

# Analysis of Undervotes in New Mexico's 2004 Presidential Ballots

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## USCountVotes

**Definition:** Ballots that contained no selection for President are referred to here as “undervotes”. Undervotes may result when a voter intentionally omits to vote for president, but when undervotes are associated with a particular kind of voting technology, a possible reason is that the machine is either failing to record the voter’s intention, or failing to offer the voter feedback he needs to register his selection on the machine.

### Abstract

We find a strong association between election day undervotes and pushbutton DRE voting machines. The average undervote in precincts where pushbutton DRE voting machines were used was 3.5%, compared to less than 1% in precincts that used scanned paper ballots. Hispanic and Native American populations were independently associated with high undervote rates, and the combination of ethnicity and pushbutton machines led to even higher undervote rates than would be expected from the sum of these effects separately.

Local variation in undervote was high. 44% of paper ballot precincts had zero undervotes, while 2% of pushbutton precincts had zero undervotes. 89 precincts had more than 10% undervotes, and all but one of these used pushbutton machines.

*These data suggest the disturbing possibility that pushbutton DRE machines may introduce a significant distortion in the voting record statewide, with the problem being most severe in areas where ethnic populations dominate.*

### *Machine types and election events*

Votes were cast early, on election day, and by absentee ballot. Given that different machines were used for these three voting “events”, the following analyses are confined to votes cast on election day.

Three types of voting machine were used:

- Push button DRE - Sequoia Advantage and Danaher Shouptronic
- Touch screen DRE - Sequoia Edge and ES&S Ivotronic
- Optical scan (paper ballots) - Optech

### *Undervotes versus No Undervotes*

A considerable number of precincts recorded no undervotes at all. This means that the distribution of undervotes across precincts is not normally distributed, there being a “spike” in the distribution representing precincts with zero undervotes. As a first step, therefore, the proportion of precincts recording no undervotes was compared with the proportion of precincts recording at least one undervote, using a non-parametric statistical method.

There were 1396 NM precincts that reported results for election day. Of these, only 127 (9%) recorded no undervotes. Of these 127 precincts recording no undervotes, 99 (78%) were in precincts using Optical scanning machines. In fact a full 44% of precincts with Optical scanning machines reported no undervotes. This is in contrast to only 8% of precincts with Touch screen DRE machines recording no undervotes, and only 2% of precincts with Push button DRE machines recording no undervotes.

The breakdown of undervotes by machine is given in Table 1.

	<b>Push button DRE</b>	<b>Optical Scan</b>	<b>Touch screen DRE</b>	<b>Total</b>
<b>No undervotes occurred</b>	22	99	6	127
<b>Some undervotes occurred</b>	1079	125	65	1269
<b><i>Total</i></b>	1101	224	71	1396
<b>Percentage of precincts with no undervotes</b>	2%	44%	8%	9%

Table 1: breakdown of precincts recording undervotes by machine

Chi square test indicated that these percentages were all significantly different from each other. Undervotes were significantly less likely to occur in Optical scan precincts than in either Push button ( $p < .1E-88$ ) or Touch screen precincts ( $p < 1E-7$ ); and significantly less likely to occur in Touch screen precincts than in Push button precincts ( $p < .001$ ).

#### ***Extent of Undervotes in Precincts in which Undervotes Occurred***

Precincts in which undervotes did occur were then subjected to further analysis.

The proportion of undervotes in each precinct was expressed in standard deviations. These proportions had an approximately normal distribution (after deletion of one outlying precinct), and the resulting scores were entered as dependent variable into an ANOVA with machine type as a fixed factor. Results from this ANOVA indicated that machine type was a significant predictor of undervotes. Post hoc tests (Tukey) indicated that in precincts using Push button DRE, a significantly greater proportion of undervotes were reported than in precincts using either Touch screen DRE or Optical scan machines ( $p < 1E-8$ ). There was no significant difference between the proportion of undervotes recorded in Touch screen and optical scan precincts.

These results remained robust when analysed using non-parametric methods (Kruskal-Wallis and Mann Whitney U).

It can be concluded, therefore, that in New Mexico, voting machine type was a significant predictor of the proportion of undervotes recorded. However, causality cannot necessarily be inferred, since voting machines are uniform across counties. County should therefore be incorporated as units for analysis, in view of the fact that county demographic characteristics, may plausibly affect undervote proportions.

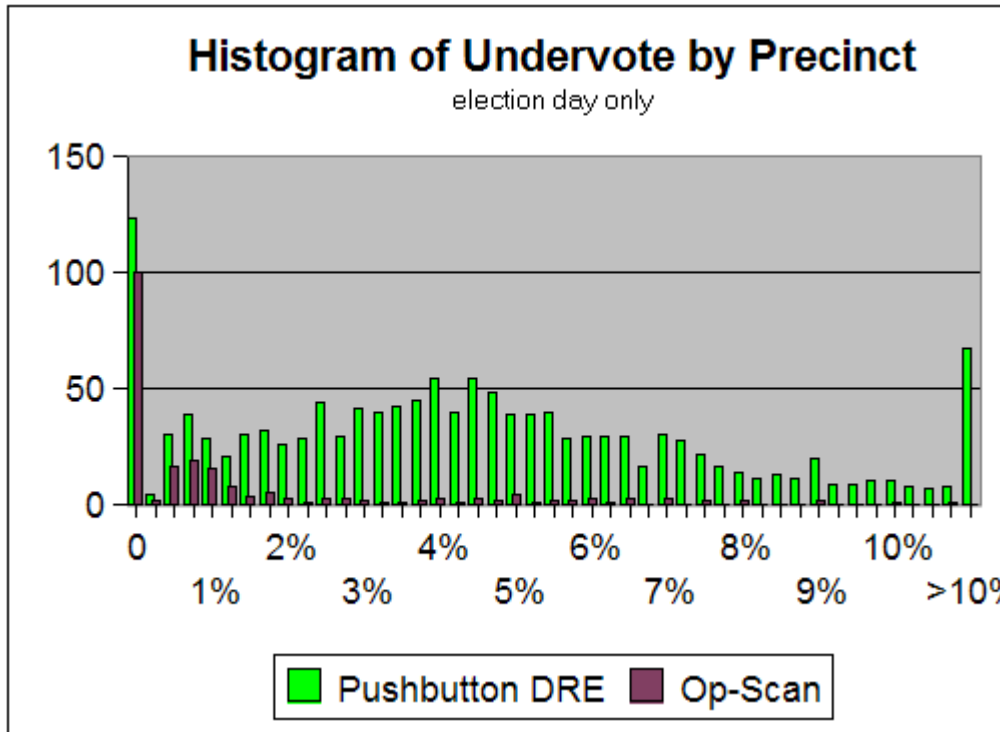
As the standardized undervote data was approximately normally distributed in precincts in which at least 1 undervote was reported, a Mixed Linear Model analysis (using SPSS) was conducted on the election day data, with “county” as a random factor, and “machine” as a fixed factor. This analysis indicated that even after modelling the effect of “county”, machine was a significant predictor ( $p < 1E-6$ ) of proportion of undervotes. Examination of the parameters

again indicated that Push button machines produced significantly more undervotes than Optical scan machine.

This result remained robust when the analysis was repeated using ranks of undervote proportions as the dependent variable.

### ***Conclusion***

Precincts that used DRE machines were significantly more likely to record undervotes than precincts that used Optical scan machines, and of the two types of DRE machines, Push button machines were more likely to record undervotes than Touch screen machines.



Of precincts that recorded at least one undervote, Touch screen machines appeared to be no worse than optical scan machines. However, Push button machines were significantly worse than both. This result remained robust when “county” was modelled as a random variable, and when the analysis was conducted on rankings.

Caveat: Because the undervote data was only approximately normally distributed, even amongst precincts in which at least one undervote ballot was reported, the results should be interpreted with caution. However, all these analyses remained robust when non-parametric methods using ranks rather than values were used.

### ***Undervotes in Ethnic Hispanic and Native American-dominated precincts***

Voting technology was coded as paper/op-scan, touch-screen DRE, or pushbutton DRE. Ethnic population was taken from 2000 census, and defined as the total percentage of self-identified Hispanics, African-Americans, Asian-Americans, and mixed race. Linear and bi-linear regression was used to analyze relationships among undervote, machine code and % minority, with the following results:

<b>Regression</b>	<b>R<sup>2</sup></b>
Undervote vs machine code	0.17
Undervote vs % ethnic population	0.25
2-var regression, Undervote vs both these variables	0.34
Undervote vs product, machine code * % ethnic	0.35
Machine code vs % minority	0.05

The best predictor of undervote was the product [machine code]\*[% ethnic]. Of the 89 precincts with undervote in excess of 10%, 88 of these used pushbutton machines. The average ethnic population in these 89 precincts was 80%, compared to 50% in all other precincts.

Only 71 precincts used touch-screen DREs on election day. In only a few of these precincts were ethnic populations dominant. There is some indication that touch-screen machines were not associated with the same kinds of problems as the pushbutton DREs, however data is insufficient to conclude that they are reliable in ethnic communities.

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#### **Data Sources:**

The source of data for this analysis is <http://www.votersunite.org/info/NMStateData4.2.xls>

There is also a summary report by Warren Stewart and Ellen Theisen, Dec 21, 2004.

<http://www.votersunite.org/info/NewMexico2004ElectionDataReport.pdf>