EARLY CHILDHOOD REGRESSION DISCONTINUITY STUDY

STUDY BRIEFING
September 13, 2016

The Study

➢ **There is increasing interest across the Nation and the state of Connecticut regarding the effectiveness of preschool programs as a means of increasing school readiness and closing achievement gaps**

➢ **Public Act 13-184 (FY14/FY15 Budget Bill) provided funding for the study with CASE named to conduct study on behalf of the Connecticut General Assembly**

➢ **Public Act 15-244 authorized additional funding for the study based on additional work effort related to suspension of the state's Prekindergarten Information System (PKIS)**

➢ **The purpose of the study is to identify the effect that full-day/school-day, state-funded preschool has on children's academic achievement and social skills at kindergarten entry**

The Process

➢ **Research Team:**

 — **Neag School of Education, UConn**

  ✓ **Study Manager: Bianca Montrosse-Moorhead, with professors graduate students, and certified assessors**

 — **CASE Staff, with Study Advisors**

➢ **Research Using Identified Methods**

➢ **Study Committee**

➢ **Study Reviewers**

➢ **Study Contacts/Stakeholders**

➢ **Guest Speaker Presentations**

Study Committee

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Education Consultant; School Readiness
Liaison: Killingly, Plainfield, Putnam

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University of Illinois at Chicago

Study Research Team

➢ **UConn, Neag School of Education**

— **Study Manager: Bianca Montrosse-Moorhead, PhD,** Assistant Professor, Measurement, Evaluation, and Assessment

— **Research Team Members**
- ✓ **Shaun Dougherty, EdD**, Assistant Professor, Ed. Leadership and Policy
- ✓ **Hannah Dostal, PhD**, Assistant Professor, Literacy Education
- ✓ **Tamika La Salle, PhD**, Assistant Professor, School Psychology
- ✓ **Jennie Weiner, EdD**, Assistant Professor, Educational Leadership

— **Research Team Associates**
- ✓ **Yujia Li, MA**, Measurement, Evaluation, and Assessment
- ✓ **Maria Avita, BA**, School Psychology

➢ *CASE Staff*

— **Richard Strauss**, Executive Director
— **Terri Clark,** Associate Director
— **Ann Bertini,** Assistant Director for Programs
— **W. Steven Barnett, PhD,** *CASE Study Advisor*; Director, National Institute for Early Education Research, Rutgers University
— **Mary Beth Bruder, PhD**, *CASE Study Advisor;* Professor of Pediatrics; Director, A.J. Pappanikou Center for Execellence and Developmental Disabilities Research, Education, and Service, UConn Health Center

Academy Member Reviewers

➢ **Theodore Holford, PhD,** Susan Dwight Bliss Professor of Public Health (Biostatistics), Yale School of Public Health

➢ **Nalini Ravishanker, PhD**, Professor and Undergraduate Director, Department of Statistics, UConn

The Study

➢ **1.0 STUDY BACKGROUND**

➢ **2.0 INTRODUCTION AND STUDY METHODS**

➢ **3.0 IMPLEMENTATION**

➢ **4.0 DATA COLLECTION AND ANALYSIS**

➢ **5.0 DISCUSSION AND IMPLICATIONS**

The Study: Appendices (1)

- ➢ **APPENDIX A: THE RESEARCH TEAM**

- ➢ **APPENDIX B: SUMMARY OF AGE-CUTOFF RD STUDIES INVESTIGATING THE EFFECTS OF PUBLICLY FUNDED PREKINDERGARTEN PROGRAMS ON CHILDREN'S ACADEMIC AND SOCIAL-EMOTIONAL SKILLS**

- ➢ **APPENDIX C: TEACHER/PARENT GUARDIAN QUESTIONNAIRES**

- ➢ **APPENDIX D: UCONN'S INSTITUTIONAL REVIEW BOARD (IRB) APPROVALS**

The Study: Appendices (2)

➢ **APPENDIX E: ANALYSIS OF POPULATION AND SAMPLES, AND OF TREATMENT AND CONTROL GROUPS**

➢ **APPENDIX F: FINAL POWER ANALYSIS**

➢ **APPENDIX G: ANALYSIS OF BASC-3 RESPONSES**

➢ **APPENDIX H: ADDITIONAL TESTS OF ESTIMATE ROBUSTNESS**

Chapter 1
Study Background

Nationwide Perspective
Supplemental to Report

➢ # Why Might Prekindergarten Be Needed?

— **Many children face the challenge of poverty with minority students often being particularly at risk—42.5% of African-American children and 37.1% of Hispanic children under age 5 *(Center for American Progress, 2012)***

— **Children from low-wealth backgrounds in rural or urban centers experience a number of barriers to academic and social development *(Brooks-Gunn & Markham, 2005; Lugo-Gil & Tamis-LeMonda, 2008)*; for example, often being 4 to 6 months behind in emergent literacy *(Guerrero et. al, 2012)* and vocabulary *(Hart & Risley, 1995)***

— **These gaps persist over time, in 2013 the gap between the average scores of white and black students is 26 points for both 4th grade math and 4th grade *(NAEP, 2013*)**

— **Remedial investments in young children, particularly those most disadvantaged, improve outcomes and reduce differences at school entrance *(Cunha & Heckman, 2008)* including those relating to social adjustment *(Mashburn et al., 2008)***

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Nationwide Perspective (2)

➢ **National Institute for Early Education Research (NIEER) 2012-13 annual report indicates (Barnett et al, 2013):**

— **Quality of programs remain variable with different degrees of emphasis and/or alignment with best practice to develop early academic and social skills**

— **2013 was the first year that all 50 states (and D.C.) had "comprehensive early learning standards" covering all areas identified as fundamental by the National Education Goals Panel**

Connecticut

➢ **Connecticut ranks high in early childhood spending, 3rd for state-expenditures and 2nd for total expenditures**

➢ **Connecticut met 6 out of the 10 NIEER standards:**

✓ **comprehensive early learning standards**

✓ **specialized training in prekindergarten**

✓ **class sizes no larger than 20 children**

✓ **a staff-child ratio of 1:10 or better**

✓ **vision, hearing, and health screenings and referrals**

✓ **home visits or home visit referrals**

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Purpose of Study

➢ **To investigate the immediate effects for prekindergarten children who attend state-funded *(i.e., School Readiness Program funded)*, full-day/school-day preschool in Connecticut**

— **Evaluation Questions:**

1. Do children who attend full-day/school-day state-funded preschool programs enter kindergarten with better <u>language and literacy skills</u> than if they had not attended the program?

2. Do children who attend full-day/school-day state-funded preschool programs enter kindergarten with better <u>mathematics skills</u> than if they had not attended the program?

3. Do children who attend full-day/school-day state-funded preschool programs enter kindergarten with better <u>social skills</u> than if they had not attended the program?

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Chapter 2
Introduction and Study Methods

Connecticut Pre-K Treatment and Dosage Differences

➢ **School Type (Treatment)**
— **Federal Head Start**
— **Federal Early Start**
— **CT Head Start**
— **School Readiness**
— **Magnet, Charter, and Private Providers**

➢ **Dosage**
— **Extended Day**
— **Full-Day**
— **School-Day**
— **Half-Day**

Study Methods (1)
What is Regression Discontinuity?

➢ **Regression discontinuity is a research method that facilitates the ability to make claims about cause-and-effect without needing to use a lottery**

➢ **Particularly useful in studies where the treatment *(in this case, state-funded prekindergarten)* cannot or should not be randomly assigned through a lottery process to determine who gets to participate**

What is Regression Discontinuity?

➤ **Method uses a cut-off variable to determine who is in the treatment group and who is in the control *(to make them "equal in expectation")***

- 3 months   **+3 months**

Study Methods (3)
What type of conclusions can be drawn from a regression discontinuity study?

| Can Conclude from RD	Cannot Conclude from RD
On average, that treatment makes a positive difference	What about the treatment makes the difference
This treatment causes better results, on average	That this is the best of all possible treatments
The tested treatment does produce positive results, on average, in the population	That this is the most efficient (resources or cost) treatment

Study Methods (4)
Sample

➢ **1,300 students total** *(650 in treatment group, 650 in control group)* **were randomly selected to participate**

— <u>Assumption</u>: **Student enrollment patterns are not changing within mature prekindergarten schools/centers** *(open 3+ years)*

— **Statistically tested this assumption through a feeder analysis:**

✓ **Assessed characteristics of prior students** *(2011-14),* **including the prekindergarten program in which they enrolled** *(i.e., not just school readiness funded)* **and where they subsequently went to kindergarten**

✓ **Assessed attrition from prekindergarten to kindergarten**

✓ **Assessed the stability of patterns over time**

— **Feeder analysis confirmed that enrollment patterns were stable, and thus a random selection process would work**

Study Methods (5)
Randomly Sampled Students with Sites
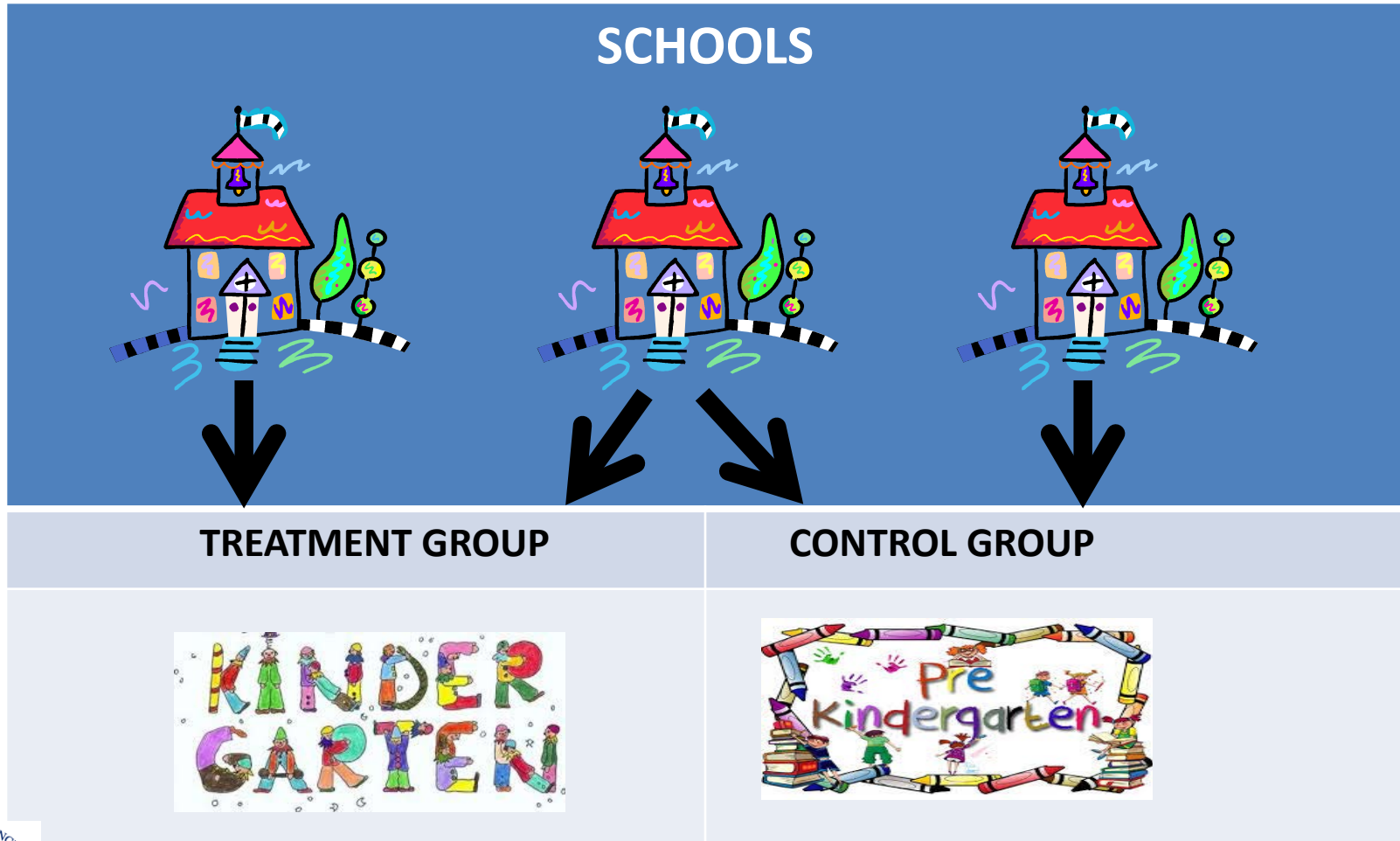
Study Methods (6)
Outcomes Measured

➤ **Early Literacy Skills**

➤ **Early Numeracy Skills**

➤ **Early Oral Language Skills**

➤ **Early Vocabulary Skills**

➤ **Social Development**

Assessments to be Deployed	Associated Skills Color
Woodcock-Johnson, 4th Ed.(WJ-IV)	🟩
Peabody Picture Vocabulary Tests , 4th Ed.(PPVT- IV)	🟦
Behavior Assessment Scale for Children, 2nd Ed. (BASC-2)	🟨

Study Methods (7)
Outcomes Measured

Test Evidence		Sub-test	Skill Focus	Max # of items	Time to Complete (mins.)
Woodcock-Johnson, 4th Ed.(WJ-IV)	**Basic Reading**	Word Attack	Phonemic Awareness	32	5
		Letter-Word Identification	Letter/word recognition	76	5
	Oral Language	Picture Vocabulary	Expressive Vocab	44	5
		Oral Comprehension	Comprehension	34	5
	Broad Math	Applied Problems	Problem solving	63	5
		Calculation	writing numbers to numerical operations	42	5
		Math Fluency	Quickly solving numerical operations	Time-based	Time-based

23

Study Methods (8)
Outcomes Measured

	Test Evidence	Sub-test	Skill Focus	Max # of items	Time to Complete (mins.)
Peabody Picture Vocabulary Tests, 4th Ed. (PPVT- IV)	Picture Vocabulary	N/A	Picture to word recognition	228	10-15

Study Methods (9)
Outcomes Measured

	Test Evidence	Sub-test	Skill Focus	# of items	Time to Complete (mins.)
Behavior Assessment Scale for Children, 2nd Ed. (BASC-2)	Social Development	N/A	Externalizing Problems Internalizing Problems Behavioral Symptoms Index Adaptive Skills	Teacher Rating Scales (TRS): 100-139 items Parent Rating Scales (PRS) contain 134-160 items	10-20 (per child) 10-20 (per child)

Chapter 3
Implementation

Implementation Timeline (1)
Sample of Key Milestones 2014

May	✓ **CASE under contract with the CGA to conduct the RD Study** ✓ **Research Team (UConn) selected, study advisors identified, and study committee established** ✓ **Initial meetings with OEC and CSDE to provide a study overview and review study tasks involving each agency, including negotiation of CSDE MOU for access to administrative data**
June	✓ **CSDE/UConn MOU for access to administrative data executed** ✓ **First study committee meeting with presentations by NIEER on RD studies and the Research Team on the proposed methodological approach for the study** ✓ **Scope of Work Task 1: Research Plan section of study report completed.**
July	✓ **IRB approval procured.**
Aug.	✓ **Notification received that Prekindergarten Information System (PKIS) eliminated** ✓ **Decision made to postpone study 1 year** ✓ **Solution adopted to obtain "PKIS-like" prekindergarten data**

Implementation Timeline (2)
Sample of Key Milestones 2015

Sept.	✓ Ordered data collection assessment materials ✓ Assessor recruitment initiated and completed ✓ IRB approval secured for data collection
Oct.	✓ School notification begins
Nov.	✓ Data collection begins
Dec.	✓ Data collection continued ✓ Decision made to extend data collection thru January

Implementation Timeline (3)
Sample of Key Milestones 2016

Jan.	✓ Decision made to extend data collection thru February
Feb.	✓ Decision made to extend data collection thru March
Mar.	✓ Data collection completed
Apr.	✓ Data analysis completed
May	✓ All chapters of final report finalized

Chapter 4
Data Collection and Analysis

Final Sample (1)

	Prekindergarten (2015-16)	Kindergarten (2015-16)
Number in group	323	206
Gender (%)		
Female	50.31	54.93
Male	49.69	45.07
Ethnicity (%)		
White	26.02	36.54
African American/Black	31.79	29.33
Hispanic/Latino	45.03	42.79
Asian	3.73	3.37
Other	9.09	6.25

Final Sample (2)

	Prekindergarten (2015-16)	Kindergarten (2015-16)
Lunch (%)		
Free	**60.44**	**51.94**
Reduced	**4.97**	**5.34**
Age when assessed (Mean/SD)	**4.3 (0.54)**	**5.4 (0.32)**

Final Sample (3)

	Prekindergarten (2015-16)	Kindergarten (2015-16)
Number in group	**323**	**206**
Average Standard Scores (Mean/SD)		
Basic Reading	**91.78 (11.93)**	**98.24 (10.99)**
Broad Math	**84.75 (20.22)**	**91.49 (12.99)**
Picture Vocabulary	**96.10 (15.44)**	**101.15 (13.98)**
Oral Comprehension	**94.16(16.09)**	**96.70 (14.83)**
Note: SD = Standard Deviation. PPVT-4 = Peabody Picture Vocabulary Tests, Fourth Edition. WJ-IV = Woodcock-Johnson, Fourth Edition		

Total Assessors Used: 58

University Based Assessors	Number of Undergrad. Assessors	Number of Graduate Assessors
UConn	32	12
Southern Connecticut State University	0	3
Fairfield University	0	2
Springfield College	0	1
Other, Non-University Based Assessors	**Number of Other Assessors**	
Retired School Psychologists	2	
UConn Faculty	6	

Data Analysis – Regression Discontinuity

➢ **Step 1: Confirm the cut-off appears random**

— **Student records from the sample showed that the distribution of birthdates is smooth and continuous around the January 1ˢᵗ cut off date**

➢ **Step 2: Confirm the study has enough participants on either side of the cut-off**

— **Student records from the sample showed that there are enough students on either side of the cut-off.**

➢ **Step 3: Confirm students on either side are "equal in expectation"**

— **There were no meaningful statistically significant differences across groups in selected demographics.**

➢ **Step 4: Use date of birth and eligibility status to predict student outcomes**

— **Gaps at the point of the cut-off provide insights into differing performance levels between the groups on average**

➢ **Step 5: Test robustness using different bandwidths and functional forms**

— **None of the results are sensitive to differences in functional form or bandwidth**

Research Question #1

> **Do children who attend full-day/school-day state-funded preschool programs enter kindergarten with better <u>language and literacy skills</u> than if they had not attended the program?**

Research Question #1
Early Literacy

Claim	Test Evidence	Measures	What Students Do on this Test	Skill Focus
Large, positive and statistically significant effects on a subset of student's early <u>literacy</u> skills (0.69 SD)	**Basic reading**	**WJ-IV: Letter-word identification**	**Recognizing and naming printed letters and words**	**Letter/word recognition**
		WJ-IV: Word attack	**Reading made-up words that conform to conventional spelling rules**	**Phonemic awareness**

Research Question #1
Early Vocabulary

Claim	Test Evidence	Measures	What Students Do on this Test	Skill Focus
Suggested positive, but non-statistically significant, effects on student's early <u>vocabulary</u> skills	**Picture vocabulary**	**PPVT-IV**	**Listening to a word describing one of four pictures and then pointing to the picture that the word describes**	**Picture-to-word recognition**

Research Question #1
Early Oral Language

Claim	Test Evidence	Measures	What Students Do on this Test	Skill Focus
Suggested positive, but non-statistically significant, effects on student's early <u>oral language</u> skills	Oral Comprehension	WJ-IV: Picture Vocabulary	Listening to a word describing one of four pictures and then pointing to the picture that the word describes	Picture-to-word recognition
		WJ-IV: Oral Comprehension	Listening to an oral passage and identifying a missing key word that makes sense	Listening comprehension

Research Question #2

➢ **Do children who attend full-day/school-day state-funded preschool programs enter kindergarten with better <u>mathematics skills</u> than if they had not attended the program?**

Research Question #2
Early Numeracy

Claim	Test Evidence	Measures	What Students Do on this Test	Skill Focus
Large, positive and statistically significant effects for most student's early numeracy skills (0.48 SD)	**Broad math**	**WJ-IV: Calculations**	**Arithmetic computation with paper and pencil**	**Writing numbers to numerical operations**
		WJ-IV: Math Fluency	**Simple calculations for three minutes**	**Quickly solving numerical operations**
		WJ-IV: Applied Problems	**Oral, math "word problems," solved with paper and pencil**	**Math problem solving**

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➢ **Do children who attend full-day/school-day state-funded preschool programs enter kindergarten with better <u>social skills</u> than if they had not attended the program?**

Research Question #3
Social Skills

Claim	Test Evidence	Measures	What Parents/Teachers Do on this Test	Skill Focus
Unknown effects for student's early <u>social skills</u>	**Social Development**	**N/A**	**Answer survey questions**	**Externalizing Problems**
				Internalizing Problems
				Behavioral Symptoms Index
				Adaptive Skills

Chapter 5
Discussion and Implications

Conclusions (1)

Can Conclude from RD
On average, the School Readiness full-day or school-day prekindergarten programs makes a positive difference in the areas identified as statistically significant. Specifically, prekindergarten students who attend School Readiness full-day or school-day programs do better, on average, in early literacy and early numeracy.

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Conclusions (2)

Cannot Conclude from RD

➢ **What about the School Readiness program makes a positive impact?**

The RD design does not provide information about the quality of instruction, the curriculum resources, or other factors that might have made these findings vary across the sample

➢ **What is the best of all possible School Readiness programs?**

This study cannot indicate whether another model of delivery might be better, nor can the study indicate comparative differences in delivery between full-day, school-day, extended-day, and half-day programming

➢ **Which aspects of the School Readiness program generated the most valuable outcomes?**

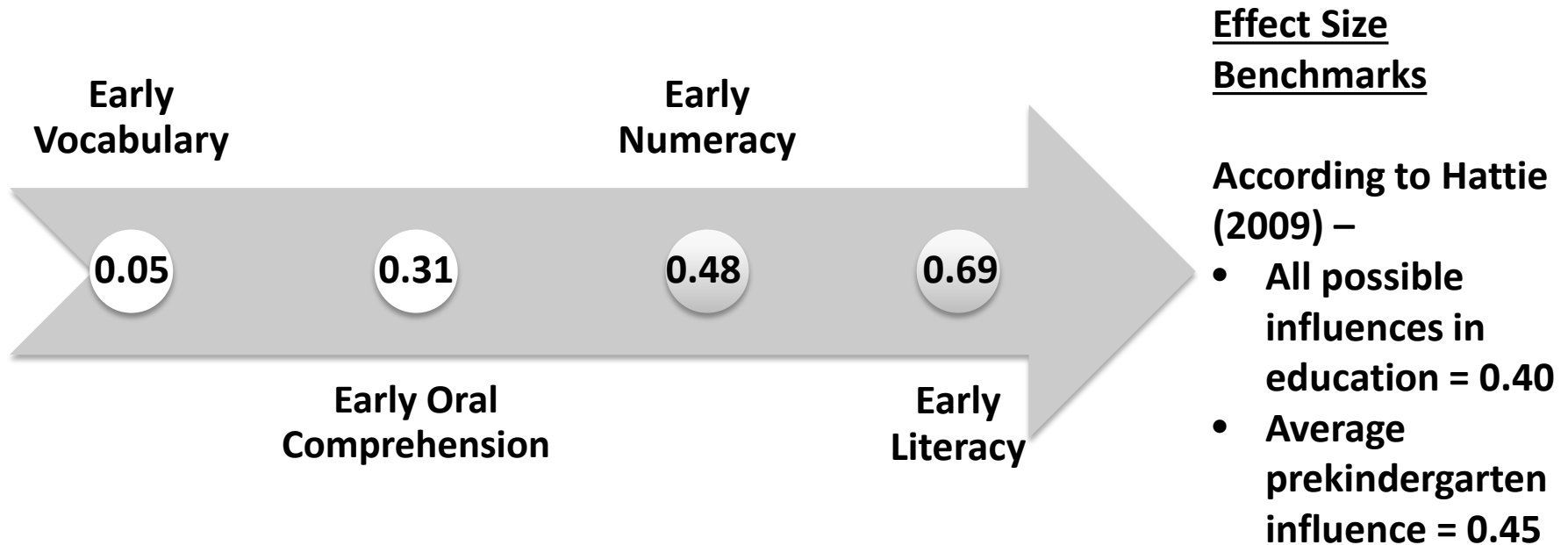**This study cannot indicate the cost-benefit associated with different funding configurations**

Conclusions (3)

➢ **Two key limitations of this study and efforts to address them are as follows**

Limitations	How Addressed
Representativeness *(Participation rate of 40.7%)*	• Frequent updates throughout the planning phase • Meetings with School Readiness program liaisons • Donation of additional administrative support from UConn • Consistent with prior studies *(Peisner-Feinberg, et al., 2014; Lipsey, et al., 2015)*
Data Collection Window *(Nov. – Mar.)*	• Statistically addressed this shift in timeline • Consistent with prior studies *(e.g., Lipsey, Farran, Bilbrey, Hofer, and Dong, 2011)* • Results indicated no statistical effect of time of testing on the results

Conclusions (4)
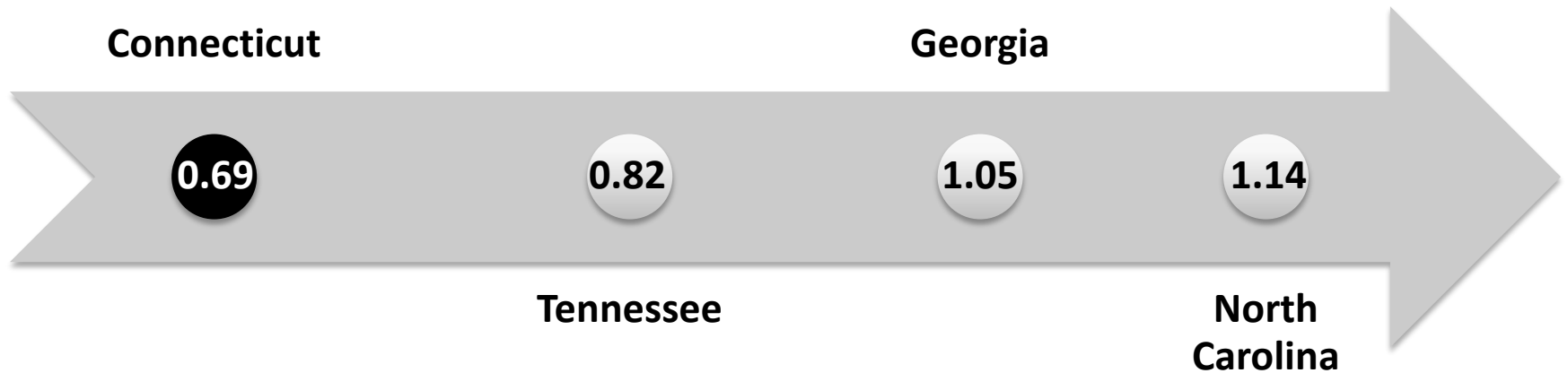
➤ How important are effects?

Effect Size Benchmarks

Early Vocabulary

Early Numeracy

0.05 **0.31** **0.48** **0.69**

Early Oral Comprehension

Early Literacy

According to Hattie (2009) –
- **All possible influences in education = 0.40**
- **Average prekindergarten influence = 0.45**

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Conclusions (5)

➢ **Interpreting Connecticut Effects in Relation to Prekindergarten Effects Found in Other States**

Conclusions (5)

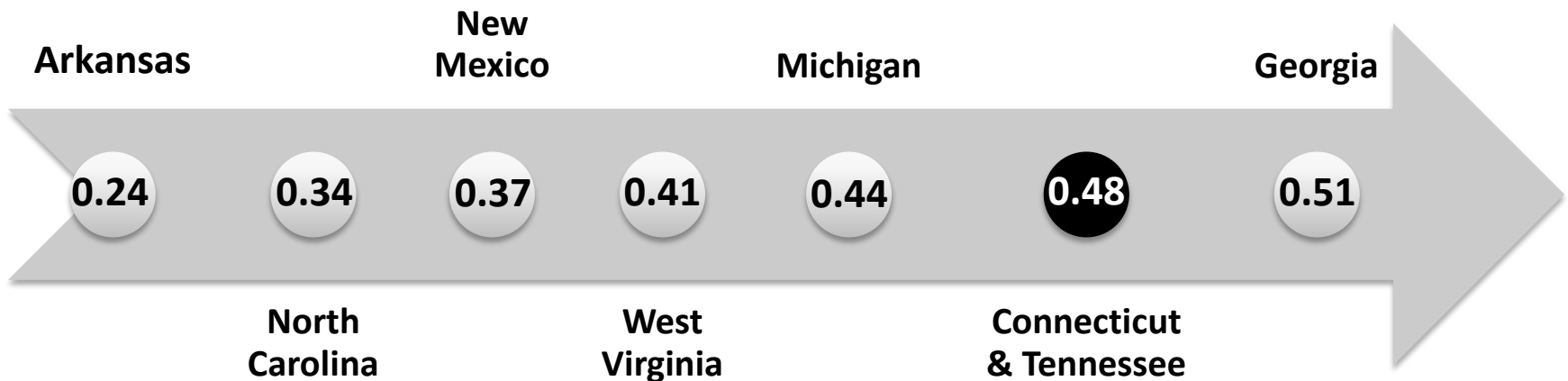**Early Literacy – Statistically Significant**

Early Numeracy – Statistically Significant

Arkansas — 0.24

North Carolina — 0.34

New Mexico — 0.37

West Virginia — 0.41

Michigan — 0.44

Connecticut & Tennessee — 0.48

Georgia — 0.51

Conclusions (7)

➢ **Interpreting Connecticut Effects in Relation to Prekindergarten Effects Found in Other Studies**

— **Effect sizes reported for other state-funded prekindergarten programs range from .23–.53 *(Gilliam & Zigler, 2001)***

— **Effect sizes for prekindergarten programs generally from .10 to .13 *(Magnuson, et al., 2004)***

— **Effect sizes for high-quality childcare programs seldom exceed .10 *(NICHD Early Child Care Research Network & Duncan, 2003; Peisner-Feinberg et al., 2011)***

— **Effect sizes for the Abecedarian project were .73 and .79 for children ages 4 and 5 years old *(Ramey, et al., 2000)***

— **Effect sizes for Perry Preschool program were .60 *(Ramey et al., 1985)***

Recommendations
Future Evaluation Questions (1)

What works?	1. Do replication studies support impact study findings across different cohorts of students? 2. Do longitudinal replication studies support impact study findings long-term? 3. Do children who attend full-day or school-day, state-funded preschool programs enter kindergarten with better social skills than if they had not attended the program?
What works for whom?	1. Do results vary by state-funded preschool program type? 2. Do results vary by student characteristics (e.g., gender, race/ethnicity, income)? 3. Do results vary by student skill level (e.g., English proficiency)?

Recommendations
Future Evaluation Questions (2)

What works, for whom, and under what conditions?	1. Do results vary by program quality? 2. Do results vary by amount of school/system instructional support?
Which aspects are valuable?	1. What is the relationship between program costs and outcomes observed? 2. Which aspects of the school readiness program generated the most valuable outcomes?

Recommendations
Conducting Future Statewide Prekindergarten Studies
Low Participation (1)

Strategy	Pro	Con
Mandate that schools and centers participate	Greater participation	Requires change in CT's governance model
Require schools and centers to file a letter of cooperation	Potential for greater participation	Limits generalizability to those that filed a letter
Plan for low participation rates	Minimize concerns about study power beforehand	Increase $ costs as will need to budget to sample a much larger overall group to ensure adequate participation

Recommendations
Conducting Future Statewide Prekindergarten Studies
Low Participation (2)

Strategy	Pro	Con
Alternative levels of stipends or alternative stipend disbursement methods	Potential for greater participation for parent/guardian and teachers	• Increase $ costs • No research to inform incentive amount • No research specific to teachers or parent/guardian
Alternative parent/guardian data collection strategies	Potential for greater participation for parent/guardian	• Increase $ costs • Shorter, potentially less informative surveys • Requires sharing parental contact and address information

Recommendations
Conducting Future Statewide Prekindergarten Studies
Student-Level Data

➢ **Data collection system that includes student demographic information** *(e.g. race/ethnicity, socio-economic status, gender)* **and program information** *(e.g., PreK program type, date student entered, date student withdrew)* **is needed to:**

— **Seamlessly follow PreK and K students**

— **Facilitate the efficient transfer of school and center student data for prekindergarten and kindergarten**

— **Share data as close to start of year as possible**

Recommendations
Funding Future Research Studies

➢ **Connecticut has history of securing external funding for this type of work** *(e.g., 2014 Preschool Development Grant from the US Department of Education)*

➢ **Potential sources**

— **U.S. Department of Education's Institute for Education Sciences**

— **U.S. Department of Health and Human Service's National Institutes of Health**

Thank You

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