# FINAL REPORT

for the

# EXIT POLL SURVEY 1988

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INTRODUCTION

Every election year, the students of Dr. Howard Christensen's sampling class have the opportunity to actually apply the methods, formulas, and concepts learned as they participate in a political exit poll survey. This "tradition" continued as the Statistics 534 class participated in conjunction with the Political Science Department to conduct exit poll surveys, interpret the resluts obtained, and make predictions, based on those results, as to the winners of statewide and national elections in 1988.

After reviewing data, methods and results from previous elections, sampling methods were defined, counties and voting places were chosen, and sampling rates and estimated turnouts were calculated. Statistical formulas were used to estimate the percentage of votes each candidate would receive, then a margin of error was calculated for those estimates.

This paper presents the work done by each of three groups from Dr. Christensen's class. Each group played a vital part in the project. The following pages discuss the activities of each in detail, showing actual formulas and explaining the procedures used.

SELECTION OF COUNTIES

Since a stratified sample was decided on, the first step was to divide the state into strata. Since the state is divided into three congressional districts, they were used as a basis for stratification. In addition, it was necessary that certain counties be included in the sample (certainty units). These also became strata. In total, four certainty units were chosen in District 1, four in District 3, and one in District 2 (the whole district/county). This resulted in 11 strata in our sample. Since District 2 consisted of just part of Salt Lake County, it was selected as a certainty unit. In the other two congressional districts, several counties were selected as certainty units because of the following: 1) students conducting the exit polls were attending universities in the county, 2) the population of the county represented a large proportion of the district, or 3) the voting record of the county was very representative of a significant minority in the state (e.g. Carbon County).

After certainty units were chosen, there were 12 counties remaining in District 1 and 10 counties remaining in District 3 from which to sample. From these counties, three more counties in each district were sampled. This selection process was based upon PPS methods (probability of selection proportional to size). The estimated turnout for each county

was used to create a running cumulative total (see Appendix I). Three numbers between 0 and the value of the cumulative total were sampled.

Once the counties that would be in the sample were known, this information was relayed to the estimation committee.

SELECTION OF VOTING PLACES

After the counties had been sampled, the projected voter turnout per county was calculated. Then, based on these projections, the number of voting places per county was calculated. The decision was made to sample 40 voting places from each of the three congressional districts. In order to calculate a within-county variance, at least two voting places needed to be polled in each selected county. A proportional allocation based on projected voter turnout was used to assign these 40 voting places among the selected counties in each congressional district. Therefore, more voting places were sampled from the counties with the larger projected turnout.

For example, in Congressional District 1, the total projected voter turnout of the counties selected was calculated. Then the proportion of the total turnout was calculated for each county. This gave the proportion of the 40 voting places that should be allocated to each county. If

there were less than two voting places allocated to any county, one voting place was taken from one of the larger counties so that all counties had at least two voting places to be polled. The allocation of voting places is given in the Table 1. The counties with the largest projected voter turnout, such as Davis and Weber County in Congressional District 1, received the largest number of voting places to be polled.

| Congressional District 1 | # of Locations |
|---|---|
| *Cache | 5 |
| *Davis | 13 |
| *Iron | 2 |
| *Weber | 12 |
| Box Elder | 3 |
| Tooele | 2 |
| Washington | 3 |
| **Congressional District 2** | |
| *Salt Lake | 40 |
| **Congressional District 3** | |
| *Carbon | 2 |
| *Salt Lake | 13 |
| *Sanpete | 2 |
| *Utah | 17 |
| Sevier | 2 |
| Summit | 2 |
| Uintah | 2 |

* Certainty Unit

**Table 1. Allocation of voting places.**

## ESTIMATION OF VOTER TURNOUT

A group was assigned to estimate the 1988 voter turnouts for the various voting precincts in Utah. Within each of the counties sampled, voter turnouts for each voting place had to be determined from past data. Each person in the estimation group was responsible for entering the pertinent data for their assigned county or counties. Because the counties were different sizes, some students were assigned only a portion of a county while others were assigned three or four counties. This was done in an effort to balance the work load. November 1980 and November 1984 data from each county was used for estimation. This data was thought to be more representative of the current year because they were also Presidential election years.

## METHODS OF ESTIMATION

A database was created of all the selected counties containing 1980 and 1984 voting information per precinct. The data included a code for the year (80 or 84), a county code, precinct numbers within the county, the total number of voters registered in each precinct, the total number of voters that turned out, and a code indicating the voting location for each particular precinct (see Appendix II). This information was compiled from county voting records. Since the precincts were realigned throughout the years in

many counties, additional precinct change information also had to be used. All the precincts were grouped according to the voting locations of the 1988 elections in an effort to track the same group of voters throughout these years.

A SAS program was then written to calculate the 1988 voter turnout per precinct. The algorithm used to determine this turnout is outlined as follows:

$$\frac{\text{1984 Registered Voters}}{\text{1980 Registered Voters}} = \text{\% change}$$

$$(\text{\% change}) \times (\text{1984 Registered Voters}) = \text{Estimated 1988 Registered Voters}$$

$$\frac{\dfrac{\text{1980 Voter Turnout}}{\text{1980 Registered Voters}} + \dfrac{\text{1984 Voter Turnout}}{\text{1984 Registered Voters}}}{2} = \text{Estimated \% Voter Turnout}$$

$$(\text{Estimated 1988 Registered Voters}) \times (\text{Estimated \% Voter Turnout}) = \text{Estimated 1988 Voter Turnout}$$

This algorithm was computed for each voting place within each of the counties sampled. The output of this program gave estimated 1988 voter turnout totals by voting place.

## RESULTS OF THE ESTIMATION PROCESS

Because sampling rates are accelerated with underestimation, the intent was to estimate conservatively, since more people than expected would vote and all necessary data would be collected. Of the 13 counties sampled, seven were underestimates. Three of the remaining six counties were overestimates exceeding 10%. For example, the estimated total turnout for Uintah County was 6671 voters. The actual turnout was 7176. The estimated turnout was divided by the actual turnout, yielding .93. This number reflects the percentage of actual turnout estimated. Data for the remaining counties is found in Appendix III.

Over and underestimates could be attributed to lack of proper data or difficulties in assigning available data. For example, in Utah County, many precincts were combined from 1986 to 1988. (In 1986 there were 273 precincts in Utah County. This number was reduced to 146 in 1988). This caused difficulty in tracking voter turnout numbers from the 1980 and 1984 elections. Similar problems were encountered in other counties.

## SAMPLING OF POLLING PLACES

After estimates for the 1988 turnout of each county had been calculated, polling places within these counties were

selected using PPS sampling. For any one county, estimates for the various locations were run through a FORTRAN program (alpha.for). This program gave a running total of the expected number of voters so that the final voting location had the cumulative total for the entire county. Next, the sample was taken using the running total so that polling places with a higher estimated turnout had a higher probability of being selected. This is similar to how the counties were selected. In a given county, the cumulative total was divided by the number of polling places to be sampled in that county. This number was used to select voting places based on a systematic use of estimated turnout. Next, a random number was selected between 0 and the cumulative total for the county. This was the random starting point and the first location that was selected. (See example in Appendix IV).

SELF WEIGHTING ESTIMATES

Proportional allocation was used in order to achieve self-weighting estimates. The estimates were self-weighting because in determining the number of elements to sample from each stratum, the stratum size was taken into account. Therefore, the larger the strata, the larger the sample size, and the sampling fraction is the same for each stratum. If

self-weighting had not been used, the sample size would be different for each polling place. In this case, it is not required to know the stratum from which each polling place comes. Therefore, the estimator is much easier to calculate.

For each strata, we calculated

$n_{ijk} = N_{i..} (1/k) (1/p_{ij}) (1/c_i)$

$n_{ijk}$ = the number of voters to be interviewed at each voting place in the strata

$N_{i..}$ = the estimated voter turnout for the strata

$(1/k)$ = the sampling fraction

$$= \frac{\text{\# voters to approach in the entire state}}{\text{Estimated voter turnout for entire state}}$$

$p_{ij}$ = the number of polling places in county i

$c_i$ = # of counties sampled in strata i

An example using Uintah County is shown in Appendix V.

DETERMINING SAMPLING RATE

Using the $n_{ijk}$ obtained from self-weighting, a sampling rate (k) was found by taking the estimated turnout for a given polling location and dividing by $n_{ijk}$. A random start was then chosen by selecting a random number (m) between 0 and the sampling rate. To conduct the sample, the interviewer started polling with the mth person leaving the polls and taking every kth person therafter for the rest of the day. (See Appendix VI for polling places and sampling rates for the entire state.)

CONSTRUCTION OF GROUPS

In the case of survey data, a common way to estimate proportions and their variances is by using ratio estimation techniques, but the calculation of the variances using this method can be very cumbersome. To facilitate the calculation of the variances, an alternate method was used. This method involved placing each individual randomly into groups, calculating the proportions within each group and then taking the variance of those proportions using standard variance of means formulas.

In the case of the exit poll, there were 120 precincts sampled. The sampling rate at each precinct was based on a total sample of 20 taken from each precinct. There were to be 20 groups, one person from each precinct in each group. Once a person was randomly assigned to a group, they were to remain in that group for the rest of the day. This was done by creating a look up table that had two variables in it: the case ID matching those on the questionnaire, and the random group numbers assigned to each case ID. It was expected that if turnout estimation procedures were correct, 20 people would be sampled at a precinct but there were 30 questionnaires sent to a voting place in case of higher turnout than was estimated. In those instances, if the first three people were assigned to groups 18, 3, 7, respectively,

then the twenty-first, twenty-second, and twenty-third persons were assigned to groups 18, 3, and 7 respectively.

To do this, the raw data was read, the case IDs in the lookup table were matched with case IDs that were in the raw data, and the corresponding group number was assigned to the record. At this point, a permanent SAS data set (with group numbers and all questionnaire information) was saved; and all subsequent computer runs were done on this data set. Any case IDs that were not matched up were not put into the SAS data set. The look-up table that contained the groups did not keep any records that had been assigned out so that group numbers within precincts would not be reused except when more than 20 were sampled from a precinct. When new raw data came in, it was compared with the most recent look-up table, and then added to the permanent SAS data set.

## HARDWARE/SOFTWARE

The analysis of the data was carried out on an IBM 9370 machine using SAS. See Appendix VII for program listing.

## CALCULATION OF ESTIMATES

Utilizing the random groups, an estimate of the overall proportion and margin of error for those favoring a given response was obtained. PROC FREQ was used to generate cross-tabs, which gave the raw count and percent selecting a given

response to a question on the polling form. Margins of error were calculated only for questions on the survey relevant to an election or ballot result. PROC SUMMARY was used to obtain the proportion in each of the random groups favoring a candidate or ballot issue. PROC MEANS utilized these values to calculate sums of squares for overall proportion favoring. This value was then divided by the
appropriate constant, in this case $n(n-1) = 20(19) = 380$ to obtain the variance of the proportion.

MARGIN OF ERROR CALCULATION

The margin of error for questions with essentially two possible responses was calculated by multiplying the standard error by 2. This simplified the following formula for calculating the variance of the difference between two random variables:

$$V(A - B) = V(A) + V(B) - 2*COV(A,B)$$

If someone votes for candidate A he cannot vote for candidate B, so there is a very high correlation between A and B. As a result, the variance of A will be almost exactly the same as the variance of B, and, the covariance will be negative with the same magnitude as the variance of A or B. This is shown in the following formula:

$$V(A - B) = V(A) + V(A) + 2*V(A) = 4*V(A).$$

Taking the square root of the above result yields the margin of error.

In a case with three choices, (such as the gubernatorial race), the sample covariances had to be calculated. PROC SUMMARY and PROC MEANS were still used to calculate the variances for each of the three choices, but PROC CORR was used to obtain the covariances. PROC CORR is not recommended for doing this since the covariance must be extracted from the variance/covariance matrix produced.

PROBLEMS AND SUGGESTIONS

Although the exit poll was a success again this year, many problems were encountered along the way and on Election Day. Some of these include the following:

1. Too many people were involved in the gathering of county data. The process might have been simplified by making the design committee smaller and by adding a subgroup to the estimation committee. This group's responsibility would be the gathering of all information necessary for estimates and sampling.

2. Things could have run more smoothly if the data collection had begun sooner. County and polling place information could be collected at the beginning of the semester. Since the counties to be sampled will not be known, data could be collected on all counties. This extra

information would be valuable to future classes.

3. Many interviewers did not show up to their polling places. Stiffer penalties should be imposed on those who have committed to show up and do not. More emphasis on the importance of the interviewer would also help.

4. Many in the statistics class did not have the opportunity to actually go to polling places. With all the people who did not show up, there should have been ample opportunities for those who would have liked to participate.

5. Better interviewer training is needed. Too many interviewers were unprepared for the cold, darkness, and length of time they were supposed to poll. Much of this could have been averted if interviewers had read the instruction sheet prior to Election Day.

6. Many interviewers did not understand what information they were to call in. This could also be alleviated by better interviewer training.

7. There was a lot of negative publicity given to exit polls prior to Election Day. Positive press releases prior to the election might improve the respondent rate.

8. Many respondents complained about the length of the questionnaire and the small print. In other sampling classes, it is emphasized that larger print and white space results in greater acceptance of questionnaires.

9. Some data entry people complained about the lack of phone calls, while other people were on the phone constantly. If possible, a random distribution of calls should be sought for rather than the priority queue.

10. The computer programs required a lot of time and space to be run. A recommendation is to run the programs on a system separate from that used for data entry.

11. Because of problems encountered with the computer programs on Election Day, more dry runs are recommended.

APPENDIX I

Cumulative estimated voter turnouts for Districts 1 and 3

| County | Estimated turnout | Cumulative turnout |
|---|---|---|
| Beaver | 2222.065 | 2222.065 |
| Box Elder | 15285.200 | 17507.260 |
| Garfield | 1973.615 | 19480.880 |
| Juab | 2773.024 | 22253.900 |
| Kane | 1920.361 | 24174.260 |
| Millard | 5069.591 | 29243.850 |
| Morgan | 2447.500 | 31691.350 |
| Piute | 757.835 | 32449.190 |
| Rich | 943.488 | 33392.680 |
| Tooele | 10062.060 | 43454.740 |
| Washington | 13178.260 | 56633.010 |
| Wayne | 1145.807 | 57778.810 |
| Daggett | 417.450 | 417.450 |
| Duchesne | 5034.746 | 5452.196 |
| Emery | 4563.378 | 10015.570 |
| Grand | 3358.660 | 13374.230 |
| San Juan | 3876.668 | 17250.900 |
| Sanpete | 6945.008 | 24195.910 |
| Sevier | 6939.226 | 31135.130 |
| Summitt | 5386.617 | 36521.750 |
| Uintah | 7996.585 | 44518.340 |
| Wasatch | 3889.629 | 48407.960 |

# APPENDIX II

Estimation file for Uintah County

```
2 05 0001 0050 034 001
2 05 0002 0233 211 002
2 05 0003 0468 398 003
2 05 0004 0393 333 004
2 05 0005 0327 271 005
2 05 0006 0109 101 006
2 05 0007 0562 479 007
2 05 0008 0434 375 008
2 05 0009 0528 411 009
2 05 0010 0219 179 009
2 05 0011 0206 165 011
2 05 0012 0849 706 012
2 05 0013 0520 414 013
2 05 0014 0232 189 014
2 05 0015 0261 225 015
2 05 0016 0425 361 016
2 05 0017 0177 138 017
2 05 0018 0230 185 018
2 05 0019 0332 274 019
2 05 0020 0348 248 020
2 05 0021 0351 321 020
2 05 0022 0820 593 020
2 05 0023 0290 276 023
2 05 0024 0579 460 024
2 05 0025 0562 512 025
2 05 0026 0135 123 026
2 05 0027 0112 105 027
2 05 0028 0217 177 028
2 05 0029 0043 031 029
1 05 0001 0041 033 001
1 05 0002 0221 200 002
1 05 0003 0475 403 003
1 05 0004 0368 332 004
1 05 0005 0291 264 005
1 05 0006 0104 096 006
1 05 0007 0502 444 007
1 05 0008 0397 356 008
1 05 0009 0432 313 009
1 05 0010 0219 169 009
1 05 0011 0212 186 011
1 05 0012 0740 665 012
1 05 0013 0527 444 013
1 05 0014 0304 200 014
1 05 0015 0256 215 015
```

Column 1: 1 = 1980
2 = 1984
Column 2: 05 = Uintah
Column 3: precincts within each county
Column 4: total registered voters
Column 5: actual turnout
Column 6: voting location code

```
1 05 0016 0494 339 016
1 05 0017 0204 149 017
1 05 0018 0217 173 018
1 05 0019 0289 224 019
1 05 0020 0367 248 020
1 05 0021 0393 325 020
1 05 0022 0723 514 020
1 05 0023 0289 266 023
1 05 0024 0574 439 024
1 05 0025 0433 398 025
1 05 0026 0133 128 026
1 05 0027 0088 077 027
1 05 0028 0192 172 028
1 05 0029 0040 032 029
```

## APPENDIX III

Predicted vs. actual turnout for sampled counties

| County | Estimated | Actual Turnout | Estimate as % of Actual Turnout |
|---|---|---|---|
| Box Elder | 15563 | 16407 | 94.8 |
| Cache | 25508 | 27814 | 92.7 |
| Carbon | 8706 | 8557 | 101.7 |
| Davis | 59594 | 68139 | 87.5 |
| Iron | 8790 | 7820 | 112.4 |
| Salt Lake | 263156 | 275591 | 95.4 |
| Sanpete | 7907 | 6486 | 121.9 |
| Sevier | 7478 | 6211 | 120.4 |
| Summitt | 7025 | 6405 | 109.7 |
| Tooele | 10840 | 6837 | (only 30 of 39 reporting) |
| Uintah | 6671 | 7176 | 93.0 |
| Utah | 60633 | 87099 | 69.6 |
| Washington | 17159 | 16495 | 104.2 |
| Weber | 58387 | 61695 | 94.6 |

## APPENDIX IV

Example of selection of polling places

The resulting output from the program alpha.for is as follows:

| | | | |
|---|---|---|---|
| 12 | 1 | 308 | |
| 12 | 2 | 434 | |
| 12 | 3 | 777 | ** |
| 12 | 4 | 1421 | |
| 12 | 5 | 1610 | |
| 12 | 6 | 2268 | |
| 12 | 7 | 2259 | |
| 12 | 8 | 2625 | |
| 12 | 9 | 2828 | |
| 12 | 10 | 3710 | |
| 12 | 11 | 4109 | ** |
| 12 | 12 | 4298 | |
| 12 | 13 | 4669 | |
| 12 | 14 | 5040 | |
| 12 | 15 | 5341 | |
| 12 | 16 | 5768 | |
| 12 | 17 | 6069 | |
| 12 | 18 | 6671 | |

Column 1 represents the county (in this case Uintah County), column 2 is the voting location, and column 3 is the running total of estimates. In this case two polling places were to be sampled; so a random number between 0 and 6671 was selected. This number was 765. This means that the third polling location was selected and by adding 3335.5 (6671/2) the 11th location was selected.

## APPENDIX V

Example of self-weighting for Uintah County

$$n_{ijk} = \frac{N_{i..}}{(k)(p_{kj})(c_i)} = \frac{42316}{(65.666)(2)(3)} = 107.58$$

$N_{i..}$ = total estimated voters in this strata

$$k = \frac{591000}{9000} = \text{estimated turnout for the state}$$

$p_{ij}$ = # of polling places sampled within each sampled county in the ith strata

$c_i$ = # of counties sampled in the strata

APPENDIX VI

Locations of polling places and sampling rates
Column 4 is the starting point. Column 5 is the sampling rate.

| | | | | |
|---|---|---|---|---|
| Box Elder | 1 | Eugene Watson Home<br>678 S. 200 W.<br>Brigham City, UT | 3 | 4 |
| | 2 | Basement of Public Library<br>Garland, UT | 3 | 3 |
| | 3 | Willard City Hall<br>Willard, UT | 3 | 8 |
| Cache | 4 | Business College<br>75 S. 400 W.<br>Logan, UT | 10 | 10 |
| | 5 | Adams School<br>530 N. 400 E.<br>Logan, UT | 6 | 18 |
| | 6 | Jones Hall<br>10th N. 1200 E.<br>Logan, UT | 6 | 11 |
| | 7 | City Hall<br>Lewiston, UT | 1 | 1 |
| | 8 | Community Bldg.<br>Richmond, UT | 5 | 9 |
| Carbon | 81 | Sally Mauro Elementary School<br>20 Second Ave.<br>West Helper, UT | 4 | 9 |
| | 82 | Mountain View Motors<br>1115 South Carbon Ave.<br>Miller Creek, UT | 1 | 8 |

| | | | | |
|---|---|---|---|---|
| Davis | 9 | Muir Elementary<br>2275 S. Davis Blvd.<br>Bountiful, UT | 14 | 23 |
| | 10 | Millcreek Junior High<br>245 E. 1000 S.<br>Bountiful, UT | 7 | 9 |
| | 11 | Tolman Elementary<br>300 E. 1200 N.<br>Bountiful, UT | 15 | 17 |
| | 12 | Centerville Junior High<br>625 S. Main<br>Centerville, UT | 6 | 16 |
| | 13 | Clearfield Library<br>562 S. 1000 E.<br>Clearfield, UT | 2 | 9 |
| | 14 | Clinton City Hall<br>1906 W. 1800 N.<br>Clinton, UT | 2 | 9 |
| | 15 | Farmington Junior High<br>160 S. 200 W.<br>Farmington, UT | 13 | 14 |
| | 16 | Burton Elementary<br>827 E. 200 S.<br>Kaysville, UT | 6 | 14 |
| | 17 | Layton Elementary<br>319 W. Gentile<br>Layton, UT | 10 | 20 |
| | 18 | Vae View Elementary<br>1750 W. 1600 N.<br>Layton, UT | 6 | 21 |
| | 19 | East Layton Elementary<br>2470 E. Cherry Lane<br>Layton, UT | 9 | 11 |
| | 20 | Fremont Elementary<br>2525 N. 160 W.<br>Sunset, UT | 1 | 7 |

| | | | | |
|---|---|---|---|---|
| | 21 | West Point Elementary<br>3788 W. 300 N.<br>West Point, UT | 1 | 9 |
| Iron | 22 | Valley View Medical Center<br>Cedar City, UT | 3 | 11 |
| | 23 | Cedar City High School<br>Cedar City, UT | 6 | 8 |
| Salt Lake 2 | 41 | Alta Care Center<br>4035 S. 500 E.<br>Murray, UT | 7 | 7 |
| | 42 | Aspen Hills Apts. (Clubhouse)<br>3969 S. 900 E.<br>Salt Lake City, UT | 4 | 4 |
| | 43 | Bella Vista Elementary<br>2131 E. 7000 S.<br>Salt Lake City, UT | 6 | 17 |
| | 44 | Brookwood Elementary<br>8640 S. Snowbird Dr. (2565 E.)<br>Sandy, UT | 7 | 15 |
| | 45 | Calvin Smith Library<br>810 E. 3300 S.<br>Salt Lake City, UT | 7 | 9 |
| | 46 | Care West Salt Lake<br>165 S. 1000 E.<br>Salt Lake City, UT | 1 | 4 |
| | 47 | Church of Christ<br>662 E. 1300 S.<br>Salt Lake City, UT | 11 | 11 |
| | 48 | Copperview Elementary<br>8449 S. 150 W.<br>Midvale, UT | 7 | 10 |
| | 49 | County Government Center<br>2001 S. State St. (North Bldg.)<br>Salt Lake City, UT | 3 | 4 |

| | | | |
|---|---|---|---|
| 50 | Dilworth Elementary<br>1953 S. 2100 E.<br>Salt Lake City, UT | 11 | 15 |
| 51 | Draper City Hall<br>12411 S. 900 E.<br>Draper, UT | 8 | 22 |
| 52 | East Sandy Elementary<br>8285 S. 870 E.<br>Sandy, UT | 3 | 6 |
| 53 | Emerson Elementary<br>1017 E. Harrison Ave. (1370 S.)<br>Salt Lake City, UT | 7 | 18 |
| 54 | First Congregational Church<br>2150 Foothill Dr.<br>Salt Lake City, UT | 4 | 4 |
| 55 | Glendale Junior High<br>1430 W. Andrew Ave. (1504 S.)<br>Salt Lake City, UT | 5 | 10 |
| 56 | Grant Elementary<br>561 W. 6181 S.<br>Murray, UT | 2 | 12 |
| 57 | Highland High School<br>2166 S. 1700 E.<br>Salt Lake City, UT | 9 | 17 |
| 58 | Hillside Junior High<br>2375 E. Garfield Ave. (1865 S.)<br>Salt Lake City, UT | 7 | 9 |
| 59 | Howard R. Driggs Elementary<br>4340 S. 2700 E.<br>Salt Lake City, UT | 9 | 12 |
| 60 | Jackson Elementary<br>750 W. 200 N.<br>Salt Lake City, UT | 5 | 13 |
| 61 | Libbie Edward Elementary<br>1655 E. 3300 S.<br>Salt Lake City, UT | 6 | 12 |

| | | | |
|---|---|---|---|
| 62 | Longview Elementary<br>6240 S. Longview Dr. (560 E.)<br>Murray, UT | 10 | 20 |
| 63 | Meadow Moor Elementary<br>5315 S. 1700 E.<br>Salt Lake City, UT | 12 | 16 |
| 64 | Midvalley Elementary<br>217 E. 7800 S.<br>Midvale, UT | 7 | 10 |
| 65 | Mountain View Elementary<br>1415 W. California Ave. (1365 S.)<br>Salt Lake City, UT | 3 | 7 |
| 66 | Murray High School<br>5440 S. State St.<br>Murray, UT | 4 | 10 |
| 67 | Oakwood Elementary<br>5815 Highland Dr.<br>Salt Lake City, UT | 10 | 13 |
| 68 | Parkside Elementary<br>5175 S. 495 E.<br>Murray, UT | 9 | 14 |
| 69 | Pioneer Elementary<br>3860 S. 3380 W.<br>West Valley City, UT | 6 | 10 |
| 70 | Redwood Elementary<br>2650 S. Redwood Rd.<br>West Valley City, UT | 2 | 12 |
| 71 | Rose Park Elementary<br>1130 W. Sterling Dr. (930 N.)<br>Salt Lake City, UT | 9 | 10 |
| 72 | Salt Lake Monument Company<br>186 "N" St.<br>Salt Lake City, UT | 4 | 4 |
| 73 | S.L. Metallurgy Research Center<br>729 S. Arapeen Dr. (2235 E.)<br>Salt Lake City, UT | 1 | 5 |

| | | | | |
|---|---|---|---|---|
| | 74 | St. Ann's School<br>430 E. 2100 S.<br>Salt Lake City, UT | 3 | 9 |
| | 75 | Terrace Apartments<br>1810 S. Main St.<br>Salt Lake City, UT | 3 | 7 |
| | 76 | Union Junior High<br>615 E. 8000 S.<br>Sandy, UT | 7 | 14 |
| | 77 | Van Cott Hall<br>University of Utah<br>Salt Lake City, UT | 2 | 6 |
| | 78 | Wasatch Presbyterian Church<br>1626 S. 1700 E.<br>Salt Lake City, UT | 3 | 12 |
| | 79 | Whittier Elementary<br>1568 S. 300 E.<br>Salt Lake City, UT | 5 | 5 |
| | 80 | Woodstock Elementary<br>6015 S. 1300 E.<br>Salt Lake City, UT | 1 | 18 |
| Salt Lake 3 | 83 | Bennion Care Center<br>6246 S. Redwood Rd.<br>West Jordan, UT | 11 | 12 |
| | 84 | Byde-A-Wyle Mobile Homes<br>3455 S. 1185 W. (Clubhouse)<br>West Valley City, UT | 5 | 6 |
| | 85 | Fox Hills Elementary<br>3775 W. 6020 S.<br>Salt Lake City, UT | 2 | 19 |
| | 86 | Hunter Elementary<br>4351 S. 5400 W.<br>West Valley City, UT | 5 | 19 |
| | 87 | John F. Kennedy Junior High<br>4495 S. 4800 W.<br>West Valley City, UT | 5 | 19 |

| | | | | |
|---|---|---|---|---|
| | 88 | Majestic Meadows Clubhouse<br>4580 S. 1055 W.<br>Salt Lake City, UT | 1 | 7 |
| | 89 | Oquirrh Hills Junior High<br>12949 S. 2700 W.<br>Riverton, UT | 15 | 15 |
| | 90 | Riverton Elementary<br>12830 S. 1700 W.<br>Riverton, UT | 10 | 16 |
| | 91 | South Jordan Elementary<br>1350 W. 10400 S.<br>Riverton, UT | 9 | 18 |
| | 92 | Taylorsville High<br>5225 S. Redwood Rd.<br>Salt Lake City, UT | 20 | 21 |
| | 93 | Vista Elementary<br>4925 S. 2200 W.<br>Salt Lake City, UT | 4 | 13 |
| | 94 | West Kearns Elementary<br>4901 S. 4720 W.<br>Salt Lake City, UT | 9 | 23 |
| | 95 | Westvale Elementary<br>2300 W. 8660 S.<br>West Jordan, UT | 4 | 14 |
| Sanpete | 96 | City Hall<br>Fairview, UT | 4 | 9 |
| | 97 | City Hall<br>Ephraim, UT | 19 | 25 |
| Sevier | 98 | City Hall<br>Monroe, UT | 1 | 3 |
| | 99 | LDS Church<br>Richfield, UT | 3 | 5 |

| | | | | |
|---|---|---|---|---|
| Summitt | 100 | Treasure Mt. Middle School<br>2530 E. Highway 248 | 2 | 13 |
| | 101 | Hoytsville LDS Church<br>1095 S. Hoystville Rd. | 3 | 3 |
| Tooele | 24 | Harris Elem. School N. Rm 19<br>215 N. First St.<br>Tooele, UT | 2 | 2 |
| | 25 | Betty Castagno Home<br>1413 E. Pine Canyon<br>Lincoln, UT | 1 | 1 |
| Uintah | 102 | Ballard Town Building<br>2100 E. 800 S.<br>Ballard, UT | 1 | 3 |
| | 103 | Naples City Office<br>1420 E. Weatherly Drive<br>Naples, UT | 1 | 3 |
| Utah | 104 | Senior Citizens Center<br>54 E. Main<br>American Fork, UT | 8 | 18 |
| | 105 | Genola Town Hall<br>Center & 8th<br>Genola, UT | 2 | 3 |
| | 106 | Sego Lily<br>550 E. 900 N.<br>Lehi, UT | 7 | 14 |
| | 107 | Mapleton Elementary<br>120 W. Maple<br>Mapleton, UT | 16 | 18 |
| | 108 | Cascade Elementary<br>160 N. 800 E.<br>Orem, UT | 10 | 16 |

| | | | |
|---|---|---|---|
| 109 | Orem Fire Station<br>300 E. 1000 S.<br>Orem, UT | 8 | 12 |
| 110 | Aspen Elementary<br>925 W. 2000 N.<br>Orem, UT | 1 | 10 |
| 111 | Mt. View Hosp. Community Classroom<br>50 Medical Dr.<br>Payson, UT | | 915 |
| 112 | Community Rec. Center<br>41 E. 200 S.<br>Pleasant Grove, UT | 3 | 13 |
| 113 | Eldred Center<br>270 W. 500 N.<br>Provo, UT | 21 | 21 |
| 114 | Imperial Trailor Park<br>1375 W. 500 N.<br>Provo, UT | 8 | 8 |
| 115 | Grandview Elementary<br>1591 Jordan Ave.<br>Provo, UT | 7 | 15 |
| 116 | Canyon Crest Elementary (Gym)<br>4664 N. Canyon Rd.<br>Provo, UT | 9 | 12 |
| 117 | Salem School<br>140 W. 100 S.<br>Salem, UT | 10 | 16 |
| 118 | Brockbank Elementary<br>340 W. 500 N.<br>Spanish Fork, UT | 8 | 12 |
| 119 | Westside Elementary<br>500 S. Main<br>Springville, UT | 6 | 11 |
| 120 | Springville High<br>1205 E. 900 S.<br>Springville, UT | 8 | 16 |

| | | | | |
|---|---|---|---|---|
| Washington | 26 | Wash. County Library Assembly Rm<br>50 S. Main<br>St. George, UT | 5 | 7 |
| | 27 | Community Center<br>Hildale, UT | 1 | 2 |
| | 28 | Washington Elementary<br>300 N. 300 E.<br>Washington, UT | 4 | 6 |
| Weber | 29 | Farr West City Hall<br>2090 N. 2000 W.<br>Farr West, UT | 7 | 13 |
| | 30 | Pioneer Elementary<br>250 N. 1600 W.<br>Marriott, UT | 6 | 8 |
| | 31 | North Ogden Elementary<br>474 E. 2650 N.<br>North Ogden, UT | 7 | 14 |
| | 32 | Horace Mann Elementary<br>1300 9th Street<br>Ogden, UT | 19 | 20 |
| | 33 | Dee Elementary<br>1550 22nd Street<br>Ogden, UT | 10 | 11 |
| | 34 | Central Middle School<br>781 25th Street<br>Ogden, UT | 5 | 12 |
| | 35 | Ogden High School<br>2828 Harrison Blvd.<br>Ogden, UT | 10 | 21 |
| | 36 | Lomond View Elementary<br>3644 N. 900 W.<br>Pleasant View, UT | 9 | 13 |
| | 37 | Heritage Park Care Center<br>2700 W. 5600 S.<br>Roy, UT | 14 | 21 |

| | | | |
|---|---|---|---|
| 38 | Roy Elementary<br>2888 W. 5600 S.<br>Roy, UT | 6 | 16 |
| 39 | Municipal Building<br>560 39th Street<br>South Ogden, UT | 3 | 7 |
| 40 | Wash Terrace Elementary<br>125 E. 4475 S.<br>Wash Terrace, UT | 6 | 15 |

# APPENDIX VII

```
cms f1 ssd disk kbyu88 ssd D:

DATA PROJECT:
 set ssd.kbyu88:
if govn=1 then bang=1:
if govn ne 1 then bang=0:
if govn=2 then wils=1:
if govn ne 2 then wils=0:
if govn =3 then cook=1:
if govn ne 3 then cook=0:
 if repl ne 2 then Mckay=0:
 if repl = 2 then Mckay=1:
 if rep2 ne 2 then owens = 0:
 if rep2 = 2 then owens = 1:
 if rep3 ne 2 then string =0:
 if rep3 = 2 then string =1:
 if attgen ne 2 then vandam=0:
 if attgen = 2 then vandam =1:
 if treasur ne 2 then monson=0:
 if treasur = 2 then monson=1:
 if pres = 1 then bush =1:
 if pres ne 1 then bush =0:
 if senate=1 then hatch=1:
 if senate ne 1 then hatch=0:
 if inita = 1 then fora = 1:
 if inita ne 1 then fora =0:
 if initb = 1 then forb =1:
 if initb ne 1 then forb =0:
 if initc =1 then forc =1:
 if initc ne 1 then forc=0:
 if prop1 = 1 then forp1=1:
 if prop1 ne 1 then forp1 =0:
 if prop2 = 1 then forp2 =1:
 if prop2 ne 1 then forp2=0:
 proc freq:
  tables pres govn senate rep1 rep2 rep3 attgen treasur inita initb initc
    prop1 prop2:
 Proc summary:
  class group:
  var bush hatch mckay owens string vandam monson
     fora forb forc forp1 forp2 :
 output out=avestuff mean=mbush mhatch mmckay mowens mstring mvandam
       mmonson mfora mforb mforc mforp1 mforp2 :
proc means noprint data=avestuff:
  var mbush mhatch mmckay mowens mstring mvandam mmonson mfora mforb
      mforc mforp1 mforp2:
  output out=vstuff css=sbush shatch smckay sowens sstring svandam
     smonson sfora sforb sforc sforp1 sforp2:
DATA:
 set vstuff:
 sebush= 200*sqrt(sbush/380):
 sehatch=200*sqrt(shatch/380):
 semckay=200*sqrt(smckay/380):
 seowens=200*sqrt(sowens/380):
 sestring=200*sqrt(sstring/380):
 sevandam=200*sqrt(svandam/380):
 semonson=200*sqrt(smonson/380):
 sefora=200*sqrt(sfora/380):
 seforb=200*sqrt(sforb/380):
 seforc=200*sqrt(sforc/380):
 seforp1=200*sqrt(sforp1/380):
 seforp2=200*sqrt(sforp2/380):
PROC PRINT LABEL:
 label sebush='MARGIN OF ERROR FOR PRESIDENTIAL RACE'
       sehatch='MARGIN OF ERROR FOR SENATORIAL RACE'
       semckay='MARGIN OF ERROR FOR USREP DISTRICT ONE'
       SEOWENS='MARGIN OF ERROR FOR USREP DISTRICT TWO'
       SESTRING='MARGIN OF ERROR FOR USREP DISTRICT THREE'
       SEVANDAM='MARGIN OF ERROR FOR ATTORNEY GENERAL'
       SEMONSON='MARGIN OF ERROR FOR TREASURER'
       SEFORA='MARGIN OF ERROR FOR INITIATIVE A'
       SEFORB='MARGIN OF ERROR FOR INITIATIVE B'
       SEFORC='MARGIN OF ERROR FOR INITIATIVE C'
       SEFORP1='MARGIN OF ERROR FOR PROPOSITION 1'
       SEFORP2='MARGIN OF ERROR FOR PROPOSITION 2':
PROC PRINT:
VAR sebush sehatch semckay seowens sestring sevandam semonson
      sefora seforb seforc seforp1 seforp2:
title 'Margins of Errors for the Races (IN PERCENTS)':

    proc summary DATA=PROJECT:
      class group:
      var bang:
      output out=avgbang mean=ag :
   proc summary DATA=PROJECT:
      class group:
      var wils:
      output out=avgwils mean=ag2 :
   proc summary DATA=PROJECT:
      class group:
      var cook:
      output out=avgcook mean=ag3 :


   data varbang:
      set avgbang:
      proc means noprint :
         var  ag:
         output out=vbang css=ssbang:

   data mvbang:
      set vbang:
      vmbang = (ssbang/380):


   data varwils:
      set avgwils:
      proc means noprint :
         var  ag2:
         output out=vwils  css=sswils:

data mvwils:
   set vwils:
   vmwils = (sswils/380):


   data varcook:
      set avgcook:
      proc means noprint :
         var  ag3:
```

```
        output out=vcook  css=sscook;

data mvcook;
   set vcook;
   vmcook = (sscook/380);

data covs;
   merge avgbang avgwils avgcook mvbang mvwils mvcook;

   proc corr noprint nosimple nocorr cov out=covbw(type=cov);
   var  ag ag2;
   proc corr noprint nosimple nocorr cov out=covbc(type=cov) data=covs;
   var  ag ag3;
   proc corr noprint nosimple nocorr cov out=covwc(type=cov) data=covs;
   var  ag2 ag3;

data c1  ;
   set   covbw;
    drop _TYPE_ _NAME_;
    if _N_ =1;

data cov1bw;
   merge covs c1;
    if _N_ =1;
   keep vmbang vmwils ag2 margerr;
   margerr=200*sqrt(vmbang+vmwils-2*(ag2/19));
   proc print;
   var margerr;

data c2  ;
   set   covbc;
    drop _TYPE_ _NAME_;
    if _N_ =1;

data cov2bc;
   merge covs c2;
    if _N_ =1;
   keep vmbang vmcook ag3 margerr;
   MARGERR=200*SQRT(vmbang+vmcook-2*(ag3/19));
   proc print;
   LABEL MARGERR='MARGIN OF ERROR ON GUBERNATIORAL RACE';
   var margerr;

data c3  ;
   set   covwc;
    drop _TYPE_ _NAME_;
    if _N_ =1;

data cov3wc;
   merge covs c3;
    if _N_ =1;
   keep vmwils vmcook ag3 margerr;
   margerr=200*SQRT(vmwils+vmcook-2*(ag3/19));
   proc print;
   var margerr;
```

APPENDIX VIII

Journals of time spent on project

Journal for Design Group

| Date | Activity | Man hours |
|---|---|---|
| Sept 26-27 | Organizing past data for use this year. | 4.0 |
| Oct 3 | Group meeting with Dr. Christensen to determine group responsibilities. | 3.5 |
| Oct 5 | Group meeting to determine certainty counties. | 8.0 |
| Oct 8 | Organizing data for PPS sampling of noncertainty counties, and then sampling those counties. | 6.0 |
| Oct 11-14 | Meetings with Political Science students to explain what we are doing. | 8.0 |
| Oct 17 | Obtained data from Salt Lake (Capitol) for use of estimation group. | 4.0 |
| Oct 20-21 | Meeting with Political Science students to touch bases on follow-up. | 2.5 |
| Oct 21 | Proportional allocation of polling places. | 8.0 |
| Oct 25-28 | PPS sampling of polling places within counties. | 19.0 |
| Oct 27 | Follow-up meeting with Dr. Christensen. | 1.0 |
| Oct 28-Nov 1 | Self-weighting and sampling rates. | 30.0 |
| Nov 2-7 | Loose ends, and explanations to P. S. | 5.0 |
| Nov 2-7 | Data entry training and interviewer training. | 14.0 |
| Nov 8 | Exitpolling. | 12.0 |
| Nov 8 | Data entry supervision. | 24.0 |
| Nov 18 | Data entry supervision. | 4.0 |
| Dec 2-8 | Report preparation. | 26.0 |
| | | 179.0 |

Journal for Voter Turnout Estimation Group

Meetings:

| | |
|---|---|
| Oct. 3 | .5 hrs |
| Oct. 17 | .5 |
| Oct. 18 | 1.0 |
| Oct. 19 | .5 |
| Oct. 21 | .5 |
| | --- |
| | 3.0 |

Getting county information, entering data:

Oct. 21 - Oct. 26 94.5 hrs

Computer program, data estimation:

Oct. 27 - Oct. 29 64.0 hrs

Data entry training:

Nov. 2 - Nov.3 8.0 hrs

Election Day:

Nov. 8

| | |
|---|---|
| 20.0 hrs | Data entry supervision |
| 8.0 | interviewing |
| 14.0 | watching KBYU, recording results |
| ---- | |
| 42.0 | |

Post Election data entry:

Nov. 10 - Nov. 17 10.0 hrs

Writing group paper:

Dec. 2 - Dec. 7 5.0 hrs

TOTAL HOURS SPENT: 238.5 hrs

Journal for Computer group

Time: Hours worked X Number of People working = Total hours

Oct. 14 — Val, Daryl, and Jeff talked with Patty Collings.
Time: 2 X 3 = 6 hours

Oct. 17 — After class, discussed issues, and talked with Dr. Christensen about probability proportional to size sampling.
Time: 1 X 4 = 4 hours

Oct. 18 — Met with Dr. Magalby's TA's to discuss who is in charge of what, codes, responsibilities, # of terms, etc. Met with Kim Sullivan concerning questionnaire and random group indicators.
Time: 1 X 4 + 1 X 1 = 5 hours

Oct. 19 — Met with Alan Long about data input responsibilities.
Time: 1 X .5 = .5 hours

Oct. 20 — Met with Larry Walters and Dr. Christensen about group indicators program.
Time: 1 X 1 = 1 hour

Oct. 24 — Discussed design, procedures to be used in SAS
Time: 1 X 4 = 4 hours

Oct. 26 — Made data entry sign-up lists for Dr. Christensen and Sister Collin's students to sign up for training and polling times.
Time: 2 X 1 = 2 hours

Oct. 27 — Calculated margin of error formulas. Tested formula on sample data set, determined how group numbers were to be created, and created initial SAS command file.
Time: 1.5 X 4 = 6 hours

Oct. 28 — Daryl talked with Dr. Christensen about variance, covariance for with three candidate race.
Time: 0.5 X 1 = 0.5 hours

| | |
|---|---|
| Nov. 1-3 | Data Entry Training Sessions with Kim Sullivan<br>Time: 6 X 1 = 6 hours |
| Nov. 2-4 | Each team member created SAS command file for determining outcome of different races.<br>Time: 4 X 4 = 16 hours |
| Nov. 4 | Created sample data set to test program.<br>Time: 1 X 19 = 19 hour |
| Nov. 4 | Meeting with Dr. Magalby, Collings, Kim Sullivan, and Brad to discuss final problems, designs, and procedural methods.<br>Time: 1 X 3 = 3 hours |
| Nov. 5 | Combined SAS command files with Political Science department's files to create final program.<br>Time: 11 X 4 = 44 hours |
| Nov. 7 | Created the random group table and tested programs with practice data.<br>Time: 1 X 2 = 2 hours |
| Nov. 8 | Supervised and Troubleshoot Data Entry. Correct program error on Margin of Error output. Watch KBYU broadcast of election results.<br>Time: 15 X 4 = 60 hours |

Total Hours: 179.0 hours

## Appendix IX

Final Results and Predictions

Dan Jones' Estimates:

| | |
|---|---|
| **Presidential** | |
| Bush | 70 |
| Dukakis | 30 |
| **Senatorial** | |
| Hatch | 70 |
| Moss | 30 |
| **U.S. Rep. District 1** | |
| Hansen | 58 |
| McKay | 42 |
| **U.S. Rep. District 2** | |
| Owens | 54 |
| Snelgrove | 46 |
| **U.S. Rep. District 3** | |
| Nielson | 70 |
| Stringham | 30 |
| **Treasurer** | |
| Alder | 55 |
| Monson | 44 |
| **Initiative A** | |
| Against | 65 |
| For | 35 |
| **Initiative B** | |
| Against | 66 |
| For | 34 |
| **Initiative C** | |
| Against | 71 |
| For | 29 |

Other races were to close to report.

Appendix IX

Final Results and Predictions

Dan Jones' Estimates:

| | |
|---|---|
| **Presidential** | |
| Bush | 70 |
| Dukakis | 30 |
| **Senatorial** | |
| Hatch | 70 |
| Moss | 30 |
| **U.S. Rep. District 1** | |
| Hansen | 58 |
| Moss | 42 |
| **U.S. Rep. District 2** | |
| Owens | 54 |
| Snelgrove | 46 |
| **U.S. Rep. District 3** | |
| Nielson | 70 |
| Stringham | 30 |
| **Treasurer** | |
| Alder | 55 |
| Monson | 44 |
| **Initiative A** | |
| Against | 65 |
| For | 35 |
| **Initiative B** | |
| Against | 66 |
| For | 34 |
| **Initiative C** | |
| Against | 71 |
| For | 29 |

Other races were to close to report.

# KBYU Exit Poll Results
## Preliminary

| Race | Time of Run | | | |
|---|---|---|---|---|
| | 5:30 | 7:30 | Final(M.E.*) | Actual |
| Sample Size | 917 | 1483 | 1688 | |
| Bush/Dukakis | 66/31 | 66/31 | 67/31(2.3) | 67/33 |
| Bangrtr/Wilson/Cook | 41/37/22 | 39/39/21 | 40/39/21(2.1) | 40/38/21 |
| Hatch/Moss | 67/31 | 67/30 | 68/29(2.4) | 67/32 |
| Hansen/McKay | 62/36 | 62/37 | 63/36(1.5) | 60/40 |
| Snelgrove/Owens | 39/60 | 36/62 | 37/60(1.7) | 41/57 |
| Nielson/Stringham | 69/29 | 71/27 | 71/27(1.3) | 67/31 |
| Wilkinson/VanDam | 47/52 | 47/51 | 47/51(1.9) | 48/52 |
| Alter/Monson | 51/47 | 51/47 | 52/46(2.3) | 54/46 |
| InitA:For/Against | 38/62 | 37/63 | 37/63(2.2) | 39/61 |
| InitB: For/Against | 36/64 | 34/66 | 35/65(1.9) | 38/62 |
| InitC: For/Against | 31/69 | 30/70 | 30/70(1.6) | 31/69 |

*Estimated margin of error=2•Estimated standard error