

Chicago Heights Early Childhood Center: Early Results from a Field Experiment on the Temporal Allocation of Schooling



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CHECC

- Large-scale randomized field experiment – how to improve outcomes for children from disadvantaged households
 - 3-4 year-old **children** and **parents**
 - New preschools, children from SD170 and surrounds
 - Longitudinal
- Implementation of CHECC
 - Years 1-2 (2010-2012) *Fryer, Levitt, List*
 - Year 3 (2012-2013) *Results just in*
 - Year 4 (2013-2014) *Just started*

Motivation: Human Capital

- Early life conditions can have persistent effects later in life
- Early childhood investment may matter more than later childhood investment
 - Self-productivity – higher investment in one period leads to greater productivity in next period (Heckman, 2007)
- Characteristics measured as of age 7 can explain a great deal of variation in later life (Currie, 2010)
 - High school completion (NLSY)
 - College completion
 - Earnings

Literature - Preschool

- Perry Preschool Project
 - PK and home visits, T=58, C=65
 - Decrease in arrests
 - Non-cognitive skills extremely important (Heckman et al., 09)
- Carolina Abecedarian Project
 - Full-day preschool: T=57, C=54
 - Positive effects at 21-yr follow up on grades, school completion
- Head Start Impact Study (2002-2006)
 - Children from wait list randomly assigned to one of 383 centers
 - T=2,783, C=1884
 - Improvement in PPVT, social skills; no improvement in math, behavior

Literature – Teaching Parents

- Home visiting programs (Howard and Brooks-Gunn, Olds et al., 1999, 2007)
 - Teaching mothers who may be at risk
 - Document small effects on early childhood cognition, but large behavioral effects for teens
- Many programs not effective, hard to get parents to participate
 - Solutions: home visits by nurses; our program with incentives

Background

Chicago Heights: Laboratory for Urban School Reform

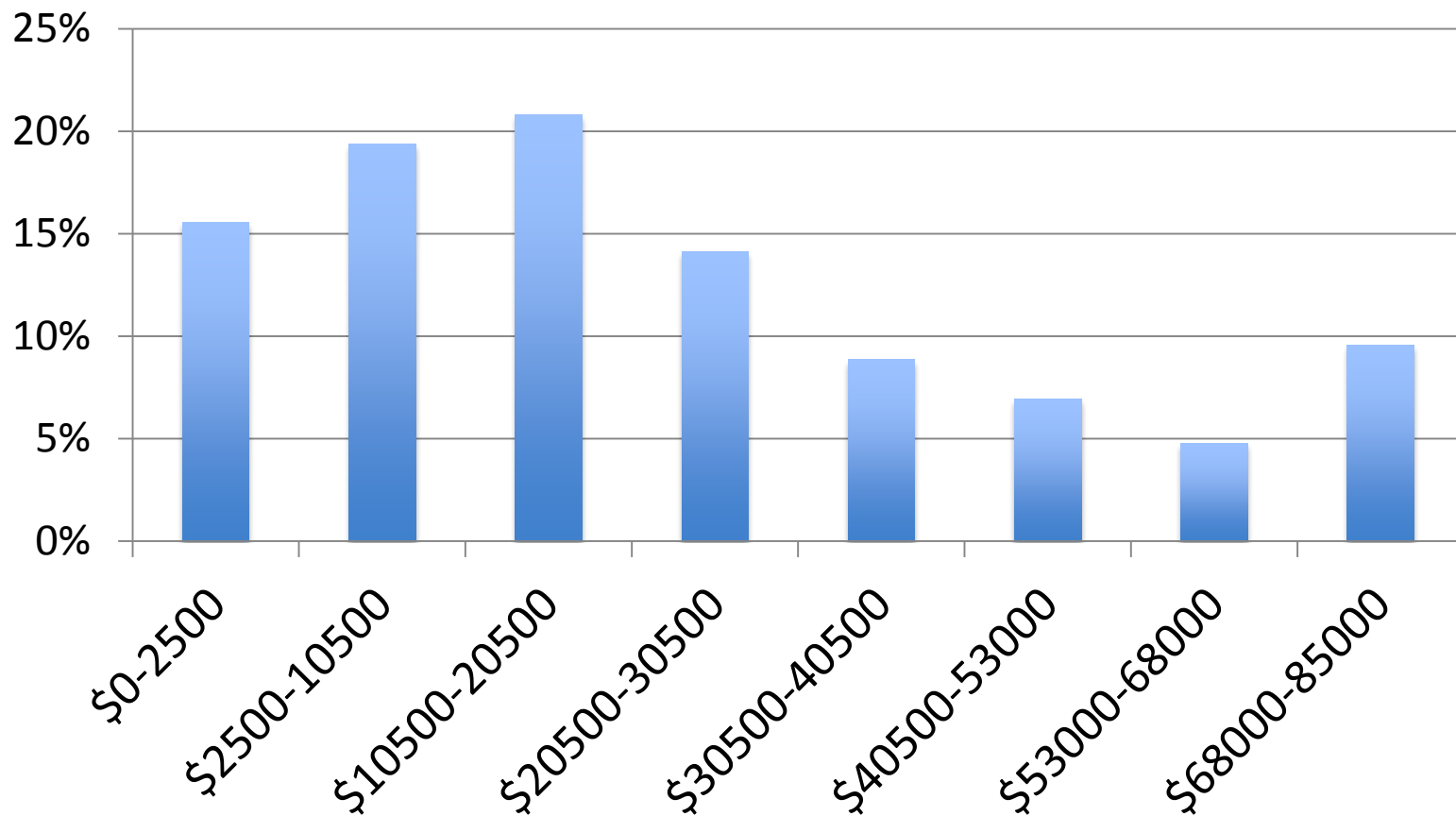
	Chicago Heights High Schools (Bloom Township)	Chicago Heights Elementary Schools	City of Chicago Elementary and High Schools
Enrollment	3,387	3,229	409,055
% Black	57%	42%	46%
% Hispanic	22 %	49%	41%
% White	17%	5%	9%
% Low Income	72%	92%	83%
Expenditure Per Pupil	\$13,537	\$10,214	\$11,536
% Meet or Exceed Elementary Standards	N/A	63%	68%
High School Standards	20%	N/A	28%
Graduation Rate	47%*	N/A	54%**

Source: Illinois Report Card

*Source: Chicago Heights Promise Working Group

**Source: Chicago Public School Office or Research, Evaluation and Accountability

Income Distribution of Sample

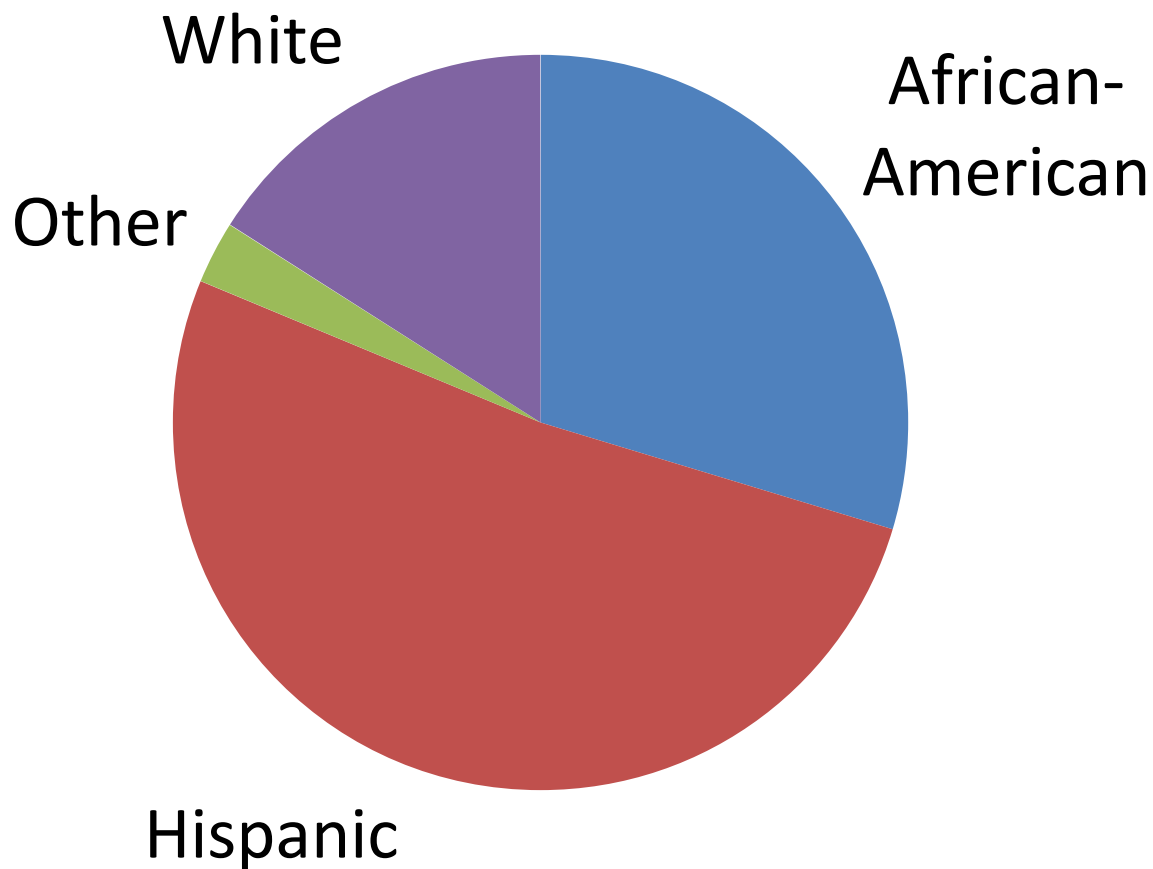


Poverty Guidelines, 2013:

\$15,510 or below for family of 2

\$19,530 or below for family of 3

Racial Makeup of Sample



Years 1-2

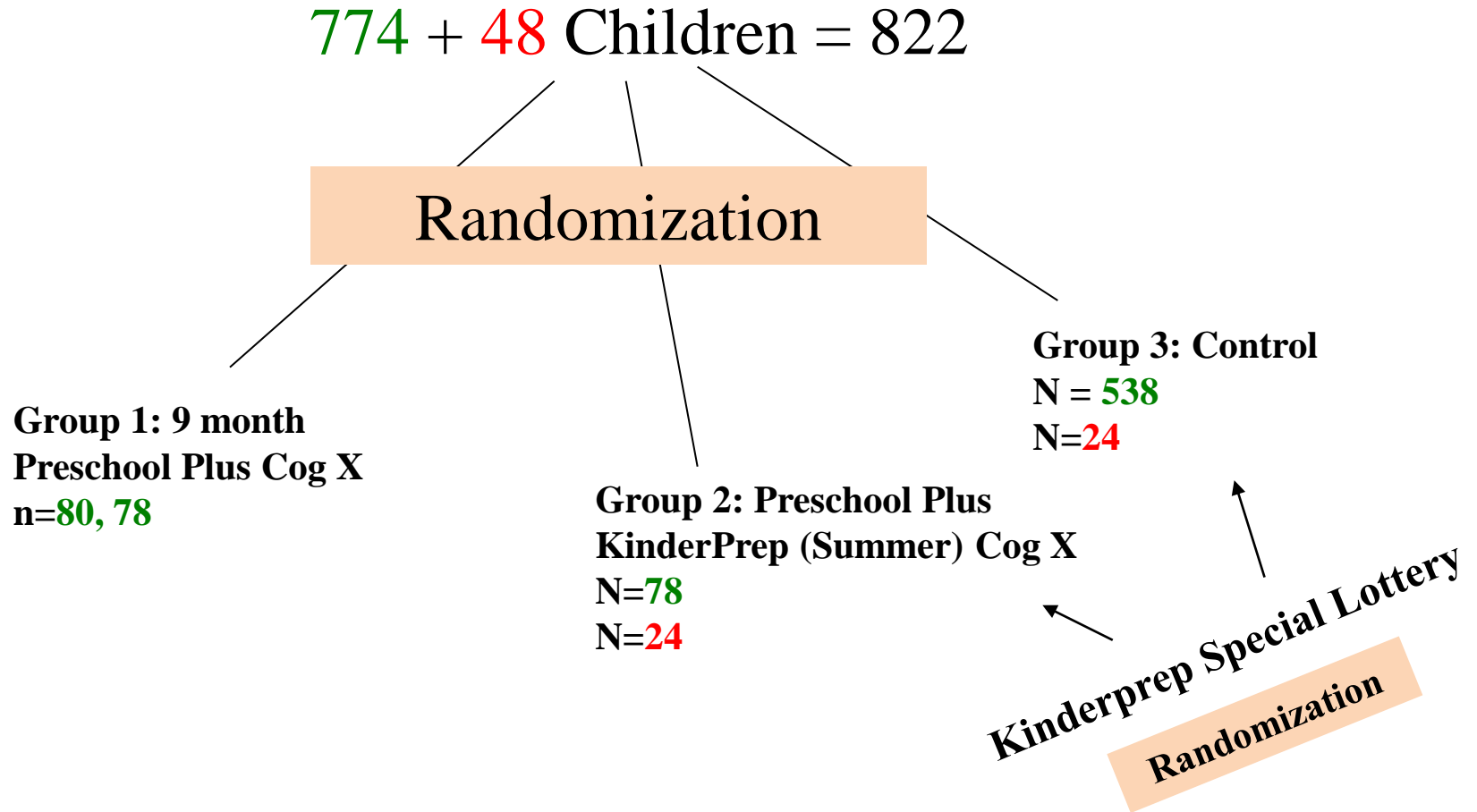
- Comparisons of investing in parents vs. children (Fryer, Levitt, List)
 - Parent Academy (Cash vs. College)
 - Preschool (Cognitive vs. Executive Function)
- Findings:
 - Preschool – *Literacy Express* significantly increases academic skills
 - Preschool – *Tools of the Mind* does not affect academics
 - Parent Academy most effective with cash rewards – increases executive function
 - Children at lower cognitive abilities most improved
 - Most improvement occurs in first 4 months

Implementation

Years 3-4

- Investigate a Preschool program combined with Parent Involvement component
- Two different timings:
 - 9 month academic year
 - 2 month summer program

CHECC Experimental Design – Year 3



‘Matched Pairs’

- Block on gender, race, age on Sep 1, SD170 or not
- Match as closely as possible on age, test scores
- Create several twin / triplet pairs
- Within each pair – randomize to control, treatment
- Check for balance on parent education level, hh. Income, distance to school, etc.

Summary of Years 3-4

- Preschool Plus, invest in parents & children,
Investigate timing (Fryer, Levitt, List, Samak)

	Preschool 9-month	Preschool KinderPrep
Meetings	Half day instruction, half day daycare – 9 months (170 days – 510 hours)	Half day summer instruction – 2 months (31 days = 124 hours)
Instruction	Morning: PK Teachers, who also instruct parents at PA sessions. Afternoon: PK Teacher assistants & PA support staff.	
Curriculum	CogX – new curriculum developed by PIs, incorporating Academic Achievement, Executive Function and STEM approaches	

	Parent Involvement 9-month & KinderPrep
Meetings	2x per month, 1 hour each. \$50 incentive for class attendance
Instruction	Child's own PK teacher
Curriculum	Based on Cog-X, theory driven, focused on <i>intentional parental involvement</i>
Child Involvement	30 min per month child/parent “workshops” in class; 'Home extension' activities for parents/children

Assessment

Internal Assessment

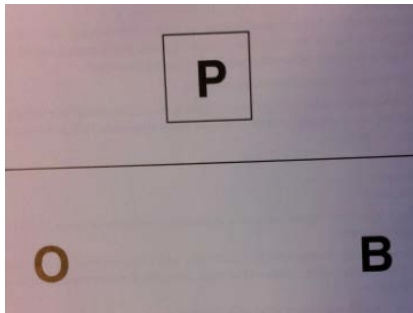
- Cognitive Achievement
 - Peabody Picture Vocabulary Test
 - Woodcock-Johnson
 - Letter-Word, Spelling, Applied Problems, Quantitative Concepts
- Executive Function
 - Blair and Willoughby Tasks (not normed)
 - Impulsivity, attention shifting
 - Preschool Self-Regulation Assessment (PSRA)

Additional Assessment

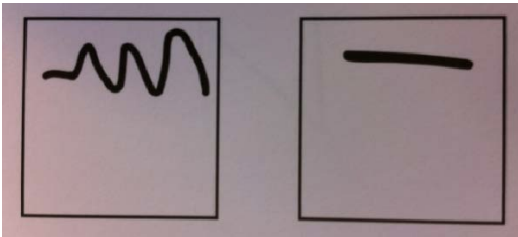
- SD170 DRA
- SD170 Head, Toes, Knees Shoulders

Cognitive Assessment

What letter is this?*

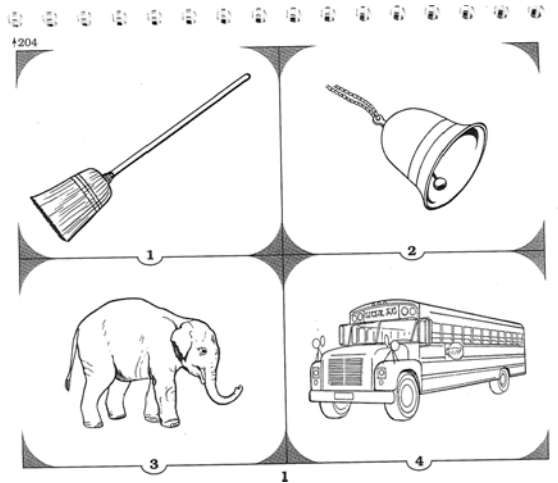


Can you draw a line like this one?*

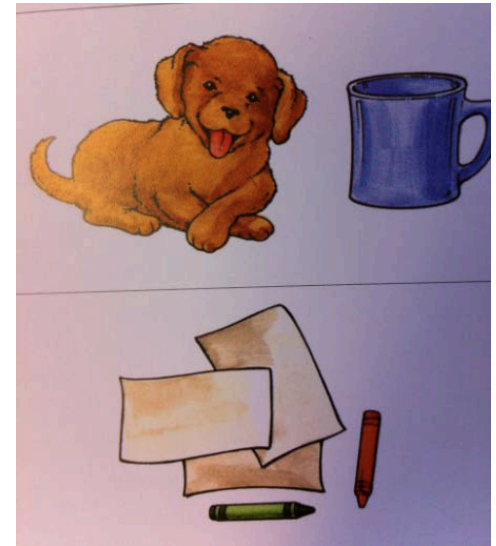


Can you write the letter A?*

Show me "bus" **

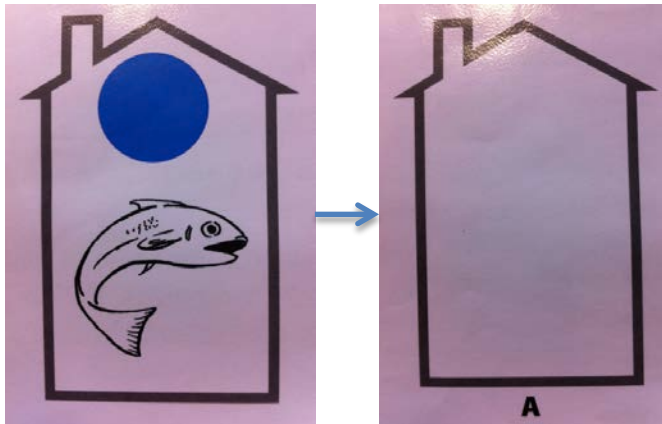


How many dogs are in this picture?*

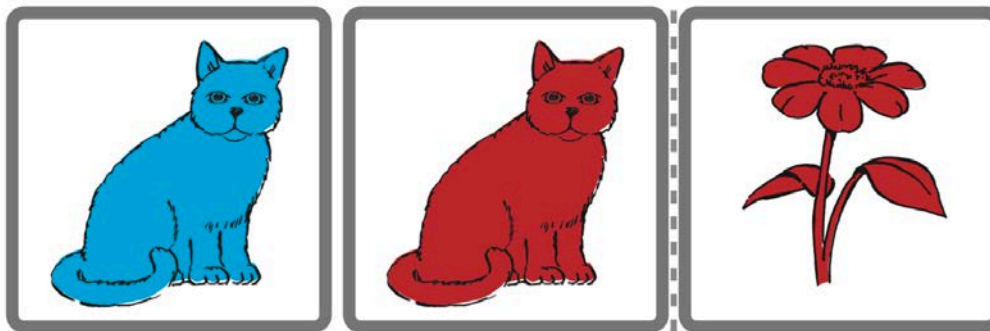
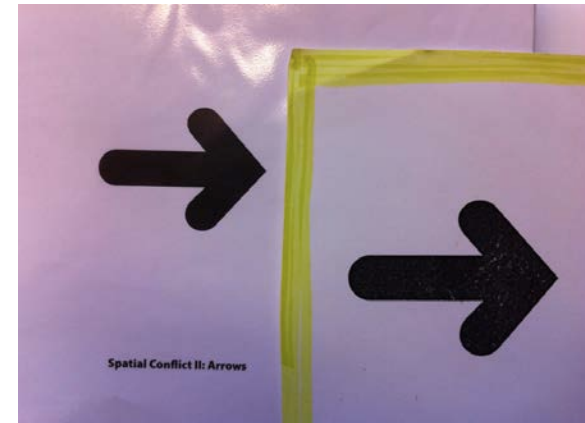


Executive Function Assessment

“What color WAS in this house?”

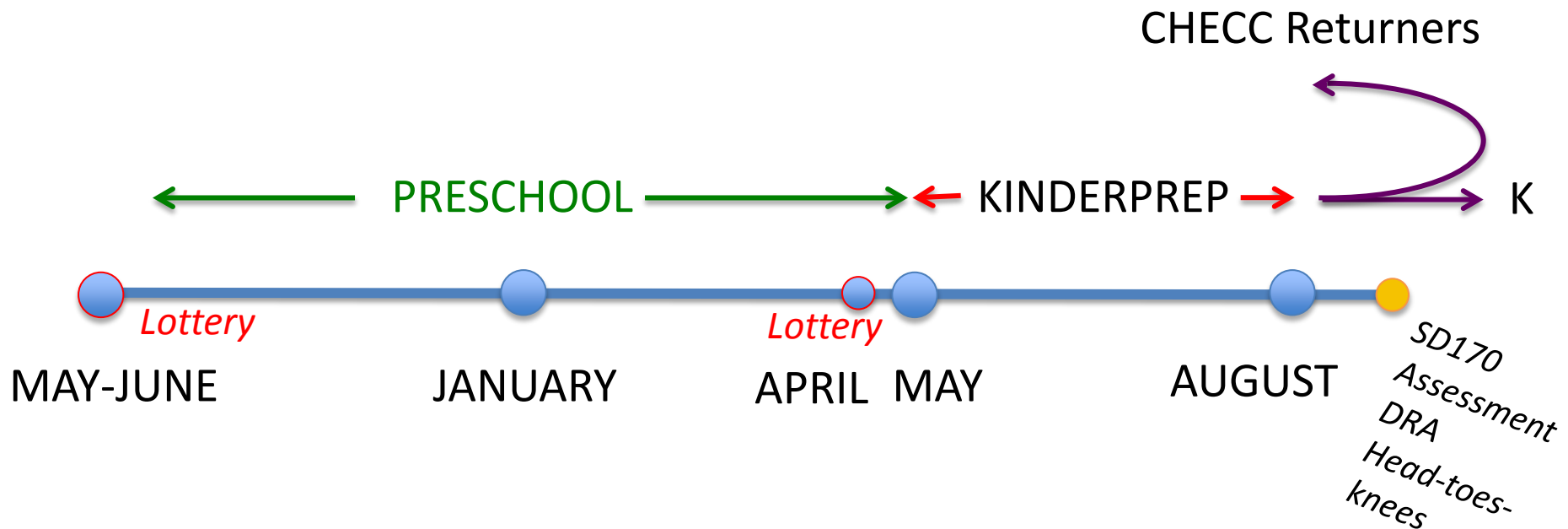


“Look where the arrow is pointing.
Which button should you touch?”



“Which of these pictures
Is the same as *this* one?”

Assessment Schedule



Assessment each year in Spring
ISTEP (Starts in 3rd Grade)

Additional Outcome Measures

- Attendance
- Grades
- Graduation rates
- Suspensions, arrests

Preliminary Results

Data Collected

- Cognitive Index (YES)
 - PPVT, WJ-III
- Executive Function Index (YES)
 - Clancy Blair Assessments
- PSRA - Attention and Emotion (YES)
- SD 170 Assessment (NOT YET)
 - DRA, Head-toes-knees, Teacher CBQ

Summary of Results – Exec. Fn. Index

Treatment	Pre-Assessment	Midyear Assessment	Post-Assessment	End of Summer Assessment
Control 3 years old	40.23 (18.49) N=226	56.31 (20.86) N=34	60.33 (14.47) N=123	63.97 (14.01) N=87
Preschool 3 years old	35.97 (18.41) N=77	55.93 (17.07) N=43	59.75 (13.99) 74	60.96 (15.82) N=49

Treatment	Pre-Assessment	Midyear Assessment	Post-Assessment	End of Summer Assessment
Control 4 years old	58.76 (18.12) (N=94)	72.16 (15.15) N=25	72.07 (13.60) N=52	77.25 (10.49) N=61
Preschool 4 years old	54.42 (13.7) N=47	67.78 (13.10) N=33	70.71 (12.82) N=57	75.92 (11.78) N=45
<u>Kinderprep</u> 4 years old	60.72 (16.24) N=59	69.77 (13.91) N=24	74.91 (12.97) N=42	77.83 (11.06) N=58

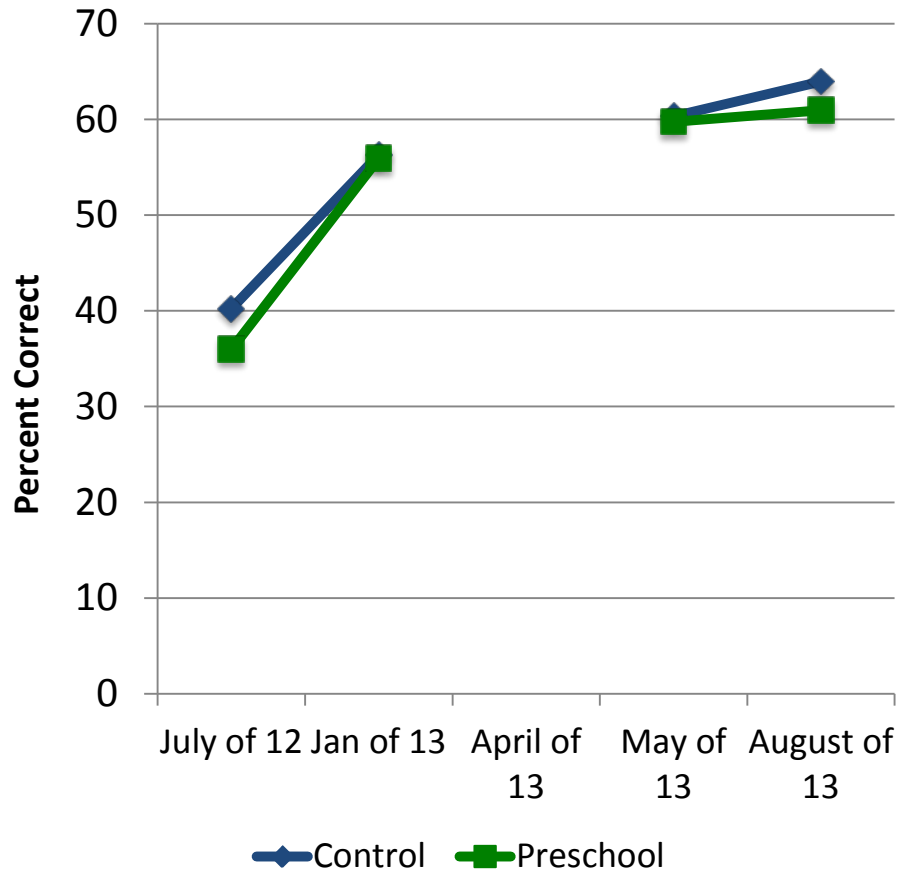
*Standard deviation in parentheses

**Mid-year uses only half the sample who attended due to a test of another exec. Function assessment

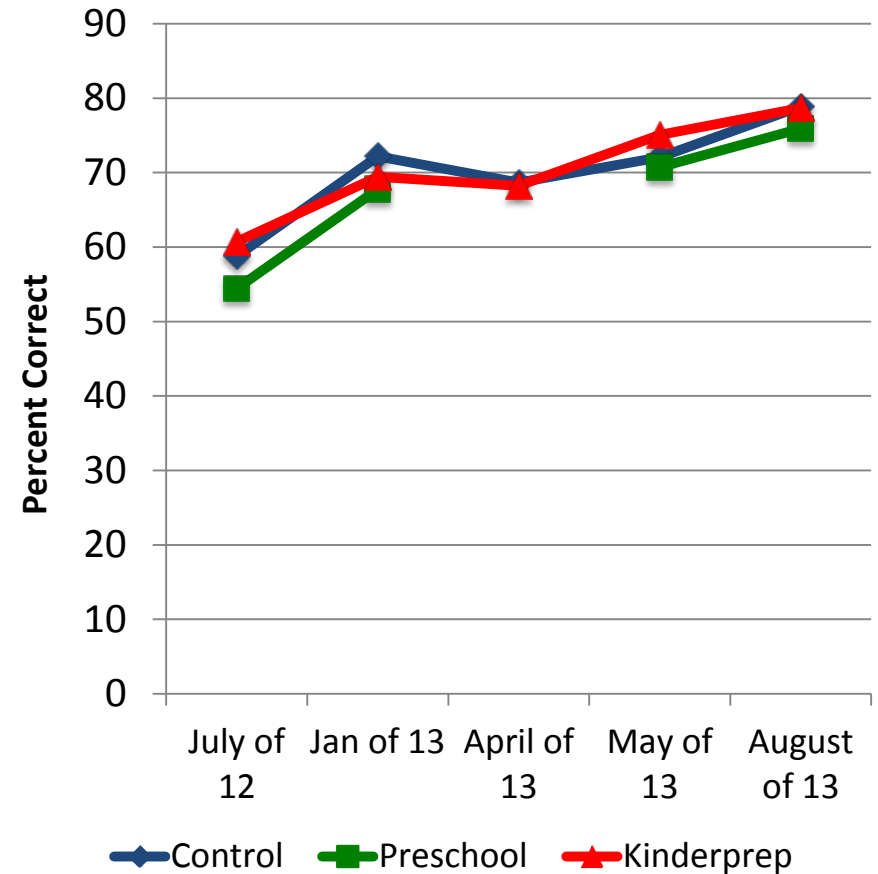


Result Overview – Executive Function

3 year olds



4 year olds



PSRA

	<i>Pre Treatment</i>		<i>Post Treatment</i>		<i>End of Summer</i>	
Treatment	PSRA- Emotion	PSRA- Attention	PSRA- Emotion	PSRA- Attention	PSRA- Emotion	PSRA- Attention
Control	1.83 (0.74) N=316	1.73 (0.27) N=316	1.98 (0.69) N=175	1.88 (0.22) N=175	2.07 (0.68) N=136	1.89 (0.18) N=136
<u>Kinderprep</u>	1.87 (0.71) N=59	1.75 (0.26) N=59	2.15 (0.61) N=41	1.92 (0.17) N=40	1.92 (0.55) N=39	1.86 (0.18) N=39
Preschool	1.66 (0.79) N=125	1.68 (0.31) N=125	1.97 (0.71) N=131	1.83 (0.24) N=131	1.95 (0.71) N=94	1.87 (0.23) N=94

*Standard deviation in parentheses

- 0 to 3 measure; 3 is better

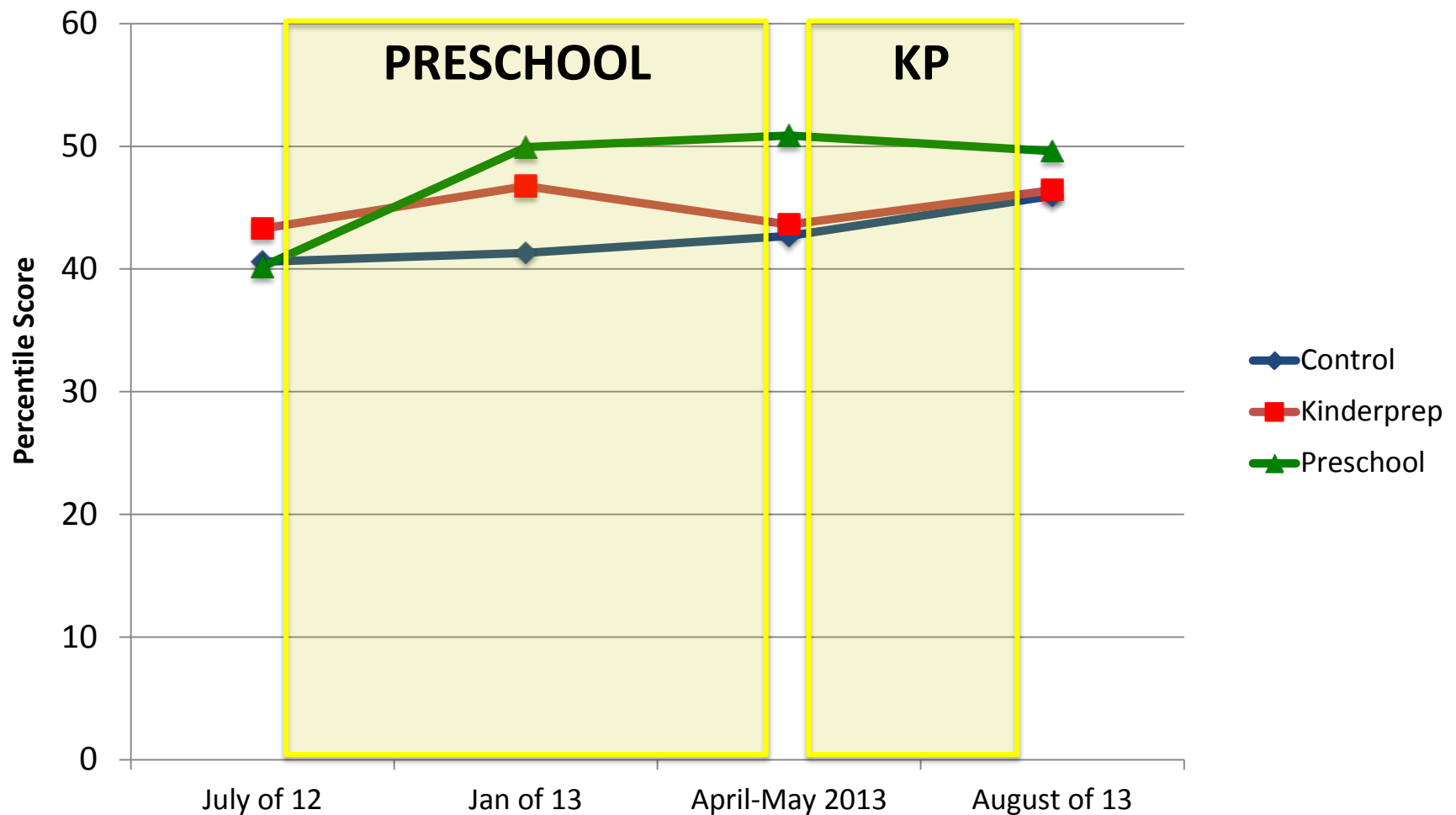
Summary of Results – Cognitive Index

Treatment	Pre-Assessment	Midyear Assessment	Post-Assessment	End of Summer Assessment
Control	40.58 (20.52) N=322	41.31 (46.76) N=138	43.23 (22.62) N=181	45.97 (22.29) N=137
<u>Kinderprep</u>	43.28 (23.18) N=59	46.76 (20.42) N=38	45.31 (21.84) N=45	46.43 (19.05) N=39
Preschool	37.31 (18.23) N=127	49.34 (18.57) N=125	51.46 (20.25) N=131	50.56 (21.16) N=94

*Standard deviation in parentheses

Result 1: Preschool significantly improves cognitive index relative to control in January, immediately at the end of the treatment and at K entry (Ranksum tests: p-values<0.01, <0.01; <0.10)

Result Overview – Cognitive Scores

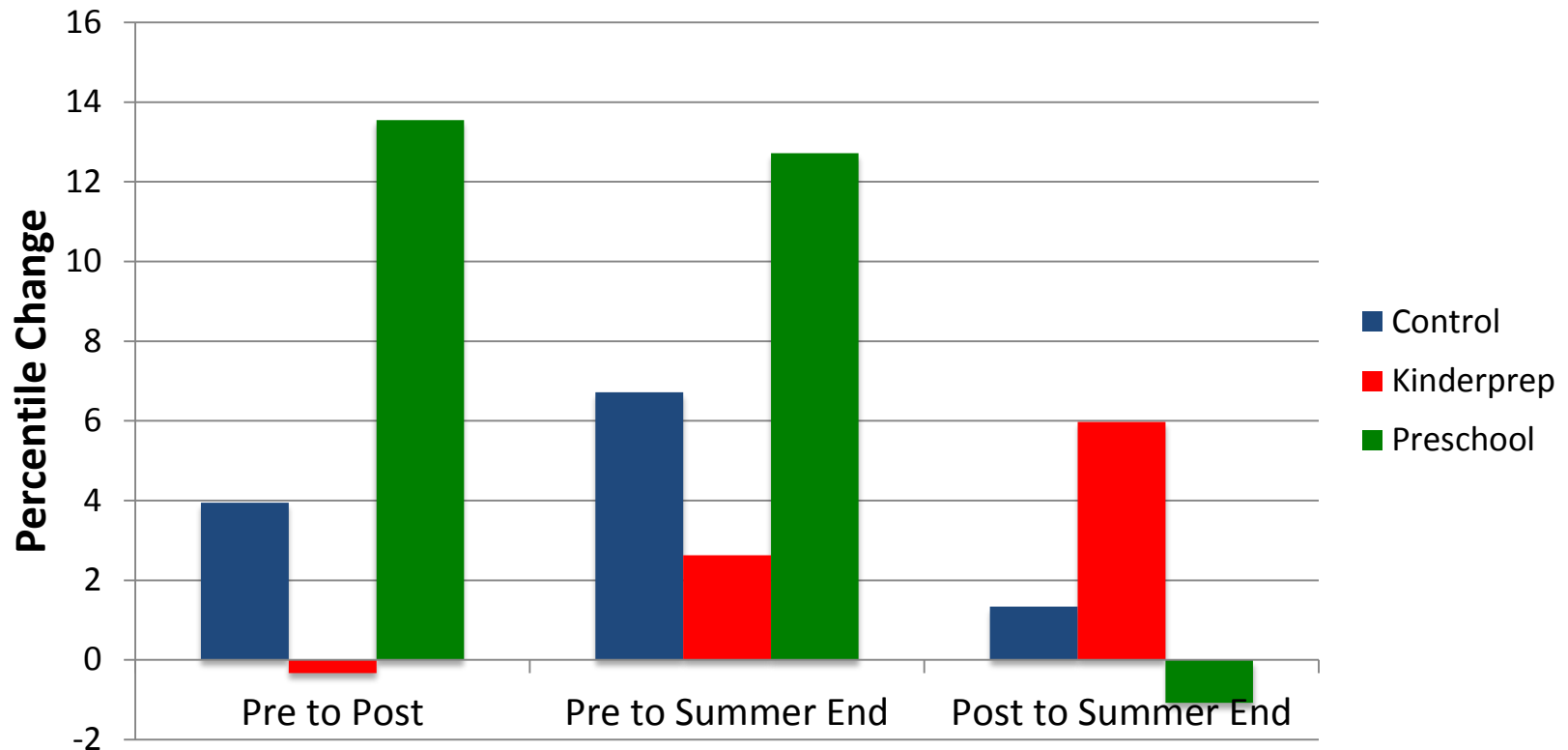


Improvement

- Must be present at both beginning and end of intervention
- Preschool: Pre to Post
- Kinderprep: Post to Summer End

Treatment	Pre to Post	Pre to Summer End	Post to Summer End
Control	166	128	106
Kinderprep	31	29	28
Preschool	111	78	87

Improvement Summary



Result 2: Kinderprep improves relative to control and Preschool between May and August (when treatment occurs) ($p\text{-value} < 0.10$). Kinderprep & PK not different when controlling for kids who are in both assessments.

Regressions of Pre to Post Cognitive Index

VARIABLES	(1) Improvement Pre to Post Cog Index	(2) Improvement Pre to Post Cog Index	(3) Improvement Pre to Post Cog Index
Preschool (=1 if in PK)	9.206*** (1.915)	8.000*** (1.895)	8.038*** (2.286)
Kinderprep (=1 if in KP)	-2.806 (2.935)	-3.077 (2.949)	-5.558 (3.938)
Cog_Pre (Cog score at entry)	-0.199*** (0.0364)	-0.223*** (0.0370)	-0.359*** (0.0602)
Ageout dummy (=1 if age out this yr)	-0.837 (2.005)	-1.086 (2.002)	0.856 (2.697)
Black (=1 if Black)		2.463 (2.334)	3.592 (2.577)
Hispanic (=1 if Hispanic)		-4.716** (2.325)	-0.130 (3.063)
Female (=1 if Female)		1.199 (1.681)	0.357 (2.174)
Income (Hh. income at entry)			0.562 (0.617)
Mother at least HS (=1 if finished HS)			0.0236 (3.654)
Mother some college (=1 if some coll.)			5.089 (3.324)
Mother College (=1 if college)			9.189** (4.036)
Constant	11.92*** (1.762)	13.73*** (2.846)	11.16*** (3.777)
Observations	306	306	206
R-squared	0.158	0.200	0.268

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Regressions of Post to Summer End Cognitive Index

VARIABLES	(1) Improvement Post to Summer End Cog	(2) Improvement Post to Summer End Cog	(3) Improvement Post to Summer End Cog
Preschool (=1 if in PK)	-0.682 (1.514)	-0.607 (1.502)	0.0276 (2.111)
Kinderprep (=1 if in KP)	6.997** (2.885)	6.955** (2.877)	5.080 (4.473)
Cog_Pre (Cog score at entry)	-0.167*** (0.0332)	-0.164*** (0.0342)	-0.155*** (0.0430)
Ageout dummy (=1 if age out this yr)	-2.972** (1.470)	-3.124** (1.444)	-2.417 (2.167)
Black (=1 if Black)		-1.883 (2.295)	-2.585 (2.867)
Hispanic (=1 if Hispanic)		-0.867 (2.287)	-1.612 (3.054)
Female (=1 if Female)		-0.756 (1.460)	-0.187 (1.887)
Income (Hh income at entry)			0.523 (0.592)
Mother at least HS (=1 if finished HS)			0.0913 (2.595)
Mother some college (=1 if some coll.)			3.008 (2.806)
Mother College (=1 if college)			1.541 (3.550)
Constant	9.538*** (1.640)	10.95*** (2.897)	7.175* (3.733)
Observations	221	221	134
R-squared	0.165	0.170	0.123

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1



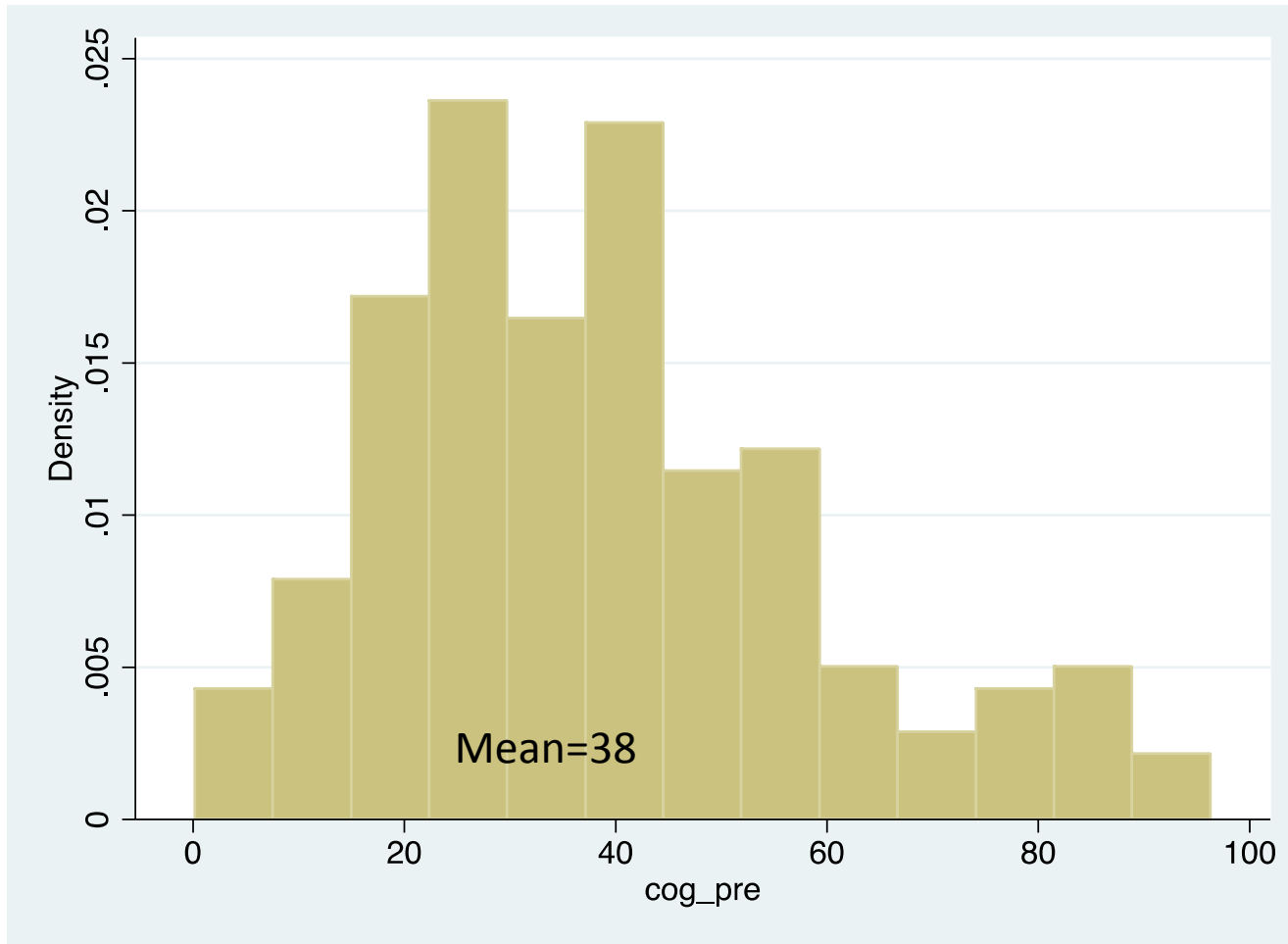
Regressions of Post to Summer End Cognitive Index

VARIABLES	(1) Improvement Pre to Summer End	(2) Improvement Pre to Summer End	(3) Improvement Pre to Summer End
Preschool (=1 if in PK)	5.453** (2.351)	4.837** (2.364)	5.284* (2.898)
Kinderprep (=1 if in KP)	0.0611 (2.866)	-0.602 (3.020)	-4.366 (4.041)
Cog_Pre (Cog score at entry)	-0.214*** (0.0414)	-0.236*** (0.0422)	-0.280*** (0.0624)
Agout dummy (=1 if age out this yr)	-4.741** (2.275)	-4.902** (2.260)	-5.167* (3.095)
Black (=1 if Black)		0.353 (2.690)	-0.0274 (2.994)
Hispanic (=1 if Hispanic)		-4.541 (2.772)	-0.347 (3.475)
Female (=1 if Female)		-0.630 (1.990)	-0.415 (2.421)
Income (Hh income at entry)			0.790 (0.623)
Mother at least HS (=1 if finished HS)			-0.566 (3.722)
Mother some college (=1 if some coll.)			6.588* (3.678)
Mother College (=1 if college)			8.032* (4.257)
Constant	16.78*** (2.211)	20.18*** (3.420)	13.76*** (4.400)
Observations	232	232	159
R-squared	0.145	0.165	0.220

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Split by Starting Score



Split by Starting Score Results

- Children below 38th percentile at start (Pre to Post Treat)

Pre to Post

VARIABLES	(1) improved_pre_post_cog	(2) improved_pre_post_cog	(3) improved_pre_post_cog
preschool	12.47*** (2.830)	10.79*** (2.774)	11.59*** (3.368)

Post to KP

VARIABLES	(1) improved_kp_post_cog	(2) improved_kp_post_cog	(3) improved_kp_post_cog
preschool	-2.132 (2.261)	-2.105 (2.283)	0.313 (2.784)
kinderprep	6.798* (3.488)	6.742* (3.444)	5.735 (3.925)

Split by Starting Score Results

- Children above 38th percentile at start (Pre to Post Treat)

Pre to Post

VARIABLES	(1) improved pre post cog	(2) improved pre post cog	(3) improved pre post cog
preschool	6.098** (2.573)	5.503** (2.610)	4.678 (3.032)
...			

Post to KP

VARIABLES	(1) improved kp post cog	(2) improved kp post cog	(3) improved kp post cog
preschool	1.155 (2.230)	1.194 (2.230)	-1.444 (4.027)
kinderprep	6.788* (3.739)	6.275* (3.753)	1.337 (6.275)

Additional Experiments

- Time preferences
- Mischel 'Marshmallow' Experiment
- Risk preferences
- Social preferences

Future Work

- Collect SD170 data (no selection problem)
 - TOT
 - ITT
- Collect data from Year 4 (additional 100s of students)
- Continue collecting data for 18 years!

- Using econ motivated interventions to investigate behavior change
- Focus on children, health, financial literacy



LAB EXPERIMENTS ↔ FIELD EXPERIMENTS



Effects of social information/image?

Charitable Giving

Recognition
Social cues

How do preferences develop?

Children/Education

Altruism
Competitiveness
Time Preference
Risk Preference

Information overload and effects of decision support tools?

Visualization & Behavioral Finance

Information Search
Choice under Risk
Financial Literacy
Financial Decisions

Incentives and information effect on change behavior and habits?

Health Behavior

Food Choice
Food insecurity



Lunchroom Studies: Peer Influence, Prompts and Incentives



Thank you!



Balance Table – All

Table 1: CHECC 2012 - All matched pairs, excluding E group and siblings

	Control	Kinderprep
N	96	96
Female	0.448 (0.500)	0.469 (0.502)
White	0.104 (0.307)	0.094 (0.293)
Hispanic	0.333 (0.474)	0.344 (0.477)
African-American	0.563 (0.499)	0.552 (0.500)
English Speaking	0.232 (0.424)	0.240 (0.429)
Missing Mother's Edu	0.083 (0.278)	0.031 (0.175)
College Educated	0.313 (0.466)	0.333 (0.474)
Highschool Education	0.135 (0.344)	0.146 (0.355)
No Diploma	0.146 (0.355)	0.156 (0.365)
Some College	0.323 (0.470)	0.333 (0.474)
Chicago Heights Resident	0.515 (0.504)	0.542 (0.501)
Age September 1st 2013	5.487 (0.295)	5.515 (0.267)
Preassessment Cog Score	42.870 (23.944)	44.808 (23.749)
Preassessment Non-cog Score	48.943 (50.878)	60.215 (40.957)
Distance from WM	7.400 (24.957)	3.237 (3.386)
Distance from HL	7.361 (24.866)	3.296 (3.473)
Distance from Summer School	6.215 (14.129)	4.008 (4.411)
Household Income	34868.852 (27599.049)	31025.641 (27081.035)

Note: The table reports means and standard deviations . The asterisks indicate statistical significance at 10/5/1 percent level. All matched children. Excludes siblings as well as unmatched new children.

Balance Table – Kinderprep Lottery

Table 1: CHECC 2012 - New Children, excluding siblings

	Control	Kinderprep
N	29	29
Female	0.448 (0.506)	0.448 (0.506)
White	0.069 (0.258)	0.103 (0.310)
Hispanic	0.310 (0.471)	0.276 (0.455)
African-American	0.586 (0.501)	0.621 (0.494)
English Speaking	0.321 (0.476)	0.179 (0.390)
Missing Mother's Edu	0.103 (0.310)	0.103 (0.310)
College Educated	0.345 (0.484)	0.241 (0.435)
Highschool Education	0.103 (0.310)	0.103 (0.310)
No Diploma	0.138 (0.351)	0.103 (0.310)
Some College	0.310 (0.471)	0.448 (0.506)
Chicago Heights Resident	0.586 (0.501)	0.655 (0.484)
Age on September 1st 2013	5.503 (0.235)	5.415 (0.294)
Preassessment Cog Score	45.214 (21.261)	45.738 (24.755)
Preassessment Non-cog Score	67.320 (13.332)	68.707 (15.813)
Distance from WM	2.697 (2.223)	3.417 (3.651)
Distance from HL	2.848 (1.831)	3.459 (3.670)
Distance from Summer School	3.038 (1.673)	3.886 (3.819)
Household Income	34423.077 (26828.229)	29981.481 (28094.785)

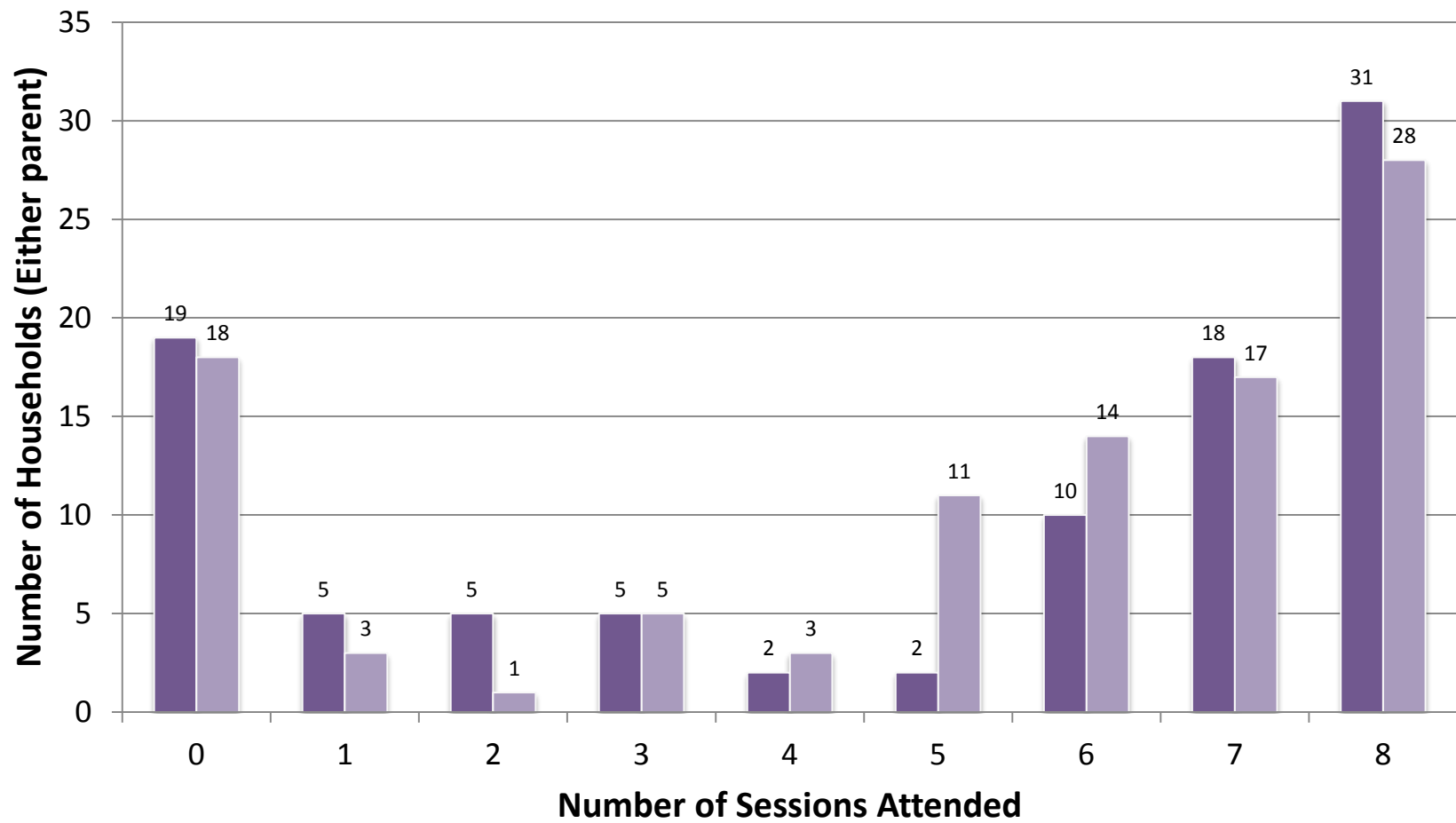
Note: The table reports means and standard deviations . The asterisks indicate statistical significance at 10/5/1 percent level. All matched children. Excludes siblings



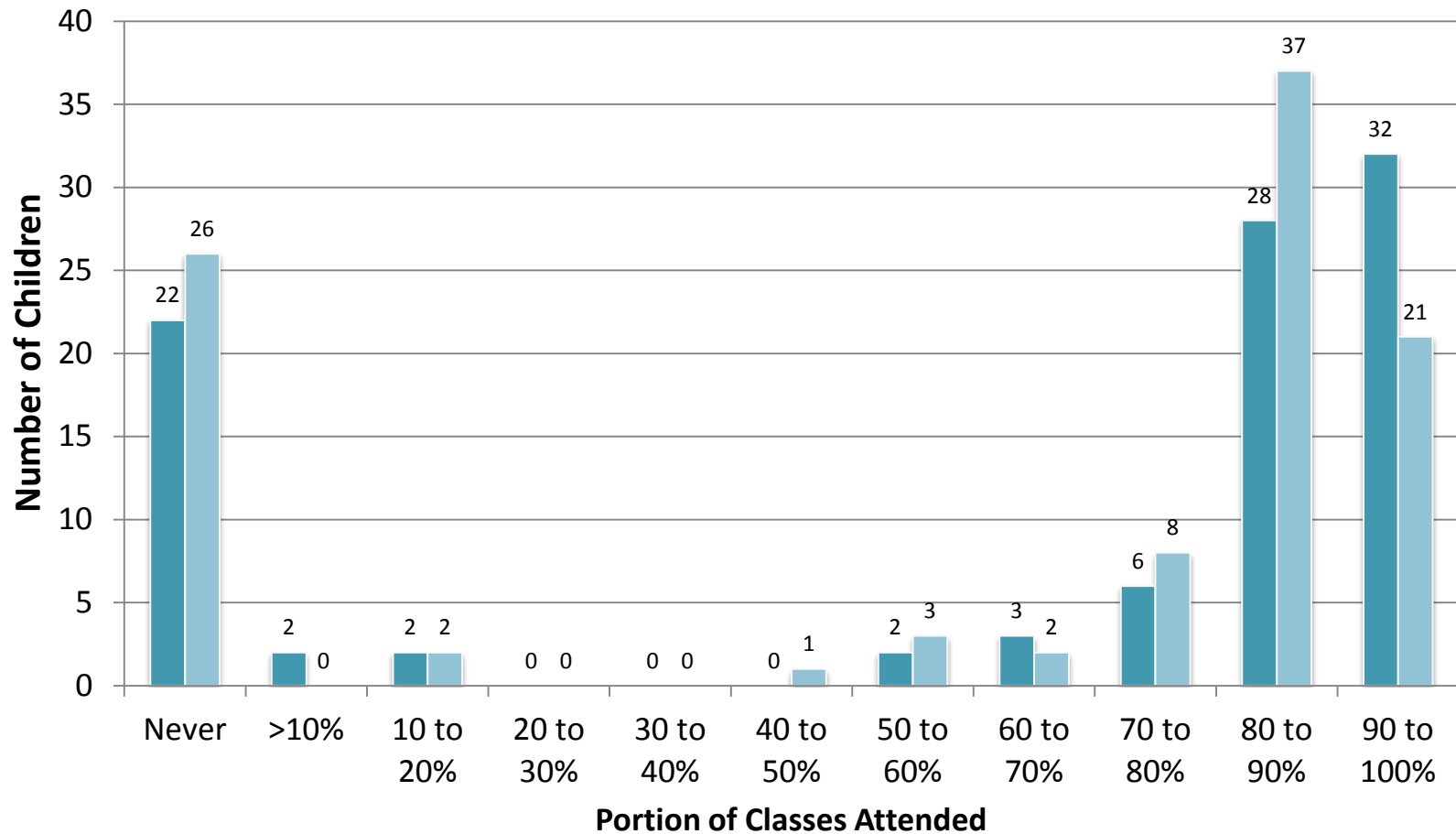
CHECC

Chicago Heights Early Childhood Center

Parent Involvement Attendance Histogram



Preschool Attendance Histogram



Daily structure & learning	Tools of the Mind	Literacy Express	Cog X
Small group and one-on-one conversations <i>Intentional engagement in classroom discussions</i>			✓
Morning meeting <i>Integrates both STEM & literacy activities</i>	✓	✓	✓
Language & Literacy <i>Teacher-led reading, phonics, and letter activities</i>	✓	✓	✓
Language & Literacy <i>Independent work</i>	✓	✓	✓
Math <i>Collaborative small-group activities</i>	✓		✓
Math <i>One-on-one instruction</i>		*	✓
Play <i>Imaginative play based that promotes executive function</i>	✓		✓
Integrated social studies and science thematic units	✓	✓	✓
Strong STEM emphasis in all daily activities			✓
Integrated parent lessons			✓

- A supplemental curricula (PreK Math) provided one-on-one lessons for all Literacy Express classrooms.

Pre to Post Noncog

VARIABLES	(1)	(2)	(3)
	improved_pre_post_noncog	improved_pre_post_noncog	improved_pre_post_noncog
eschool	-0.463 (1.670)	-0.0606 (1.716)	2.005 (2.171)
nderprep	0.563 (2.690)	0.659 (2.661)	1.995 (3.481)
ncog_pre	-0.712*** (0.0410)	-0.721*** (0.0395)	-0.713*** (0.0560)
out	4.912** (1.989)	5.403*** (1.923)	4.125 (2.669)
ack		-1.916 (2.368)	-1.993 (2.764)
panic		1.313 (2.258)	0.435 (2.929)
nale		1.795 (1.468)	2.844 (1.825)
ome			0.790 (0.523)
ghschool_m			0.175 (3.934)
mecollege_m			-1.661 (2.695)
llege_m			-4.042 (3.289)
nstant	49.55*** (2.039)	49.03*** (3.064)	46.39*** (4.080)
bservations	301	301	204
squared	0.531	0.540	0.511

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1



Post to KP Noncog

VARIABLES	(1)	(2)	(3)
	improved kp post noncog	improved kp post noncog	improved kp post noncog
preschool	-1.955 (1.758)	-1.736 (1.748)	-1.789 (2.485)
kindergarten	1.578 (2.212)	2.193 (2.263)	4.908 (3.520)
noncog_post	-0.548*** (0.0612)	-0.553*** (0.0620)	-0.581*** (0.0729)
ageout	8.313*** (1.810)	8.496*** (1.872)	10.44*** (2.788)
black		1.023 (2.453)	2.829 (3.135)
hispanic		2.865 (2.407)	5.480 (3.787)
female		-0.647 (1.592)	-3.318 (2.105)
income			1.369** (0.689)
highschool_m			1.894 (3.209)
somecollege_m			-0.714 (3.355)
college_m			-0.682 (3.956)
Constant	36.50*** (4.228)	35.23*** (5.041)	30.51*** (7.096)
Observations	221	221	134
R-squared	0.287	0.293	0.357

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

