2006 equipment	-.04316*	.00252	-17.16	<.0001

* statistically significant

N = 8550

Adjusted R² = .2586

F = 136.53, pr <.0001

Conclusion

This analysis provides some cautionary advice to local administrators about decisions with regard to voting equipment and poll worker training and recruitment. According to our results, having Californians vote on direct recording electronic (DRE) equipment, rather than on paper ballots, as well as hiring a large percentage of fully retired poll workers adds to the error rate in the precinct. This can be countered in various ways. One is using the same equipment over time, i.e. providing the opportunity for poll workers and voters to become used to the equipment in the polling place. Two is hiring poll workers with some previous polling place experience, i.e. having worked at least one election in the past, and three is providing training that has some tactile contact with the tools of Election Day. Four is providing written or video reference material to workers at the training, and five is focusing training on how to operate voting equipment and demonstrate that operation to voters. Each of these actions should add to lowering errors and residual votes at polling places.

References

- Alvarez, R. Michael, Stephen Ansolabehere, and Charles Stewart III. 2005 “Studying Elections: Data Quality and Pitfalls in Measuring of Effects of Voting Technologies across States.” The Policy Studies Journal. Vol. 33, No. 1.
- Alvarez, R. Michael and Erik K. Antonsson. 2007. “Bridging Science, Technology, and Politics in Election Systems.” The Bridge. Vol.37, No. 2. Summer 2007
- Ansolabehere, S. 2004. Voting machines, race and equal protection. Election Law Journal 1(1): 61–70.
- Ansolabehere, Stephen and Andrew Reeves. 2006. “Using Recounts to Measure the Accuracy of Vote Tabulations: Evidence from New Hampshire Elections 1946-2004. 12 March 2006.
- Ansolabehere, Stephen and Charles Stewart III. 2005. “Residual Votes Attributable to Technology.” Journal of Politics 67(2): 365-389.
- Arrison, Sonia and Vince Vasquez. 2006. Upgrading America’s Ballot Box: The Rise of E-voting 2nd Edition. Pacific Research Institute. San Francisco, CA.
- Brady, Henry. 2004a. “Performance of Voting Systems on March 2, 2004.” UC DATA, Survey Research Center, UC Berkeley.
- 2004b. “Postponing the California Recall to Protect Voting Rights.” PS: Political Science & Politics 37(1):27-32.
- 2005. “American Elections and HAVA.” Presentation given at Carter Ford Commission on Federal Election Reform.
- 2005 “Let’s Not Forget About Accuracy.” Presentation at the Voting Systems Testing Summit, California Secretary of State, November 2005.
- Brady, Henry, Justin Buchler, Matt Jarvis, John McNulty. 2001. *Counting All the Votes: The Performance of Voting Technology in the United States*. Survey Research Center and Institute of Governmental Studies, UC Berkeley.
- Brady, Henry, and Iris Hui. 2006a. “Methods for Assessing Voting System Performance: Evaluating Los Angeles County’s InkaVote Using GIS.” Paper presented at the Midwest Political Science Association Meeting, Chicago, IL.
- Brady, Henry, and Iris Hui. 2006b. “Is It Worth Going the Extra Mile to Improve Causal Inference? Understanding Voting in Los Angeles County.” Paper prepared for the Political Methodology Annual Meeting, Davis, CA.
- Byrne, Michael D., Sarah P. Everett, and Kristen K. Greene. 2007. “Usability of Voting Systems: Baseline Data for Paper, Punch Cards, and Lever Machines.” Proceedings of the SIGCHI conference on Human factors in computing systems: Politics & Activism. April/May 2007. San Jose, CA
- Dee, Thomas S. 2005. “Do Punch Cards Promote Voter Error? Evidence from the California Recall Election,” Swarthmore College Department of Economics Unpublished Manuscript.
- Glaser, Bonnie and Karin Mac Donald. 2007. “The Attraction of Working from 6 am to 9:30 pm for a Fraction of Minimum Wage: Poll Workers and Their Motivation to Serve,” prepared for presentation at the 2007 Annual Meeting of the Midwest Political Science Association, April 2007
- Glaser, Bonnie and Karin Mac Donald, 2007. “Survey of Poll Workers in California – General Election November 7, 2006 Final Report on Eight California Counties,” May 1, 2007
- Glaser, Bonnie and Karin Mac Donald, “Voices from the Polling Place,” recommendations prepared for the California Secretary of State’s Office, April 1, 2007

- Grigg, Delia. 2005. "Measuring the Effect of Voting Technology on Residual Votes." 16 May 2005.
- Herron, Michael C., and Jasjeet S. Sekhon. "Black candidates and black voters: assessing the impact of candidate race on uncounted vote rates." The Journal of Politics 67.1 (Feb 2005): 154(24).
- Kimball, David and Martha Kropf. 2005. "Ballot Design and Unrecorded Votes on Paper-based Ballots," Public Opinion Quarterly 69.4 (Winter 2005): p508(22).
- Kimball, David C. and Martha Kropf. "Ballot Initiatives and Residual Ballots in the 2004 Presidential Election." Paper prepared for presentation at the 2006 Southern Political Science Association Meeting, January 2006, Atlanta, GA;
- Kimball, David C., Chris T. Owens, and Katherine M. Keeney. 2003. "Unrecorded Votes and Election Reform." Spectrum: The Journal of State Government 76(1):34-37.
- Kimball, David C., Chris Owens, and Katherine McAndrew. 2001. "Who's Afraid of an Undervote?" Southern Political Science Association, Atlanta. November 2001.
- Knack, Stephen and Martha Kropf. 2003. "Voided Ballots in the 1996 Presidential Election: A County-Level Analysis." Journal of Politics 65(3):881-898.
- Kropf, Martha and David Kimball, "Election Administration, Voting Equipment and Residual Votes Six Years After Florida." Paper prepared for presentation at the 2007 Midwest Political Science Association Meeting, April 15, 2007, Chicago, IL
- Leib, Jonathan, and Jason Dittmer. "Florida's residual votes, voting technology, and the 2000 election." Political Geography 21.1 (Jan 2002): 91-98.
- Luttmer, Erzo F.P. and Kelly Shue. 2006. "Who Misvotes? The Effect of Differential Cognition Costs on Election Outcomes." November 2006.
- Mac Donald, Karin and Bonnie Glaser. 2007. "From Locomotive to Bullet Train: Street-Level Implementation of E-Voting," prepared for presentation at the 2007 Annual Meeting of the Midwest Political Science Association, April 2007
- Mac Donald, Karin and Bonnie Glaser. 2006. "The Why, How, What and When of Precinct Boards: Reactions from the Front Lines; A Survey of California Poll Workers in the Primary Election of 2006," prepared for the Annual Conference of California Association of Clerks and Election Officials (CACEO), July 25, 2006
- Miller, GERALYN M. 2005. "Methodology, statistics, and voting error: an exploration of 2000 presidential election data in two states." Policy Studies Journal 33.1 (Feb 2005).
- Moynihan, Donald P. 2004. "Building Secure Elections: E-voting, Security and Systems Theory." Public Administration Review 64(5): 515-528.
- Moynihan, Donald P. and Carol L. Silva. 2005. "What Is the Future of Studying Elections? Making the Case for a New Approach." Policy Studies Journal. February 2005. Vol. 33, Iss. 1.
- The National Commission on Federal Election Reform, Century Foundation Press, 'To Assure Pride and Confidence in the Electoral Process: The Final Report of The National Commission on Federal Election Reform,' 7/1/2001
- Sinclair, D.E. "Betsy" and Michael Alvarez. 2004. "Who Overvotes, Who Undervotes, Using Punchcards? Evidence from Los Angeles County." Political Research Quarterly 57(1):15-25.
- Stewart, Charles III. 2005. "Residual Vote in the 2004 Election: VTP Working Paper Version Number 2.3." February 2005.

- Tomz, Michael, and Robert P. Van Houweling. 2003. "How Does Voting Equipment Affect the Racial Gap in Voided Ballots?" American Journal of Political Science 47 (1): 46-60.
- Traugott, M. W., Hanmer, M. , Park, W. , Herrnson, P. , Niemi, R., Conrad, F. and Bederson, B. 2005. "[The Impact of Voting Systems on Residual Votes, Incomplete Ballots, and Other Measures of Voting Behavior.](#)" Paper presented at the annual meeting of the American Political Science Association, Washington, DC. September 2005
- Warf, B. 2006. "Voting technologies and residual ballots in the 2000 and 2004 presidential elections." Political Geography. Vol. 25 No. 5, pp. 530-556, June 2006.

APPENDIX A - Poll Worker Survey Methodology and Instrument

California's 58 counties had roughly 25,000 voting precincts in the 2006 Primary election that were staffed by approximately 100,000 poll workers. On average, a precinct board consists of 4 members and often there is more than one precinct board in a polling place. In multi-precinct polling places, each board has its own table, but may share voting booths, equipment such as scanners, and staff if necessary.

The survey was deployed as follows. The survey instrument consisted of 32 questions, printed on a double sided 8 ½" x 11" sheet of paper. (See below) We stapled a self-addressed postage-paid business reply envelope to each survey, coded them by county, and collated them into packs of 4, 5, 6 or 8, depending on requests by counties. The surveys were then packaged into a large envelope that was stamped "For Inspector and Poll Workers", one for each precinct, and delivered to the counties for inclusion into the precinct supplies. The objective was that poll workers, upon unpacking their supplies, would find the envelope, distribute the surveys amongst themselves, fill them out either on or after Election Day, and drop them into the mail to EARC. During a pilot study in one county during the November 2005 special election, EARC received responses from 68 percent of surveyed workers. Within three months after the June 2006 Election, EARC received back approximately 42 percent of the surveys state-wide. Responses continued to come back for eleven months after the election, even though another election had since occurred, illustrating the enthusiasm of these poll workers for providing feedback.

We had eight individuals coding for three months, and for open-ended questions we developed a coding scheme using an emergent and reiterative method. With first glance at the hundreds of surveys we saw common language, we started with codes for these clearly ubiquitous answers, and as coders progressed they suggested new common categories which were then assigned additional codes to use in data entry. For text that had already been entered without a code these were then recoded into the appropriate category. This process of developing the coding scheme took about three weeks with eight individuals coding and meeting every other day to discuss the codes.

Dear Poll Worker: Please complete this confidential questionnaire to assist a University of California study on poll worker training in California, and then return it in the postage paid envelope. As a poll worker, your expertise is essential to our research and your participation is much appreciated. We hope our research helps to improve the poll worker experience and election process for everyone. (Please complete both sides of this page.) **THANK YOU! THANK YOU!**

ABOUT YOUR TRAINING BEFORE ELECTION DAY

1. Did you attend a training class for the June 6, 2006 Election? Yes _____ No _____
 If No, why not? _____

2. Have you attended trainings in the past for other Elections? Yes _____ (If Yes, how many)? _____ No _____

	(for questions below please circle the number that applies)					
3. How convenient was the training location?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
4. How convenient was the training time?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)

5. Did you receive any reference materials (manuals, checklists, etc.) at training to take home? Yes ___ No ___ N/A ___
 If Yes, did you review any of the materials before reporting to your polling site on Election Day? Yes ___ No ___
 If you did NOT review materials received, why not? _____

6. Do you have additional comments about and/or suggestions for improvement of **poll worker training**?

ABOUT YOUR ELECTION DAY EXPERIENCE

1. Have you worked as a poll worker in previous elections? Yes _____ No _____
 (If Yes, in **how many elections** have you worked as a poll worker?) _____

2. Please circle your job title on Election Day June 6, 2006:

Inspector Judge Clerk Other _____

What were your job titles in past elections? _____

	(for questions below please circle the number that applies)					
3. How well did the training prepare you for Election Day?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
4. How well did the training prepare you to operate any voting equipment (such as ballot marking devices, ballot scanners, electronic machines) on Election Day?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
5. How well did the training prepare you to demonstrate to voters how to operate any voting equipment (such as ballot marking devices, ballot scanners, electronic machines)?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
6. How well did the training prepare you to manage different voter situations and questions on Election Day?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
7. How effective was the training in preparing you to serve voters with disabilities?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
8. How effective was the training in preparing you to serve voters with limited English proficiency?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
9. How helpful was the training/instruction you received <u>on Election Day</u> from other poll workers or election staff?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
10. How adequate were the available reference materials for guiding you through Election Day processes and procedures?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)
11. In your opinion, how well did Election Day processes go at your polling place?	0(N/A)	1(poor)	2	3(good)	4	5(excellent)

(please turn over for Page 2)

ABOUT YOUR ELECTION DAY EXPERIENCE (continued)

12. Do you think class training is valuable for working at the polls? Yes ____ No ____ Not Sure/Don't Know ____

13. Did you have adequate reference materials available to you on Election Day? Yes__ No__ Not Sure/Don't Know ____

What materials were most useful on Election Day? _____

14. Do you have additional comments about and/or suggestions for improving **written poll worker reference materials**?

ABOUT BEING A POLL WORKER IN GENERAL

1. Why did you become a poll worker?

2. When you are not serving as a poll worker, what do you do?

(for example: high school student, college student, retired, county employee, state employee, teacher, in business, etc...)

3. Are you willing to work in future elections? Yes ____ No ____ (why not?) _____

4. Do you have additional comments about and/or suggestions for improving **your county's poll worker program**?