Effects of the Tennessee Voluntary Prekindergarten Program on School Readiness

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SREE September 2012

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Funded by the Institute for Education Sciences Grant #R305E090009
Why Investigate TN Pre-K Effects?

- Tennessee invests over $85 million a year in its statewide Pre-K program
- 934 state-funded Pre-K classrooms that serve 18,000+ economically disadvantaged children across all 95 Tennessee counties
- Some Tennessee legislators question the value of Pre-K, e.g., calling it “expensive babysitting”
- No randomized longitudinal study of public Pre-K has yet been conducted

TN-VPK Program

- State licensed teacher with an early childhood education endorsement in each classroom;
- Small class size-- maximum of 20;
- Approved age-appropriate curriculum aligned with the Tennessee Early Childhood Education Developmental Standards;
- Minimum of 5.5 hours per day, exclusive of nap time, for a minimum of 180 days per year within a calendar that includes 200 working days of 7.5 hours for teaching staff.
TN-VPK Child Population

- To be eligible for TN-VPK, children must be age four on or before September 30 of the respective school year.
- By statutory requirement, the program gives top priority to children who qualify for the Free or Reduced Price Lunch Program, and the majority of the children enrolled statewide meet that criterion.

Two Interleaved Studies in the Evaluation

1. RCT (Randomized Controlled Trial)
   - Random assignment of VPK applicants to admission or waiting list in willing schools expecting more applicants than they had places in their program
   - Strong design
   - Allows longitudinal follow-up
   - Not necessarily representative of TN-VPK statewide
Two Interleaved Studies ...

2. RDD (Regression Discontinuity Design)
   - Compares outcomes for children before (control) and after (treatment) the age cutoff for TN-VPK eligibility
   - Applied to a representative sample of VPK programs spread over four regions of TN
   - Includes classroom observations and teacher and administrator surveys
   - Does not allow longitudinal follow-up
   - 40 classrooms per region; more than 3400 students to date – potential of 2400 more

Full Sample of Randomized Applicant Lists: Cohorts 1 & 2

122 Lists submitted for randomization:
- Unique schools, 1 list either cohort =49
- Unique schools, 1 list, both cohorts=26
- Unique schools, 2 lists CH 1, 1 list CH 2=7

115 Useable randomized lists

7 Resulted in either no Pre-K or no Control cases
Full Sample of Randomized Children: Cohorts 1 & 2

3252
On the 115 eligible randomized applicant lists

11
Set aside by school and not randomized

7
Too young

2
Over income

18
Blended Pre-K

3214
In final sample

1964
Treatment

1250
Control

TN Pre-K Effectiveness Study
Randomized Control Trial Participants
Group 1 Pre-K 2009 - 2010
Group 2 Pre-K 2010 - 2011
RCT Intensive Sub-study (ISS)

- Includes children with parental consent in the Pre-K and Control conditions
- Parent interviews
- Assessment of language, literacy, and math skills of the children enrolled in both conditions
  - At the beginning and end of the Pre-K year
  - At the end of each subsequent year through 3rd grade
- Kindergarten teacher ratings of school readiness, liking for school, and classroom behavior at beginning of K year

<table>
<thead>
<tr>
<th>Source</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort 1</td>
<td>26</td>
<td>.02</td>
<td>.87</td>
<td>.35</td>
</tr>
<tr>
<td>Cohort 2</td>
<td>53</td>
<td>.18</td>
<td>1.00</td>
<td>.68</td>
</tr>
</tbody>
</table>
ISS Randomized Applicant Lists: Cohorts 1 & 2

- 115 Eligible Lists for full sample
- 12 No children consented
- 24 Resulted in no consented Pre-K or no consented Control cases
- 79 Usable randomized lists for ISS sample
  - 60 schools
  - 21 school districts

ISS Analysis Sample: Cohorts 1 & 2

- 1197 Consented children on the 79 eligible randomized lists
- 48 Never assessed
- 70 Not posttested
- 1079 In analysis sample
  - 773 Treatment
  - 306 Control
  - 302 Control after PS trimming
Intensive Substudy Outcome Measures

Woodcock Johnson III Scales

- **Literacy**: Letter-Word Identification, Spelling
- **Language**: Picture Vocabulary, Oral Comprehension
- **Math**: Applied Problems, Quantitative Concepts
- **Overall WJ Composite**
  - Mean W score across all WJ scales

Kindergarten Teacher Ratings

- Academic Child Behavior Record: School Readiness, Liking for School, & Behavior Problems
- Cooper-Farran Work-Related & Social scales

Analysis Sample – Control Arrangements
### Analysis Sample: Baseline Differences

<table>
<thead>
<tr>
<th></th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Male</td>
<td>48%</td>
<td>47%</td>
</tr>
<tr>
<td>% Black</td>
<td>22%</td>
<td>24%</td>
</tr>
<tr>
<td>% White</td>
<td>59%</td>
<td>49%</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>16%</td>
<td>25%</td>
</tr>
<tr>
<td>% ESL</td>
<td>16%</td>
<td>29%</td>
</tr>
<tr>
<td>Mean Age at Pretest</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Mean WJ Composite</td>
<td>395</td>
<td>392</td>
</tr>
</tbody>
</table>

### Analysis Plan – Propensity Scores

- Variables included in Propensity Score
  - Male
  - Black
  - Hispanic
  - ESL
  - Age at Postest
  - Test Lag
  - Test Interval
  - Working Parents
  - Library Card Use
  - Newspaper Subscription
  - Magazine Subscription
  - Mother Education
  - All Pretests

- Propensity Score used as Level 1 covariate in all analyses
- Consent rate for T and C groups on each randomized list, and interaction, used as Level 2 covariates.
Overall VPK Impact on WJIII Achievement Measures

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pre-K</th>
<th>Control</th>
<th>b</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Composite</td>
<td>773</td>
<td>302</td>
<td>5.59**</td>
<td>.34</td>
</tr>
<tr>
<td>Literacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter-Word ID</td>
<td>773</td>
<td>302</td>
<td>12.36**</td>
<td>.47</td>
</tr>
<tr>
<td>Spelling</td>
<td>773</td>
<td>302</td>
<td>6.06**</td>
<td>.24</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture Vocabulary</td>
<td>773</td>
<td>302</td>
<td>3.73**</td>
<td>.21</td>
</tr>
<tr>
<td>Oral Comprehension</td>
<td>773</td>
<td>302</td>
<td>1.71*</td>
<td>.10</td>
</tr>
<tr>
<td>Math</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Problems</td>
<td>773</td>
<td>302</td>
<td>4.60**</td>
<td>.20</td>
</tr>
<tr>
<td>Quantitative Concepts</td>
<td>773</td>
<td>302</td>
<td>4.72**</td>
<td>.30</td>
</tr>
</tbody>
</table>

** p < .05       * p < .10

Woodcock Johnson Composite Score Pre-K Gain

![Graph showing pretest-posttest standard deviation with VPK and No VPK lines. The VPK line shows a .68 SD increase compared to a .34 SD increase for No VPK.](image)
VPK Effects on the WJII Subscales

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Control Group Pre-Post Effect Size</th>
<th>Pre-K Effect Size</th>
<th>% Improvement with Pre-K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Composite</td>
<td>.68</td>
<td>.34</td>
<td>50%</td>
</tr>
<tr>
<td>Literacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter-Word ID</td>
<td>.49</td>
<td>.47</td>
<td>96%</td>
</tr>
<tr>
<td>Spelling</td>
<td>.71</td>
<td>.24</td>
<td>34%</td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture Vocabulary</td>
<td>.33</td>
<td>.21</td>
<td>63%</td>
</tr>
<tr>
<td>Oral Comprehension</td>
<td>.41</td>
<td>.10</td>
<td>25%</td>
</tr>
<tr>
<td>Math</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Problems</td>
<td>.61</td>
<td>.20</td>
<td>32%</td>
</tr>
<tr>
<td>Quantitative Concepts</td>
<td>.60</td>
<td>.30</td>
<td>50%</td>
</tr>
</tbody>
</table>

Overall Impact on Kindergarten Teachers’ Ratings

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pre-K</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Cooper-Farran Social Behavior</td>
<td>699</td>
<td>263</td>
</tr>
<tr>
<td>Cooper-Farran Work-Related Skills</td>
<td>699</td>
<td>263</td>
</tr>
<tr>
<td>ACBR Preparedness for Kindergarten</td>
<td>698</td>
<td>263</td>
</tr>
<tr>
<td>ACBR Peer Relations</td>
<td>698</td>
<td>263</td>
</tr>
<tr>
<td>ACBR Behavior Problems</td>
<td>699</td>
<td>263</td>
</tr>
<tr>
<td>ACBR Feelings About School</td>
<td>698</td>
<td>263</td>
</tr>
</tbody>
</table>

** * p <.05  * p <.10
Differential Effects on WJIII Composite Achievement Measure

<table>
<thead>
<tr>
<th>Interaction with condition</th>
<th>b</th>
<th><strong>p &lt; 0.05</strong></th>
<th>No difference</th>
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</thead>
<tbody>
<tr>
<td>Cohort</td>
<td>-1.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity: Black</td>
<td>0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity: Hispanic</td>
<td>7.33**</td>
<td></td>
<td>Favors Hispanic children</td>
</tr>
<tr>
<td>Native English Speaker</td>
<td>-6.87**</td>
<td></td>
<td>Favors ELL children</td>
</tr>
<tr>
<td>Pretest</td>
<td>-0.12**</td>
<td></td>
<td>Favors children with low baseline scores</td>
</tr>
</tbody>
</table>

**p < 0.05    * p < 0.10

Differential Effects for ELL vs. Non-ELL Children on the WJIII Composite Score
Differential Effects for Children Beginning with Low vs. High Baseline Scores on the WJIII Composite Score

Conclusions

- Children in VPK made significantly greater gains across all the achievement measures during the Pre-K year than similar children not in VPK
- The effects were larger for literacy measures than for math or language
- Effects were greater for ELL and Hispanic children
- Effects were greater for children with low baseline scores
- Kindergarten teachers rated children in VPK the previous year higher on readiness for K, work-related skills and social behavior than children without VPK.
Future Results Still to Come

- Follow-up of outcomes for the Intensive Substudy Cohorts through third grade
- Grade retention, special education placement, and achievement test outcomes for the full RCT sample through third grade
- Effect estimates from the RDD, eventually including more than 140 VPK classrooms
  - Correlation of child gain with classroom characteristics

Thanks?