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Mary Vollero
Chair, Concerned Voters of Centre County
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Re: Statistical Services (SCC# 07-2-014)

Dear Mary,

Please find attached a report of our findings for the 2007 Centre County Election Poll. The report contains a comparison of election results obtained from the exit poll survey with official election results. The report also contains some basic summaries of voter participation in the polling process and tabulations of voter participation by gender, age, race, and educational group. Finally, the report contains a summary of the results of logistic regression that was used to determine the extent of trouble with touch screen voting and satisfaction with the touch screen voting machines.

We hope that you find this report useful in your project, and encourage you to contact us if you have any questions.

Thank you for contacting the Statistical Consulting Center.

Sincerely,

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Exit Poll Results
of the
2007 Elections in Centre County, PA
Prepared for
Concerned Voters of Centre County

Prepared by:
Durland Shumway

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Summary

An exit poll was conducted at three precincts in Centre County: College North, Ferguson North 2, and Patton North 2. The exit poll sample constituted about 25% of the official number of ballots cast in the election. Overall, the election results as determined by the exit poll were in agreement with the official election results. About 4 % of people polled reported trouble with the electronic touch screen voting machines. The percentage reporting trouble with touch screens did not differ significantly by gender, ethnic group, or education level. The percentage reporting trouble with the touch screens did vary significantly with age group. Results of a logistic regression analysis indicate that older age groups had a significantly greater likelihood of having trouble with the touch screens. Satisfaction with the touch screens did not differ significantly by gender, ethnic group, or education level. Results of logistic regression analysis indicate that older age groups tended to report greater levels of dissatisfaction with the touch screen voting machines compared to the most-satisfied age group (36-55 years).

Introduction

Exit polls were conducted at three locations in Centre County on November xx 2007, following a protocol previously described for the 2006 Election Poll. Completed surveys were secured by the Statistical Consulting Center and entered into excel files following a double entry system (using two computers). The datasets were cross-validated using Proc Compare (SAS v9.1) and any discrepancies were resolved by referring to the original survey forms. Official election results were obtained from the Centre County Government website.

Data Analysis

Poll results for individual races were compared to official election results using single sample proportion tests. In cases where the official and exit poll winners are the same, the exit poll winning candidate's percentage was compared to the official winning candidate's percentage. In cases where the official and exit poll winners did not match, the percentage for exit poll winners were compared to the official winner's percentages. P-values less than 0.05 indicate significant differences between two percentages.

Contingency Tables (cross tabulations of votes by categories) were constructed for hypothesis testing. By listing a factor of interest in the rows of a table (for example, age classes), and the a response variable in the columns (for example, yes or no in the case of having trouble with touch screens) we can evaluate the hypothesis that proportions of voters having trouble with touch screens. In each test, a p-value that is less than 0.05 indicates that factor of interest listed in the rows of the table does not significantly affect the proportions of the voters having trouble with touch screens. In cases were the number of observations per cell of the table is very low, an alternative (but similar) test (Fisher's Exact test) was used and the interpretation of the results are identical.

Logistic Regression Analysis was used to determine the change in likelihood (an odds ratio) of a response occurring for different categories of the factors of interest. In the case of trouble with touch screens, where the response is simply yes of no, the likelihood is for having trouble with touch screens. The odds ratio, a comparative likelihood, expresses how much more likely a yes response is compared to a reference group. An exploratory summary of the data indicted which group for a factor had the least trouble with touch screens. The odds ratio for the other groups indicates how much more likely a respondent reported trouble with the touch screen. An odds ratio of 1.0 indicates that a group is 'equally likely' compared to the reference group.

The degree of satisfaction with touch screens was analyzed with a similar formulation of logistic regression. Here the response variable has multiple ordered levels (an ordinal variable). This analysis was structured so that likelihood of *being dissatisfied* was evaluated for different categories of factors of interest. As a result, the odds ratios indicate how many times higher the odds are of being dissatisfied with the touch screens compared to the most satisfied group. A value of 1.0 indicates equal likelihood.

Results

A total of 711 voters completed the exit poll survey. This sample represents about one-fourth of the total ballots cast, and these were fairly evenly distributed for the three precincts (Table 1).

Table 1. Sampling Intensity by Precinct

Precinct	Ballots Cast	Number Polled	Percent Sample
College	844	208	24.64 %
Ferguson	1512	280	18.52 %
Patton	1677	223	13.30 %

Table 2. Results of individual races by precinct.

A) Justice of the Supreme Court

Precinct	Official Winners	Exit Poll Winners	Exit Poll Percent	95% Confidence Interval For Exit Poll Winner	Official Winner Percent	p-value*
College	Lalley-Green	Lalley- Green	28.61	23.86 - 33.74	30.29	0.5434
	Krancer	McCaffery	20.35	21.37 - 30.97	25.32	0.1801
Ferguson	Lalley-Green	Todd	26.43	22.43 - 30.74	28.21	0.4313
	McCaffery	McCaffery	26.87	22.85 - 31.20	24.70	0.3084
Patton	Lalley-Green	Lalley-Green	31.27	26.48 - 36.37	31.83	0.8699
	Krancer	Krancer	23.66	19.34 - 28.43	27.06	0.1644

The winning candidates from exit poll matched the official winning candidates in 2/3's of the cases. Moreover, when a different candidate was identified by the exit poll, the percentage of votes for the exit poll candidate did not differ significantly (indicated by a p-value greater than 0.05) from the official winning candidate's percentage.

B) County Commissioner

Precinct	Official Winners	Exit Poll Winner	Exit Poll Percent	95% Confidence Interval	Official Winner Percent	p-value*
College	Dershem	Dershem	21.37	17.27 – 25.94	27.17	0.3231
	Eich	Eich	23.84	19.56 – 28.55	20.67	0.8407
Ferguson	Dershem	Dershem	29.44	25.46 – 33.66	24.91	0.0247
	Eich	Eich	20.77	17.28 - 2.461	23.53	0.1592
Patton	Dershem	Dershem	24.81	20.58 - 29.42	27.17	0.3231
	Eich	Mascolo	21.19	17.22 - 25.60	20.67	0.8407

Poll winners matched the official winners in all but one case, and the Official winner's percentage was within the 95% confidence interval for the poll winner.

C) Judge of Common Pleas

Precinct	Official Winner	Exit Poll Winner	Exit Poll Percent	95% Confidence Interval	Official Winner Percent	p-value*
College	Grine	Ruest	56.72	36.33 - 50.44	51.10	0.0317
	Ruest	Grine	43.28	49.56 - 63.67	48.78	0.0291
Ferguson	Grine	Grine	66.29	60.24 - 71.97	58.29	0.0094
	Ruest	Ruest	33.71	28.03 - 39.76	41.71	0.0094
Patton	Grine	Grine	57.55	50.59 - 64.29	51.27	0.0780
	Ruest	Ruest	42.45	35.71 - 49.41	48.73	0.0780

There was complete agreement between official and poll winners for this race. Percentages, however, differed significantly in many cases between exit poll and official winners.

D) School Director

Precinct	Official Winner	Exit Poll Winner	Exit Poll Percent	95% Confidence Interval	Official Winner Percent	p-value*
College	McGlaughlin	McGlaughlin	19.39	16.69 - 22.33	18.97	0.7907
	Small	Small	18.25	15.62 - 21.13	18.82	0.7225
	Madore	Madore	18.88	16.21 - 21.79	18.76	0.9573
	Grimes	Grimes	18.50	15.85 - 21.39	18.64	0.9661
	Stahl	Stahl	18.50	15.85 - 21.39	18.61	0.9833
Ferguson	Stahl	Stahl	18.69	16.42 - 21.14	18.60	0.9622
	McGlaughlin	McGlaughlin	17.96	15.72 - 20.37	18.28	0.8186
	Madore	Madore	17.77	15.54 - 20.18	17.76	0.9999
	Small	Small	17.68	15.45 - 20.08	17.60	0,9700
	Grimes	Grimes	17.59	15.37 - 19.98	17.48	0.9506
Patton	Stahl	Stahl	19.04	16.43 - 21.87	19.24	0.9264
	McGlaughlin	McGlaughlin	18.56	15.98 - 21.37	18.95	0.8160
	Madore	Madore	18.44	15.87 - 21.24	18.92	0.7647
	Small	Small	17.96	15.42 - 20.74	18.48	0.7405
	Grimes	Grimes	17.84	15.30 - 20.61	18.41	0.7121

There was complete agreement between official and poll winners for this race, although the order of winners in terms of percentage of votes did vary between poll and official counts.

Table 3. Exit poll turnout numbers

A) By Party

Table of Precinct by Party				
Precinct	**Party**			**Total**
	Democrat	**Republican**	**Independent**	
College Twp North	71 34.13%	107 51.44%	30 14.42%	208
Ferguson North 2	112 40.00%	129 46.07%	39 13.93%	280
Patton Twp North 2	74 33.18%	123 55.16%	26 11.66%	223
Total	257	359	95	711
Frequency Missing = 7				

B) By Gender

Table of Precinct by Gender			
Precinct	**Gender**		**Total**
	Male	**Female**	
College Twp North	101 48.33%	108 51.67%	209
Ferguson North 2	132 47.14%	148 52.86%	280
Patton Twp North 2	100 44.64%	124 55.36%	224
Total	333	380	713

C) By Age

Table of Precinct by Age					
Precinct	**Age**				**Total**
	18-35	**36-55**	**56-75**	**over 75**	
College Twp North	42 20.00%	97 46.19%	63 30.00%	8 3.81%	210
Ferguson North 2	30 10.75%	112 40.14%	112 40.14%	25 8.96%	279
Patton Twp North 2	28 12.56%	118 52.91%	72 32.29%	5 2.24%	223
Total	100	327	247	38	712
Frequency Missing = 6					

D) By Race

Table of Precinct by Race							
Precinct	**Race**						**Total**
	Native American	**Asian**	**African American**	**Hispanic /Latino**	**White/Caucasian**	**Other**	
College Twp North	15 7.21%	1 0.48%	2 0.96%	1 0.48%	188 90.38%	1 0.48%	208
Ferguson North 2	11 3.97%	4 1.44%	3 1.08%	1 0.36%	252 90.97%	6 2.17%	277
Patton Twp North 2	19 8.52%	6 2.69%	0 0.00%	0 0.00%	194 87.00%	4 1.79%	223
Total	45	11	5	2	634	11	708
Frequency Missing = 10							

E) By Education Level

Table of Precinct by Education						
Precinct	**Education**					**Total**
	High School Graduate	**Some College**	**College Graduate**	**Current Grad Student**	**Post Graduate**	
College Twp North	29 13.88%	40 19.14%	78 37.32%	10 4.78%	52 24.88%	209
Ferguson North 2	9 3.21%	29 10.36%	95 33.93%	5 1.79%	142 50.71%	280
Patton Twp North 2	24 10.86%	37 16.74%	71 32.13%	8 3.62%	81 36.65%	221
Total	62	106	244	23	275	710

Trouble with Touch Screen Voting Machines

Table 4. Tabulations of frequency counts for voters having trouble with touch screens.

A) Overall

Trouble	Frequency	Percent
Yes	30	4.20
No	684	95.80

Overall 4.2 % of those polled reported trouble with the touch screen voting machines.

B) By Gender

Table of Gender by Trouble			
Gender	**Trouble**		**Total**
	Yes	**No**	
Male	12 3.61%	320 96.39%	332
Female	18 4.75%	361 95.25%	379
Total	30	681	711
Frequency Missing = 7			

The percentage of people experiencing trouble with touch screens did not differ significantly between males and females ($p=0.4527$).

C) By Race

Table of Race by Trouble			
Race	**Trouble**		**Total**
	Yes	**No**	
Native American	3 6.67	42 93.33	45
Asian	2 18.18	9 81.82	11
African American	0 0.00	5 100.00	5
Hispanic/Latino	0 0.00	2 100.00	2
White/Caucasian	23 3.64	609 96.36	632
Other	2 18.18	9 81.82	11
Total	30	676	706

The percentage of people having trouble with the touch screens appear to vary by race, but there were too few observations per cell to test this hypothesis. As a result, races were combined into two ethnic groups, Caucasian and Non-Caucasian.

Table of Ethnicgroup by Trouble			
Ethnicgroup	**Trouble**		**Total**
	Yes	**No**	
Caucasian	23 3.64	609 96.36	632
Non-Cauca	7 8.54	75 91.46	82
Total	30	684	714

The percentage of Non-Caucasian people having trouble with touch screens was significantly higher ($p=0.0376$) than the percentage of Caucasian reporting trouble with touch screens.

D) By Educational Level

Table of Education by Trouble			
Education	**Trouble**		**Total**
	Yes	**No**	
High School Graduate	3 4.92	58 95.08	61
Some College	5 4.72	101 95.28	106
College Graduate	6 2.47	237 97.53	243
Current Grad Student	0 0.00	23 100.00	23
Post Graduate	16 5.82	259 94.18	275
Total	30	678	708

The percentage of people reporting trouble with touch screens did not vary significantly (p=0.3180) among educational groups.

E) By Age Class

Table of Age by Trouble			
Age	**Trouble**		**Total**
	Yes	**No**	
18-35	3 3.00%	97 97.00%	100
36-55	7 2.15%	319 97.85%	326
56-75	15 6.10%	231 93.90%	246
over 75	5 13.16%	33 86.84%	38
Total	30	680	710

The percentage of people reporting trouble with touch screens varied significantly among the age classes (p=0.0051). A logistic regression analysis was then performed to further evaluate this relationship.

Response Profile		
Ordered Value	**Trouble**	**Total Frequency**
1	Yes	30
2	No	680

Odds Ratio Estimates			
Effect	**Point Estimate**	**95% Wald Confidence Limits**	
18-35 vs. 36-55	1.409	0.358	5.555
56-75 vs. 36-55	2.959	1.188	7.374
over75 vs. 36-55	6.905	2.075	22.979

The odds of having trouble with the touch screen for the 18-35 age group is not significantly different from the group reporting the least percentage of trouble (36-55). This is evident by the fact that the 95% confidence interval contains the value 1.0, which indicates equal likelihood. On the other hand, the 56-75 age group was nearly 3 times more likely to experience trouble compared to the 36-55 age group. People over 75 years in age were nearly 7 times more likely to experience trouble with the touch screen compared to the 36-55 age group.

Satisfaction with the Touch Screens

Overall satisfaction with the touch screens varied from about 67 % being very satisfied to about 5 % being very dissatisfied.

Table 5. Level of Satisfaction with Touch Screens

A) Overall

Satisfaction	Frequency	Percent
Very satisfied	480	67.32 %
Somewhat satisfied	163	22.86 %
Somewhat dissatisfied	36	5.05 %
Very dissatisfied	34	4.77 %

B) By Gender

Table of Gender by Satisfaction					
Gender	**Satisfaction**				**Total**
	Very satisfied	**Somewhat satisfied**	**Somewhat dissatisfied**	**Very dissatisfied**	
Male	221 66.57	80 24.10	13 3.92	18 5.42	332
Female	257 67.99	82 21.69	23 6.08	16 4.23	378
Total	478	162	36	34	710

The levels of satisfaction with the touch screens did not vary significantly between genders (p=0.4467).

C) By Ethnic Group

Table of Ethnicgroup by Satisfaction					
Ethnicgroup	**Satisfaction**				**Total**
	Very satisfied	**Somewhat satisfied**	**Somewhat dissatisfied**	**Very dissatisfied**	
Non-Caucasian	48 58.54	28 34.15	3 3.66	3 3.66	82
Caucasian	432 68.46	135 21.39	33 5.23	31 4.91	631
Total	480	163	36	34	713

The percentage of voters reporting various levels of satisfaction did not differ significantly between Caucasian and Non-Caucasian groups (p=0.0779).

D) By Age Class

Table of Age by Satisfaction					
Age	**Satisfaction**				**Total**
	Very satisfied	**Somewhat satisfied**	**Somewhat dissatisfied**	**Very dissatisfied**	
18-35	66 66.00 %	21 21.00 %	9 9.00 %	4 4.00 %	100
36-55	239 73.31 %	67 20.55 %	9 2.76 %	11 3.37 %	326
56-75	152 61.79 %	64 26.02 %	16 6.50 %	14 5.69 %	246
over 75	19 51.35 %	11 29.73 %	2 5.41 %	5 13.51 %	37
Total	476	163	36	34	709

The percentage of people with different levels of satisfaction varied significantly (p=0.0081) among age classes.

Because the levels of dissatisfaction form an ordinal variable, a proportional odds model logistic regression was then used to further explore this relationship.

Response Profile		
Ordered Value	**Satisfaction**	**Total Frequency**
1	Very dissatisfied	34 (4.80 %)
2	Somewhat dissatisfied	36 (5.08 %)
3	Somewhat satisfied	163 (22.99 %)
4	Very satisfied	476 (67.14 %)

Odds Ratio Estimates			
Effect	**Point Estimate**	**95% Wald Confidence Limits**	
18-35 vs. 36-55	1.484	0.926	2.378
56-75 vs. 36-55	1.729	1.219	2.454
over75 vs. 36-55	2.797	1.450	5.394

The 18-35 age group did not differ significantly from the age group that was most satisfied with the touch screens (36-55 years) in the tendency to be dissatisfied. On the other hand, the 56-75 age group was 1.7 times more likely to express dissatisfaction with the touch screens. People over 75 were nearly 3 times more likely to be dissatisfied than the 36-55 age group.

Analysis by Satisfaction Levels.

For this analysis, the four levels of satisfaction were 'collapsed' into two levels: some degree of satisfaction and some degree of dissatisfaction.

1) Overall results

Satisfaction Level	Frequency	Percent
Dissatisfied	75	10.45
Satisfied	643	89.55

Table of Ageclass by Satisfaction Level			
Ageclass	**Satisfaction Level**		**Total**
	Dissatisfied	**Satisfied**	
18-35	13 13.00	87 87.00	100
56-75	31 12.55	216 87.45	247
over75	8 21.05	30 78.95	38
36-55	21 6.42	306 93.58	327
Total	73	639	712

The percentage of people expressing some level of dissatisfaction varied significantly ($p=0.0065$) among the age classes. The most satisfied group was the 36-55 year old group. A logistic regression was then employed to characterize this relationship.

Response Profile		
Ordered Value	**Satisfaction Level**	**Total Frequency**
1	Dissatisfied	73
2	Satisfied	639

Odds Ratio Estimates			
Effect	**Point Estimate**	**95% Wald Confidence Limits**	
18-35 vs 36-55	2.177	1.048	4.525
56-75 vs 36-55	2.091	1.170	3.738
over75 vs 36-55	3.886	1.586	9.525

Results of a logistic regression analysis reveals that compared to the most satisfied group (age 36-55) the 18-35 year old group was 2.2 times more likely to express dissatisfaction with the touch screens. The 56-75 year age group was 2.1 times more likely to express dissatisfaction with the touch screens, and the over 75 year age group was 3.9 times more likely to express dissatisfaction with the touch screen voting machines.

E) By Educational Level

Table of Education by Satisfaction					
Education	**Satisfaction**				**Total**
	Very satisfied	**Somewhat satisfied**	**Somewhat dissatisfied**	**Very dissatisfied**	
High School Graduate	34 54.84	26 41.94	1 1.61	1 1.61	62
Some College	72 67.92	28 26.42	3 2.83	3 2.83	106
College Graduate	173 70.90	48 19.67	14 5.74	9 3.69	244
Current Grad Student	13 59.09	5 22.73	2 9.09	2 9.09	22
Post Graduate	183 67.03	55 20.15	16 5.86	19 6.96	273
Total	475	162	36	34	707
Frequency Missing = 11					

Percentages of voters expressing different levels of satisfaction showed some variation with the education level, but results of proportional odds logistic regression indicated that there was no significant increase in the odds of being dissatisfied compared to the most satisfied group (college graduates).

Odds Ratio Estimates			
Effect	**Point Estimate**	**95% Wald Confidence Limits**	
High School Graduate vs College Graduate	1.641	0.935	2.880
Some College vs College Graduate	1.079	0.662	1.759
Current Grad Student vs College Graduate	1.806	0.765	4.265
Post Graduate vs College Graduate	1.242	0.860	1.792

Each of the 95 % confidence intervals for the odds ratios contains the value of 1.0, and so we conclude that there the likelihood of experiencing dissatisfaction with the touch screens is not different among the educational levels.