



History of the Debate Surrounding the 2004 Presidential Election

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This paper is available at <http://electionarchive.org/ucvAnalysis/US/Presidential-Election-2004.pdf>



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Kerry Wins Presidential Election according to the Exit Polls (November 2, 2004)

Buried so deep in the methodology statement of the National Election Pool (NEP) that nobody but the serious sleuth is likely to find it, the protocol of Edison/Mitofsky, the private company that conducted the National Exit Poll, calls for the gradual Election Night replacement of genuine exit poll data with incoming vote counts. As vote counts become available (that is, as the polls close) they are used to "adjust" or "force" (the term of art used by Edison/Mitofsky) the exit poll results to conform with emerging final vote tallies -- *basically the exit polls morph from being Exit Polls at 9 pm to being virtual carbon copies of the vote tallies a few hours later.* The Exit Poll adjustments are purportedly designed to help the media clients get a leg up on the results (send A team to winner's ballroom, B team to loser's, etc.) and to supply useful demographic information to analysts. For these and other purposes of their paying clients, the exit polls can be most helpful if they are in line with the vote totals.

On Election Night 2004, Dr. Jonathan Simon¹ who had learned about the Edison/Mitofsky plan to displace the exit poll data, downloaded and printed time-stamped screenshots from CNN showing pre- and post-adjustment exit poll results for 44 states and the national sample (i.e. the popular vote). Because of a computer problem at Edison, these late-night screenshots of normally weighted but *unadjusted* exit poll data remained posted several hours longer than intended -- and thus presented the most accurate, complete and authentic weighted exit poll tallies for each state and the national sample. Each of these screenshots also included the number of *respondents*, as well as a demographic breakdown of the poll results.

As recorded and publicized by Dr. Simon and ultimately acknowledged by Edison/Mitofsky as their "Call 3 Weighted" data, these exit poll results revealed the discrepancies between the exit poll results and vote counts both in key states and in the national popular vote, giving rise to the critical debate over the cause: either inexplicably skewed exit polls or outcome-altering mistabulation of the votes.

Pollsters Alter Exit Poll Data to be the Same as Election Results (November 3)

The normal demographic weighting of the raw exit poll data produced the CNN numbers up until about 12:24 a.m. November 3rd 2004. At this juncture E/M's glitched servers finally kicked in and began replacing these results with the "adjusted" (or "forced" or "super-weighted" or "non-demographically weighted") results that matched the vote tallies. Once the full-sample authentic exit poll results were replaced in each state and for the national sample between midnight and 1 a.m., the intention was never to post or publish the authentic exit poll results again.

It immediately became clear to Dr. Simon that highly significant and unprecedented adjustments were being made to the exit poll percentages with little or no change in the number of respondents, confirming that the Edison/Mitofsky forcing protocol was happening in real time.

"Adjusted" exit poll results, because they are forced to congruence with the tabulated vote, *will be the same as the official election results no matter what the actual exit poll data has been*, and therefore they bear no relation to the exit polls themselves. However these new results, that are simply election results based on progressively larger samples of the tabulated vote, continue to be put forth *as exit polls*, which of course they no longer are.

¹ Jonathan Simon is a chiropractic physician, attorney, and former political survey research analyst.



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This led to great confusion on the part of analysts, commentators, and the public at large. Few recognized, on November 3rd, the significance and value of the results captured by Dr. Simon. Owing to a computer accident at Edison and the foresight of a concerned citizen, these authentic data became part of the public record -- allowing independent statisticians to review and analyze the authentic 2004 exit poll results -- and became the basis for a discussion: Why the disparity between exit polls and the official tally?

For decades, the official vote tallies had been the Holy Grail against which the pollsters calibrated their techniques. Perhaps predictably, the pollsters themselves were not pleased to see their work held up as an independent check on the honesty and accuracy of government tallies, and therefore either erroneous or colossally damning to the integrity of the election results. Very quickly, the NEP organization released a statement that their numbers “must have” been skewed, perhaps by a greater participation from Kerry voters. The hypothesis that Bush voters were more reluctant to be polled than Kerry voters was already being floated by media pundits well before there could have been any data provided to back it up.

What Are the Effects of Forcing the Exit Polls to Match Election Results?

In past election years the exit poll adjustments have been relatively minor while in 2004 they were, statistically speaking, *huge*: The National Exit Poll (sample size >13,000 voters) was off by 4.7 standard deviations. In other words there was approximately a one in a million chance of obtaining the 2004 exit poll results by random chance given the reported official election results unless there was error in the polling protocol or mistabulation of the vote).

The adjustment entailed taking exit poll results that were recorded at 38% Democrat and 35% Republican and weighting (multiplying by weights) to equal to 37% Democrat and 37% Republican (as well as shifting the Independents (26%) about 7% toward Bush). This not only is an enormous adjustment statistically but also would necessitate that the Republicans won the turnout battle in virtually every state, when observational evidence tells us just the opposite.

It is vital to understand the distinction between *weighting* and *adjusting* (or forcing) of exit polls. *Weighting* of the raw data (the actual questionnaire responses) constitutes the best efforts of the exit pollster to “get it right,” to achieve an accurate sample of the electorate using the best available demographic and vote-pattern parameters from prior elections, before the vote count from the current election is known. *Adjusting*, on the other hand, simply constitutes a distortion of the results to match the vote count in the current election. The results captured by Dr. Simon were weighted. The raw data—in the form of individual questionnaire responses—has not been publicly disclosed by Edison/Mitofsky in spite of repeated requests by independent analysts seeking to address and resolve the critical questions that have been raised in the exit poll debate.

A partial release of raw data to the Roper Institute (the “Roper Data”)² included individual questionnaire responses and demographics but failed to identify the sampled precincts from which the questionnaires were drawn. The Roper Data shows that the mean weightings for the adjusted

² Roper Data comes from a CD called Election Day Exit Polls 2000-2004, issued by The Roper Center for Public Opinion Research, University of Connecticut. Their site is <www.RoperCenter.UConn.edu>



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national data were something like a +1.196 factor for Kerry and a +1.367 factor for Bush.³ Dividing 1.367 by 1.196 gives us the equivalent of a +14.3% comparative up-weighting of Bush respondents in going from the raw data to the "adjusted" data to get the 2.7% Bush victory. Some of this 14% probably results from normal over-sampling and weighting parameters (e.g. inner city precincts may have been deliberately over-sampled and then down-weighted). But 14% is a *lot of weight* in an election decided by 2.7% and it is incumbent on Edison/Mitofsky to give a detailed and specific response explaining exactly how the vote count-exit poll conforming results required a 14% up-weighting of raw data in favor of Bush.

We remain at the mercy of Edison/Mitofsky in accepting their pre-adjustment weighting factors if they do not release the relevant data and weighting and adjustment procedures. We also are forced to make the assumption that recent elections from which some of these weighting factors derive were not themselves marred by distorting patterns of selective disenfranchisement and vote mistabulation. Indeed the exit poll discrepancy would be even wider if not for the rightward-shifting effect on normal weighting parameters of rightward skewed vote patterns likely produced by voter disenfranchisement and vote mistabulation in recent (i.e., 2000 and 2002) elections⁴. The cooperation of E/M and their major media clients has been limited and quite grudging. Indeed only the existence of the Simon downloads forced E/M to acknowledge that their exit polls were "off" (based on the bedrock assumption that the vote counts were gospel) and began the search for exit poll-based explanations.

Surprising Florida Election Results (November 3)

Following prior statistically unlikely senatorial, presidential, and gubernatorial elections and the examination of Diebold's digital recording electronic (DRE) voting machines,⁵ some people became suspicious of election results produced by DRE voting systems that enable insiders to tamper with widespread vote counts. However, optical scan and punch-card ballots are also counted electronically and there are many ways to innocently or deliberately cause vote miscounts that are unique to each voting system or election procedure.

On October 29th 2004, Kathy Dopp proposed to the Open Voting Consortium's email list that a statistical study should be done to detect possible vote count errors and asked for input.⁶ On November 3rd Kathy Dopp, looking for possible odd patterns in Florida's DRE counties, posted official election results and voter registration data that compared results from Florida's optical scan and electronic voting counties. To Dopp's surprise, the data showed a highly improbable pattern in

³ Because only Jonathan Simon of NEDA has thus far done these calculations - we would appreciate independent verification of the values of a +1.196 factor for Kerry and a +1.367 factor for Bush. Please go into the Roper Data CD with SPSS (or equiv) and run the means for the weightings of all the questionnaires in the National Sample and let us know what values you obtain.

⁴ For instance, in the Florida 2000 election, tens of thousands of legal Democratic voters were wrongly removed from voter registration rolls, and not allowed to vote, and Florida's optical scan counties, when recounted later by the Miami Herald, showed that Florida's electoral votes would have gone to Gore, if votes had been accurately counted to reflect voter intent.

⁵ Bev Harris stumbled on Diebold's source code in early 2003, following a statistically implausible Georgia election, and experts have since then examined Diebold's DREs. (pp. 4 - 5 in <http://utahcountvotes.org/AdviceReDiebolds.pdf>)

⁶ The OpenVotingConsortium.org list is comprised primarily of computer scientists and computer professionals who have been designing better voting and election systems since 2000 election. The October 29th email and thread are preserved here: <http://gnosis.python-hosting.com/voting-project/October.2004/0212.html>



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Florida's optical scan counties: more votes for Bush than would be expected. Kathy Dopp⁷ then formed a discussion list for statisticians, academicians, and others who contacted her. Among these, Charlie Strauss, Elizabeth Liddle, and Josh Mitteldorf contributed statistical analyses and charts for Dopp's Web site. So that county size would not be a confounding factor, Florida counties of similar size were selected for comparison.

"Voting machine used" was a very significant predictor of vote counts ($p < .01$ meaning that the likelihood that this would occur by chance was less than 1 in 100), with optical scan favoring Republicans. There was no significant difference between these two groups of counties in either number of registered voters or their ratio of registered Republicans to registered Democrats. The pattern was found to be statistically significant: In other words, Florida counties which used optical scan vote counting equipment exhibited a much higher share of Bush votes compared to Republican voter registration, than counties which used DRE voting equipment. Vote counts in Florida's optical scan counties in the 2004 presidential election appeared suspect.

This group of statisticians, academics, and others formed a nonprofit corporation to investigate the accuracy of elections called US Count Votes (USCV), which was later renamed the National Election Data Archive (NEDA).

Concrete evidence was provided by The Miami Herald that Florida's optical scan counties' votes were miscounted in both the 2000 and 2004 presidential elections.

- In the 2000 election, Gore would have won Florida if the counties using optical scan equipment had been recounted.
- After the 2004 election, The Miami Herald did a little-known hand recount of 2.7 counties that increased the Kerry vote by a percentage large enough that, extrapolated statewide, would have meant a victory for him in Florida.⁸

"Theories of Fraud Easily Debunked" (November 9)

A New York Times article on Nov. 9, "Theories of Fraud Easily Debunked", incorrectly claimed that Wand, Sekhon and Mebane, respectively of Stanford, Harvard, and Cornell had debunked US Count Votes' (USCV) work. However, all of Mebane et al's criticisms at the time were based on an incorrect assumption that USCV had not accounted for county size in its statistical analysis. Mebane et al were invited to join USCV's discussion list for statisticians and much discussion ensued.

"The Unexplained Exit Poll Discrepancy" (November 10, updated January 5)

Even as the New York Times was declaring that the controversy was over, a University of Pennsylvania political scientist, Dr. Steven F. Freeman, was writing about "The Unexplained Exit Poll Discrepancy".⁹ His Internet-published article, stamped as "EARLY DRAFT", was widely

⁷ Kathy Dopp has an MS in mathematics from the University of Utah, with graduate level computer science work. She founded Utah Count Votes in 2004 and in 1994 founded one of Utah's first Internet Service Providers. Since 2004 she has written more than a dozen papers on the subject of U.S. elections systems with computer scientists and statisticians.

⁸ In other words, they stopped counting 0.7 way through the ballots for the third county!

⁹ Steven Freeman holds a Ph.D. from MIT in organizational studies, and is a visiting scholar at the University of Pennsylvania's Center for Organizational Dynamics, where he teaches research methods, including polling.



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circulated, and presented for the first time Simon's downloaded numbers (which Freeman corroborated against web page screen images he had independently preserved). Freeman made the point that exit polling was a mature art and that elsewhere in the world, exit poll numbers were used as an independent check on the accuracy of government vote counting. He tabulated the exit poll discrepancies in 11 "swing" states that had been identified early in the campaign as crucial to victory for either party. The discrepancies indicated a broad Kerry bias nationwide, but were significantly higher in these 11 states. He explained clearly the difference between raw and adjusted exit poll numbers. (The New York Times article the previous day had made mistaken arguments because this distinction was not appreciated.) Freeman established that the difference between exit polls and official results could not be chalked up to a statistical fluke. But he considered other possible explanations as well, and explained why they seemed unsatisfactory. Freeman concluded cautiously:

Widespread assumption of misplay undermines not only the legitimacy of the President, but faith in the foundations of the democracy. ... The election's unexplained exit poll discrepancies make fraud or mistabulation ... an unavoidable hypothesis, one that is the responsibility of the media, academia, polling agencies and the public to investigate.

Freeman has continued to research the issue in as much detail as possible, and the results of his work will appear in his forthcoming book, *Was the 2004 Presidential Election Stolen?*, to be published in November 2005 by Seven Stories Press. His thesis is that the official explanation for the difference between exit poll and official results -- that Kerry voters participated at a higher rate -- is unsupported by the data. Instead, the within-precinct disparity (WPD)¹⁰ is statistically significantly correlated with election administration variables such as Republican gubernatorial control, state electoral importance and voting technology -- in other words, exit poll results differed from official results more in states with Republican governors, in states whose results were critical to the election, and in precincts that used certain vote counting technologies.

Explaining Florida's Unusual Voting Patterns (November 14)

On November 14th a study by Jasjeet S. Sekhon of Harvard claimed that the differences in Florida's voting patterns in DRE and optical scan counties could instead be due to the distributions of variables such as party registration, past votes and demographics.¹¹ One of Sekhon's assumptions was that Florida's 2000 official election results were correct, despite the 2001 Miami Herald recount showing that Gore would have won Florida if he had requested a recount of its optical scan counties. In 2004, Dopp had noticed that Florida's optical scan counties outperformed for Bush in the official vote count as compared to Republican voter registration share, as compared to Florida's DRE counties. Out of 67 Florida counties, Sekhon selected 8 optical scan counties and 7 electronic ballot counties, to compare with each other based on such factors as party registration, past votes, and demographics.

¹⁰ Also referred to as "within precinct error" (WPE) by many commentators following terminology used in the January 19 Edison/Mitofsky report – see below.

¹¹ The 2004 Florida Optical Voting Machine Controversy: A Causal Analysis Using Matching - see <http://jsekhon.fas.harvard.edu/papers/SekhonOpticalMatch.pdf>



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None of the optical scan counties that Sekhon selected for studying Florida's 2004 election showed the pattern of exaggerated Bush vote share over Republican registration share. In the optical scan counties he selected, Bush vote share out-performed Republican registration share by an average of 34%, whereas, Florida optical scan counties had produced, on average, 157% more Bush vote share than expected from Republican registration share. On the other hand, in Florida DRE counties, Bush vote share had out-performed Republican voter registration by an average 4.2%. Yet the DRE counties that Sekhon selected had out-performed Republican registration by 25.6%.

Thus, the Florida DRE and optical scan counties in Sekhon's study exhibited more similar voting patterns to each other than the general population of Florida's DRE and optical scan counties did. (See Appendix A for details.)

Sekhon's conclusion, not surprisingly, was that there was no discernable difference in voting patterns between Florida's counties using optical scan and DRE voting equipment. He said "there is no support in this data for the contention that optical voting machines had a significant causal effect on the Kerry vote."

Conclusion: Precinct-Level Election Results and Exit Poll Data are Needed

In response to Sekhon's paper, it was decided by the academics of the National Election Data Archive (NEDA)¹² list that precinct-level, as opposed to county-level, election results data is required for definitive analysis of vote patterns. Since then NEDA has attempted to raise the funds necessary to build a National Election Data Archive for collecting and publicly releasing the necessary detailed election data for independent scientific analysis.

Bush Wins the Popular Vote: One in 959,000 Chance (December 28, updated January 2, 2005)

A study of the unadjusted exit poll results from a much larger national sample (originally reported by E/M to have 13,047 respondents) was done by Jonathan Simon and Ron Baiman¹³, who calculated that there was a one in 959,000 chance that Bush could have won the popular vote by 2.8% given Kerry's 2.6% lead in the exit poll.¹⁴

New Mexico Precinct Election Data Reveals Presidential Election Tampering (January 3)

New Mexico was one of the states that Kerry won according to the unadjusted exit polls, yet Bush won according to official results. The Green Party collected New Mexico's detailed precinct-level election data, broken out by vote-type, necessary to analyze election results.

¹² See <http://electionarchive.org>

¹³ Ron Baiman holds a Ph.D. in Economics and has worked in the field of applied statistical analysis for 16 years. He currently holds a joint appointment as a Senior Researcher at the Institute of Government and Public Affairs and as an Assistant Research Professor at the College of Urban Planning and Public Affairs, at the University of Illinois at Chicago. He is Vice President of U.S. Count Votes.

¹⁴ See www.freepress.org/departments/display/19/2004/1054. E/M later disclosed that the national sample size was 12,219 reducing the odds to "only" one in 455,600 – see footnote 3, USCV March 31 paper.



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In the New Mexico 2004 presidential election, over 2,000 more absentee ballot votes were counted than had been cast.¹⁵ New Mexico also had the highest rate in America of "under-votes" in the presidential race, where allegedly an average 3.5% of voters did not cast a vote for president in DRE voting machine counties as compared to an undervote rate of under 1% in New Mexico's optical scan counties. NEDA's statistical analysis found a strong association between Election Day under-votes and pushbutton DRE voting machines. The average under-vote in precincts where pushbutton DRE voting machines were used was 3.5%, compared with less than 1% in precincts that used optical scan paper ballots. Hispanic and Native American populations were independently associated with high under-vote rates, and the combination of ethnicity and pushbutton machines led to even higher under-vote rates than would be expected from the sum of these effects separately.¹⁶

According to Warren Stewart, who collected and organized much of the data:

Particularly alarming were cases like Taos County, where optically scanned paper ballots were used in early and absentee voting, and DREs were used on Election Day. In early and absentee voting in Taos County, the presidential undervote rate was well below 1%, while on Election Day the undervote rate soared to almost 10%! Or San Miguel County, Precinct 14 where every single person who voted early (on paper) voted for one presidential candidate or another while 27% of their neighbors who voted electronically on Election Day apparently didn't vote for any of them.¹⁷

Currently local U.S. election officials report election data *after* adding together the separate vote counts for absentee, early, Election Day, and provisional vote types. This allows insiders to pad votes for one candidate in one vote type and simultaneously subtract votes for a different candidate in another vote type, to add these two vote counts together thus hiding any evidence of fraud, and to then report the conglomerated data. Everything looks fine!

If States wish to detect and prevent election tampering, or problems with voting machines, then local election officials must publicly report precinct-level election results broken out by vote type.¹⁸

Irregular Touch-screen Election Results in the Washington State Governor's Race (January 6)

Snohomish County Washington featured side by side Election Day paper and touch screen voting technologies in the same precincts. 68% of voters voted on paper ballots and 32% cast electronic touch screen ballots. Both paper and touch screen data was available for all precincts except in a very small number of mail-in ballot precincts.

These side-by-side voting technologies shed light on whether or not differences in results are due to differences in voting technologies or differences in demographics between counties (as was alleged by Sekhon with the Dopp Florida study).¹⁹

¹⁵ See the National Election Data Archive analysis http://uscountvotes.org/ucvAnalysis/NM/NMAnalysis_EL_JM.pdf and a summary report by Warren Stewart and Ellen Theisen, Dec 21, 2004 <http://www.votersunite.org/info/NewMexico2004ElectionDataReport.pdf>

¹⁶ Note: "Phantom" padded absentee ballot votes are hidden in the course of usual election data reporting when they are added together with the Election Day vote counts. i.e. the high rate of "under-votes" cancels out when added together with the extra "phantom" votes. Most states similarly aggregate their election data before reporting it and thus similarly hide evidence of possible vote tampering.

¹⁷ From an October 24, 2005 news article: <http://www.americanchronicle.com/articles/viewArticle.asp?articleID=3167>

¹⁸ For more information see <http://uscountvotes.org/ucvData/US/How2CollectData.pdf>



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Dr. Jeffrey Hoffman and attorney Paul R. Lehto began a precinct-level “parallel voting technologies study” of the Washington Governor's race in Snohomish County.²⁰ This natural side-by-side study was enhanced by a hand recount of the paper ballots in the Governor’s race which (although initially subjected to optical scan counting) were subjected after Election Day in the Governor’s race to both a hand recount -- eliminating sources of error from both scanners and tabulator computers -- as well as an exhaustive election contest litigation and trial in which both sides focused on the questions of alleged fraud by voters themselves, along with the issues brought up by precincts in which there were “more votes than voters in the poll books”. The Republicans, having lost the hand recount and being the ones who wanted to sue, did not include within their election contest any issues of electronic voting.²¹

The paper ballot data had been stripped of both voter fraud and computer or scanning-related errors by the huge investigations by the political parties and the recount processes without any material change in Snohomish County paper ballots, while the touch screen electronic voting data was not litigated at all, and thus did not have any of its potential error examined or litigated.²² Hence, the Sequoia touch screen voting machines were isolated as the more likely source of any discrepancies between touch screen voting and paper balloting, if any election irregularities were shown.

In Snohomish county, Democrat Gregoire won by approximately 2000 votes in the 68% of votes cast on paper ballots, and Republican Rossi won by a relative landslide of 8500 votes in the 32% of the votes cast on electronic ballots, giving Rossi a 6500 vote margin in normally Democratic Snohomish County, where no competitive Democrat in recent history has lost the county.

Analysis of the Snohomish precinct-level election data, the available exit poll data, and past election data showed that:

1. The chance of the same voting population obtaining these Snohomish county election results, when randomly placed into a 68% population representing paper ballots, and a 32% population representing touch-screens, was statistically highly implausible.
2. The conclusive differences in election results produced by the two voting technologies cannot be attributed to "late surges" for Republican Rossi because the CNN exit poll favored Democrat Gregoire and a high number of Election Day absentee paper ballots were used.
3. Historically in past elections, Democrats did better on Election Day than Republicans who did better on absentees. While the liberalization of absentee voting in

¹⁹ Large numbers of paper ballots were cast on Election Day and not as classic early or absentee ballots, thus significantly reducing the likelihood that the difference in time that ballots were cast could explain the discrepancies between voting technologies.

²⁰ The scientific study of Lehto & Hoffman can be found at www.votersunite.org/info/lehtolawsuit.asp

²¹ Ultimately, Republican Dino Rossi (the winner in the original count as well as the machine recount) was displaced by Democrat Christine Gregoire in the hand recount, with the election contest failing to identify enough votes to change the Gregoire margin of victory from the hand recount, and Gregoire was sworn in as Governor of Washington state.

²² In fact, the two political parties stipulated that printing the electronic ballot “images” by the truckload and then hand counting them was too much effort for a recount that would not be meaningful in the electronic context. Instead, the parties stipulated that the “hand recount” would consist of adding up the “results reports” printed at each polling place touch screen machine to see if those paper reports matched the reported touch screen results on Election Day. However, not all machines actually printed a result report on Election Day, a fact apparently never fully disclosed to the parties.



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Washington tends to equalize the parties' absentee votes, the advent of Sequoia electronic touch screen voting in 2002 coincided with Democrats being several percentage points off on Election Day for the first time.

It is not possible to conclusively eliminate all conceivable political explanations, particularly where the secret ballot itself prevents anyone from tracing ballots back to voters, and thus allows the winners of an election and their supporters to hypothesize any scenario that might explain the results with no data being available to disprove it. To pierce through the fog of these political explanations, *touch-screen election results were reported for the first time on a machine-by-machine level*, rather than on a precinct-by-precinct level. This allowed a detailed analysis of how each machine voted, among the 4 to 12 machines at each polling location.²³

Lehto & Hoffman published an analysis of the results of this machine-by-machine data:

1. The touch-screen voting machines used on Election Day had from 31 to approximately 150 votes on them apiece. Lehto & Hoffman isolated the machines with 30 or fewer votes that were taken out of service prior to the end of Election Day, usually because of observed vote-switching behaviors from Democratic votes to Republican or Libertarian, or because of freezing up. The 19 touch screens that fit this profile contained altogether over 50% more votes for Republican Rossi than for Democrat Gregoire (155 votes to 101 votes), with Gregoire not winning on any of the 19 machines. Touch screens that are malfunctioning are indistinguishable from properly functioning touch screens, so it is impossible to attribute any political explanation to the large differences in malfunctioning machines.
2. This data conclusively shows that touch-screen malfunctions (or vote fraud) were not politically neutral, i.e. the malfunctions or election fraud systematically favored the Republican gubernatorial candidate.
3. The statistical evidence of systematic bias in favor of Republicans was backed up by numerous eyewitness reports and statements of vote switching by KOMO TV and Internet news coverage of problems observed on Election Day. Snohomish County trouble-shooters problem logs also provided circumstantial evidence. These extensive reports overlapped the 19 machines taken out of service and extended countywide to more than half of the Snohomish polling locations.

The existence of election irregularities systematically favoring the Republican political party over other parties was thus conclusively shown on Sequoia touch screens in Snohomish County via eyewitness evidence, statistical evidence, computer evidence, circumstantial and inferential evidence, and evidence in the troubleshooters' logs.

Are these election irregularities intentional or accidental? The normal rule is that random errors (when there are lots of them) tend to cancel each other. This indicates that intentional fraud is the most likely explanation. However, it matters little for the integrity of the election results whether

²³ Each machine is programmed to have not only the ballot styles of the other precincts at that polling location, but all of the ballot styles for the precincts on one of the nine routes for distribution of voting machines in Snohomish County. This is done to facilitate random distribution of voting machines within a given route. However, it also means that voting machines within a given route can accidentally or purposefully be allowed to cast ballots for precincts outside their proper polling location.



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the actual error is brought about by intent or by accident because in either case the wrong candidate is elected and the system has been corrupted.

The Snohomish County story continues.²⁴ Although the Snohomish analysis is on the gubernatorial race, the incidence of actually observed and reported vote switching countywide was highest in the presidential race. i.e. Kerry votes were turned into Bush votes or Libertarian votes, and the voter had difficulty changing the touch screen back to Kerry votes. There was also a comparable discrepancy in favor of Bush on a precinct by precinct basis between paper ballots and touch screen balloting in the presidential race. There were no reports of any touch screen calibration or vote switching problems in the twenty or more other races and referenda on the multi-screen ballot. Switching was seen only in the top political races like President, Senator and Governor. Lehto & Hoffman will issue an updated paper by January 2006, joined by additional co-authors.

Exit Pollsters' Explanation for the Discrepancies: Bush Voters Respond Less (January 19)

If the pre-adjustment exit poll data had not been captured and posted online as a result of a computer breakdown at Edison then Edison/Mitofsky (E/M), or its media clients might not have come forward on January 19th with their report which contained some data and analysis²⁵, and the "exit poll-vote count" discrepancy might not have been discovered.

Responding to the controversy surrounding the discrepancies in the November 2nd exit polls, E/M issued a 77-page report to account for why their exit polls were so unexpectedly far off. The E/M report *concluded that their exit polls were wrong because Kerry voters were more willing to complete exit polls than Bush voters*. The Edison/Mitofsky report confirmed that there were large unexplained differences between their exit polls and the official results of the 2004 presidential election – much larger than in previous elections (p. 31). The E/M report attributed these discrepancies to erroneous exit poll results at the exit-poll precincts which it called “within precinct error” (WPE)²⁶, rather than problems with how exit poll results were weighted when state level results were estimated.²⁷ The national exit poll indicated a 3-point victory for Kerry, whereas the official election results indicated that Kerry lost by 2.5%, a difference of 5.5%.

The E/M report asserted that a “hypothetical” exit poll completion rate of 56% for Kerry voters and 50% for Bush voters could explain all of the observed 2004 WPE discrepancy (p. 31 of E/M report). This was dubbed by many the "reluctant Bush responder" (rBr) hypothesis.

²⁴ Lehto and his pro bono attorney Gordon (a candidate for Congress in Washington's 8th Cong. District, www.randygordonforcongress.com) have sued to void the contract used to purchase the Sequoia electronic voting machines on the grounds that secret vote counting and lack of disclosure created by corporate trade secret vote counting is both against public policy and unconstitutional. Lehto and Gordon are requesting that the purchase contract be declared void. Both the study and the pleadings in the lawsuit are collected and updated at www.votersunite.org/info/lehtolawsuit.asp

²⁵ See “Evaluation of Edison/Mitofsky Election System 2004” at <http://exit-poll.net/election-night/EvaluationJan192005.pdf>

²⁶ This will be referred to as “within precinct discrepancy” (WPD) in other sections of this report as the source of these discrepancies (error or vote miscount) has not been established.

²⁷ This conclusion has not been definitively established as there are questions regarding the evidence used in the E/M report to support it (see USCV March 31 report, p.8) that have not been clarified by E/M. Thus, in its analysis, USCV had to assume that all exit poll discrepancy can be attributed to WPD in its analyses.



Precincts with Highest Bush Vote Share had Responded *More* to Exit Polls (January 28)

The National Election Data Archive pointed out that Edison/Mitofsky offered no evidence to support their conclusion about chattier Kerry voters and noted that E/M's data indicates that voters in precincts that voted heavily for Bush appeared to be slightly *more* willing to talk to exit pollsters than Kerry voters.²⁸

"Analysis of the 2004 Presidential Election Exit Poll Discrepancies" (March 31)

The National Election Data Archive initiated the mathematical study of the patterns of exit poll discrepancies (WPD) - called "within precinct error" (WPE) by Edison/Mitofsky, that are produced by varying exit poll response rates of Kerry and Bush voters. NEDA used Edison/Mitofsky's reported discrepancies (WPD) and overall response rates values to show what exit poll response rates of Kerry and Bush voters would produce the data in the exit pollsters' report.²⁹

The January E/M report had discussed factors that affected WPD and *asserted* that Kerry and Bush voter exit poll response rates of K=56% and B=50% could explain all of the WPD (p. 31 of E/M report). However, E/M offered no evidence to support this hypothesis.³⁰

NEDA's algebraic analysis showed that the patterns of exit poll response that would be required to cause the 2004 exit poll discrepancies were surprising and not consistent with the Edison/Mitofsky hypothesis.³¹ For the discrepancies between exit poll results and official results to be due to greater willingness of Kerry voters' to complete exit polls, Kerry voters would have had to be much more willing to complete polls than Bush voters *in precincts which voted 80% or more for Bush*, and no more willing than Bush voters to complete polls in precincts which voted 80% or more for Kerry!³²

Calculations showed that, to produce the exit poll discrepancies from Kerry/Bush exit poll response differences, Kerry voter response rates would have to be 20% to 30% greater than Bush voters' response rates in precincts where the Bush vote share was over 80%. And, equally surprising, Kerry voter exit poll response rates would have to be 20% to 30% greater in precincts where Bush vote share was over 80%, than Kerry voter exit poll response rates in precincts where Kerry vote share was over 80%! This is contrary to common sense. In any case, clearly the exit poll discrepancies in the 2004 presidential race were *not* caused by an overall 56% Kerry to 50% Bush exit poll response rate ratio.

NEDA also showed, using the 1% margin of error publicized by E/M for their national exit poll, that there was less than a one in 16.5 million chance, based on sampling error, that Bush had won the popular vote, given the national exit poll result.³³

²⁸ http://electionarchive.org/ucvAnalysis/US/USCountVotes_Re_Mitofsky-Edison.pdf

²⁹ See USCV March 31 updated April 12 report Table's 2 – 4, p. 11 and p. 25

³⁰ See Sept. 8 report op. cit., p. 4-5 for explanation of need for explanation based on "model" and not "data" variance. The exit pollsters did not provide a multiple regression analysis showing that these factors along with 56% and 50% average response rates could explain the WPE/WPD patterns.

³¹ See July 8, 2005 and March 31, 2005 reports at: www.uscountvotes.org.

³² See Appendix G of Sept. 8 USCV report op. cit.

³³ Appendix D of March 31 USCV report op cit.



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NEDA appealed to E/M to provide a substantive statistical explanation for its irregular exit poll discrepancy patterns and to release precinct-level, unadjusted exit poll data to enable independent analysts to test or reject hypothesized explanations. To date, neither a substantive statistical explanation nor the data has been provided.³⁴

Elizabeth Liddle, who was an active participant in the NEDA discussion list at the time, noticed that an “inverted U” asymmetric shaped WPD pattern emerged when Kerry and Bush voter response rates were unequal and are held constant over precincts with increasing Kerry (or Bush) vote shares. NEDA then derived this pattern algebraically from “differential partisan response” (Bush *minus* Kerry voter exit poll completion rates)³⁵ to show why the “inverted U” pattern appears, why WPD will be at a maximum in perfectly competitive districts (precincts where Bush and Kerry each got 50% of the official vote), and why differential partisan response will be equal to WPD (E) in these evenly matched precincts when the completion rate (R) is 50%.

This asymmetric inverted “U” WPD pattern meant that the 10% Kerry over-estimate in precincts which voted over 80% for Bush was even *more* implausible because precincts which voted over 80% for Bush should have *near zero* WPD if the discrepancy was caused by exit poll response bias.

"Exit Polls 2004: differential non-response or votecount?" (April 19, updated April 27)

Liddle wrote a paper, "Edison/Mitofsky Exit Polls 2004: differential non-response or votecount" which concluded:

"The pattern [in E/M data] instead is consistent with the E/M hypothesis of widespread reluctant Bush responders, provided we postulate a large degree of variance in the degree and direction of bias across precinct types."³⁶

Exit pollster Mitofsky and pollster Mark Blumenthal, began to rely on Liddle's work to support their position that exit poll error caused the 2004 exit poll discrepancies³⁷. Liddle based her conclusion on a simulation of WPEs obtained by varying Bush and Kerry voter response rates (B and K) as Gaussian distributions with constant means, over precincts that varied in Bush and Kerry vote share.

Though Liddle cited the NEDA paper, Liddle neglected to point out that her analysis was based on the very same K/B ratios by precinct category that USCV had already investigated in its March 31st report in which NEDA found that the exit poll data is inconsistent with a pervasive exit poll response bias hypothesis.³⁸ Liddle simulated, graphed, and took the log of, the K/B results.

³⁴ See Sept. 8 report op. cit., p. 4-5 for explanation of need for explanation based on “model” and not “data” variance.

³⁵ added Appendix B which appears in both NEDA reports

³⁶ See <http://www.geocities.com/lizzielid/WPEpaper.pdf> (p. 21, brackets added). Though the qualifiers regarding the “postulation of a large degree of variance in the degree and direction of bias” could be interpreted as a loophole that would allow consistency with almost *any* WPD pattern (one can “postulate” anything), the testable hypotheses in this statement would appear to be that the reluctant Bush responder phenomenon is *not significantly* correlated with precinct partisanship, or that there is not a “constant average bias” explanation for exit poll discrepancies across precinct partisanship categories with a residual that is less or equal to *model* variance – see USCV Sept. 8 report, Appendix G..

³⁷ Liddle has since been hired several times by Mitofsky.

³⁸ see USCV March 31 paper. Liddle derived her “alpha=K/B” without reference to the equations for K and B derived earlier in this March 31st report.



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How could Liddle have come to the opposite conclusion of NEDA based on an analysis of the same variables, and same data, that NEDA had previously investigated? Some observers were under the impression that Liddle's analysis uncovered a new "artifact" or "confounding" that resolved the debate and showed that the reluctant Bush responder (rBr) hypothesis could, after all, explain the exit poll data.³⁹

The flaws in Liddle's analysis (discussed in more detail in Appendix A) included:

- The asymmetry in Liddle's graph that makes it slightly resemble the E/M data is caused as a result of a mathematical "nit" of linking an absolute difference (WPD) measure to a ratio measure.
- Her analysis at this point was based on her simulations that did not exactly replicate the Edison/Mitofsky data. Simulations by NEDA which also calculated probabilities, showed that, even using assumptions that worked best for the "reluctant Bush responder" (rBr) hypothesis, rBr was an unlikely, if not impossible, explanation for the discrepancy between official results and exit poll results.
- Liddle's analysis works only if 10% of all of the precincts which voted over 80% for Bush are dropped from the data. If 10% of such precincts in the country were corrupted, this could represent a very serious problem.

"Vote Fraud Theorists Battle Over Plausibility" (April 24)

On April 24th Washington Post reporter Terry M. Neal cautiously concluded that "Ultimately, the USCV report is interesting. But is it anything more than that? Given the statistical complexity of the information, I don't feel qualified to answer that question after a few days of investigation. Scientists and statisticians will continue to debate these issues for months, if not years to come."⁴⁰

Neal's article included comments by exit pollster Mitofsky and the "Mystery Pollster" Blumenthal⁴¹ dismissing USCV's work. Blumenthal, a Democratic pollster, was quoted as saying:

"The Edison-Mitofsky report includes overwhelming evidence that the error rates were worse when interviewers were younger, relatively less experienced, less well educated or faced bigger challenges in selecting voters at random,"

Blumenthal failed to note that Mitofsky had not produced any evidence to show why such factors would influence primarily precincts that voted for Bush or produce such one-sided pro-Kerry exit

³⁹ See for example: http://www.mysterypollster.com/main/2005/04/the_liddle_mode.html and http://www.tompaine.com/articles/20050505/what_didnt_happen_in_ohio.php. The later piece by Russ Baker also gives much credence to a critique by Rick Brady (see footnote above for reference) whose main point has to do with whether Freeman's original study (see above for reference) takes proper account of the possibility of "insignificant digits" in its margin of error calculations, and uses (after the fact and unexplained) increased Mitofsky cluster adjustment factors. However, Brady's points have been shown to have *negligible* impact – see cover to Baiman January 31, 2005 affidavit to the Supreme Court of Ohio at: http://uscourtvotes.net/docs_pdf/analysis/OH/Affidavit_04-21_ver2.pdf, and in any case are irrelevant to more recent calculations of a 1 to 16.5 million chance that Bush could have won the popular vote given the national exit poll result, that is based on E/M's reported margin of error – see USCV, March 31 paper, Appendix D. Finally, E/M's January 19, 2005 own report acknowledging statistically implausible exit poll error in the 2004 presidential race confirms the substantive accuracy of Freeman's analysis.

⁴⁰ <http://www.washingtonpost.com/wp-dyn/content/article/2005/04/24/AR2005042401545.html>

⁴¹ Blumenthal lists his credentials here http://www.mysterypollster.com/main/2004/09/about_mystery_p.html



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poll bias. USCV had already discussed these factors in its March 31st paper.⁴² Mark Blumenthal admitted on his mysterypollster.com web site that he had not followed USCV's "complex algebra" (basic college level algebra), and had relied on the analysis of Liddle (see above) to make his conclusions. Currently Blumenthal's web site cites a paper by Bruce O'Dell, former USCV Vice President, to support his conclusions dismissing NEDA's work⁴³. O'Dell's paper, updated on June 1st mischaracterized USCV's work (See Appendix A.) and relied heavily on Liddle's flawed analyses (See above.)

Blumenthal, by relying on the work of Liddle and O'Dell, thus wrongly dismissed USCV's work.

Exit Pollster Presents Scatter-plot of Exit Poll Discrepancies (May 14)

At a May 14th presentation at the American Association of Public Opinion Researchers conference, exit pollster Mitofsky embraced the notion that Liddle's paper included a novel hitherto undiscovered methodology that provided an explanation for the exit poll discrepancy.⁴⁴ Graphs from Liddle's paper were included in Mitofsky's presentation. Mitofsky did not explain how Liddle could have arrived at an *opposite* conclusion to that of NEDA through almost the same analysis.

At the conference, Ron Baiman of NEDA asked Warren Mitofsky why he had not provided any substantive statistical analysis to support the K=56% and B=50% "reluctant Bush responder" (rBr) hypothetical. Mitofsky said that multivariate regression analysis that would support the rBr hypothetical had been done but not publicly released. When Baiman asked why neither these results nor the data that would allow independent analysts to replicate this regression analysis had been provided, Mitofsky claimed that releasing this data would compromise "respondent confidentiality".

Note: This alleged confidentiality barrier to releasing unadjusted precinct-level exit poll data was belied when a "blurred" version of this data for Ohio was released in June 2005 to the Election Science Institute (ESI) (see discussion below of the ESI report). Moreover, the data on anonymous exit pollsters and polling conditions (which apparently has not even been released for Ohio) has no relation to exit poll *respondents*, and thus could not compromise their confidentiality.

Mitofsky presented a scatter plot that he claimed was evidence for a pervasive exit poll response explanation for the exit poll discrepancy. This scatter-plot showed that Liddle's new bias index had no significant non-zero linear correlation with precinct partisanship; that is, one could draw a straight horizontal line through a plot of the values of LN(K/B) where K = Kerry voter response rate and B= Bush voter response rate.

An interesting finding from Mitofsky's scatter-plot is that it showed exit polled precincts in which exit polls had over-estimated the Bush vote share by amounts well beyond the margin of sampling error. Although such over estimates of Bush vote share occurred in fewer precincts than over-estimates of Kerry vote share, if such large discrepancies are being caused by vote fraud, it is not confined to one party.⁴⁵

⁴² http://electionarchive.org/ucvAnalysis/US/Exit_Polls_2004_Edison-Mitofsky.pdf

⁴³ See Bruce O'Dell's paper here http://www.digitalagility.com/data/ODell_Response_to_USCV_Working_Paper.pdf

⁴⁴ See for example: http://www.mysterypollster.com/main/2005/04/the_liddle_mode.html

⁴⁵ That our elections might be tampered with is not a surprise in an election system where vote counts are seldom independently audited to detect and correct errors and payoffs for vote fraud range from being able to control budgets in the millions at the county level, to billions at the state level, to trillions at the federal level.



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Flaws in the Linear Analysis Argument

Whether Mitofsky's scatter plot, considered as whole, produced a zero correlation does not trump the analysis already presented by NEDA because a zero correlation can be produced by any number of nonlinear variations. Taking natural logs of mean and median K/B (the proportion of Kerry responders to Bush responders)⁴⁶ going from precincts where Bush received less than 20% vote share to precincts where Bush received over 80%, gives LN(K/B): (a) from means: - 0.0166, 0.1448, 0.1704, 0.1414, 0.4626, and (b) from medians: 0.019, 0.137, 0.168, 0.141, 0.438. This shows variation and a positive correlation. i.e. K/B, to be consistent with the data, has to be higher in precincts where Bush did well. Evidently, the small number of exit polled precincts where either Kerry or Bush got over 80% and the "inverted U" (not flat linear) shape of K/B from the 90% of the data that is clustered in the precincts with closer vote margins, are sufficient to generate a flat zero correlation.⁴⁷

"The 2004 Election: Exit Poll Error or Vote Miscount?" (May 15, updated September 8)

NEDA's further calculations⁴⁸ showed that:

- a minimum ratio of 58% Kerry voter exit poll response rate to 50% Bush voter response rate, would be necessary to produce the national exit poll discrepancies (WPD);
- Exit poll discrepancy (WPD) patterns that would be caused by vote miscounts can be calculated and studied. If vote miscounts favoring Bush occurred, precincts with increased exit poll discrepancy would shift into higher Bush vote share categories, producing patterns consistent with the E/M data;
- mean and median exit poll discrepancy levels for Ohio's precincts where Bush vote share was over 80% are significantly greater than in other precincts;
- pervasive, statistically significant, unexplained pro-Kerry exit poll discrepancies⁴⁹ occurred in Ohio;
- there were no statistically significant pro-Bush exit poll discrepancies for Ohio exit polled precincts with reported Bush vote share over 56%; and
- the Ohio exit poll discrepancy pattern is incompatible with a reluctant Bush responder (rBr) exit poll error explanation and consistent with vote miscounts.

⁴⁶ in Table 1, p. 20, Sept. 8, USCV report

⁴⁷ Warren Mitofsky's statement in a (5/26/2005) (after the AAPOR conference) communication to Ron Baiman, that: "There is no constant mean bias conjecture on our part. This is wholly USCV's invention" appears to vindicate USCV's original position that the "constant mean bias" or rBr hypothesis cannot explain the exit poll discrepancy. The subsequent debate hinged on whether "pervasive" bias that is significantly related to precinct vote share, rather than constant, rBr, could explain the data. The statistical analysis in Appendix G of the Sept. 8, USCV report shows that is the case for the national data. The NEDA analysis of the Ohio precinct level exit poll data shows irrefutably that "pervasive" rBr cannot explain the pattern of the Ohio exit poll discrepancies – see discussion below.

⁴⁸ See http://electionarchive.org/ucvAnalysis/US/exit-polls/USCV_exit_poll_analysis.pdf This paper derived new equations for deriving exit poll discrepancy patterns that would be produced by vote tampering as well as further analyzed the exit poll discrepancy patterns in the Edison/Mitofsky data using formulas that NEDA had earlier derived for looking at patterns of exit poll discrepancy produced by exit poll response bias that differed by political party.

⁴⁹ "Pro-Kerry" exit poll discrepancies are when Kerry did better in exit polls than in the official vote. (i.e. when the exit poll overestimated the Kerry vote share.) "Pro-Bush" exit poll discrepancies are when Bush did better in exit polls than in official election results.



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For a more detailed explanation see NEDA's paper "*The 2004 Presidential Election: Exit Poll Error or Vote Miscount?*" and Appendix B below.

“Ohio Exit Polls: Explaining the Discrepancy” (June 6)

The Election Science Institute (ESI) in its report: "*Ohio Exit Polls: Explaining the Discrepancy*", June 6, 2005, by Susan Kyle, Douglass A. Samuelson, Fritz Scheuren, Nicole Vicinanza, Scott Dingman and Warren Mitofsky concluded that: "...the data do not support accusations of election fraud in the Ohio Presidential election of 2004".⁵⁰

However, the report states, "ESI looked at the range of non-response rate possibilities in the sampled precincts to see whether the reported vote in those precincts fell inside that range. In 47 of the 49 precincts it did (see Figure 1)." In other words, ESI found two precincts which had completely impossible election results, given their exit poll results. In a third precinct election results were on the extreme end of the possible.

ESI's report compares 2000 and 2004 election results, assuming the correctness of Ohio's 2000 election results, to show similar statistical tendencies to declare the validity of the 2004 vote tallies.

Flaws in the ESI Ohio Study:

The premise on which the ESI analysis was based is logically invalid. ESI's analysis was based on the hypothesis that if vote fraud occurred, then Bush would have had a larger vote share than in the prior election in more precincts. This is incorrect because a candidate could win an election due to vote fraud, without increasing his vote share from a prior election at all - as long as his overall vote share was larger than his opponent's. ESI's entire analysis was mathematically proven to be logically invalid in an October 28th NEDA paper "*Mathematical Proof that Election Sciences Institute's Test to Rule Out Vote Fraud is Logically Incorrect - Even If Logically Corrected, ESI's Test Would Require More Data and Have Many Pitfalls*".

In fact, a subsequent report by NEDA "*The Smoking Gun: Ohio Exit Poll Data Show Virtually Irrefutable Evidence of Vote Miscount*" shows that the data in the ESI report provides evidence supporting Ohio vote miscount rather than refuting it. (See below.)

*ESI makes no attempt to explain the Ohio 2004 exit poll discrepancies themselves, which are large and statistically impossible.*⁵¹

Carter-Baker Recommend Audits & No Unadjusted Exit Polls (September)

The Carter-Baker Commission on Federal Election Reform reported that:

"DRE [voting machines] run on software that can be compromised...The greater threat to most systems comes not from external hackers, but from insiders who have direct access to the machines. There is no reason to trust insiders in the election industry any more than in other industries...regular

⁵⁰ See http://www.votewatch.us/reports/view_reports , "ESI Brief - Analysis of the 2004 Ohio Exit Polls and Election Results". Limited OH exit poll data is also available at that URL.

⁵¹ See March 31, 2005 scientific paper at: www.uscountvotes.org.



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audits of voting machines are also needed to double-check the accuracy of the machines' vote tallies."⁵²

Independent audits of randomly selected precinct or machine counts, using voter verified ballots, if routinely performed for every election, would go a long way towards ensuring accurate U.S. vote counts.

However, the Carter-Baker Commission also recommended that "News organizations should voluntarily agree to delay the release of any exit poll data until the election has been declared." In light of the unfortunate practice of forcing exit poll results to match election data, this recommendation would mean that Americans would forfeit an important tool with which to judge the accuracy of U.S. election results.⁵³

U.S. EAC "Voluntary Guidelines for Voting Equipment" (as of September)

Proposed U.S. Election Assistance Commission (EAC) "Voluntary Voting System Guidelines" as of September 30th do not require voting systems to be *independently* auditable, separate from insiders within the voting and elections system. Thus, the U.S. EAC voting systems guidelines neglect to require detection and correction of vote count errors that might be innocently, or deliberately, introduced by insiders. Many voting systems are available that do not offer hand-countable voter verified paper ballots that can be used for independent audits of vote count accuracy.

"Federal Efforts to Improve Security and Reliability of Electronic Voting Systems Are Under Way but Key Activities Need to Be Completed" (September)

The nonpartisan U.S. Government Accounting Office (GAO) in its September 2005 report "*ELECTIONS -- Federal Efforts to Improve Security and Reliability of Electronic Voting Systems Are Under Way, but Key Activities Need to Be Completed*"⁵⁴ on page 38 said,

"...there is evidence that some of these concerns [with voting systems]—including weak controls and inadequate testing—have caused problems with recent elections, resulting in the loss and miscount of votes."

Its *Recommendations for Operations* section, page 41, stated:

"A post-election audit of voting systems should be conducted to reconcile vote totals and ballot counts, even if there is no recount scheduled." "An audit of the election system and process should be conducted after election day to verify that the election was conducted correctly and to uncover any evidence of security breaches or other problems that may not have surfaced on Election Day."

Freeman - Mitofsky Exit Poll Debate (October 14)

On Friday, October 14, at the University of Pennsylvania, as part of the Philadelphia Chapter of the American Statistical Association's fall meeting, Steven Freeman debated Warren Mitofsky.

⁵² Such audits are already required in ten states: CO, CT, HI, IL, MN, NM, NY, NC, WA, and WV.

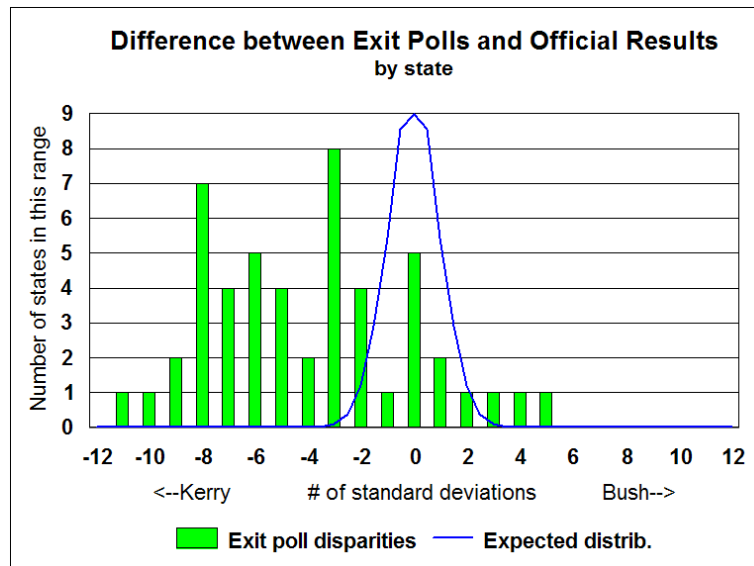
⁵³ See http://electionarchive.org/ucvInfo/release/Carter-Baker_exit-polls.pdf

⁵⁴ See http://www.bradblog.com/Docs/GAOREport_ElectionSecurity_102105.pdf



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Freeman noted that Republican and Democratic governors; proportions of blacks in the state, and complaints about election problems all are positively correlated with within precinct exit poll discrepancy (WPD). Steve Freeman showed a histogram of WPD which is reproduced below.⁵⁵



Exit poll discrepancies (WPD) should, by sampling design, fall mostly where there is area under the blue curve, from -4 to +4 standard deviations if the discrepancies (WPD) are due to random sampling error. The area under the blue curve represents probability, with the entire area under the curve being 100% probability. Every 1 unit green bar is drawn where one state's average WPD fell in the 2004 presidential election. For instance, there are 8 states whose average WPD fell exactly 3 standard deviations below the expected value of zero. The proportion of the area under the blue curve from -3 standard deviations to the leftmost part of the blue curve is the probability for those eight states having their average WPD be what it is or less.

The WPE/WPD numbers in the above chart are based on what Edison/Mitofsky labeled "IM-WPE" in its 19 Jan report. Freeman said these are the same average exit poll discrepancies for each state, but with outliers not filtered out. It was decided justifiable to use the binomial formula, which gives a fraction of a percent, compared with 2-3% standard deviation used in the 19 Jan report. So that the variance of these precincts is not statistical scatter, but rather represents the diversity of the state, by design.

Steve Freeman displayed the CNN screen shot from election night, derived from the same NEP poll, showing how voters voted in 2004 compared to 2000:

(1) Bush retained 90% of his 2000 base, but Kerry retained 91% of Gore's 2000 base. Bush got a minority of new voters and of Nader voters. Thus, given that Bush lost the popular vote in 2000, where could he have picked up enough votes to prevail in 2004?

(2) Despite the fact that the exit poll showed a Kerry victory, a plurality of pollees said they voted for Bush in 2000, despite the fact that Gore won the 2000 popular vote. This is another indication

⁵⁵ All Freeman's debate slides and charts are available at <http://www.appliedresearch.us/sf/epdiscrep.htm>



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that the poll was oversampling Republicans, not Democrats as claimed in the "reluctant Bush responder" hypothesis.

Freeman appealed to E/M to make the precinct-level data available for independent review and analysis, and this was well-received by the audience of statisticians.

Mitofsky's talk included less data and more of his points were rhetorical. He spent significant time talking about how data released before the poll was complete was unreliable. He enumerated the factors that make for unreliability, including inexperienced pollsters, and large distances from the polling place. He said the response rate was low because the form was too complicated and time-consuming, and that the networks had insisted on a 2-page form when he thought an instant "Who did you vote for?" would yield a much higher response rate and greater accuracy.

Mitofsky displayed the same scatter-plot by partisanship he had displayed in May and said that this analysis was done by Elizabeth Liddle and Mark Lindemann, who, he claimed, formerly had believed that the election was stolen, before they looked carefully at the data, and then changed their minds. However, Lindeman was in the audience and rose to speak for himself (and for Liddle), saying that Mitofsky had mischaracterized his view.

Mitofsky presented a new plot at the end of his talk. Mitofsky stated that "This plot kills the fraud argument." The scatter-plot was prepared by Liddle as a national version of a similar scatter-plot done for Ohio by ESI. On one axis is the ratio of votes, by precinct, 2004/2000. On the other is $\arctan(\alpha = K/B)$ - which is Liddle's measure of WPD. This analysis was based on the assumption that if there is vote fraud, then Bush must have outperformed his vote share in those precincts as compared to the prior election. There is no significant correlation, and a regression line through the "blue-shift" precincts is indistinguishable from the regression line through the "red-shift" precincts. Since WPE was modest in 2000 (not distinguishable from zero, by some measures), Mitofsky's conclusion was that the exit polls cannot be taken as a demonstration of fraud.

This same invalid analytical argument was proposed originally by Election Science Institute (ESI) in its June, 2005 report and has been proven to be logically incorrect by a mathematical proof in NEDA's recent paper "Mathematical Proof that Election Sciences Institute's Test to Rule Out Vote Fraud is Logically Incorrect -- Even If Logically Corrected, ESI's Test Would Require More Data and Have Many Pitfalls".

Mitofsky reiterated his refusal to make exit poll data public on grounds of confidentiality despite the fact that Ohio's precinct-level data was released in June 2005 without compromising confidentiality.

Finally, Mitofsky said that he didn't know where Freeman came up with his numbers. He looked at the numbers, compared them with the data from the 19 Jan report, and said that they were way off.

In questions after the debate, Freeman explained that his data came from data labeled IM-WPE in the Edison/Mitofsky 19 Jan report. Freeman said raw WPD/WPE by itself is a telling statistic, being the difference between what people said they voted for and how those votes were recorded. In this sense, it's a pure measure of fraud, whether or not you can predict the election with these data. Mitofsky took the position that you can't tell anything from the precinct-level data until you run it through the algorithms and weightings that he has spent many years developing.



Mathematical Proof that ESI/Mitofsky Analysis is Logically Invalid (October 31)

A logic examination mathematically proved that the analysis employed by Mitofsky in his October presentation to the American Statistical Association in which Mitofsky declared "This kills the vote fraud theory" (for the entire nation) was useless for analyzing exit poll data because it was based on a logically invalid hypothesis. Any combination of the variables ESI was studying could occur with or without vote fraud, so the ESI analysis was not useful. The National Election Data Archive (NEDA) who performed the logical analysis, requests that ESI and Mitofsky, in the future, analytically check and mathematically verify their hypotheses and explanations of the 2004 exit poll discrepancies *before* publicly releasing them. American democracy demands such responsibility from its mathematicians and scientists for analyzing its elections. Any analysis based on an invalid hypothesis cannot be used to conclude anything one way or the other.

See NEDA's "Mathematical Proof that Election Sciences Institute's Test to Rule Out Vote Fraud is Logically Incorrect -- Even If Logically Corrected, ESI's Test Would Require More Data and Have Pitfalls" to read the proof.⁵⁶ NEDA's logical analysis mathematically proved that ESI's earlier analysis and conclusion ruling out vote fraud in Ohio was logically invalid.

"Ohio Exit Poll Data Are Consistent with Vote Miscount" (2005)

Precinct-level Ohio exit poll data made public on June 6, 2005 shows a pattern that is consistent with vote miscount.

The patterns of Ohio's exit poll results show similar patterns to the national exit poll sample described in Edison/Mitofsky (E/M)'s January 19th report and studied in earlier USCV reports.⁵⁷

NEDA will be issuing an analysis in late 2005 showing that the precinct-level Ohio exit poll evidence presented in the ESI report provides support for vote miscount.⁵⁸

Conclusion: Evidence for Vote Miscount in the 2004 Presidential Election

The possibility that the 2004 election exit poll discrepancy was caused by vote miscount has become increasingly credible as successive (E/M and ESI) reports claiming support for exit-poll error have instead provided more evidence for vote miscount.

The nonpartisan U.S. Government Accounting Office (GAO) in its September 2005 report "*ELECTIONS -- Federal Efforts to Improve Security and Reliability of Electronic Voting Systems Are Under Way, but Key Activities Need to Be Completed*"⁵⁹ on page 38 said,

⁵⁶ <http://electionarchive.org/ucvAnalysis/US/exit-polls/ESI/ESI-hypothesis-illogical.pdf>

⁵⁷ See May 15, 2005 (updated September 8, 2005) and March 31, 2005 scientific papers at: www.uscountvotes.org .

⁵⁸ NEDA made numerous requests (starting on August 1, 2005) for clarifications of the evidence presented in the ESI report but have not yet (as of October 14, 2005) received a response.

⁵⁹ However, the recommendations of this GAO report naively assume that: 1. good voting systems can be obtained by legislation or regulation; 2. good voting systems can be obtained by testing; and 3. a voting system can be created that cannot be subverted. In a letter to the GAO included in this report, the U.S. E.A.C. suggests that the E.A.C., in conjunction with the National Association of State Election Directors (NASED), should be responsible for setting voting



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"...there is evidence that some of these concerns [with voting systems]—including weak controls and inadequate testing—have caused problems with recent elections, resulting in the loss and miscount of votes."

The Ohio precinct-level exit poll data released in June shows irregular patterns of exit poll discrepancies that *are not explainable by any exit poll error hypothesis, or "hypothetical", offered to date.*

Neither a "constant mean" nor a "pervasive" pro-Kerry exit poll bias could possibly explain the E/M national aggregate exit poll data, or the detailed Ohio precinct-level exit poll data. To date no evidence-supported Exit Poll-based explanation of the Great Discrepancy has been provided.

The state and national, as well as the detailed Ohio precinct-level exit poll data provide evidence in support of a vote fraud hypothesis.

The refusal by Edison/Mitofsky to permit independent analysis of their trove of data is has deepened public concern. The shoddy and inadequate analysis (claiming, for example, that linear correlation analysis, or a 56%-to-50% response bias, is sufficient to support the E/M hypothesis) that *has* been released to the public has deepened the uncertainty about what happened in the 2004 elections. The Mitofsky/Liddle pervasive mean bias conjecture is unsupported by and inconsistent with the publicly available data.

Spin and obfuscation have spread the myth that the "exit polls are unreliable". The support of the media for the pollsters' exit poll response bias hypothesis as an explanation of the discrepancies between the exit polls and the election results in the presidential election, without any serious evidence, has been a travesty.

Many electronic U.S. voting systems do not permit voters to view the actual record of votes cast. Worse, the vast majority of U.S. votes are counted secretly by a small handful of inside programmers and election officials using confidential vote counting software, and the resulting vote counts are not routinely *independently* audited to detect and correct errors. Hence, U.S. vote counts are vulnerable to wide-spread nationwide tampering.

The current U.S. Election Assistance Commission's technical staff is led by the same person who ushered in un-auditable e-voting systems in Georgia, and so no adequate voting system guidance is likely to come from this federal organization tasked with protecting our voting systems.

Analysis of limited available election results data has shown suspicious patterns, such as the New Mexico data that revealed padded absentee ballot votes and high rates of under-votes in counties using digital recording electronic voting machines; the Washington state election that showed an unlikely probability to vote Republican when using DRE voting machines and Democratic when using mail-in ballots in the same precincts⁶⁰; and the Ohio precinct-level exit poll results show what seem to be impossible election results.

system standards. Yet both organizations currently are led by proponents of electronic ballot voting systems which are not independently auditable and thus do not include a reliable method to detect and correct vote count errors.

⁶⁰ See this report by Paul Lehto and Jeffrey Hoffman

<http://www.votersunite.org/info/SnohomishElectionFraudInvestigation.pdf>



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Recommendations: Detailed Election Data Monitoring and Independent Audits

Public Release of Detailed Exit Poll Data & Methodologies

Detailed national exit poll data that has *not* been adjusted to match the official election results, and detailed data on the exit pollsters and precinct exit polling conditions, has not been publicly released by Edison/Mitofsky or the National Election Pool (the consortium of AP, CBS, NBC, Fox, ABC, CNN that commissioned the 2004 exit polls)⁶¹, and it should be. Precinct identifiers are needed to physically investigate precincts with high WPD, some of which have impossibly high WPD: Why were they so high? County identifiers are needed to statistically examine effects of voting technology and partisan control.

One of the ways to get to the real factors that influence exit poll response rates is to do a serious multi-factor analysis based on model (and not data) variance.⁶² Mitofsky claimed to have done the regressions but not to have released them. However, we are skeptical that this analysis was done in a thorough and complete manner because an analysis of the aggregate exit poll data shows that the hypothetical Kerry voter and Bush voter response rates of 56% and 50% that presumably came out of this investigation, cannot possibly explain the relative magnitudes of exit poll discrepancy shown in the E/M report.⁶³

There is no sufficiently important or legitimate reason not to publicly release the exit poll data and very good reasons, relating to a minimal sense of public responsibility and survey ethics, for E/M to immediately release the data without further delay. Private business contracts or personal confidentiality should not trump critical public interest in this data. The credibility of our election system is an extremely important national issue. It should not take six months or more to provide a serious analysis of such an important issue, particularly if some of the “nation's best” analysts have been looking at it.

Public Release of Detailed Election Results Data

All states and counties could monitor their election accuracy by publicly releasing detailed precinct-level election results data broken out by vote type (absentee, early, provisional, Election Day, etc.) immediately after polls close so that the public and independent analysts could investigate and detect irregular vote counts in time for candidates to request recounts. A public National Election Data Archive would enable the public to detect probable vote count errors immediately following elections. With adequate funding, NEDA could build the national election data collection and public distribution systems in time to safeguard the November 2006 elections!⁶⁴

See NEDA's paper "*What election data can Election Offices collect and publicly release in order to Monitor Elections for accuracy?*"⁶⁵ for an explanation of how evidence of vote fraud is covered up when detailed election data is not made available.

⁶¹ Adjusted precinct level data are available at: http://www.ropercenter.uconn.edu/2004_presidential_election_polls.html.

⁶² See Sept. 8 USCV, p. 4, for discussion of this point.

⁶³ See Table 2, p. 19, May 21 USCV report: alpha had to be increased to at least 1.15 to get WPD's in range of the E/M data.

⁶⁴ NEDA has been designing a public election data archive with assistance from volunteer database programmers since December 2005, but funding to hire full-time programmers/system administrator is required to implement it.

⁶⁵ See http://electionarchive.org/ucvAnalysis/US/election_officials/ElectionArchive_advice.pdf



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Posting detailed election data and up-to-date voter registration data on the Internet to make it readily available would enable independent analysts to identify precincts with probable vote count errors and alert the public when recounts or investigations seemed justified.⁶⁶ The public could assist election officials to monitor election integrity. The National Election Data Archive needs funding soon if it is to create its National Election Data Archive in time for analyzing the November 2006 election results.

Independently Audit Vote Counts in Every Election

Routine independent audits in all elections -- of a small proportion of randomly selected precincts or machine vote counts -- would have an excellent chance of detecting any vote miscounts. The method for determining what proportion of precinct or machine counts to audit, in order to have a high probability of detecting vote count errors, is described in NEDA's July 30th paper "*How Can Independent Paper Audits Detect and Correct Vote Miscounts?*"⁶⁷

It is not enough to require voter verifiable paper records of ballots. The paper records must be easily and *independently* auditable by the same method the voter uses to verify them; and they must be *routinely audited by persons other than the voting machine vendor or other insiders* within the election system.⁶⁸

The payoff for vote fraud includes control of budgets from millions to billions to trillions from the city to county to state to federal level. Why would we not perform routine independent audits to ensure our vote count accuracy?

⁶⁶ Statutes that simply acknowledge a public right of access to the data without requiring that the information be collected and stored in a readily accessible data base are inadequate.

⁶⁷ http://electionarchive.org/ucvAnalysis/US/paper-audits/Paper_Audits.pdf NEDA is seeking funding to research (together with voting system experts) to develop best practices for randomly selecting precinct or machine counts to audit and for determining what actions to take when discrepancies are found during audits.

⁶⁸ Limited studies have shown that DRE paper rolls, because they require an extra step to verify for voters, are verified by perhaps 30% of voters. Deliberately introduced errors on the paper rolls are often missed by voters. Paper rolls are difficult to count by hand, and counting paper rolls automatically by reading their bar codes is not an *independent* audit because the voter cannot verify that the bar code is correct.



Appendix A: Flaws in the Sekhon, Liddle and O'Dell Arguments

Flaws in Sekhon's Florida Paired-Counties Study⁶⁹:

- Sekhon's DRE county sample was not representative of Florida's DRE counties
 - Only 46.7% of all Florida's DRE counties had more Republican votes than expected based on registration numbers, but 75% of Sekhon's sample had more Republican votes, thus his DRE sample looked more like the optical scan counties than the general population of DRE counties. He even selected Sumter County -- the DRE county with the second-highest shift to Bush and paired it with optical scan counties twice.
 - Sekhon included the two DRE counties with the smallest populations, in his sample of eight DRE counties that had the highest shift towards Republican voting of any of the DRE counties.
 - The average unexpected⁷⁰ shift to Republican voting in the DRE counties was 4.2% in all 15 DRE counties and 12.2% in the 8 medium-sized DRE counties, but in Sekhon's DRE sample, the average shift to Republican voting was 25.6%.
- Sekhon's optical scan counties sample was not representative of Florida's optical scan counties
 - The 8 optical scan counties Sekhon selected for matching had an average shift to Republican of 34%, compared with an overall average shift to Republican of 15.7% in Florida's 52 optical scan counties (and a 33% shift in Florida's medium-sized optical scan counties). Sekhon's selection of optical scan counties matched his non-representative sample of DRE counties, but was not representative of Florida's optical scan counties.

Flaws in Liddle's Analysis⁷¹ included:

- a) By looking at a simulation of an exaggerated ratio of Kerry-to-Bush voters' exit poll response (Liddle assumed a 2:1, K/B ratio giving an "alpha" of 2)⁷² Liddle produced an "inverted U" shaped WPE/WPD graph that seemed asymmetric enough, so that it appeared that it could approximate the E/M reported WPD outcomes. The asymmetry of the "inverted U" WPD curve – which gives a slightly larger WPD in high Republican precincts seemed to be consistent with the (much higher) WPD of high Bush precincts in the E/M data.⁷³

The asymmetry is a mathematical result of linking an absolute difference (WPD) measure to a ratio measure ($\alpha = K/B$). This "mathematical nit" cannot possibly explain the dramatic asymmetry in the E/M data.⁷⁴ If an absolute difference "differential partisan response" measure is used (Bush - Kerry voter response rates), this small asymmetry disappears

⁶⁹ <http://jsekhon.fas.harvard.edu/papers/SekhonOpticalMatch.pdf>

⁷⁰ Based on voter registration numbers

⁷¹ <http://www.geocities.com/lizzielid/WPEpaper.pdf>

⁷² Rather than, for example, assuming the E/M hypothetical of $K/B = 0.56/0.50$, which gives an Alpha of 1.12.

⁷³ See Liddle Table 1 and Mitofsky presentation

⁷⁴ See the WPD's generated by a constant $\alpha = 1.15$ in Table 2, p. 19, May 21, USCV report.



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altogether. Only with highly magnified levels of alpha (such as a 2: 1 ratio of K:B representing $\alpha=2$) will this small effect look significant.

- b) Liddle's analysis at this point was based entirely on hypothetical simulations. In response, NEDA did some *simulations* – trying to match E/M WPD and response outcomes with constant alpha. NEDA's simulations showed that matching E/M reported mean and median WPD levels, and over-all response rates with constant alpha was highly improbable to impossible.⁷⁵ In other words, NEDA's simulations showed that even for the K:B ratio that worked best, the rBr hypothesis was not a likely explanation for the discrepancy between official results and exit poll results.
- c) Defenders of Liddle's analysis claimed that the only unusual thing about the scatter plot data are four high Bush outliers⁷⁶ in the precincts that voted over 80% for Bush, that are not offset by any high Kerry outliers, and that these Bush outliers should be dropped. However, four outliers represent 10% of a sample of 40. If 10% of all of the high Bush precincts in the country were corrupted, this could represent a very serious problem.⁷⁷

Moreover, even if the four outliers are removed, the other ways in which the E/M data are not consistent with constant mean bias hypothesis need to be addressed. The NEDA reports have shown, for example, that the E/M hypothesis is not consistent with the high *median* WPE in precincts with 80% or greater Bush vote, and with the very small *mean* and *median* WPE in precincts with an 80% or greater Kerry official vote, that would not be affected by removing a small number of outliers in high Bush vote precincts.⁷⁸

The flaws in O'Dell's criticisms⁷⁹ of USCV's work included:

- a simulation that O'Dell performed that he said replicated the E/M data using a 58.5% Kerry to 50% Bush exit response rate plus a 3% vote shift in precincts where Bush vote share was over 80%. This result may be correct, but did not disprove USCV's finding that 56% Kerry to 50% Bush voter exit poll response rates could not explain the exit poll data,
- mischaracterization of USCV's paper⁸⁰,
- an unsupported statement by O'Dell on page 2, that "...a closer look at the data they [USCV] cite in their report reveals that Kerry and Bush supporter exit poll response rates actually did not vary significantly by precinct partisanship.",

⁷⁵ See USCV Sept. 8, report, op. cit., Appendix F, Table 5, p. 22.

⁷⁶ Outliers are data points so far removed from the rest that they can be considered meaningless.

⁷⁷ See USCV Sept. 8 report, op. cit., p. 8-10

⁷⁸ USCV Sept. 8, report, Appendix F, Table 5, p. 22, op. cit.

⁷⁹ http://www.digitalagility.com/data/ODell_Response_to_USCV_Working_Paper.pdf

⁸⁰ On page 2 O'Dell claims that "The key argument of the USCV Working Paper is that Edison/Mitofsky's exit poll data cannot be explained without either (1) highly improbable patterns of exit poll participation between Kerry and Bush supporters that vary significantly depending on the partisanship of the precinct in a way that is impossible to explain, or (2) vote fraud." However, no such statements existed in USCV's paper. Further, USCV has always recognized that various combinations of exit poll response bias and vote miscounts could potentially cause the exit poll discrepancy patterns found in the E-M data. USCV never claimed to be able to "prove fraud" from the aggregate E-Mexit poll discrepancy data - just to show evidence that appears suspect and warrants on-the-ground investigation - the only way to "prove fraud". Hence, USCV has consistently used the term "vote miscount" rather than "fraud".



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- a statement by O'Dell in a heading on page 3 that the "USCV vote shift simulator is flawed" followed by arguments that assumed that USCV's vote shift simulator gave correct results.⁸¹ O'Dell then states the obvious fact that the E/M exit poll data could not be exactly reproduced by an evenly distributed 6% vote shift, as though this refuted a claim that USCV had made.
- unsupported contrivances like mapping straight lines to obviously nonlinear graphs, removing the high Kerry and high Bush precincts from the analysis, removing the roughly 10% of the highest WPE in precincts where Bush received over 80% of vote share -- in order to show that his conclusions were correct, and
- An erroneous claim that Liddle's LN(K/B) "bias" index analysis shows that USCV's prior and subsequent investigations are wrong (See the above discussion of Liddle's analysis.)

⁸¹ USCV pioneered the algebra that enabled patterns of WPD/WPE that would result from both exit poll response rate differences and also from vote fraud, to be determined.



Appendix B: "The 2004 Presidential Election: Exit Poll Error or Vote Miscount?"

NEDA released several new findings in its May working paper, including:

1. It is mathematically possible to study the pattern of exit poll discrepancies (WPE/WPD) that are caused by miscounting votes, as well as those produced by exit poll response rates.
2. It would be mathematically impossible to produce the E/M reported mean and median exit poll discrepancy (WPD) values with an average Kerry voter to Bush voter (K/B) exit poll response "bias" (or "alpha") ratio of 1.12 (when K=56% and B=50%) so the E/M hypothetical explanation could not be correct. NEDA found that a *minimal* bias of about 1.16 would be necessary to produce the national WPD outcomes.⁸²
3. Based on the most conservative possible estimates of *model* variance (assuming exit poll response rates of only 20 voters and thus *maximal* standard deviations and confidence intervals), mean and median WPD levels reported by E/M for Ohio precincts with reported Bush vote over 80% *are* significantly different from those in other partisan categories of precincts.⁸³
4. Analysis of non-responder vote patterns, based on unadjusted precinct level exit poll data from Ohio, show "pervasive" statistically significant pro-Kerry exit poll discrepancies across all precinct partisanship categories, but *no* statistically significant pro-Bush exit poll discrepancies for precincts with official Bush votes of 56% or greater.⁸⁴ The pattern of Ohio's precinct-level exit poll data is incompatible with any "pervasive" rBr exit poll error explanation.

"The 2004 Presidential Election: Exit Poll Error or Vote Miscount?" paper can be found at: http://electionarchive.org/ucvAnalysis/US/exit-polls/USCV_exit_poll_analysis.pdf

⁸² See USCV Sept. 8 report, op. cit., Appendix B, and Appendix F, Table 6, p. 22

⁸³ See USCV Sept. 8 report, op. cit., Appendix G, Table 1 p. 24, and Table 3 p. 26.

⁸⁴ See USCV Sept. 8 report, op. cit., Appendix H, Table 1, p. 30.