

Explaining the Racial Achievement Gap in the Pittsburgh Public Schools

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Agenda

1. Introduction
2. Racial Achievement Gap in Pittsburgh:
PSSA Patterns over Time
3. Principal and Teacher Effects on Student
Achievement in Pittsburgh Public Schools
4. Things to do next

1. Introduction

□ Who is Bob Strauss?

- A product of suburban Cleveland
- Michigan/LSE/Wisconsin
- Federal, state, local public service
- 2 Presidential pens, various awards
- Battered parent of 3: 21 (Elena), 25 (David), 27 (Sarah)
- Fiscal and Education Reform social worker

□ Why am I here?

- Various Research Projects with Pittsburgh Public Schools:
 - Teen Attitudes Survey in 1999
 - 2004 Training of PPS Principals: Statistics and Educational Assessment
 - September 2005 Project to Analyze Racial Achievement Gap
 - Ms. Haijing Hao's Hard Work December, 2006, Z. Sheng in May, 2006
- 1996-8 State Board of Education Project, 354 reforms of teacher preparation
- State Board asked me to evaluate the effects in 2006-8

Data Sources for PPS and State Research Projects

- Pittsburgh SD Data Warehouse
- State Personnel and Withdrawal Files
- State Certification Files
- State Praxis Files
- PSSA Identifiable Information
- State Retirement System
- Act 48 Relational Database
- Pending College Board SAT Analysis
- District/School Data Census Data
- Surveys of Hiring Practices: Superintendents, Board Presidents, and Union Presidents

2. Student Achievement: PSSA Patterns

■ Racial Achievement Gap: Pittsburgh vs. Philadelphia



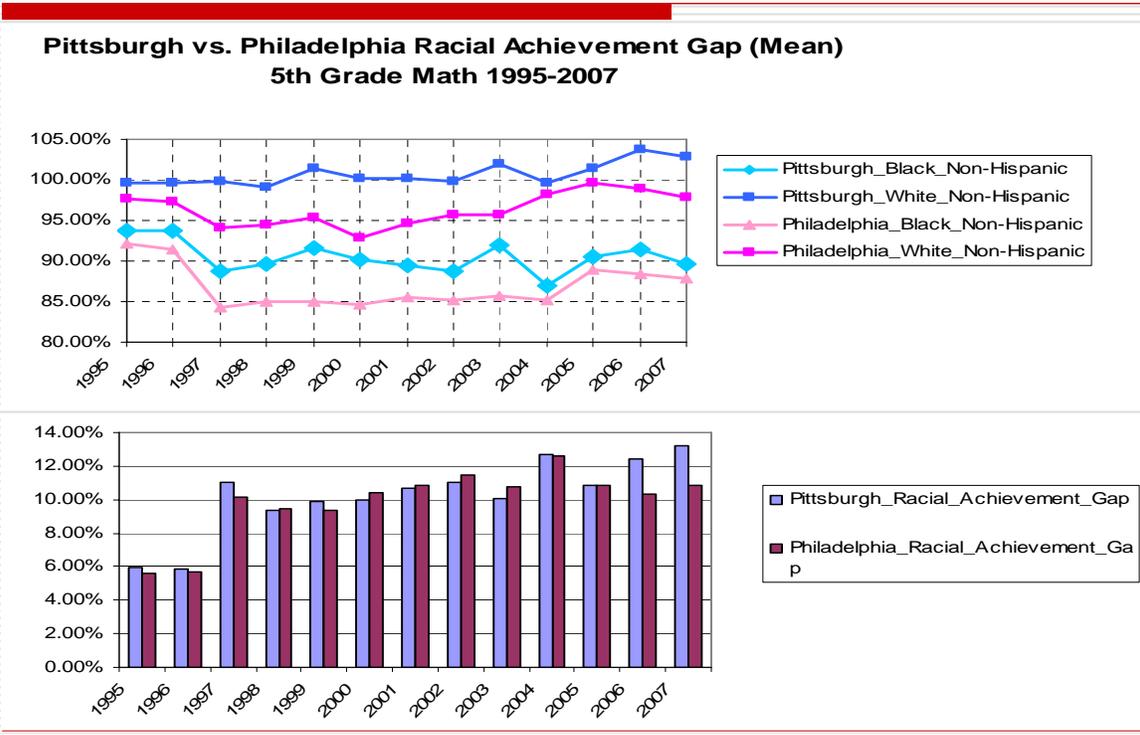
Comparing A District's Score to Statewide Mean

- 2006 Grade 5 Math PSSA for Pittsburgh

Mean Black PSSA Score/ Statewide Mean PSSA Score

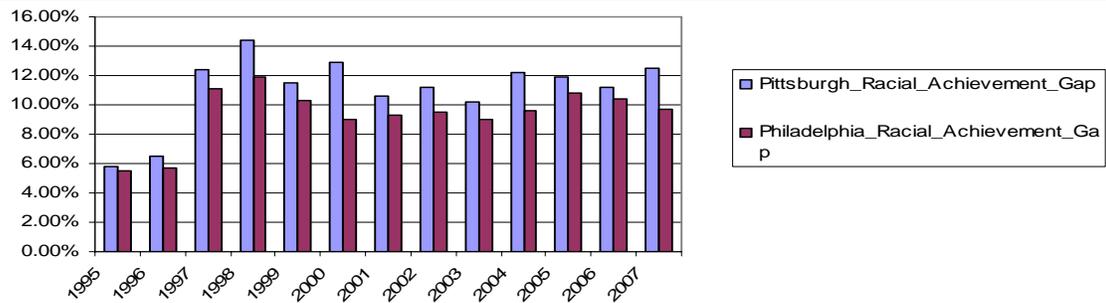
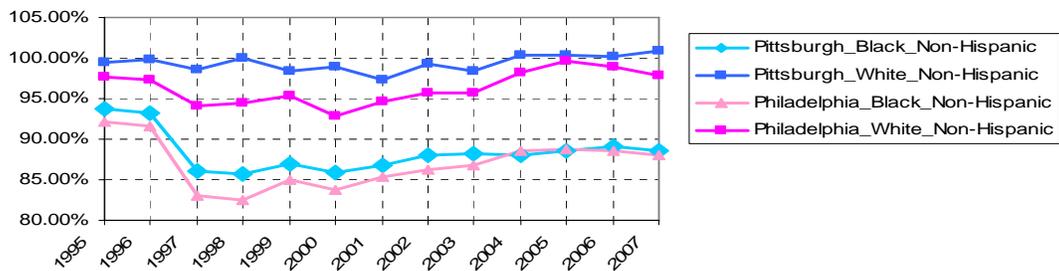
- Example: $1300 / 1423 = 91.4\%$

Math Racial Achievement Gap (Mean): Pittsburgh vs. Philadelphia, 5th Grade, 1995-2007



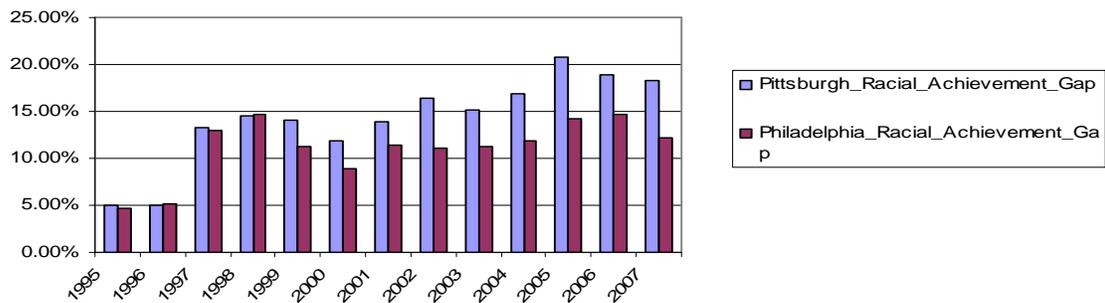
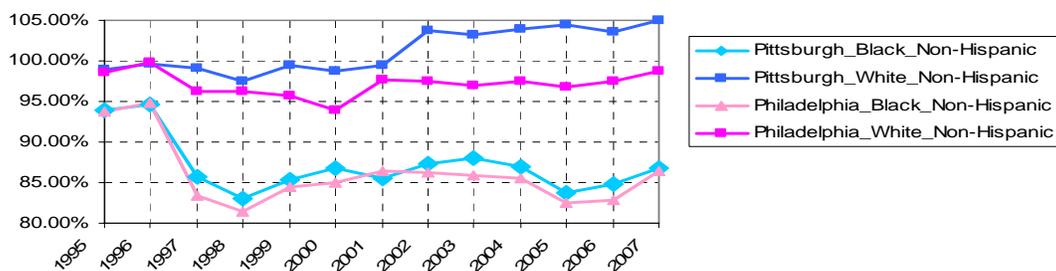
Math Racial Achievement Gap (Mean): Pittsburgh vs. Philadelphia, 8th Grade, 1995-2007

**Pittsburgh vs. Philadelphia Racial Achievement Gap (Mean)
8th Grade Math 1995-2007**

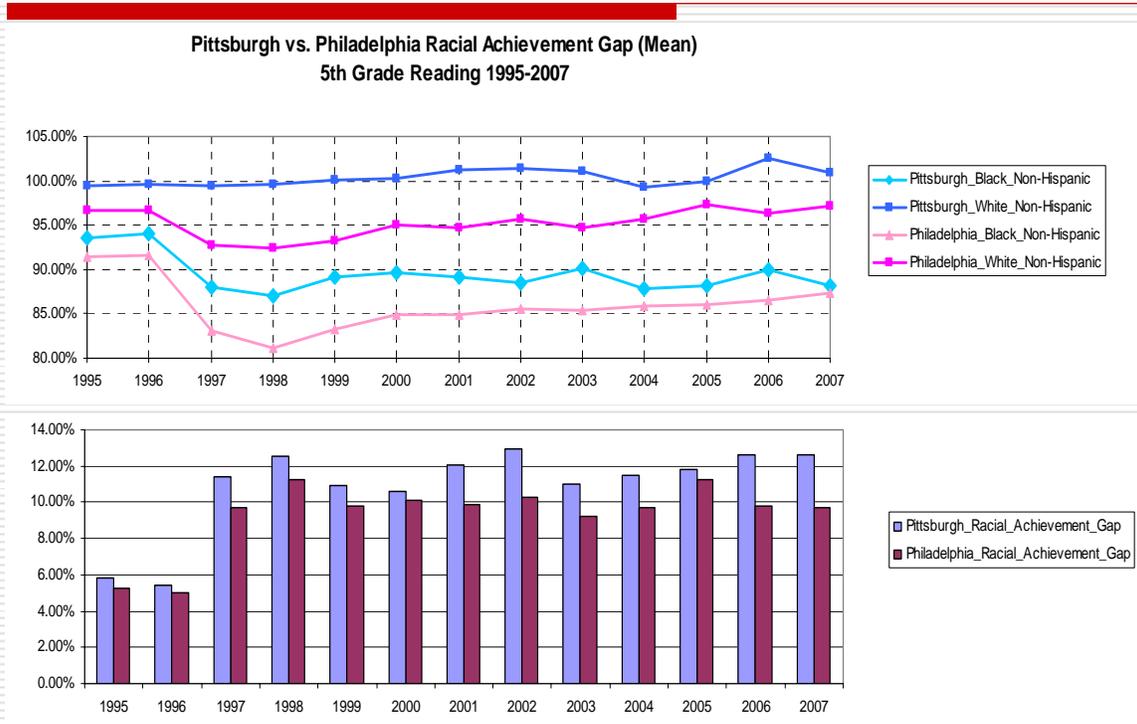


Math Racial Achievement Gap (Mean): Pittsburgh vs. Philadelphia, 11th Grade, 1995-2007

**Pittsburgh vs. Philadelphia Racial Achievement Gap (Mean)
11th Grade Math 1995-2007**

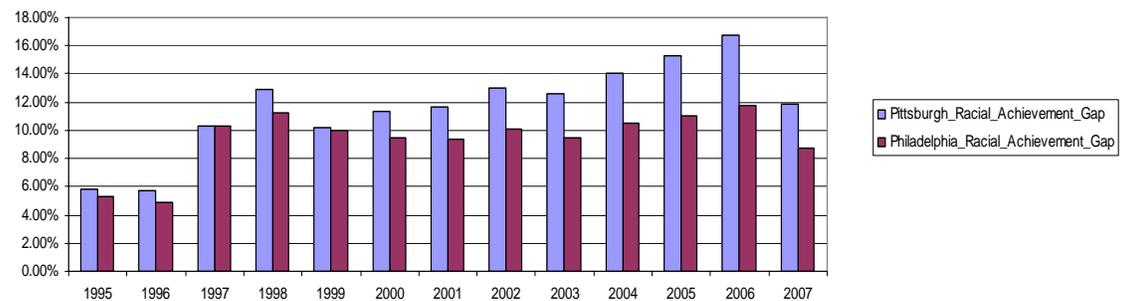
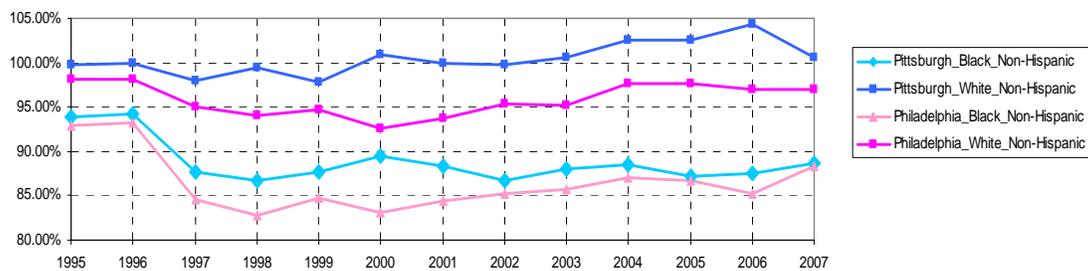


Reading Racial Achievement Gap (Mean): Pittsburgh vs. Philadelphia, 5th Grade, 1995-2007



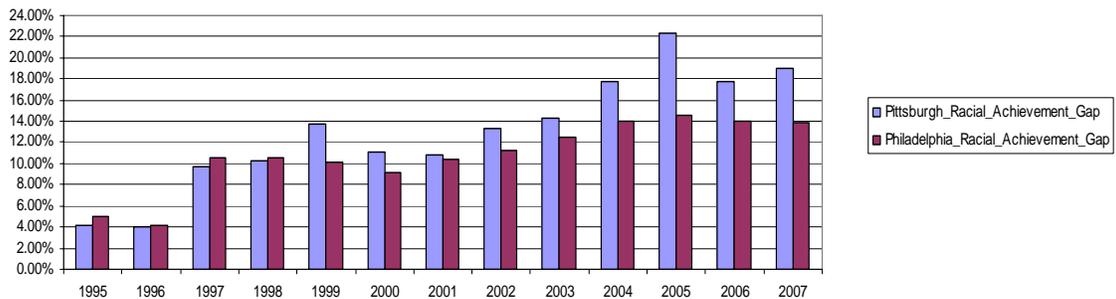
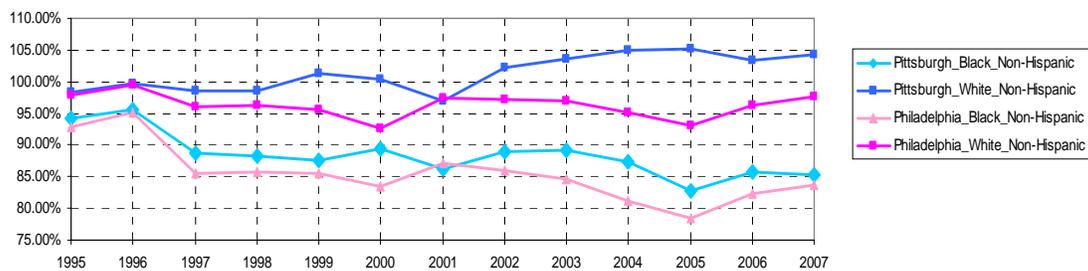
Reading Racial Achievement Gap (Mean): Pittsburgh vs. Philadelphia, 8th Grade Reading 1995-2007

Pittsburgh vs. Philadelphia Racial Achievement Gap (Mean)
8th Grade Reading 1995-2007



Reading Racial Achievement Gap (Mean): Pittsburgh vs. Philadelphia, 11th Grade Reading 1995-2007

Pittsburgh vs. Philadelphia Racial Achievement Gap (Mean)
11th Grade Reading 1995-2007



Summary

- The racial achievement gap by the numbers:

		Math			Reading		
		Black	White	Gap	Black	White	Gap
5	2006	91.38%	103.79%	12.41%	89.95%	102.58%	12.63%
	2007	89.69%	102.90%	13.21%	88.19%	100.85%	12.66%
	Changes	-1.69%	-0.89%	0.80%	-1.76%	-1.73%	0.03%
8	2006	89.04%	100.23%	11.19%	87.54%	104.30%	16.76%
	2007	88.51%	100.97%	12.47%	88.65%	100.55%	11.90%
	Changes	-0.54%	0.74%	1.28%	1.12%	-3.75%	-4.87%
11	2006	84.76%	103.61%	18.85%	85.76%	103.47%	17.71%
	2007	86.75%	105.02%	18.27%	85.34%	104.38%	19.04%
	Changes	1.99%	1.41%	-0.58%	-0.42%	0.91%	1.33%

3. Principal and Teacher Effects on Student Achievement

- Factors Explaining the Gap:
 - Prior achievement, SES, race, gender
 - Family background, attendance, disciplinary incidents
 - School Resources: Principal and Teacher Effects
- The Results and Implications

The Research Questions

1. What is happening over time to Black/White differences in student achievement in Pittsburgh Public Schools?
2. What is happening over time to achievement differences between economically disadvantaged and non-disadvantaged students?
3. How much of the 10-20% differential can be explained by student and family background?
4. How much of the 10-20% differential can be attributed to prior student success, building and classroom resources?
5. What is happening to these differences at the building (principal) and classroom levels, i.e., when we drill down?
6. Can best practices be inferred from the data and inform how to narrow the achievement gap?

Time Line of Analysis: Example

Apr. 2004
Terra Nova



Kids Characteristics
Principal or Teacher

Jan. 2005
Dibels

Mar. 2005
PSSA



Research Methodology

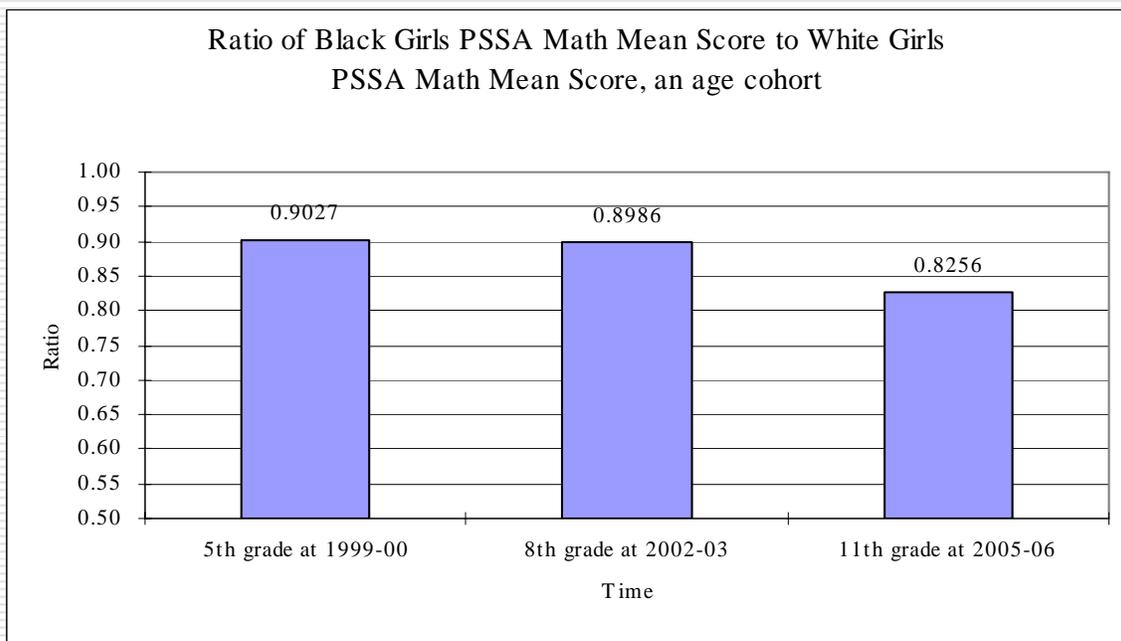
- The statistical modeling of student performance, which generally examines the following basic relationship, a student achievement on an Exam (PSSA Reading, Math) depends on:
 - 1) prior math/reading achievement of the student
 - 2) gender
 - 3) ethnicity (compared to white)
 - 4) socio-economic background
 - 5) family structure (single parent, institutional compared to two parent)
 - 6) special education and gifted status
 - 7) school attendance
 - 8) disciplinary incidents

Research Methodology (cont'd)

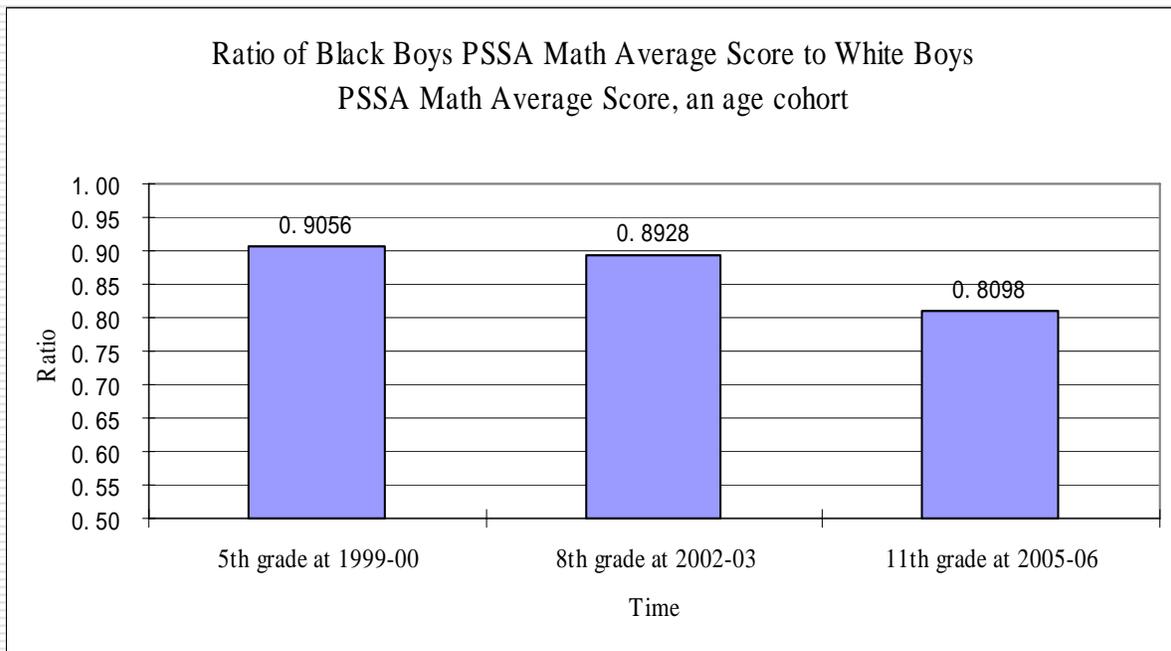
- In addition to factors 1-8 above, the modeling procedure has examined:
 - 9) differential principal effects, or
 - 10) differential Math/English teacher effects.

- Factors 9-10 can be used to identify more successful principals and teachers, holding constant factors 1-8.

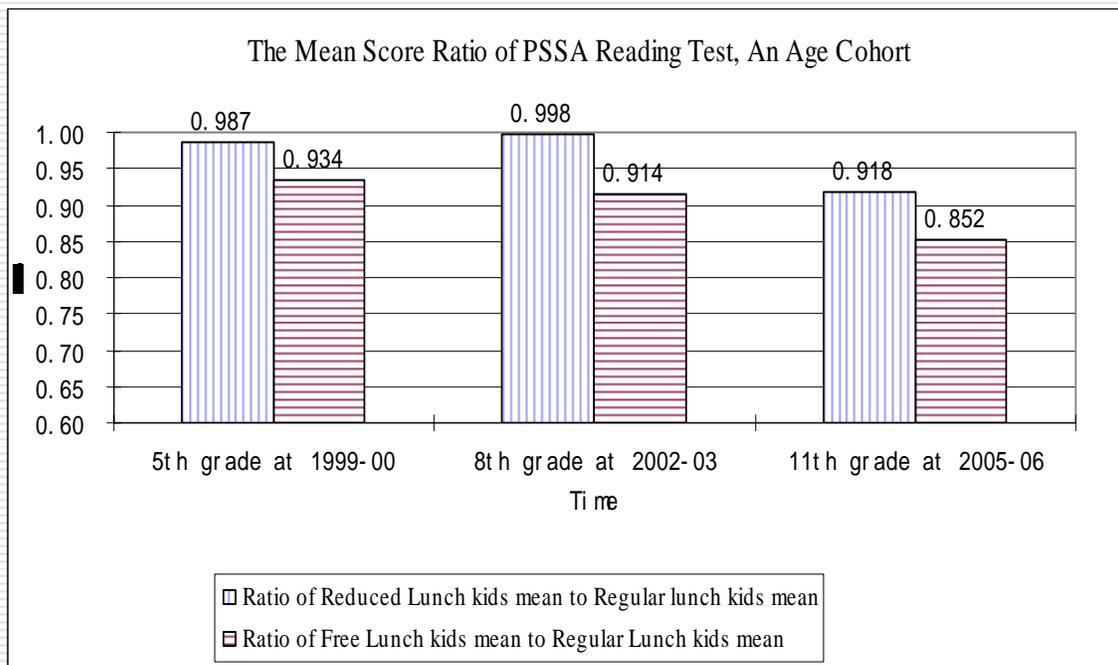
Some General Cohort Results: PSSA Math by Race, Girls



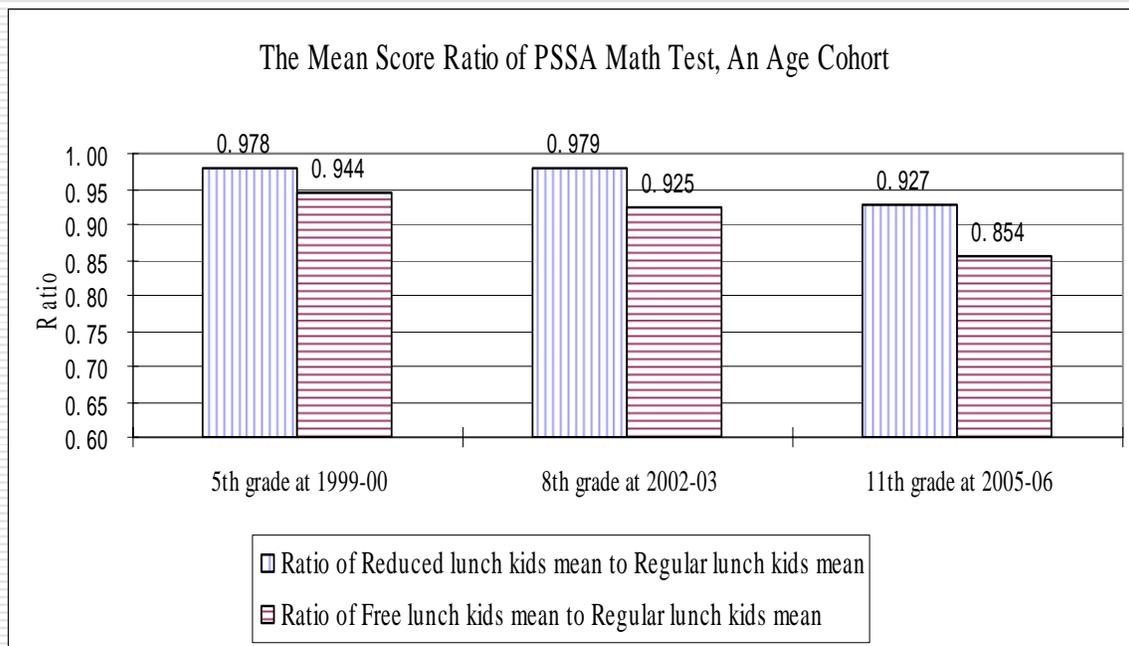
Some General Cohort Results: PSSA Math by Race, Boys



Some General Cohort Results: PSSA Reading, by SES



Some General Cohort Results, PSSA Math, by SES



Statistical Analysis: PSSA Reading and Prior Terra Nova Reading

- 60.6% of the variation in individual PSSA reading scores was explained by the statistical model:
 - 1) Terra Nova reading is a very powerful predictor of PSSA reading: A 1% improvement in prior year Terra Nova Reading is associated with a 1.7% improvement in PSSA Reading grade scores.
 - 2) Girls did 1.7% better than boys.
 - 3) Compared to Whites, Blacks scored 4% lower; note that this is a much smaller achievement gap than the general one, 10% to 20%, noted above in the graphs.
 - 4) Compared to regular lunch, a student receiving a free lunch scored 1.9% lower, and a reduced lunch scored 0.5% lower.

Statistical Analysis: PSSA Reading and Terra Nova (cont'd)

- 5) Compared to a two-parent family, a student coming from a single parent family scored 1.0% lower.
 - 6) A special education student scored 6.5% lower on PSSA reading.
 - 7) A gifted student scored 4.9% higher.
 - 8) Every disciplinary incident was associated with a 0.85 % lower PSSA reading.
 - 9) A 1% increase in attendance rate in school days is associated with a 0.06% improvement in PSSA Reading scores.
- Comment: Terra Nova reading results are very powerful in predicting PSSA reading results.

PSSA Reading Explained by Prior Terra Nova Reading, Principals or English Teachers

- By controlling for the previous Terra Nova Reading score and each principal, the explanatory power increased from 61% to 64%.
 - Of the 89 principals under whom the tests were administered, 33 displayed significant effects on PSSA reading scores, ranging from +15.66% higher to -35.65% lower than the reference principal (around the median principal).

- By controlling for the previous Terra Nova Reading score and the English teachers, the explanatory power increased from 61% to 68%.
 - Of the 236 teachers under whom the tests were administered, 90 displayed significant effects on PSSA reading scores ranging from +14.38% higher to -24.94% lower score than the reference teacher (around the median teacher).

Statistical Analysis: PSSA Math and Terra Nova

- 50.1% of the variation in individual PSSA math scores was explained by the statistical model that controlled for previous student Terra Nova Math, other student characteristics and building effects:
 - 1) A 1% improvement in prior year Terra Nova Math is associated with a 0.92% improvement in PSSA Math grade scores. Thus, Terra Nova Math is a very powerful predictor of PSSA Math.
 - 2) Girls did 1% worse than boys.
 - 3) Compared to Whites, Blacks scored 3.1% lower and Asian scored 3.4% higher; note that this is a much smaller achievement gap than the general one, 10% to 20%, noted above in the graphs.

Statistical Analysis: PSSA Math and Terra Nova (cont'd)

- 4) Compared to regular lunch students, a student receiving a free lunch scored 0.9% lower.
- 5) Compared to coming from a two-parent family, a student coming from a single parent family scored 1% to 8% lower.
- 6) A special education student scored 5.9% lower on PSSA Math and a gifted student scored 7.4% higher.
- 7) Every incident was associated with a 0.49% lower PSSA reading score.
- 8) A 1% increase in attendance rate in school days is associated with a 0.09% improvement in PSSA Math scores.

PSSA Math Explained by Prior Terra Nova Math, Principals or Math Teachers

- By controlling for the prior year Terra Nova Math score and the principals, the explanatory power increased from 51% to 60%.
 - Of the 89 principals under which the tests were administered, 62 displayed significant effects on PSSA reading scores ranging from +17.5% higher to -37.2% lower than the reference principal (around the median principal).
- By controlling for the prior year Terra Nova Math score and the Math teachers, the explanatory power increased from 51% to 68%.
 - Of the 199 teachers under which the tests were administered, 148 displayed significant effects on PSSA reading scores ranging from +32.4% higher to -27% lower than the reference teacher (around the median teacher).
- Comment: Terra Nova Math results are very powerful in predicting PSSA Math results.

Excel Spreadsheet

- [Math Teachers' Effect Model \(Click to see the table\)](#)

	# of Obs	=	6846			
	F(212, 6623)	=	308.08			
	R-squared	=	0.6779			
	Root MSE	=	0.09021			
	drop if class_count<5					
	school year		Grade 3	Grade 7	Grade 8	Total
	2004		1,235	0	1,415	2,650
	2005		1,203	1,396	1,597	4,196
	Total		2,438	1,396	3,012	6,846
	log_pssa_math					
	Explanatory Variables:		Size of Effect	t		
1	log_prev_terra_math		1.4979	52.56		
2	sex_female=1		-0.0128	-5.69		
3	race_American Indian		-0.0740	-2.27		
4	race_asian		0.0080	0.69		
5	race_black		-0.0178	-5.73		
6	race_hispanic		-0.0180	-1		
7	race_multi_race		-0.0054	-0.93		
8	lunch_free		-0.0099	-3.72		
9	lunch_reduced		-0.0079	-1.56		
10	single_father_parent		-0.0032	-0.82		
11	single_mother_parent		-0.0086	-3.05		
12	institute_parent		-0.0110	-0.39		
13	substitutue_parent		-0.0145	-2.41		
14	foster_parent		0.0022	0.18		
15	special_education		-0.0299	-6.84		
16	gifted_member		0.0303	5.47		
17	incident_count		-0.0019	-3.9		
18	log_attendence_days		0.0356	5.02		
19	log_school_white_rate		0.0003	0.04		
20	log_class_white_rate		0.0264	6.76		
21	Math_teacher_is_hmroom		0.0042	0.97		
22	class_size		-0.0002	-0.53		
23	school_enrollment		-0.0001	-1.62		
24	Teacher 55		0.1786	4.63		
25	Teacher 159		0.1125	1.3		
26	Teacher 59		0.0718	2.91		
27	Teacher 172		0.0661	2.44		
28	Teacher 107		0.0457	1.78		
29	Teacher 21		0.0414	1.7		
30	Teacher 133		0.0350	1.01		
31	Teacher 33		0.0333	1.29		
32	Teacher 137		0.0315	1.38		

33	Teacher 109		0.0260	1.54		
34	Teacher 92		0.0260	0.67		
35	Teacher 42		0.0218	0.75		
36	Teacher 13		0.0211	0.49		
37	Teacher 134		0.0168	0.7		
38	Teacher 165		0.0122	0.42		
39	Teacher 40		0.0076	0.25		
40	Teacher 56		0.0028	0.08		
41	Teacher 37		0.0001	0		
42	Teacher 67		-0.0003	-0.01		
43	Teacher 132		-0.0091	-0.2		
44	Teacher 180		-0.0095	-0.39		
45	Teacher 72		-0.0132	-0.45		
46	Teacher 146		-0.0161	-0.57		
47	Teacher 131		-0.0172	-0.59		
48	Teacher 27		-0.0180	-0.59		
49	Teacher 87		-0.0186	-0.57		
50	Teacher 176		-0.0192	-0.55		
51	Teacher 98		-0.0238	-0.98		
52	Teacher 75		-0.0249	-0.42		
53	Teacher 163		-0.0266	-0.88		
54	Teacher 41		-0.0270	-0.97		
55	Teacher 186		-0.0275	-0.97		
56	Teacher 80		-0.0279	-1.17		
57	Teacher 53		-0.0289	-1.32		
58	Teacher 139		-0.0298	-1.02		
59	Teacher 118		-0.0315	-1.57		
60	Teacher 46		-0.0349	-1.54		
61	Teacher 83		-0.0358	-1.46		
62	Teacher 103		-0.0358	-1.15		
63	Teacher 48		-0.0386	-1.5		
64	Teacher 58		-0.0386	-1.01		
65	Teacher 140		-0.0396	-1.65		
66	Teacher 60		-0.0412	-1.41		
67	Teacher 23		-0.0434	-2.02		
68	Teacher 6		-0.0437	-1.31		
69	Teacher 121		-0.0459	-1.26		
70	Teacher 81		-0.0464	-2		
71	Teacher 28		-0.0465	-1.34		
72	Teacher 112		-0.0467	-2.06		
73	Teacher 9		-0.0491	-1.92		
74	Teacher 110		-0.0521	-1.37		
75	Teacher 86		-0.0526	-1.59		
76	Teacher 26		-0.0529	-1.54		
77	Teacher 39		-0.0554	-1.32		
78	Teacher 147		-0.0559	-2.35		
79	Teacher 54		-0.0562	-2.32		
80	Teacher 113		-0.0568	-2.69		

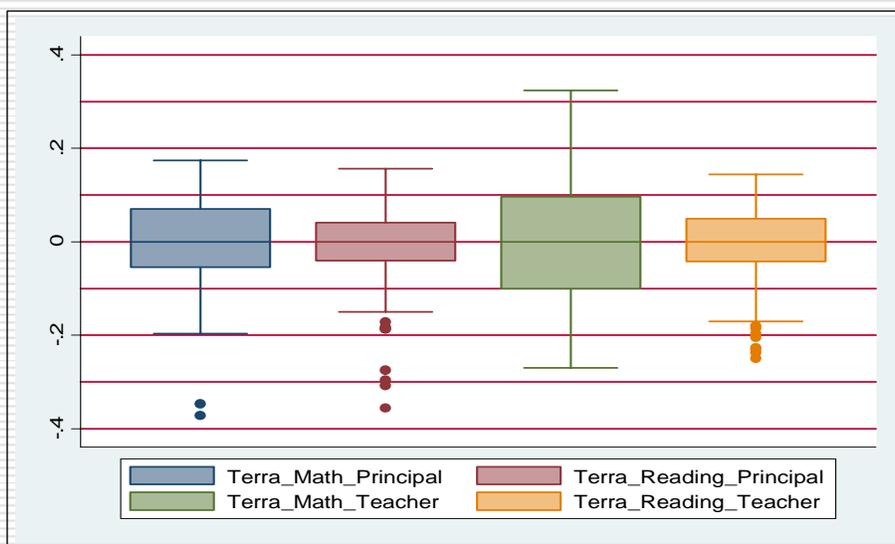
81	Teacher 108		-0.0582	-1.36		
82	Teacher 57		-0.0589	-2.26		
83	Teacher 179		-0.0590	-2.06		
84	Teacher 100		-0.0594	-2.3		
85	Teacher 45		-0.0598	-2.27		
86	Teacher 49		-0.0608	-3.12		
87	Teacher 149		-0.0617	-2.72		
88	Teacher 1		-0.0629	-1.84		
89	Teacher 104		-0.0678	-2.56		
90	Teacher 116		-0.0680	-2.6		
91	Teacher 114		-0.0711	-3.07		
92	Teacher 7		-0.0712	-3.2		
93	Teacher 11		-0.0729	-3.65		
94	Teacher 125		-0.0750	-2.55		
95	Teacher 88		-0.0783	-2.44		
96	Teacher 178		-0.0815	-2.34		
97	Teacher 32		-0.0846	-3.27		
98	Teacher 135		-0.0850	-3.56		
99	Teacher 43		-0.0873	-2.88		
100	Teacher 20		-0.0915	-3.4		
101	Teacher 189		-0.0916	-1.86		
102	Teacher 14		-0.0921	-2.95		
103	Teacher 156		-0.0949	-2.13		
104	Teacher 15		-0.0954	-3.66		
105	Teacher 47		-0.0959	-4.1		
106	Teacher 50		-0.0960	-2.13		
107	Teacher 74		-0.0963	-2.65		
108	Teacher 5		-0.1002	-3.7		
109	Teacher 173		-0.1014	-2.9		
110	Teacher 61		-0.1018	-5.01		
111	Teacher 12		-0.1077	-5.1		
112	Teacher 166		-0.1086	-3.04		
113	Teacher 62		-0.1099	-2.87		
114	Teacher 63		-0.1134	-2.56		
115	Teacher 8		-0.1161	-4.14		
116	Teacher 69		-0.1175	-4.54		
117	Teacher 19		-0.1176	-4.28		
118	Teacher 64		-0.1181	-4.06		
119	Teacher 68		-0.1202	-2.84		
120	Teacher 141		-0.1248	-4.32		
121	Teacher 115		-0.1276	-2.69		
122	Teacher 85		-0.1294	-3.67		
123	Teacher 123		-0.1451	-5.14		
124	Teacher 79		-0.1501	-6.49		
125	Teacher 196		-0.1507	-4.4		
126	Teacher 187		-0.1534	-4.4		
127	Teacher 157		-0.1561	-6.5		
128	Teacher 89		-0.1600	-6.23		

129	Teacher 174		-0.1603	-5.06		
130	Teacher 136		-0.1630	-8.62		
131	Teacher 22		-0.1657	-5.11		
132	Teacher 35		-0.1673	-6.1		
133	Teacher 197		-0.1690	-5.08		
134	Teacher 36		-0.1743	-5.89		
135	Teacher 142		-0.1839	-9.15		
136	Teacher 130		-0.1848	-5.86		
137	Teacher 16		-0.1850	-6.29		
138	Teacher 162		-0.1855	-5.65		
139	Teacher 101		-0.1911	-6.4		
140	Teacher 193		-0.1912	-9.59		
141	Teacher 34		-0.1914	-10.93		
142	Teacher 170		-0.1965	-9.17		
143	Teacher 93		-0.1985	-9.45		
144	Teacher 52		-0.1987	-9.93		
145	Teacher 199		-0.1997	-4.47		
146	Teacher 31		-0.2013	-8.23		
147	Teacher 152		-0.2055	-2.77		
148	Teacher 24		-0.2078	-7.79		
149	Teacher 154		-0.2098	-9.41		
150	Teacher 177		-0.2119	-11.17		
151	Teacher 94		-0.2124	-11.08		
152	Teacher 151		-0.2131	-10.13		
153	Teacher 29		-0.2146	-6.16		
154	Teacher 105		-0.2152	-7.31		
155	Teacher 71		-0.2165	-11.99		
156	Teacher 150		-0.2165	-13.39		
157	Teacher 2		-0.2197	-10.65		
158	Teacher 182		-0.2210	-11.44		
159	Teacher 155		-0.2213	-11.66		
160	Teacher 184		-0.2221	-5.33		
161	Teacher 30		-0.2235	-9.25		
162	Teacher 99		-0.2239	-8.86		
163	Teacher 66		-0.2256	-10.49		
164	Teacher 78		-0.2270	-13.14		
165	Teacher 171		-0.2302	-9.97		
166	Teacher 106		-0.2334	-11.32		
167	Teacher 158		-0.2339	-10.14		
168	Teacher 168		-0.2365	-8.7		
169	Teacher 153		-0.2374	-9.71		
170	Teacher 188		-0.2400	-7.88		
171	Teacher 120		-0.2407	-13.49		
172	Teacher 194		-0.2408	-10.79		
173	Teacher 190		-0.2450	-6.21		
174	Teacher 25		-0.2458	-14.71		
175	Teacher 95		-0.2459	-8.69		
176	Teacher 122		-0.2495	-6.82		

177	Teacher 185		-0.2495	-12.74		
178	Teacher 77		-0.2529	-15.28		
179	Teacher 129		-0.2541	-15.46		
180	Teacher 65		-0.2543	-12.41		
181	Teacher 51		-0.2546	-6.17		
182	Teacher 38		-0.2557	-9.8		
183	Teacher 17		-0.2561	-13.51		
184	Teacher 90		-0.2574	-8.78		
185	Teacher 102		-0.2586	-7.99		
186	Teacher 181		-0.2587	-14.83		
187	Teacher 195		-0.2600	-8.94		
188	Teacher 70		-0.2606	-8.05		
189	Teacher 117		-0.2634	-12.58		
190	Teacher 138		-0.2645	-11.78		
191	Teacher 76		-0.2666	-14.21		
192	Teacher 148		-0.2683	-11.63		
193	Teacher 4		-0.2700	-15.58		
194	Teacher 169		-0.2701	-13.84		
195	Teacher 73		-0.2712	-17.5		
196	Teacher 97		-0.2715	-10.79		
197	Teacher 143		-0.2772	-18.43		
198	Teacher 10		-0.2812	-16.04		
199	Teacher 127		-0.2813	-15.66		
200	Teacher 18		-0.2848	-15.64		
201	Teacher 119		-0.2851	-12.68		
202	Teacher 44		-0.2879	-5.65		
203	Teacher 161		-0.2935	-15.33		
204	Teacher 183		-0.2939	-14.1		
205	Teacher 124		-0.2961	-17.11		
206	Teacher 167		-0.2972	-9.71		
207	Teacher 84		-0.3026	-16.3		
208	Teacher 144		-0.3036	-12.58		
209	Teacher 126		-0.3037	-11.09		
210	Teacher 96		-0.3068	-11.92		
211	Teacher 3		-0.3110	-6.82		
212	Teacher 198		-0.3123	-12.57		
213	Teacher 192		-0.3188	-8.76		
214	Teacher 175		-0.3255	-11.71		
215	Teacher 160		-0.3331	-12.6		
216	Teacher 164		-0.3351	-18.33		
217	Teacher 91		-0.3374	-5.2		
218	Teacher 128		-0.3525	-19.89		
219	Teacher 191		-0.3656	-10.67		
220	Teacher 145		-0.3705	-11.75		
221	Teacher 82		-0.3836	-10.19		
222	Teacher 111		-0.4151	-10.9		
223	Constant		-2.2363	-12.14		

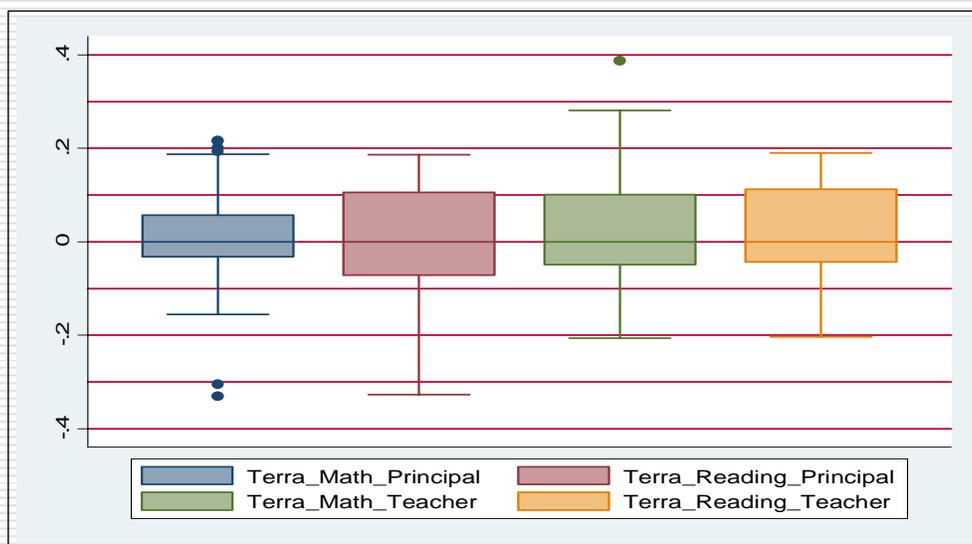
Summarization by Box Plot

The Coefficients Distribution of Principals and Teachers Fixed Effects

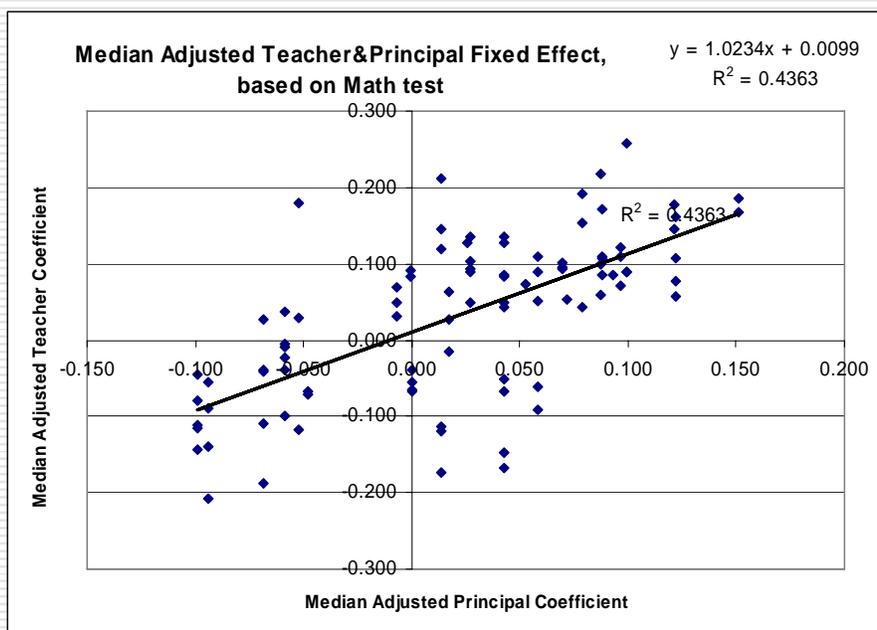


Summarization by Box Plot (cont'd)

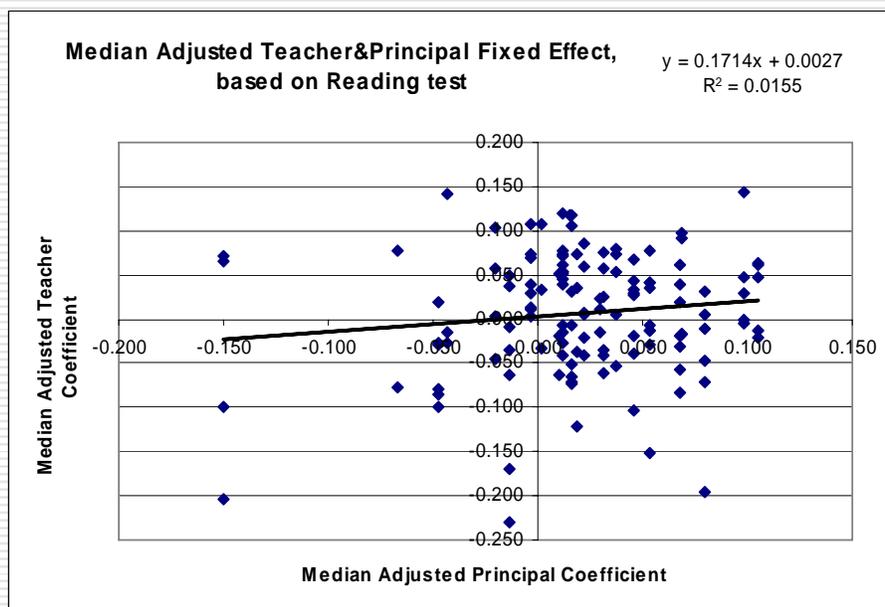
The 5% Significant Coefficients Distribution of Principals and Teachers Fixed Effects



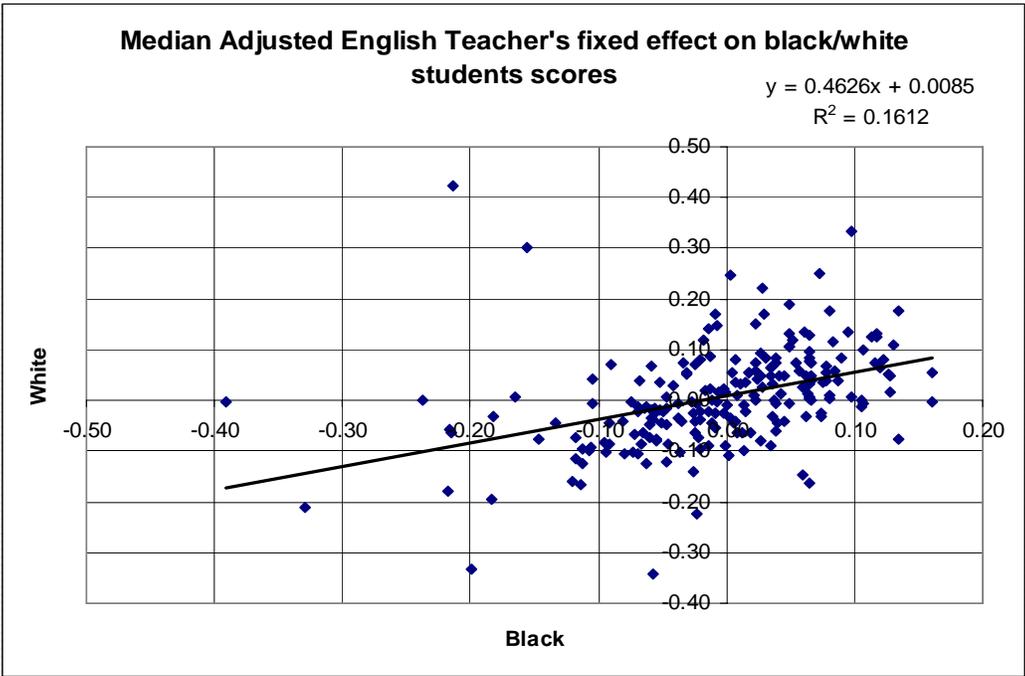
Principal and Teacher Effects: Math



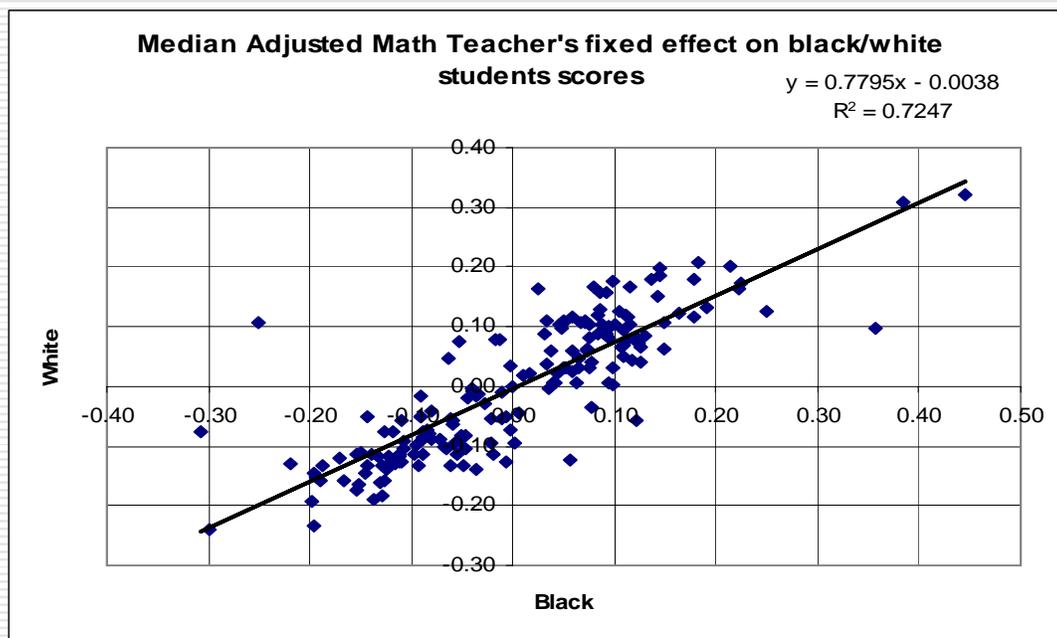
Principal and Teacher Effects: Reading



English Teacher's Fixed Effects: Black vs. White Students



Math Teacher's Fixed Effects: Black vs. White Students



4. Things to Do Next Development

- Value in Examining Principal and Teacher Best Practices
- Derive Implications for Professional Development and Student Assignment
- Examination of 2006-7 Data