Lead Exposure and the Black-White Test Score Gap

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Racial Disparities in Test Scores

Figure 7. Trend in NAEP reading average scores and score gaps for White and Black 9-year-old students

* Significantly different (p < .05) from 2012.

NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.
Large literature examining causes of the gap

• Reviewed by Jencks and Phillips, eds (2008 and 2011) and Magnuson and Waldfogel, eds (2008)

• Consider the following factors:
  • Family income
  • Family structure
  • Parenting practices
  • Quality of educational inputs
  • School segregation (Reber, 2010; Guryan, 2004))
  • Neighborhood segregation (Card and Rothstein, 2007)

• Even considering all the above factors, substantial gaps remain
Two Related Questions:

• Can environmental inequality explain any of the racial gap in test scores?
  • African-Americans disproportionately exposed to pollutants
  • Conditional on exposure, may have fewer resources to counter negative effects (eg, nutrition)

• Can environmental regulation reduce disparities in test scores?
Trends in racial disparities in lead & test scores
Greater Exposure of African-Americans to Lead

• Nationally, African Americans more likely to live in old (pre 1978) housing

• Within RI, differences even greater with respect to the oldest housing
  • Due to concentration of African American in the core urban parts of the state
  • 60% of poor whites live in the urban core, 89% of poor blacks do

<table>
<thead>
<tr>
<th></th>
<th>Pre 1978</th>
<th>Pre 1945</th>
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<tbody>
<tr>
<td>Black</td>
<td>0.83</td>
<td>0.52</td>
</tr>
<tr>
<td>White</td>
<td>0.74</td>
<td>0.37</td>
</tr>
<tr>
<td>&lt;=100% FPL</td>
<td>0.81</td>
<td>0.43</td>
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<tr>
<td>&gt;=200% FPL</td>
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Structure of The Research:

• Document disparities in lead levels by race and income
• Examine a policy aimed at reducing lead levels among RI children
  • Disproportionate declines in the lead levels of African American & the poor
• Link declining disparities in lead levels with declining disparities in test scores
Data

• Data on child blood lead levels (BLLs) in first 72 months of life (RIDOH) linked with third through eight grade test scores (RIDE)
  • On average, 4.7 (median=4) BLLs per child
  • Date of test, location of child, method, level
  • NECAP test scores for reading and math in grades 3-8, free-lunch status, IEP
  • Linked with vital statistics data: maternal race, ethnicity, education, marital status, birth weight, gender, month prenatal care initiated, birth order
• Covers birth cohorts 1997-2005 in the state.
  • In RI, 80% of all children screened at least once by 36 months
  • In RI, 15-20% in private school as of 2010
  • Final sample of 70,000 linked children
Fig 1: Certificates and 1997 Tract Characteristics
Effect Size

• Average lead levels fell from 4 to 2.5 over this period
• On average, the rise in DOH certificates can explain 15-20% of this decline.
• DOH certificates not evenly distributed across the state: living in a neighborhood that received a high number of certificates, associated with slightly less than a doubling of the decline in lead levels
Can lead certificates explain the disproportionate decline in lead among black children?

• More certificates in neighborhoods with a larger share black
• Within neighborhoods, black children’s lead levels disproportionately affected by certificate availability
• Of the 2.3 point decline in average lead levels among African Americans for 1998-2004 birth cohorts, 52% is explained by the rise in certificates.
Figure 5C: Reading Scores by Race & Cohort

Black

[Graph showing density distribution of reading scores for Black students in 1998 and 2004.

White

[Graph showing density distribution of reading scores for White students in 1998 and 2004.

Kernals: epanechnikov, bandwidth: 2.5230 for Black, 1.8808 for White.
Trends in disparities in test scores

• Racial gap in test scores fell from 9.7 for those born in 1998 to 6.3 for those born in 2004 (from 70% to 45% of a standard deviation).

• For lead, the racial gap fell from 2.2 to 0.9 over this same period

• Based on our estimates, the decline in the gap in lead levels explains half of the decline in the test score gap.

• Income gap in test scores and lead both fell, but by smaller amounts:
  • Income test score gap fell from 9.3 to 8.4 (67% to 60% of a std deviation)
  • Income lead level gap fell from 1.83 to 0.99
Conclusions

• RI policy targeted and disproportionately reduced the lead levels of African American and low income children.

• The resulting declines in racial disparities in lead exposure can explain a substantial share of the recent decline in racial test score disparities.
  • Eliminating the black-white test score gap single most effective way to reduce racial economic inequality (Jencks and Phillips, 2011).

• Policy Implications: Targeting environmental regulation at children at greatest risk has the potential to reduce disparities in future economic outcomes.