
Vote Dilution: Measuring Voting Patterns by Race/Ethnicity

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Voting Rights Act of 1965

- Section 2 prohibits any voting standard, practice or procedure (including a redistricting plan) that results in the denial or dilution of minority voting strength.
 - Section 5 requires covered jurisdictions to submit any election changes (including redistricting plans) to the US Department of Justice. To obtain preclearance, a jurisdiction must demonstrate that the change does not have a:
 - Racially discriminatory effect – the plan cannot be retrogressive for minority voting strength;
 - Racially discriminatory purpose (even if plan is not retrogressive).
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Vote Dilution Analysis

- Vote dilution analysis should be conducted by any state with a significant minority population (Section 2 applies to all states) to ensure that a proposed redistricting plan does not fragment, submerge or unnecessarily pack a geographically concentrated minority population in violation of Section 2.
 - If a jurisdiction is covered by Section 5, then the analysis should be conducted to ensure that the proposed redistricting plan is not retrogressive (compared to the plan in place) with regard to minority voting strength.
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Racially Polarized Voting

- According to *Thornburg v. Gingles* (the first Supreme Court case to interpret the 1982 amendments to the Voting Rights Act incorporating the results test), racially polarized voting is the “evidentiary linchpin” of a vote dilution claim.
 - A racial bloc voting analysis is required to determine if minorities vote cohesively and if whites bloc vote to defeat minority-preferred candidates (two of the three *Gingles* preconditions for establishing illegal vote dilution).
 - Section 5 regulations also point to “the extent to which voting in the jurisdiction is racially polarized” as one of the factors considered by the Attorney General in making preclearance determinations.
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Statistical Techniques for Measuring the Degree of Polarized Voting

Statistical techniques must be used to estimate the extent of racially polarized voting:

- Homogeneous Precinct Analysis
 - Bivariate Ecological Regression Analysis
 - Ecological Inference Analysis
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Homogeneous Precinct Analysis

- The simplest method for estimating voting behavior by race/ethnicity is to compare voting patterns in “homogeneous precincts” – that is, election precincts that are composed of a single racial/ethnic group.
 - If there is a precinct composed entirely of black voters, and the voters within that precinct give 85% of their votes to Candidate Z, then we know that 85% of the black voters supported Candidate Z.
 - Since precincts are usually not exclusively one race/ethnicity, precincts 90% or more single race/ethnicity are usually considered homogeneous for purposes of this analysis.
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Estimates for Homogeneous Black Precincts

Precinct	Total VAP	Black VAP (percent Black VAP)	Total Votes for Office (percent turnout of VAP)	Votes for Candidate X (percent votes cast for X)	Votes for Candidate Y (percent votes cast for Y)
2	785	738 (94.0%)	493 (66.8%)	464 (94.1%)	29 (5.9%)
3	1426	1392 (97.6%)	870 (61.0%)	830 (95.4%)	40 (4.6%)
TOTAL	2211	2130 (96.3%)	1363 (61.6%)	1294 (94.9%)	69 (5.1%)

Estimates for Homogeneous White Precincts

Precinct	Total VAP	White VAP (percent White VAP)	Total Votes for Office (percent turnout of VAP)	Votes for Candidate X (percent votes cast for X)	Votes for Candidate Y (percent votes cast for Y)
4	1395	1300 (93.2%)	920 (65.9%)	124 (13.5%)	796 (86.5%)
5	867	846 (97.6%)	645 (74.4%)	109 (16.9%)	536 (83.1%)
6	821	810 (98.7%)	698 (85.0%)	72 (10.3%)	626 (89.7%)
TOTAL	3083	2956 (95.9%)	2263 (73.4%)	305 (13.5%)	1958 (86.5%)

Results of Homogeneous Precinct Analysis

	Candidate X	Candidate Y
Black voters	94.9%	5.1%
White voters	13.5%	86.5%

Conclusion: This contest is racially polarized because an overwhelming majority of black voters (94.9%) preferred Candidate X while the vast majority of white voters (86.5%) supported Candidate Y.

Drawbacks of Homogeneous Precinct Analysis

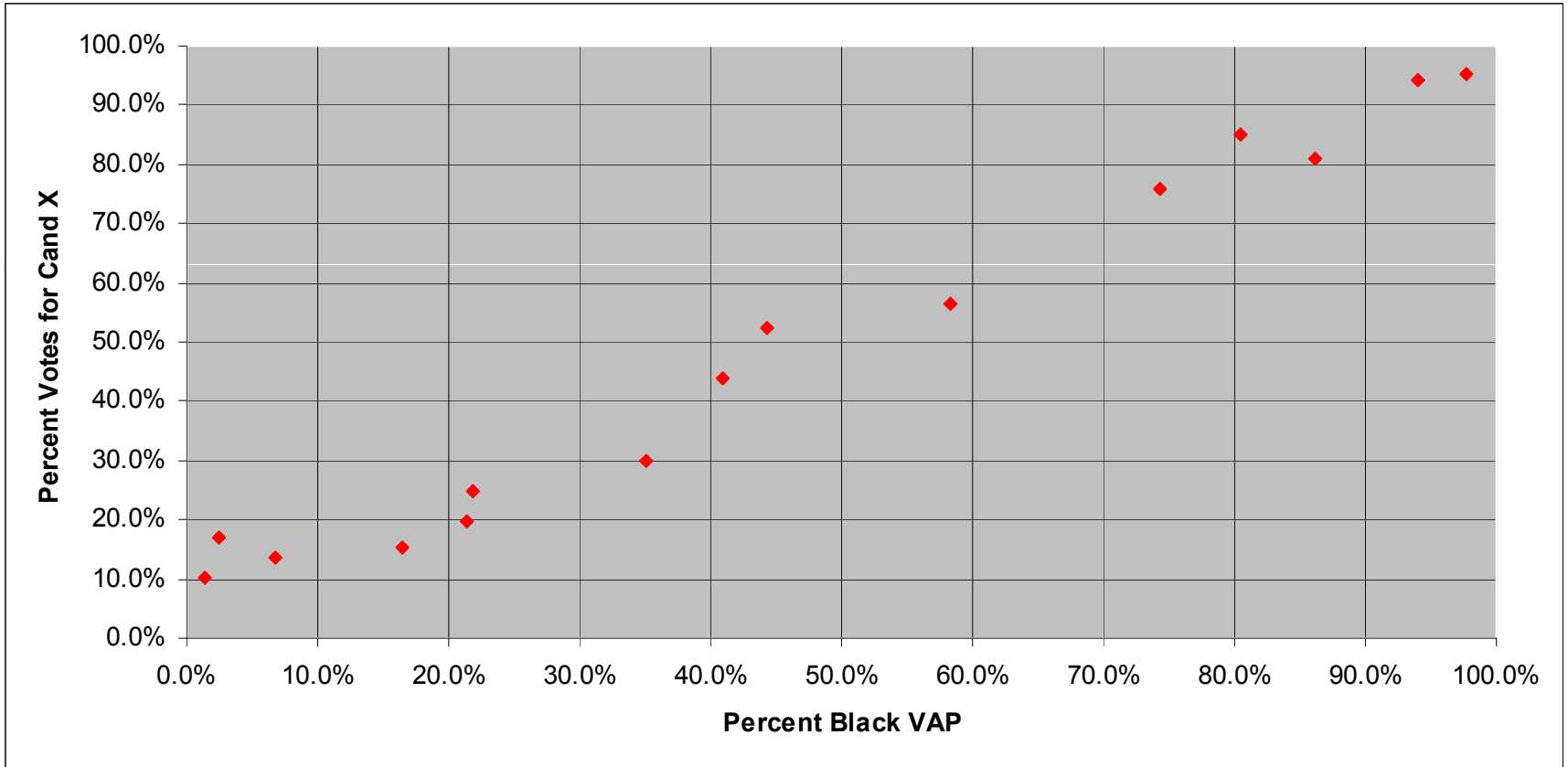
- In many jurisdictions there are no precincts that can be classified as homogeneous, even at the 90% cutoff point.
 - These estimates are derived from only those precincts that are homogeneous – often only a small, possibly unrepresentative, sample of the population. The voting behavior of those living in more racially/ethnically diverse areas not incorporated into these estimates.
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Bivariate Ecological Regression Analysis

- Information about voting behavior in all precincts, not just homogeneous precincts, is incorporated into analysis.
- Estimates of voting patterns by race/ethnicity can be produced even when there are no homogeneous precincts.
- Bivariate = two variables (racial/ethnic composition of the precinct and the votes cast for a given candidate within the precinct)
- Ecological = aggregate data rather than individual level data (precinct level data)
- Regression = statistical means of summarizing the relationship between variables by assuming a linear relationship among the variable and calculating the line that best fits the data

Precinct	Total VAP	Black VAP (percent Black VAP)	Total Votes for Office (percent turnout of VAP)	Votes for Candidate X (percent votes cast for X)	Votes for Candidate Y (percent votes cast for Y)
1	1200	891 (74.3%)	761 (63.4%)	578 (76.0%)	183 (24.0%)
2	785	738 (94.0%)	493 (62.8%)	464 (94.1%)	29 (5.9%)
3	1426	1392 (97.6%)	870 (61.0%)	830 (95.4%)	40 (4.6%)
4	1395	95 (6.8%)	920 (65.9%)	124 (13.5%)	796 (86.5%)
5	867	21 (2.4%)	645 (74.4%)	109 (16.9%)	536 (83.1%)
6	821	11 (1.3%)	698 (85.0%)	72 (10.3%)	626 (89.7%)
7	1123	654 (58.2%)	696 (62.0%)	392 (56.3%)	304 (43.7%)
8	895	720 (80.4%)	546 (61.0%)	465 (85.2%)	81 (14.8%)
9	1103	452 (41.0%)	706 (64.0%)	309 (43.8%)	397 (56.2%)
10	1522	325 (21.4%)	1023 (67.2%)	201 (19.6%)	822 (80.4%)
11	958	826 (86.2%)	542 (56.6%)	439 (81.0%)	103 (19.0%)
12	1147	402 (35.0%)	711 (62.0%)	214 (30.1%)	497 (69.9%)
13	789	130 (16.5%)	601 (76.2%)	91 (15.1%)	510 (84.9%)
14	574	254 (44.3%)	423 (73.7%)	221 (52.2%)	202 (47.8%)
15	895	195 (21.8%)	582 (65.0%)	145 (24.9%)	437 (75.1%)
TOTAL	15500	7106 (45.8%)	10217 (65.9%)	4654 (45.6%)	5563 (54.4%)

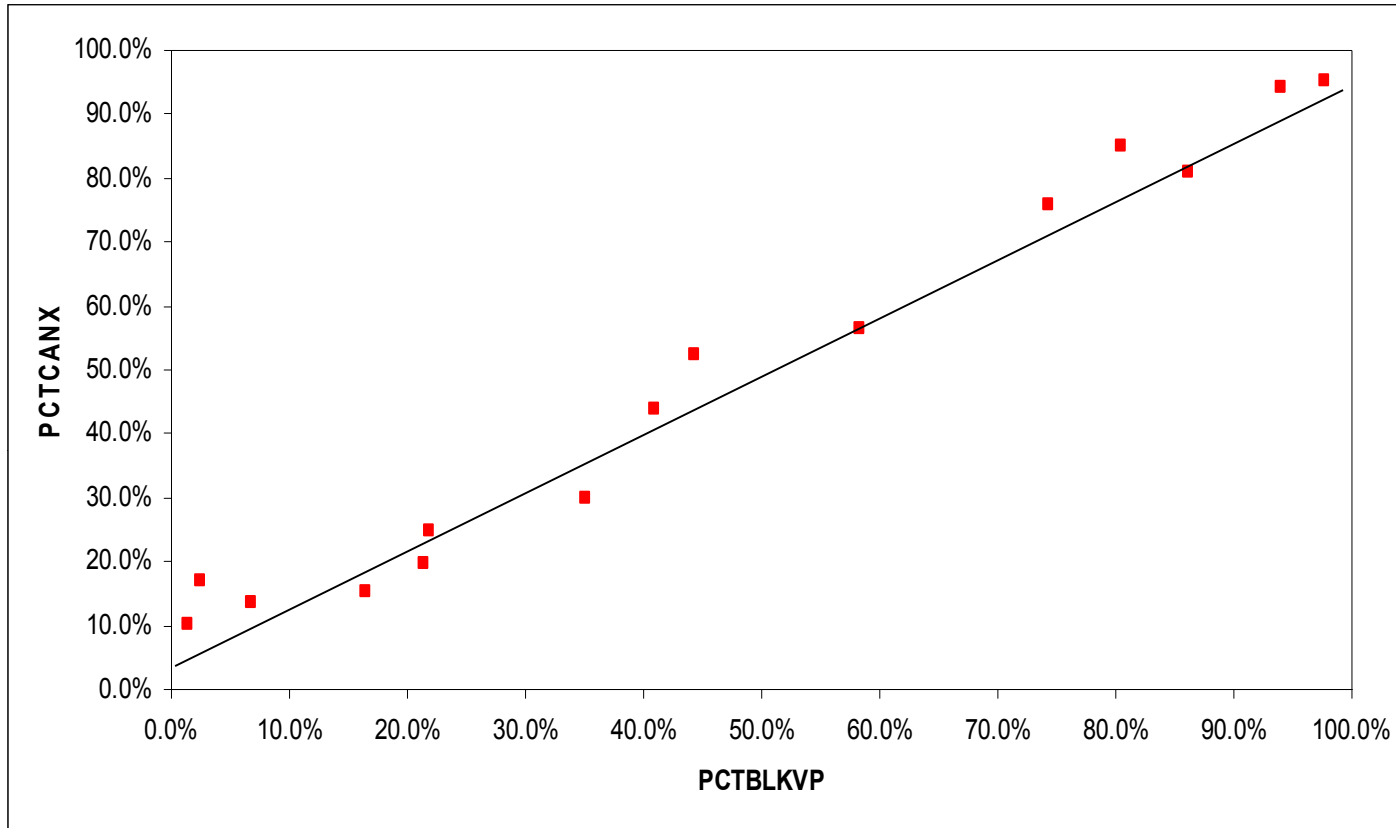
Plot of Percent Black Voting Age Population and Percent Votes for Candidate X for each Precinct



Producing Regression Estimates

- Regression analysis provides a statistical means of summarizing the relationship depicted on the graph between the two variables (“percent black” and “percent votes for Candidate X”) by calculating the line that best fits these data points.
 - The regression line that fits the data "best" is the straight line in which combined distances (or deviations) between each of the points on the graph and the line is less than for any other possible line.
 - The point at which the line crosses the vertical axis – that is, the point on the horizontal axis at which there are no blacks (0% black VAP) – is the estimate of how many whites voted for a given candidate.
 - The point at which the line reaches 100 percent on the horizontal axis (100% black VAP) is the estimate of the percentage of black votes that went to the candidate.
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SPSS Regression Output for Sample Precincts



Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.339	2.102		2.539	.025
Pctblkvp	.921	.037	.990	24.791	.000

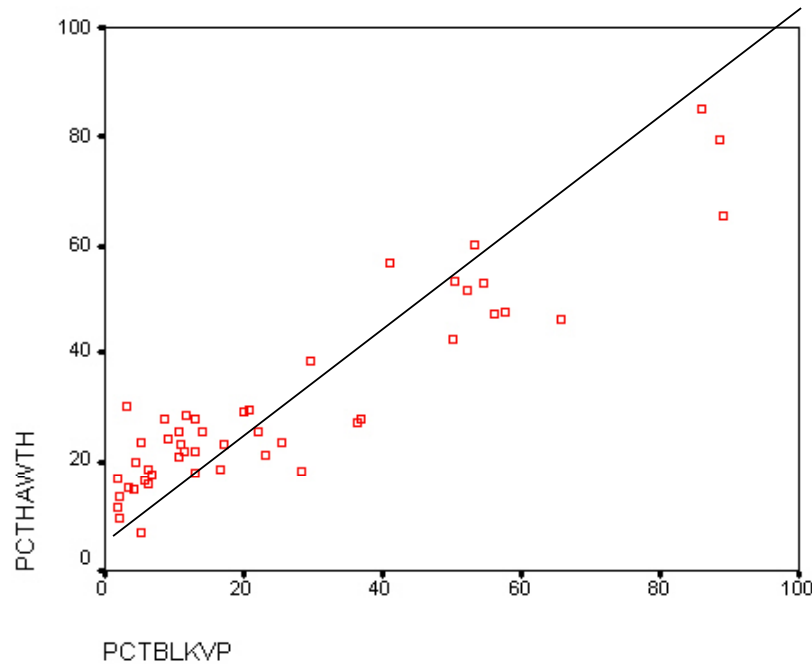
Results of Bivariate Ecological Regression Analysis

	Candidate X	Candidate Y
Black voters	97.4%	2.6%
White voters	5.3%	94.7%

Conclusion: This contest is racially polarized with 97.4% of the blacks casting a vote for Candidate X while most of the white voters (94.7%) supported Candidate Y.

Disadvantages of Bivariate Ecological Regression Analysis

- This statistical technique can produce estimates that fall outside the bounds of possibility – negative estimates or estimates of over 100% of a group voting for some candidates in some instances.



Ecological Inference

- Ecological Inference (EI) was developed by Prof. Gary King in part to address the problem of the out-of-bounds estimates that are possible with bivariate ecological regression analysis.
 - EI uses even more information about each precinct than bivariate ecological regression analysis by incorporating the *method of bounds* into the calculation of the estimates.
 - The method of bounds is used in combination with maximum likelihood statistics to produce estimates of voting patterns by race.
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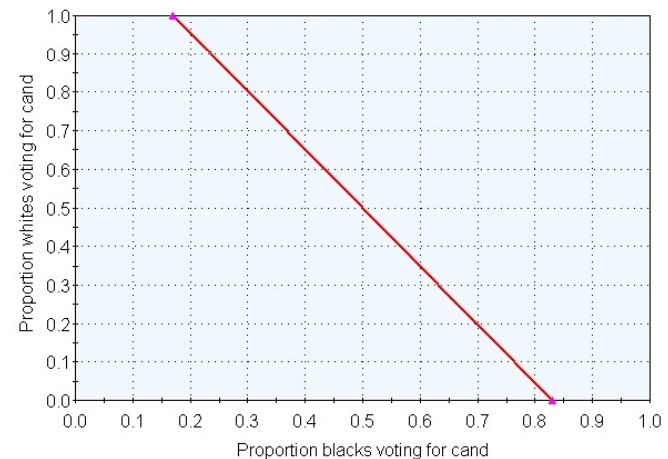
Method of Bounds

- For each precinct we can identify the range of possible values for the percentage of, for example, black and white voters that voted for any given candidate.
 - In one precinct, for example, we know that there are 100 voters, 60 of whom are black and 40 white. We also know that Candidate Z received 50 votes.
 - Bounds for black voters: the most black voters who could have voted for Candidate Z is 50/60 and the least is 10/60 (since even if all white voters cast a vote for the candidate, 10 votes would still be unaccounted for).
 - Bounds for white voters: as few as no whites and as many as all whites could have voted for Candidate Z given 50 votes and 40 whites (but 60 black voters).
 - The minimum estimate for blacks (10/60 or .17) gives us the maximum estimate for whites (40/40 or 1.0); and the maximum estimate for blacks (50/60 or .83) give us the minimum for whites (0.0).
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Plotting Bounds

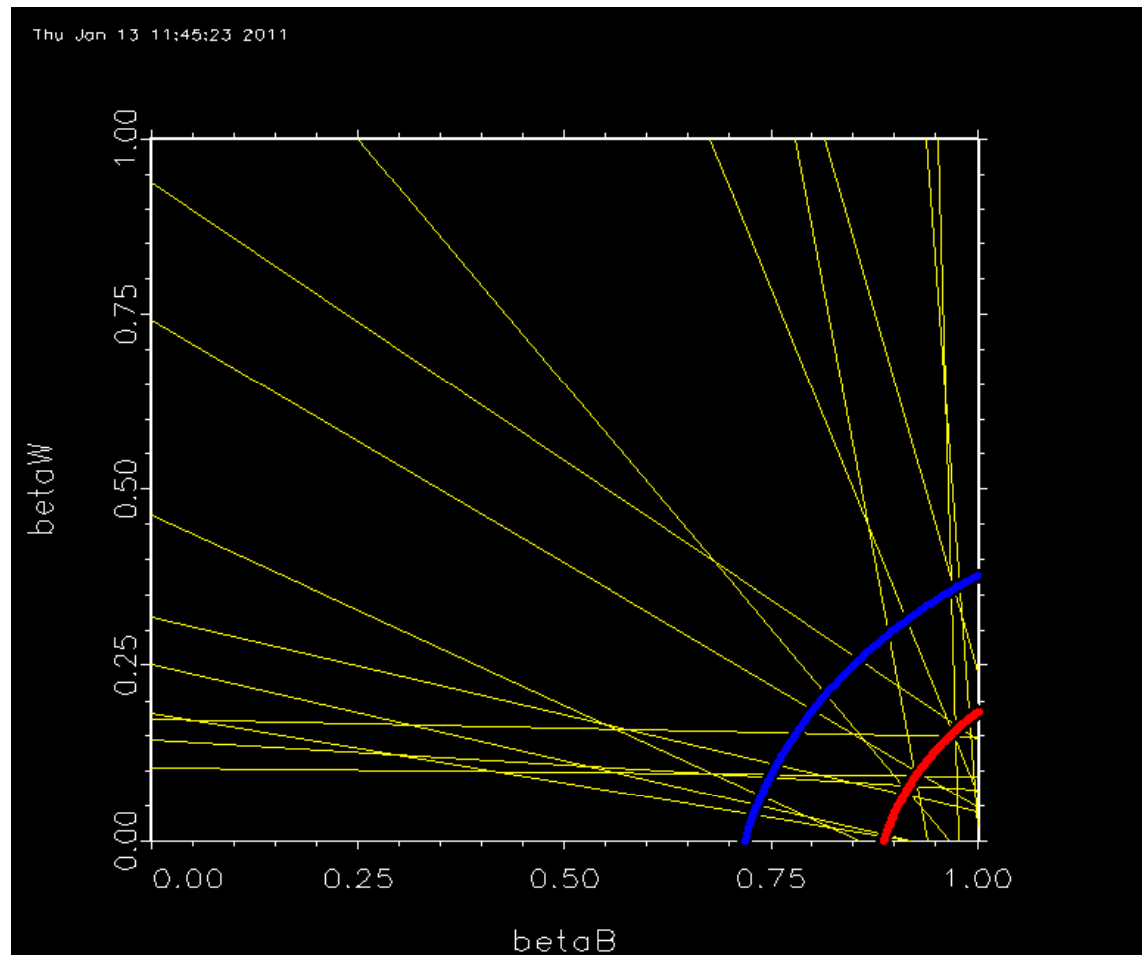
- A line can be plotted representing each possible value for the proportion of black and white voters supporting Candidate Z in this precinct.
- The horizontal axis is the proportion of blacks that could have voted for the candidate and the vertical axis the proportion of whites that could have voted for the candidate.
- Recall that minimum estimate for blacks ($10/60$ or $.17$) gives us the maximum estimate for whites ($40/40$ or 1.0); the maximum estimate for blacks ($50/60$ or $.83$) give us the minimum for whites (0.0).

For this precinct, then, the line would begin at $(1.0, .17)$ and end in the bottom right hand corner at $(0.0, .83)$.



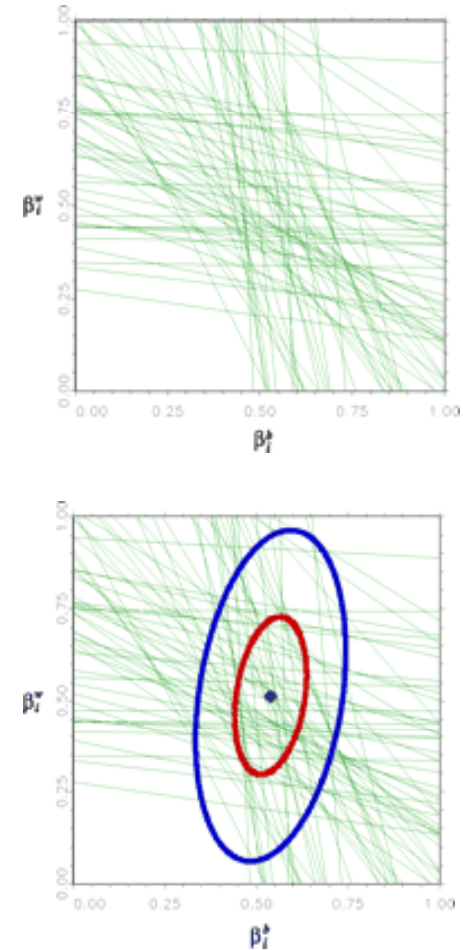
ID	Black Voters	White Voters	Total Votes for X	Total Votes for Y	Max black votes for X	Min white votes for X	Max white votes for X	Min black votes for X	Maximum black proportion with minimum white proportion	Maximum white proportion with minimum black proportion
1	565	196	578	183	565	13	196	382	1.00/.07	1.00/.68
2	463	30	464	29	463	1	30	434	1.00/.03	1.00/.94
3	849	21	830	40	830	0	21	809	.98/.00	1.00/.95
4	63	857	124	796	63	61	124	0	1.00/.07	.14/.00
5	16	629	109	536	16	93	109	0	1.00/.15	.17/.00
6	9	689	72	626	9	63	72	0	1.00/.09	.10/.00
7	405	291	392	304	392	0	291	101	.97/.00	1.00/.25
8	439	107	465	81	439	26	107	358	1.00/.24	1.00/.82
9	289	417	309	397	289	20	309	0	1.00/.05	.74/.00
10	218	805	201	822	201	0	201	0	.92/.00	.25/.00
11	467	75	439	103	439	0	75	364	.94/.00	1.00/.78
12	249	462	214	497	214	0	214	0	.86/.00	.46/.00
13	99	502	91	510	91	0	91	0	.92/.00	.18/.00
14	187	236	221	202	187	34	221	0	1.00/.14	.94/.00
15	127	455	145	437	127	18	145	0	1.00/.04	.32/.00

Tomographic Plot for Sample Precincts

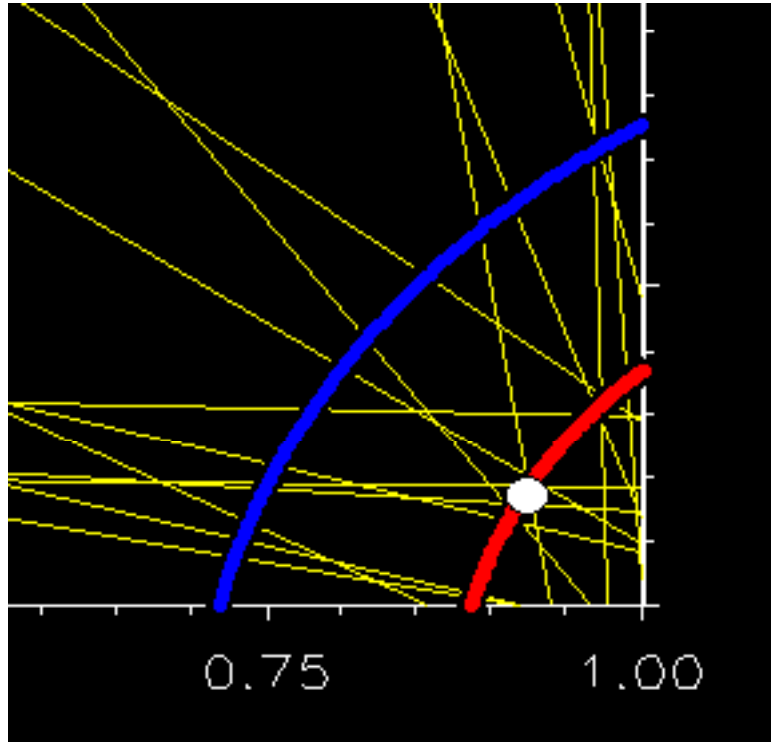


Maximum Likelihood Estimation

- MLE is a technique used to find the location of the smallest circle (ellipse) that intersects as many of the line segments in the tomographic plot as possible.
- Falling within the outer ellipse in the plot below are those line segments that have a 95% probability of containing the true coordinates (that is, the true value of the proportion of black and white voters supporting a candidate).
- A series of concentric circles (ellipses) within this circle, called a *family of curves*, is produced by MLE.
- The intersection of this family of curves, represented by the point in the center of the lower plot, is the single best estimate of the true coordinates.



Producing EI Estimates



- In the case of our sample precincts, the line segments are concentrated in the bottom right hand corner of the plot.
- The portions of the ellipses outside the realm of possible values have been truncated.
- The best single estimate of the value of the proportion white and proportion black voting for the candidate is (.083,.939).

Results of Ecological Inference Analysis

	Candidate X	Candidate Y
Black voters	93.9%	6.1%
White voters	8.3%	91.7%

Conclusion: This contest is racially polarized with 93.9% of the black voters supporting Candidate X, while 91.7% of the whites voted for Candidate Y.

Drawbacks of EI

- Because the estimates are the result of a simulation procedure, the estimates can change slightly each time the simulation is run (i.e., the estimates may not necessarily be duplicated precisely on subsequent runs).
 - Although this methodology has been employed by courts in reaching decisions regarding the presence or absence of racial bloc voting, it has not been specifically embraced by the US Supreme Court like the other two statistical techniques (*Thornburg v Gingles*).
 - This statistical method is particularly challenging to explain to the Court.
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Comparing the Results of the Three Statistical Techniques

	Votes for Candidate X		
	Homogeneous Precinct	Bivariate Ecological Regression	Ecological Inference
Black voters	94.9	97.4	93.9
White voters	13.5	5.3	8.3

- Are the results consistent across statistical methods?
- Is voting polarized?
- Is the polarization legally significant?

If Voting is Polarized

- If polarization is legally significant and minority voters are sufficiently concentrated, the state must create district(s) that provide minority voters with an opportunity to elect candidates of choice.
 - If covered by Section 5, the state must demonstrate that the proposed redistricting plan offers minorities the same (or greater) opportunity to elect candidates of choice as the current plan.
 - The “effectiveness” of proposed minority districts can be ascertained using the results of the racial bloc voting analysis.
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Determining the Effectiveness of Proposed Minority Districts

If minority opportunity districts are to be created or maintained, several methods can be used to determine their probable “effectiveness”:

- Racial/ethnic composition of proposed district(s);
 - Use of estimates derived from racial bloc voting analysis (average turnout and votes for minority-preferred candidates by race) to determine percentage of votes minority-preferred candidates are likely to receive in the proposed district(s);
 - Election results from previous contests that included minority-preferred candidates recompiled to reflect results in proposed district(s).
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Conclusion: What, Why, How and When of Vote Dilution Analysis

- ***What is entailed in a vote dilution analysis?*** Analysis of voting patterns by race/ethnicity to determine if voting is polarized and if proposed districts offer minorities an opportunity to elect candidates of choice
 - ***Why do the analysis?*** Ensure compliance with the Voting Rights Act
 - ***How is the analysis conducted?*** Statistical analysis of voting patterns required
 - ***When should the analysis be conducted?*** Prior to adopting a final redistricting plan
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