School-Level Teacher Qualifications and School Environments: Untangling Their Interrelationship for School Improvement

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Context for our Research

- **Teacher quality research**
  - Teacher qualifications are related to student performance at both the classroom level and the school level.
- **School effects research**
  - Strength of school environments have been linked to student achievement differences.
- **This study explores the link** between the collective qualifications of teachers in a school and school environments.

Research Questions

- Are the measurable qualifications of teachers (what we refer to as teacher academic capital) at the school level related to school environments?

- If so, do school environments interact with teacher academic qualifications to improve student achievement?

Our Data

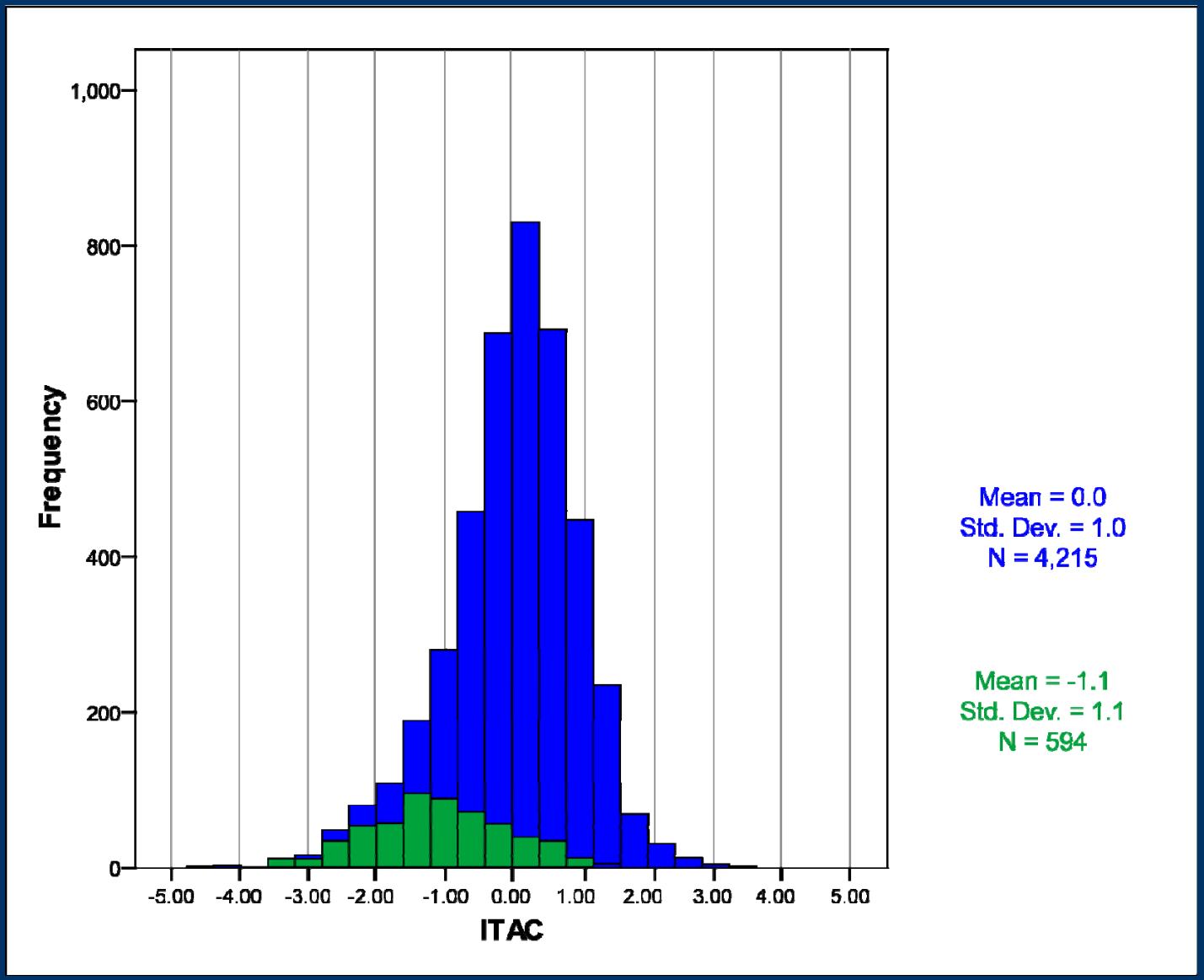
- The study uses 2002-2003 data on public elementary/middle and high schools in Chicago.
- **Teacher Qualifications:**
  - We created a school-level **Index of Teacher Academic Capital (ITAC)** to capture the average collective level of academic-oriented preparation of teachers in each school.
  - We used the State of Illinois's teacher service record (TSR) data, the state certification data and ACT data for all teachers in Chicago Public Schools in 2002-2003.
- **School Environments:**
  - We created **4 school environment indicators + 1 composite indicator** based on multiple measures from the Consortium on Chicago School Research's (CCSR) Spring 2003 teacher and student surveys of Chicago public schools.

Index of Teacher Academic Capital (ITAC)

- **ITAC statistically combines five school-level measures of teachers' academic-oriented qualifications that research indicates are related to student achievement (Mean = 0.0, SD = 1.0):**

ITAC Components	Weight
Teachers' Mean ACT Composite Score	0.91
Teachers' Mean ACT English Score	0.90
% of Teachers Failing the Basic Skills Test on Their First Attempt	-0.36
% of Teachers with Emergency or Provisional Certification	-0.50
Teachers' Mean Undergraduate College Competitiveness Ranking	0.45

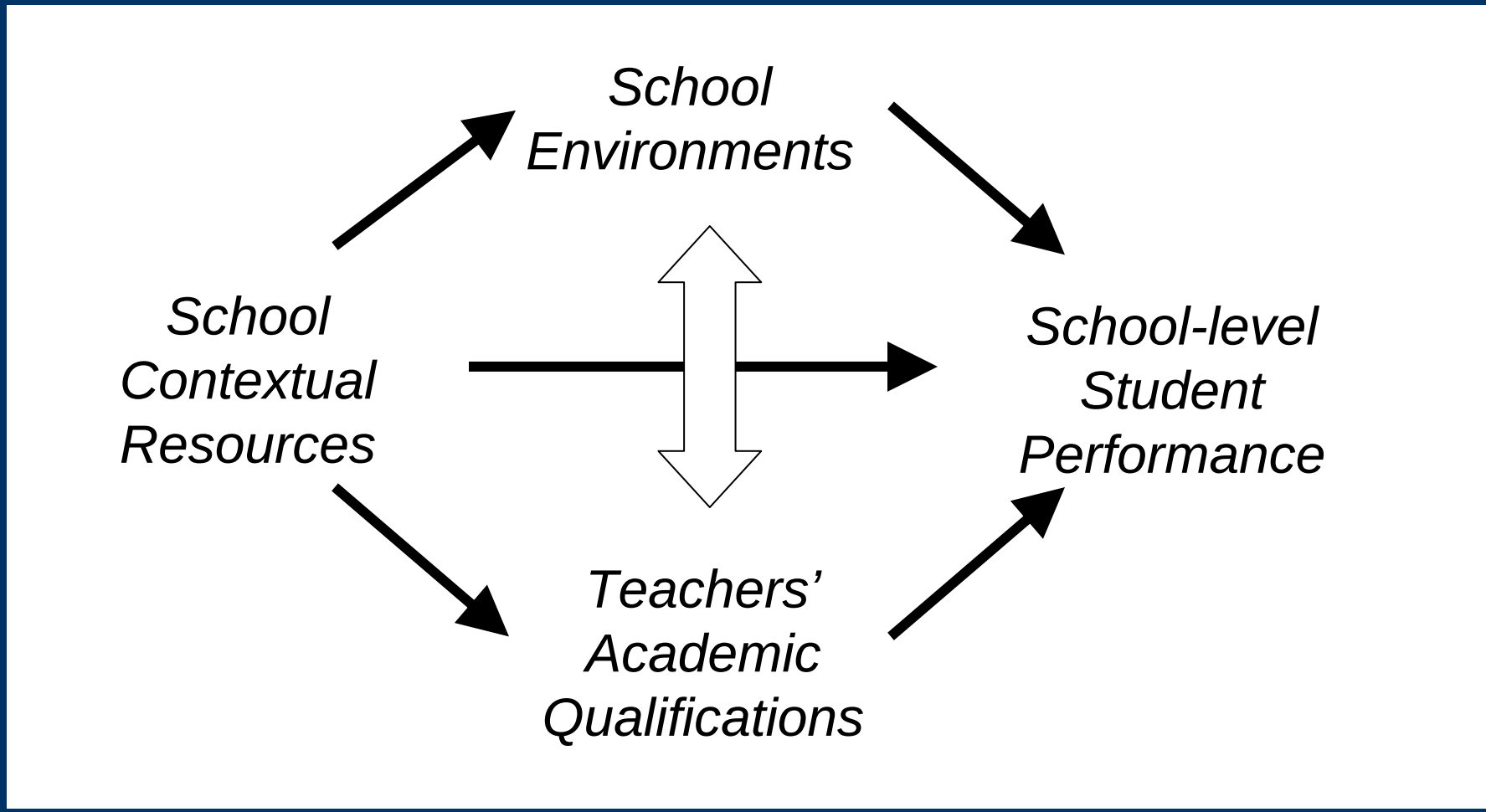
Distribution of 2002-03 ITAC for Illinois and CPS



Construction of School Environment Factors

School Environment Factor	Component Measures
Distributed Leadership (Cronbach's alpha = 0.92)	• Teacher Influence • Instructional Leadership • Program Coherence • Teacher-Principal Trust
Parent-School Relations (Cronbach's alpha = 0.88)	• Knowledge of Students' Culture • Parent Involvement in School • Teacher Outreach to Parents • Teacher-Parent Trust
Teacher Professional Community (Cronbach's alpha = 0.94)	• Collective Responsibility • Innovation • Peer Collaboration • Reflective Dialogue • School Commitment • Socialization of New Teachers • Teacher-Teacher Trust
Safety and Order (Cronbach's alpha = 0.67)	• Classroom Behavior • Incidence of Disciplinary Action • Safety
Overall Climate	• Combination of the other four factors

The Conceptual Framework



Adapted from model by Brookover, Beady, Flood, Schweitzer, and Wisenbaker (1979).

RQ1: Are the measurable qualifications of teachers related to school environments?

Bivariate Correlations with ITAC	Elementary/ Middle Schools	High Schools
Distributed Leadership Factor	0.19	0.35
Parent-School Relations Factor	0.37	0.53
Teacher Professional Community Factor	0.26	0.48
Safety and Order Factor	0.42	0.67
Overall Climate Measure	0.34	0.59
Number of Schools in Sample	213	34

$p \leq .01$, $p \leq .05$

- Schools with more academically-prepared teachers tend to have more positive school environments as well.
  - Correlations are stronger at the high school level.
- Correlations with Safety and Order factor are highest at both school levels.

Note: ITAC and School Environment factors are distributed disproportionally among types of schools – 99%+ African American schools are least likely to have high values, racially integrated schools are most likely to have high values.

RQ2: Do school environments interact with teacher academic qualifications to improve student achievement?

1. Regression Models of Achievement Gains

- For elementary/middle schools, we have average **ITBS gain scores in reading and math** based on a CCSR-developed measure of individual student growth from the prior year.
- No measure of gain scores available at the high school level.
- **Control variables in the regression models:**
  - Racial/SES school categories and % of LEP students in each school included as school contextual resource variables
  - % of teachers in each school with ≤ 3 years of teaching experience

Results for Reading Gains at Elem/Middle Schools

(Numbers in cells are standardized coefficients. N=213).	Reading Gains on ITBS (2001-02 to 2002-03)				
	I	II	III	IV	V
Teachers' Qualifications					
ITAC	0.14	0.08	0.12	0.13	0.13
% teachers with ≤ 3 year exp.	-0.06	-0.06	-0.07	-0.07	-0.06
School Contextual Resources					
African American Moderate SES	0.18	0.15	0.18	0.17	0.18
Predominately Latino	0.39	0.29	0.38	0.31	0.35
Predominately Minority	0.26	0.22	0.26	0.22	0.24
Racially Diverse	0.34	0.29	0.34	0.27	0.31
Racially Integrated	0.69	0.55	0.68	0.58	0.64
% Limited English Proficient	-0.19	-0.15	-0.19	-0.22	-0.20
School Environment Factors					
Distributed Leadership	0.13				
Parent-School Relations		0.33			
Teacher Professional Community			0.16		
Safety and Order				0.25	
Overall Climate					0.12
R-squared	0.46	0.52	0.47	0.47	0.47

- **School contextual resources have the largest impact on reading gains.**
- **Both ITAC and school environment factors have statistically significant independent effects.**
- **No statistically significant linear interaction effects between ITAC and school environment factors were found.**

Note: School classification reference category is African American Low SES.

p≤0.01 **p≤0.05** **p≤0.10**

Results for Math Gains at Elem/Middle Schools

(Numbers in cells are standardized coefficients. N=213).	Mathematics Gains on ITBS (2001-02 to 2002-03)				
	I	II	III	IV	V
Teachers' Qualifications					
ITAC	0.08	0.02	0.06	0.06	0.06
% teachers with ≤ 3 year exp.	-0.06	-0.07	-0.08	-0.09	-0.07
School Contextual Resources					
African American Moderate SES	0.20	0.16	0.19	0.18	0.19
Predominately Latino	0.41	0.31	0.40	0.27	0.35
Predominately Minority	0.27	0.23	0.27	0.21	0.23
Racially Diverse	0.31	0.27	0.31	0.19	0.25
Racially Integrated	0.73	0.58	0.72	0.55	0.64
% Limited English Proficient	-0.15	-0.11	-0.15	-0.20	-0.15
School Environment Factors					
Distributed Leadership	0.20				
Parent-School Relations		0.40			
Teacher Professional Community			0.24		
Safety and Order				0.39	
Overall Climate					0.31
R-squared	0.53	0.61	0.55	0.56	0.56

- **School context matters for math gains as well.**
- **School environment factors show even stronger effects for math gains.**
- **ITAC is not significant for math gains, but inexperience matters marginally.**
- ***Croninger et al. (2007) found a similar result at the school level, and surmise that the teacher effects difference by subject is due to emphasis on reading in elementary grades.***

Note: School classification reference category is African American Low SES.

p≤0.01 p≤0.05 p≤0.10

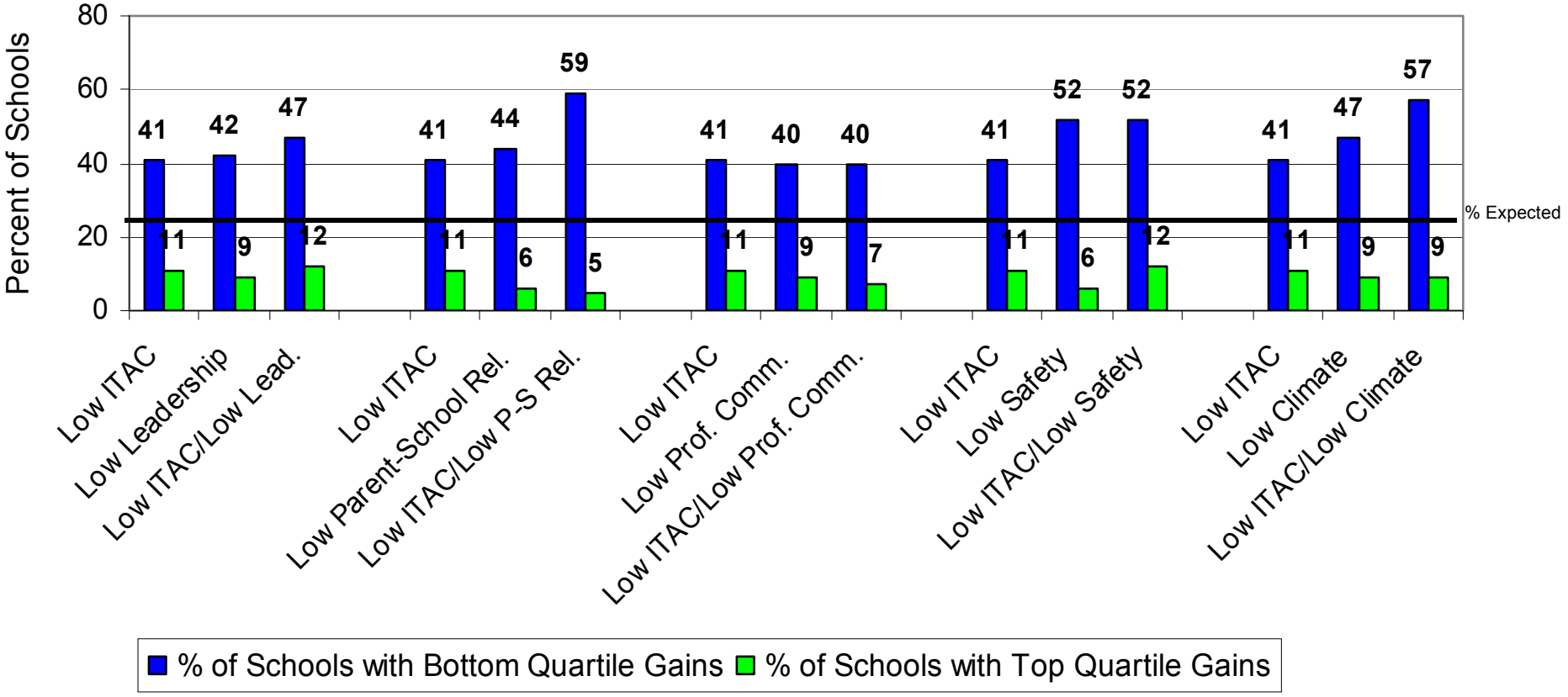
RQ2: Do school environments interact with teacher academic qualifications to improve student achievement?

2. Examine interactions between ITAC and School Environments at the Low and High Ends

- We calculate the percentage of elementary/middle schools with bottom quartile reading gains versus top quartile reading gains for schools with (i) bottom quartile and (ii) top quartile ITAC and school environments.

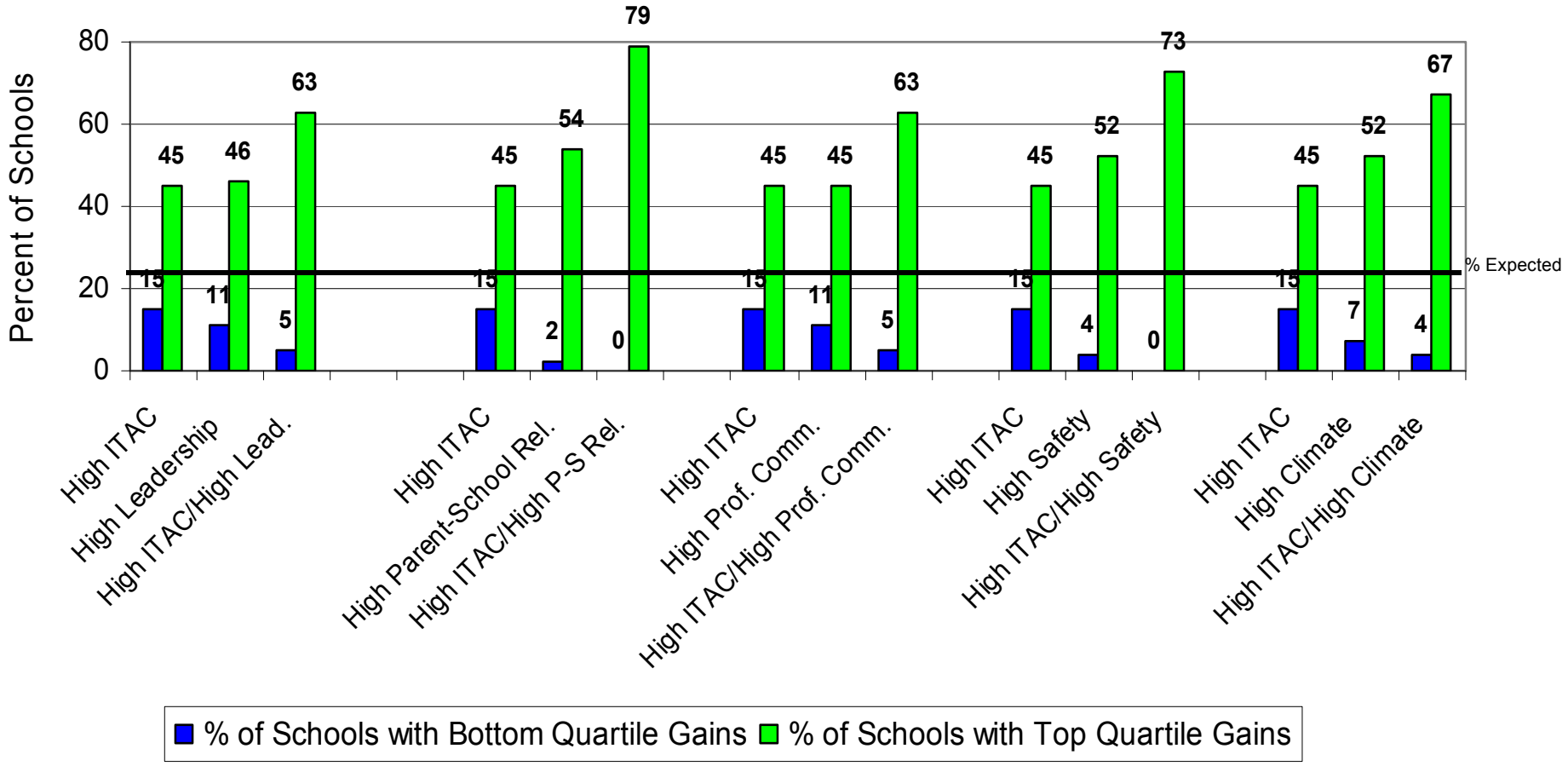
- There are too few schools with High ITAC/Low climate values or Low ITAC/High climate values to consider.

Interaction Effects on Reading Gains for Elem/Middle Schools with Bottom Quartile ITAC and Bottom Quartile School Climate Factors



Note: Similar results were found for math gains.

Interaction Effects on Reading Gains for Elem/Middle Schools with Top Quartile ITAC and Top Quartile School Climate Factors



Note: Similar results were found for math gains.

Summary of Key Findings

- School environments have significant independent effects on elementary/middle school gains in reading and math.
  - The parent-school relations and safety and order factors appear to have the largest effects.
- The collective academic qualifications of teachers (ITAC) in a school have an independent effect on reading gains in elementary/middle schools.
- While we found no significant *linear* interactions between ITAC and school environments in our achievement models, there are some interaction effects in the top and bottom quartiles, particularly within schools that are high on both.

Final Observations

- The quality of school environments, like the academic capital of teachers, is distributed unevenly across schools in Chicago such that schools that are advantaged in one arena tend to be advantaged in the other arena as well.
- As a result, some schools in Chicago, most notably those that are nearly 100 percent African American, are doubly disadvantaged – and thus additionally hampered with regard to gains in performance.
- Given the independent impacts and interaction effects of ITAC and school environments, Chicago needs to be concerned with improving both. Parent-school relations and Safety and Order appear to be especially important climate factors.

Future Directions

- Do schools with positive environments attract teachers with strong academic qualifications? *Or* are teachers with strong academic qualifications better able to create positive school environments? Further research using multiple years of data is needed so that we can better understand the dynamics of the relationship between these school-level factors.

- The correlations between ITAC and school environments were found to be even stronger at the high school level. Student gain scores are needed for high schools so that we can examine the contributions of these factors at that level.