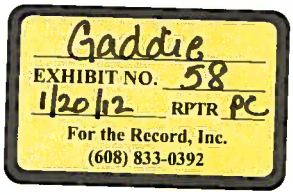
REBUTTAL REPORT OF RONALD KEITH GADDIE, Ph.D.

Submitted in
Baldus, et al., v. Brennan, et al. 2:2011cv00562 (E. D. Wisc.)

January 13, 2012



1. Corrections to Report of December 13 2011

In Table 9, the incumbent core shares for members sharing the pairing in Senate district 21 were transposed. The correct numbers appear below. The correction does not alter the Senate core retention calculations in Table 8 of the report.

Senate 21	Wirch-D, 22	+4.46%	42.03%
	Wanggaard-R, 21	-3.25%	57.97%

I reviewed and recalculated my largest core retention numbers for the Assembly map. The largest core retention is 66.30%.

In three Assembly districts, errant incumbent core retention values were reported. In district 49, the incumbent core retention is 95.8% (rather than 95.69%); in Assembly district 56, the incumbent core retention is 65.20% (rather than 63.66%); and in Assembly district 78, the incumbent core retention is 32.10% (rather than 26.90%). The corrected statistics for incumbent cores that appear in Table 8 of my initial report are:

	All Assembly Members	Assembly Dem. Inc. (N = 39)	Assembly Rep. Inc. (N = 59)	Assembly Ind. Inc. (N = 1)
Average	61.72%	54.74%	65.88%	88.33%
Low	8.55%	8.55%	17.74%	88.33%
High	99.91%	99.91%	97.67%	88.33%

2. Movement of District Lines in Act 44, the Congressional Map

The most recent Wisconsin congressional remap under Act 44 maintains an average core of 84.33%. The number of persons moved in Wisconsin in 2011 under Act 44 is just under 892,000 -- 15.67% of the state.

Sometimes states achieve population equality in their districts by only moving around a few thousand people. For example, mapmakers and stakeholders may agree to maintain the status quo. But, just because a least change approach can fix the population deviation in a map, it does not necessarily follow that the 'least-change' described by Professor Nordheim must be the approach used by the map drawers. It also does not follow that partisan gerrymandering is at work when a legislature, court, or commission moves more people than 'necessary'.

Consider a state where the redistricting process is held in high regard by political scientists – Iowa. In Iowa, a commission handles redistricting subject to a variety of criteria, including the mandate to use counties as district building blocks. In 1992, Iowa crafted a congressional plan

with five districts. Ten years later, the state remapped, to comply with one-person, one-vote requirements. Table 1 (below) shows the deviations from ideal for the Iowa map before redistricting, which summed to 181,419 persons. But, when Iowa's commission determined its final map, 1,226,004 persons were in a district moved away from the core of their old district (see also Maps 1a and 1b). Iowa's commission moved forty percent of the state's residents into districts where they would have a new congressional representative.

3. Compactness in Act 44, the Congressional Map

Professor Nordheim reports five compactness scores for the previous congressional districts and the districts from Act 44. An examination of his compactness data indicates that there is a positive correlation between the old and new district compactness across all five measures.

For two of the measures (the Polsby-Popper score and the Circumference/Perimeter) the relationship is significant at better than a .05 level; for the other three scores, the correlation is significant at better than a .10 level. The changes in compactness are not statistically significant from the old map to the Act 44 map. A paired-samples t-test of the district compactness for the 2002 and 2011 maps showed no significant difference on any of the five compactness measures from the old map to Act 44.

4. Professor Mayer reports that, of the ten least compact districts on the smallest circumscribing circle (SCC) score, six are Democratic districts and four are Republican districts. These districts are not identified in the report, but an examination of his compactness reports indicates the ten worst districts on the SCC score are districts 1, 37, 64, 93, 76, 70, 13, 84, 62, and 33. The SCC is one of four compactness scores that Mayer examines – and, considering his 2002 expert report in *Jensen v. Panzer* (in which he examined nine compactness measures) notes that it is inappropriate to rely on just one compactness measure.[1]

When one looks at the other compactness scores[2] of the ten districts that rank in the bottom ten on the smallest circle score, just two – districts 1[3] and 64 – also rank in the bottom ten on the convex hull, perimeter to area, and equal circle scores (Table 2). Indeed, three of the districts he identified as the least compact, also rank among the top half of compact districts on the other three compactness measures (districts 13, 62, and 84), and two rank in the top three quartiles for compactness on at least two measures (districts 76 and 93).

The same divergence occurs at the other end of the SCC compactness distribution (Table 3). Of the twenty most compact districts on the SCC noted by Professor Mayer, nine are among the

[1] Professor Nordheim correctly notes that different measures of compactness capture different information about the shapes of districts. Compactness measures are designed to summarize information about attributes of maps – and political scientists and the courts recognize that compactness is measured in the context of an entire map.
[2] All compactness scores in this analysis were drawn from data and documents provided by Professor Mayer.
[3] District 1 presents a special challenge and will always rank as relatively low on compactness scores, because it is the Door Peninsula.

twenty most compact on the Convex Hull measure (districts 8, 21, 27, 30, 31, 65, 80, 82, 98); two (districts 44 and 58) do not rank in the top half and district 44 ranks in the bottom quintile.

Seven are also among the twenty most compact on the Polsby-Popper (PTA) measure (districts 8, 21, 28, 30, 55, 80, 82); five districts (districts 31, 44, 53, 58, 78) do not rank in the top half, and districts 44 and 78 rank among the least ten compact. District 27 ranks 50th of 99 districts.

Seven of the districts identified are also among the twenty most compact on the equal circle score (districts 8, 21, 30, 55, 82); seven districts (districts 27, 44, 53, 58, 65, 73, 78) do not rank in the top half (and districts 44 and 78 rank among the least five compact).

Professor Mayer's critique relies on emphasizing one measure of compactness, the smallest circle score. When other measures of compactness are examined, these districts are not consistently the most (or least) compact districts in the Assembly.[4]

5. There is no significant relationship between the party of an incumbent and the compactness of the district where the incumbent is placed. Professor Mayer's initial analysis attempts to suggest a relationship between the compactness of the assembly districts in Act 43 and the party of the incumbent. In Table 4, linear regression analysis is used to test the statistical significance and direction of the relationship between party incumbents in a district and compactness. The results show no statistically significant relationship between the presence of incumbents of either party, and district compactness, on any of the four measures of compactness presented by Professor Mayer.

7. Delayed voting is not unusual. And, in Wisconsin, it is not excessive.

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[4] Measures of compactness are generally correlated. The SCC score has the weakest correlation to the other measures of compactness provided in his report.

	SCC	PTA	Convex Hull	CircumTest	Total Perimeter	Dist. Area
SCC		**.317****	**.475****	**.237***	-0.008	0.112
PTA			**.664****	**.974****	-0.086	0.151
Convex Hull				**.700****	-0.065	0.087
CircumTest					-0.072	0.16
Total Perimeter						**.902****
N=99						

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Professor Mayer criticizes the delayed voting effect of the Senate districts in Act 43. I previously noted in my initial report that 299,688 persons (5.27% of all persons in Wisconsin) lived in a Senate district where delayed voting would occur. When one accounts for the 164,843 persons who reside in delayed-voting districts where a recall was also conducted in 2011, only 134,845 will be subject to the six-year voting delay. As a matter for comparison, I note that, in 2002, four maps were advocated by Professor Mayer to the Court for possible adoption. As indicated in Table 5, all four of these maps had proportionally greater delayed voting in the Wisconsin Senate than under Act 43. And, despite a six percent increase in Wisconsin's population during the decade, two plans advocated by Professor Mayer actually had greater numbers of voters affected by delayed voting?

In my initial report, I noted that nineteen states including Wisconsin have delayed voting effects in their state Senates,[5] and I reported data from Oklahoma showing higher numeric and proportional delayed voting (just under 8.0% of the state).

Delayed voting data from six states for this redistricting cycle – Wisconsin, Oklahoma, Oregon, Ohio, Missouri, and California -- appear in Table 6. Of six states examined, the range of persons moved into districts and experiencing delayed voting varies from a low of 115,769 in Oregon to a high of 3,972,984 in California. In percentage terms, the low is 3.02% in Oregon and the high is 10.66% in California. Wisconsin had the third-lowest raw number of persons in delayed voting studied (just behind Oklahoma), and the second-lowest percent of the state experiencing delayed voting (behind Oregon).[6]

8. Difference of Means Test for Core Retention in the Senate and Assembly under Act 43.

The application of a difference of means test for the level of incumbent core retention for the Senate indicates that there is no significant difference in the core retention by Democratic versus Republican incumbent senators (t = .252, unequal variances assumed; see Table 7).

In the Assembly, there is a significant difference between the average core retention for the Democratic versus Republican incumbents (t = -2.049, unequal variances assumed). However, if one examines the nine Democratic incumbent districts with the lowest core retention, explanations exist for their low cores.

Some disparities in the core retention of Democratic incumbent districts are explained by what appear to be specific decisions in the crafting of the map. Examples occur in three areas of the map: southeastern Wisconsin surrounding the cities of Kenosha and Racine; in and around the City of Milwaukee; and in the city of Madison and Dane County.

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[5] Alaska, Arizona, California, Colorado, Georgia, Idaho, Illinois, Kansas, Louisiana, Michigan, Minnesota, Montana, Nevada, New Jersey, North Dakota, Oregon, Rhode Island, and Washington also have election recall. Virginia has a recall petition, but the recall is made via a recall trial (similar to an impeachment) rather than a vote of the people.

[6] There is a 17-person discrepancy in the number of persons in the Oklahoma disfranchisement split in the data presented in Table 6 versus the data in my initial report. This discrepancy arises from my initial calculations.

8.1 Kenosha-Racine: Five districts around Kenosha and Racine have an average largest core retention of 52.6%. There is one incumbent pairing (district 61) and one open seat (district 65). Just under 64% of district 66 is at the core of district 61.

The districts concentrate African-American and Hispanic voters as a minority 'influence' in Senate 22 (Assembly 64, 65, 66). The new senate district now encompasses all of City of Kenosha and most of the City of Racine, while Senate district 21 largely encompasses the rural townships of Racine and Kenosha counties.

District	Largest Core	Incumbent Core
Assembly 61	63.9%	63.9%* 36.1%**
Assembly 63	40.4%	40.4%
Assembly 64	48.9%	48.9%
Assembly 65	50.2%	Open seat
Assembly 66	59.7%	59.7%

*Core from the previous 66th Assembly district.
**Core from the previous 65th Assembly district.

8.2 Milwaukee County: Change surrounding the design of the majority minority districts in Milwaukee county is associated with lower core constituency retention in several districts.

In Senate district 3, the core retention is 76.6% -- just below average for all senate districts in Act 43. Senate district three is 47.5% Hispanic population and 7.2% African American population The predecessor district was just over 45.1% Hispanic population.

Assembly districts 7, 8, and 9 are wholly in Senate district 3. Unlike the encompassing senate district, all of the districts have lower core retention rates. The average largest core retention is 45.3%, with a range of 30.9% to 55.3%; the average incumbent core is 33.4%, with a range of 13.9% to 55.3%. Two incumbents are paired in Assembly district 7.

An examination of the pre- and post-redistricting maps shows that the orientation of Assembly districts 7, 8, and 9 are changed from the 2002 map so that they run north-south beside each other, rather than east to west. This change is implemented to craft the majority Hispanic districts 8 and 9, while also crafting district 7 to maintain the Hispanic influence in Senate District 3.

District	Largest Core	Incumbent Core
Assembly 7	30.9%	30.9%* 13.9% **
Assembly 8	55.3%	55.3%
Assembly 9	49.9%	No incumbent

*Core from the previous 7th Assembly district.
**Core from the previous 9th Assembly district.

Assembly districts 11 and 12 have largest core (and incumbent core) retention values of 47.8% and 51.9%, respectively, and were -6.3% and -3.8% from the district ideal population before redistricting. These districts are adjacent to districts 10, 16, and 18, which were, respectively, -10.5%, -8.6%, and -15.8% under the ideal population. All of these districts are majority-African American districts. Districts 11 and 12, already under population, shed additional population from their cores to accommodate repopulating districts 10, 16, and 18 (The core retention numbers for those districts are: for district 10, 66.3%; for 16, 68.5%; and for district 18 61.4%.

African-American Core 1

District	Largest Core	Incumbent Core
Assembly 11	47.8%	47.8%
Assembly 12	51.9%	51.9%

The subsequent movement of 11 and 12 to the north and west further move Assembly districts 22, 23, and 24. These districts have a range of largest core retention between 36.9% and 48.8%, and a range of incumbent core retention from 35.7% to 47.7%. These districts are contained in Senate district 8, which has a largest core (and incumbent core) retention of 73.3%. The Assembly districts within the Senate district are largely rearranged from territory originally shared within old Senate 8. Most of Senate 8's core loss is to majority-black Senate district 4 (33,182 persons).

District	Largest Core	Incumbent Core
Assembly 22	48.8%	35.7%
Assembly 23	36.9%	36.1%
Assembly 24	47.74%	47.7%

8.3 Madison and Dane County: In Madison, the city was previously divided among six Assembly districts. The new map places four whole districts within the city of Madison (48, 76, 77, 78), and the remainder in a fifth district. Two open Dane seats are created in the process, in Assembly district 80 and also a new open seat to the southeast of Madison, Assembly district 47.

District	Largest Core	Incumbent Core
Assembly 77	41.2%	36.1%
Assembly 78	34.9%	32.1%
Assembly 79	50.1%	31.4%
Assembly 80	46.5%	Open seat
Assembly 81	57.6%	57.6%
Assembly 42	54.9%	54.9%
Assembly 47	46.6%*	Open seat
Assembly 48	50.6%**	50.6%**

*From previous 48th Assembly district.
**From previous 81st Assembly district.

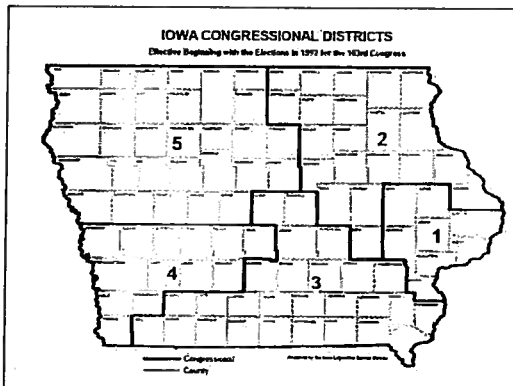
8.4 In Table 8, the Assembly districts examined in sections 10.1, 10.2, and 10.3 are excluded from the difference of means test applied to incumbent core retentions in Table 7. The difference between the Democratic and Republican average incumbent cores is not statistically significant.

Tables and Figures

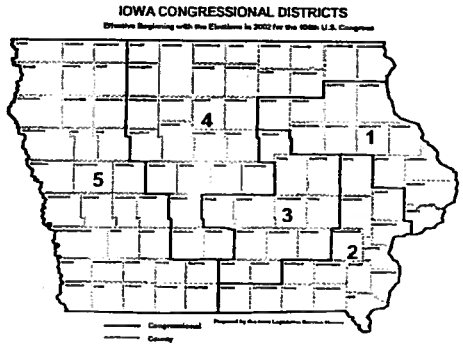
Table 1: Equalizing Populations in Iowa, 2002

District Number, 1992	Deviation from 2000 census ideal, 1992 map	District Number, 2002	How many persons not from largest core in new district?
1	18,572	1	229,038
2	16,408	2	174,391
3	47,642	3	210,704
4	72,137	4	355,874
5	26,660	5	255,997
Sum, total persons deviating from ideal:	181,419	Sum of persons moved from core of old district with a different representative after redistricting	1,226,004

Source: Computed from 2000 US Census



Map 1a: Iowa Districts Effective for 1992-2000



Map 1b: Iowa Districts Effective for 2002-2010

Source: http://www.legis.state.ia.us/Redist/Redist.html

Table 2: The Ten Least-Compact Districts on the Smallest Circle Score, as they Rank on Other Compactness Measures

District	Smallest Circle Score (SCC)	SCC Rank	Convex Hull	Convex Hull Rank	Polsby-Popper (PTA) Score	PTA Rank	Equal Circle	Equal Circle Rank
1	0.10	**99**	0.50	**99**	0.08	**94**	0.28	**94**
37	0.11	**98**	0.64	87	0.14	87	0.41	85
64	0.12	**97**	0.51	**98**	0.08	**93**	0.28	**93**
93	0.13	**96**	0.74	56	0.18	75	0.45	73
76	0.13	**95**	0.65	85	0.24	54	0.52	54
70	0.14	**94**	0.66	83	0.16	83	0.43	82
13	0.14	**93**	0.89	4	0.26	45	0.57	39
84	0.15	**92**	0.80	30	0.29	36	0.6	28
62	0.15	**91**	0.80	29	0.34	24	0.66	14
33	0.15	**90**	0.69	76	0.18	77	0.45	74

Table 3: The Twenty Most-Compact Districts on the Smallest Circle Score, as they Rank on Other Compactness Measures

District	Smallest Circle Score (SCC)	SCC Rank	Convex Hull	Convex Hull Rank	Polsby-Popper (PTA) Score	PTA Rank	Equal Circle	Equal Circle Rank
65	0.45	1	0.85	**9**	0.25	48	0.52	52
36	0.44	2	0.80	25	0.32	29	0.6	27
71	0.44	3	0.81	21	0.27	42	0.53	45
78	0.41	4	0.76	45	0.07	95	0.27	96
73	0.39	5	0.77	37	0.26	47	0.52	51
39	0.38	6	0.77	38	0.33	27	0.59	30
8	0.36	7	0.88	**5**	0.44	**5**	0.66	**12**
21	0.35	8	0.92	**1**	0.55	**2**	0.78	**1**
82	0.35	9	0.90	**2**	0.44	**4**	0.68	**6**
40	0.34	10	0.81	22	0.33	26	0.58	32
27	0.33	11	0.82	**18**	0.25	50	0.52	53
44	0.33	12	0.66	82	0.06	97	0.26	97
80	0.33	13	0.82	19	0.35	**20**	0.62	22
98	0.33	14	0.85	10	0.28	40	0.55	42
28	0.32	15	0.75	47	0.36	18	0.62	21
30	0.32	16	0.88	**6**	0.57	**1**	0.77	**2**
58	0.32	17	0.74	51	0.15	84	0.4	86
31	0.31	18	0.83	**15**	0.23	55	0.53	49
53	0.31	19	0.76	46	0.18	74	0.44	77
55	0.31	20	0.80	26	0.44	**7**	0.7	**3**

Table 4: Party, Incumbency, and Compactness

Smallest Circle Score	b	$s.e._b$	t	Convex Hull	b	$s.e._b$	t
Intercept	.265	.019	13.721	Intercept	.742	.022	33.973
Republican Inc.	-.015	.020	-.732	Republican Inc.	.019	.023	.814
Democratic Inc.	-.033	.021	-1.552	Democratic Inc.	-.028	.024	-1.178
Adjusted R^2	0.006			Adjusted R^2	0.059		
N	99			N	99		
Polsby-Popper/PTA	b	$s.e._b$	t	Equal Circle	b	$s.e._b$	t
Intercept	.254	.028	9.042	Intercept	.512	.031	16.732
Republican Inc.	.025	.030	.831	Republican Inc.	.033	.032	1.011
Democratic Inc.	-.026	.030	-.867	Democratic Inc.	-.029	.033	-.867
Adjusted R^2	0.044			Adjusted R^2	0.053		
N	99			N	99		

Table 5: Delayed Voting In Select Maps Proposed to the Court in 2001

	#Persons	% of State*
Democratic Map A	**303,951**	**5.67%**
Democratic Map B	**301,604**	**5.62%**
SB 463	298,749	**5.57%**
Democratic Map C	282,772	**5.27%**
*2000 census		

Table 6: Delayed Voting in Six States, 2012 Apportionment Cycle

State	Votes in 2012	% Delayed	Odd-to-Even	Even-to-Odd	Unchanged	Total Pop.
Oregon	Even	3.02%	132,720	115,769	3,582,585	3,831,074
Wisconsin	Even	5.27%	313,540	299,688	5,073,758	5,686,986
Ohio	Even	7.48%	807,835	862,773	10,728,669	11,536,504
Oklahoma	Odd	7.98%	299,511	304,977	3,146,863	3,751,351
Missouri	Odd	9.89%	592,586	674,786	4,721,555	5,988,927
California	Odd	10.66%	3,972,984	3,895,767	29,385,205	37,253,956

Source: Data compiled by John Diez/Magellan Strategies BR, January 11 2012.

Table 7: Difference of means test, Incumbent Core Retention

Senate	Mean (s_d)	s.e.	*Assembly*	Mean (s_d)	s.e.
Republican (n=17)	.7764 (.1299)	.031	Republican (n=59)	.6588 (.2246)	.029
Democratic (n=16)	.7885 (.1449)	.036	Democratic (n=39)	.5474 (.2592)	.042
	t = 0.252 (p = .803)			t = -2.195 (p = .031)	

Table 8: Difference of means test, excluding districts discussed in sections 8.1, 8.2, and 8.3

Assembly	Mean (s_d)	s.e.
Republican (n=54)	.6746 (.2264)	.031
Democratic (n=26)	.6146 (.2821)	.055
	t = -.948 (p = .349)	