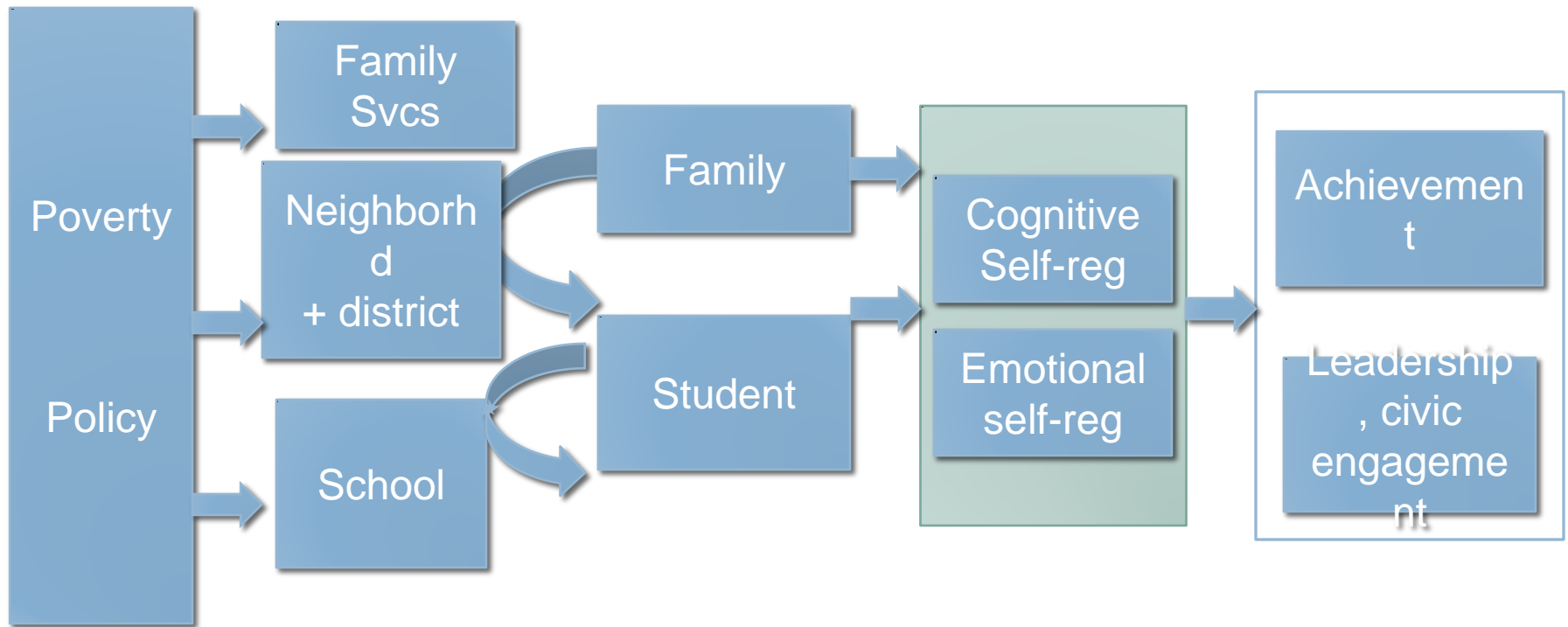


“Toxic Stress:” How economic inequality hurts child development (and how early intervention can help)

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JULY 30, 2015

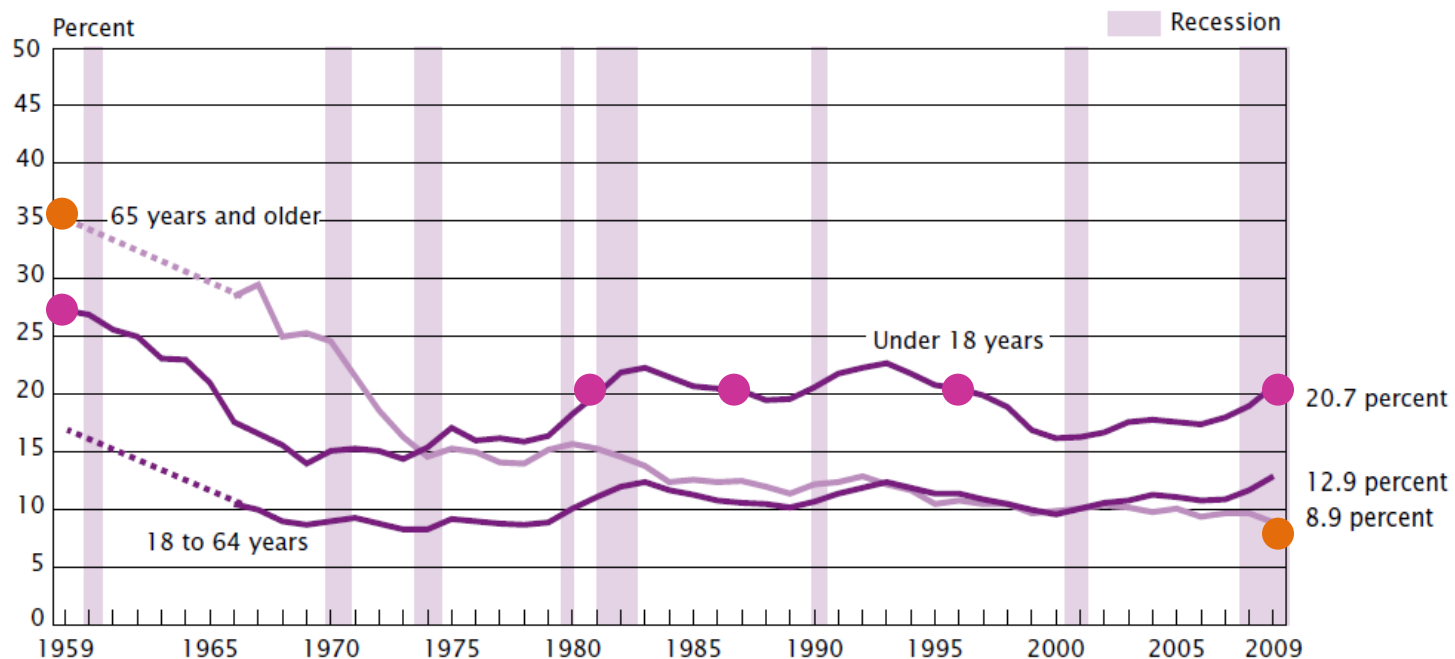
Overview



Leveraging neuroscience to understand the “cost” of exposure to poverty-related “toxic” stressors
Leveraging prevention science to understand the policy options we have to support resilience in the face of risk

Child and Family Poverty in the U.S.

Figure 5.
Poverty Rates by Age: 1959 to 2009



Notes: The data points are placed at the midpoints of the respective years. For information on recessions, see Appendix A.
Data for people aged 18 to 64 and 65 and older are not available from 1960 to 1965.
Source: U.S. Census Bureau, Current Population Survey, 1960 to 2010 Annual Social and Economic Supplements.

Tackling the 'achievement gap': Is the solution to ask teachers to increase instruction?

Income gap between our nation's richest and poorest children has widened dramatically, with correspondingly large educational disparities in their chances for early school success (Reardon, 2011).

- Results from the nationally representative Early Childhood Longitudinal Survey-K, for example, highlight that children from economically disadvantaged households arrive at kindergarten substantially behind in early reading and math skills, as compared to their middle- and higher-income counterparts (Chatterji, 2006; Lee & Burkham, 2002).

To tackle these disparities, states and national funding sources (e.g. IES) have recently made major investments in funding the design and evaluation of range of innovative programs targeting early language, mathematics skills, and reading among children at risk of school failure (see as examples, Clements & Jarama, 2008; Diamond, Justice, Seigler & Snyder, 2013).

While a number of those academically-oriented interventions have yielded evidence of student gain, a new generation of interventions also highlights the promise of supporting the self-regulatory processes that underlie those early academic skills.

Why?

Opportunities for learning: Self-regulation as key foundation

Cognitive regulation-- Developmental science, neuroscience clearly demonstrate

- Children's learning relies on higher-order cognitive processes called "Executive Functions" of EF.
- Attention
- Working Memory
- Inhibitory control

EF in early childhood consistently predicts math (and reading) in later grades over and above IQ, processing speed (Navarro, et al., 2010; Blair & Razza, 2007; Clark et al., 2012)

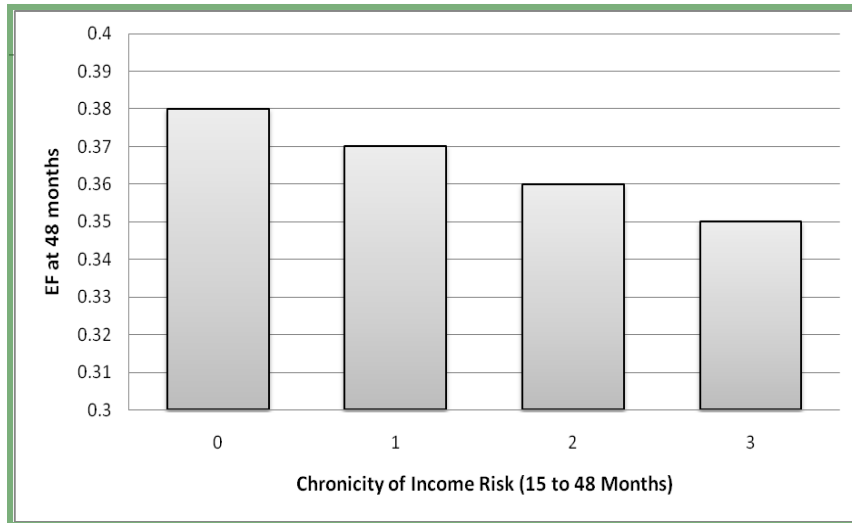
Links between emotional regulation (ER) and EF--

- Short time course: Moderate arousal supports EF, while high negative arousal is disruptive to attention, working memory-- e.g. test anxiety.
- Over longer time course, exposure to "toxic stress" -> disrupted neuroendocrine (e.g. HPA axis) function associated with emotion regulation. This system, in turn, supports or constrains development of EF over time.

Implications for later life outcomes: (Moffit & Caspi)

- High self-control -> income age 32, for example, is $B = -0.112$.
- Low self-control in early childhood is associated with almost double the likelihood of criminal conviction by age 32 (OR = 1.714)

The malleability of EF (and ER) to “toxic stress”



SES disparities in EF,
Children exposed to higher
levels of poverty for longer
periods of time have greater
difficulty with

- Attention
- Working memory
- Inhibitory control

Raver, Blair et al (2014)

Increasing evidence for the “toxic stress” hypothesis –

Stressors associated with poverty increase wear and tear on cardiovascular and HPA axis-> hypothesized to be “biomediator” of impact on brain development and function

Repair: Neuroscience and intervention

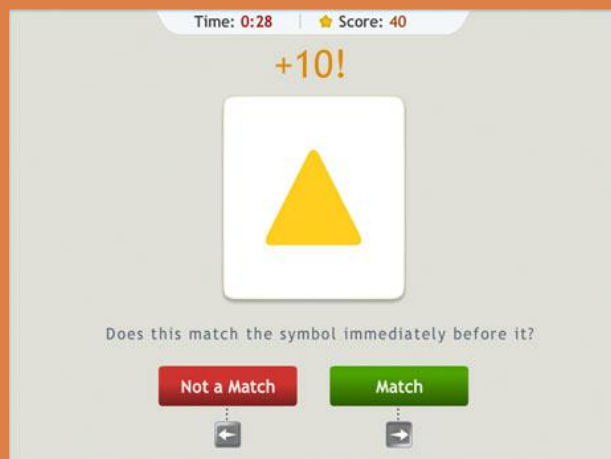
Recent advertisement for
Webinar in Education Week:

“Researchers at the University of Wisconsin-Madison believe new video games like Crystals of Kaydor and Tenacity can measure student learning in real time **while literally rewiring kids' brains** to help them pay better attention and improve their behavior.”

“Lure of neuroplasticity” - the rapid development in childhood of the neural substrate of EFs -> explosion in the number of products that claim to “train the brain” (Rabipour & Raz, 2013).

Efforts to improve children’s executive function:

- Laboratory-based game-like computer-based training administered to individual children (Loosli, Buschkeuhl, Perrig, & Jaeggi, 2012; Mackey, Hill, Stone, & Bunge, 2011),
- Clinically oriented training targeting children with difficulty (such as those children with ADHD) (Klingberg et al., 2005),
- Interventions targeting children’s classroom, home environments (Diamond et al., 2007).



CSRP- Cluster-randomized trial implemented in Head Start settings to support children's self-regulation and school readiness.

Funded by NICHD

4-component model:

- Teacher training +
- Stress reduction
- Mental Health Consultation-coaching
- Mental Health Consultation- 1-on-1 services to children with highest EBPs

Implemented in 7 neighborhoods of concentrated disadvantage.

Communities experiencing < median levels of crime.

18 Sites, 90 teachers, 602 children.
Rates of consent = 91%,
SD = 6% .

Legend

% Poverty

0.00 - 20.00

20.01 - 40.00

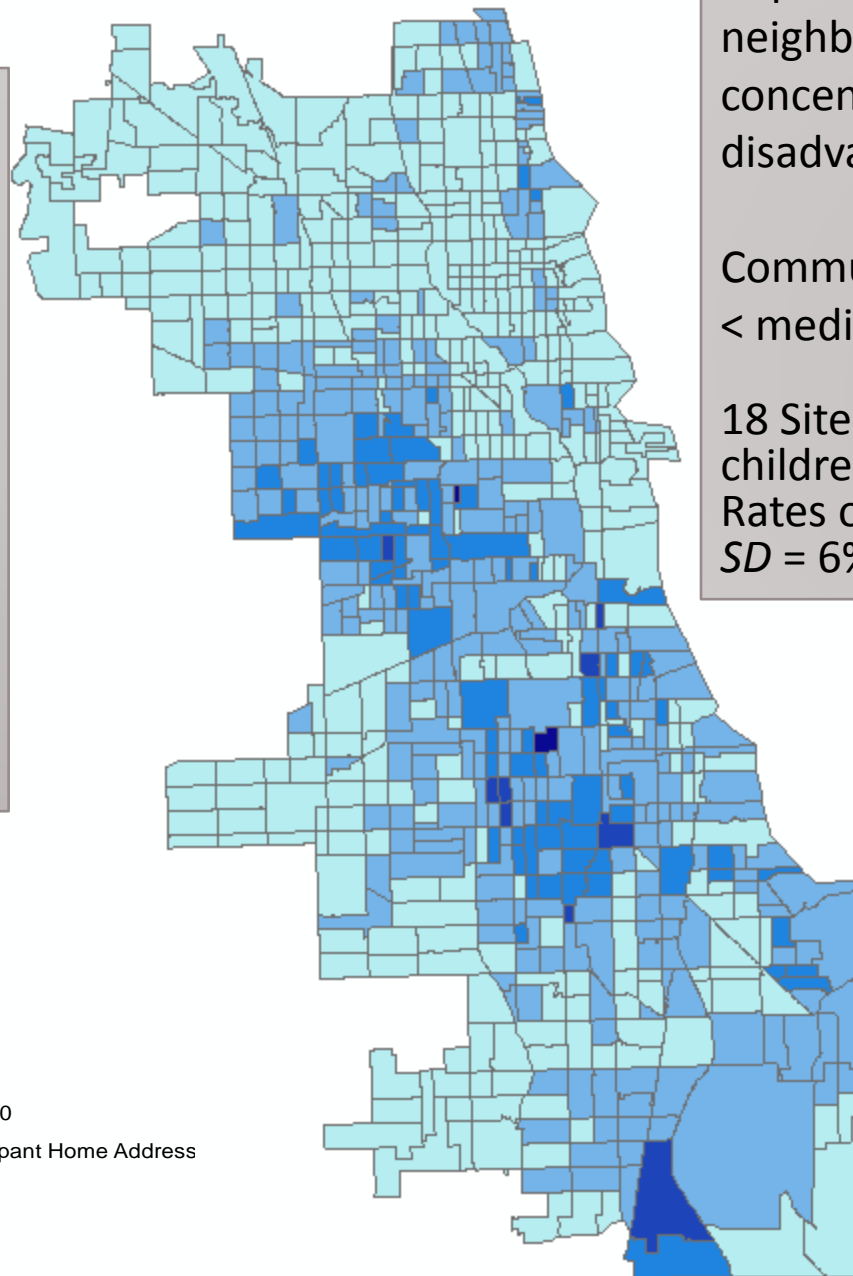
40.01 - 60.00

60.01 - 80.00

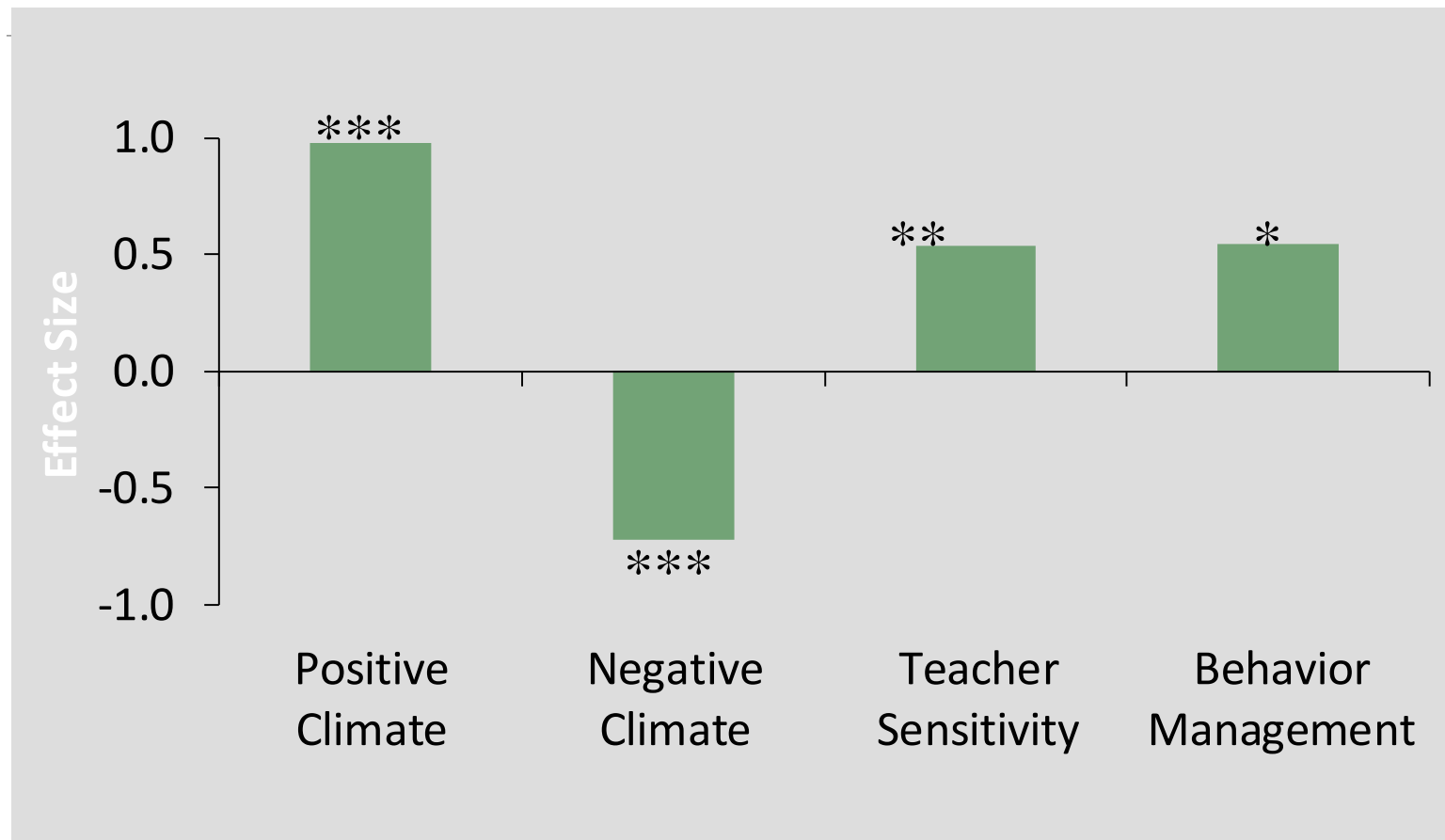
80.01 - 100.00

■ CSRP Participant Home Address

● Homicides



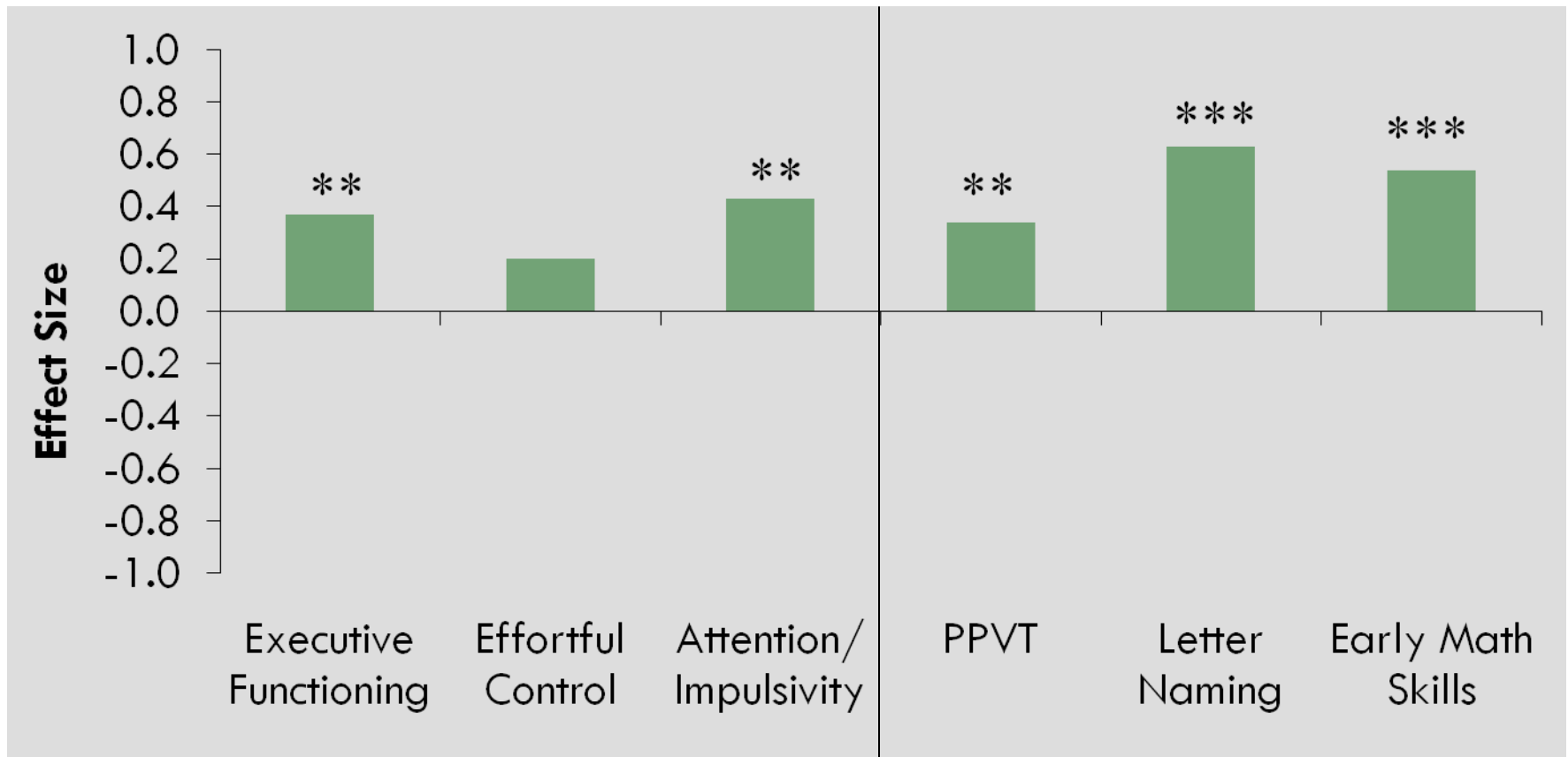
Impacts on CLASS, end HS Year



SOURCE: Raver, Jones, Li-Grining, Metzger, Champion, & Sardin (2008), *Early Childhood Research Quarterly*.

NOTES: Significance levels are indicated as * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Impacts on EF, Self-Reg, Pre-Ac Skills

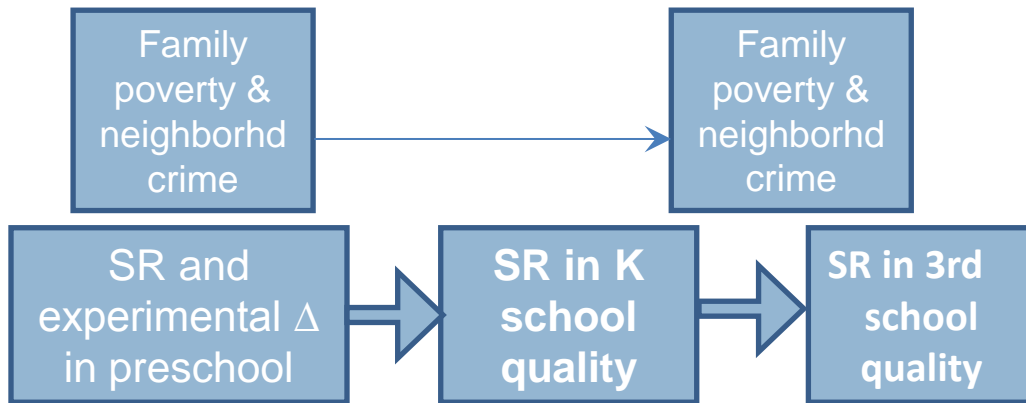


SOURCE: Raver, Jones, Li-Grining, Zhai, Bub, & Pressler (2011), *Child Development*.

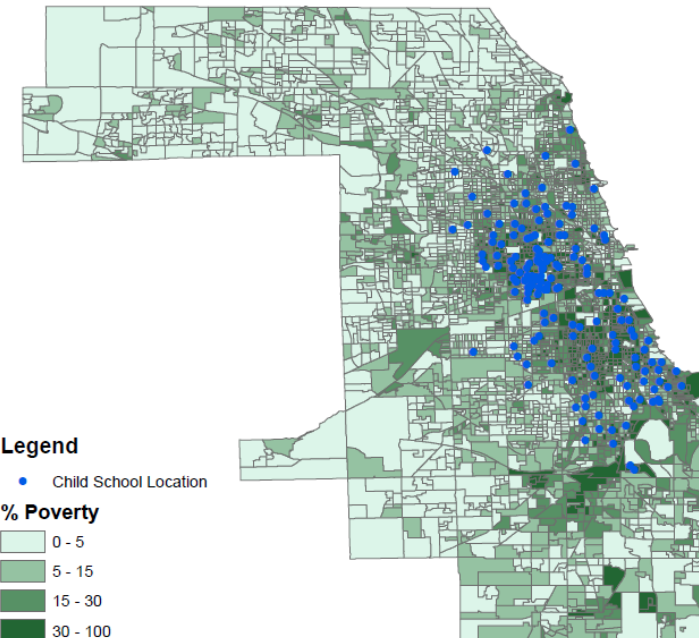
NOTES: Significance levels are indicated as * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

What happens when children go to elementary school?

- What represents “fair expectations” of long-term impact in the context of poverty-related adversity?
- re children facing, besides Δ in preschool quality?



Children are exposed to “2nd treatment” of higher vs. lower school quality + ongoing exposures to neighborhood stressors



What do we mean by toxic stressors?

“Approx 1/3rd sample exposed to 5-7 very different types of risks from ages 4-11



Raver, C. C., Roy, A. & Pressler, E. (2014). Struggling to stay afloat. In Amato et al (Eds) *Families in an Era of Increasing Inequality: Diverging Destinies*

Roy, A. & Raver, C. C. (2014). Are all risks equal? Early experiences of poverty-related risk and children’s functioning. *Journal of Family Psychology*, doi: 10.1037/a0036683

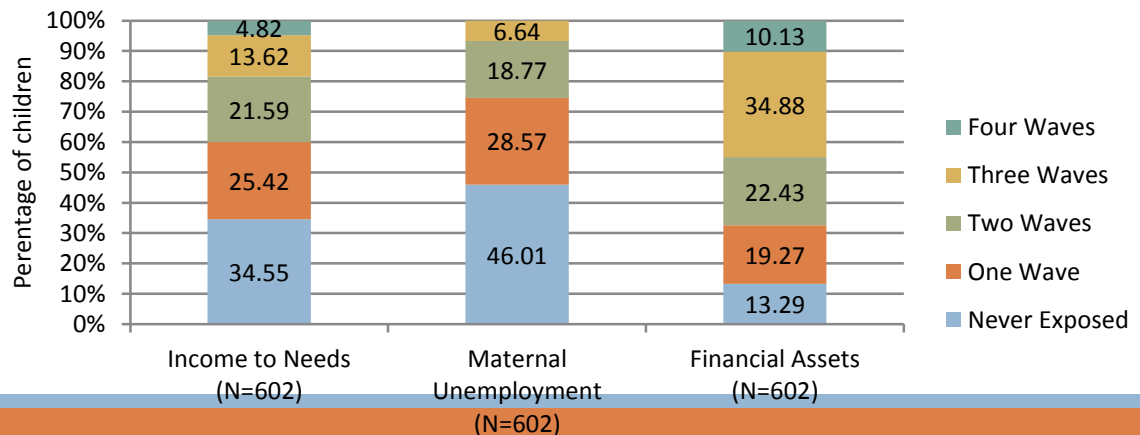
Moving beyond a “when it rains, it pours” perspective -

Types

- Low income/low SES –
- Trouble “making ends meet” - financial hardship – psychological distress as key feature –
- Substandard, crowded housing –
- Exposure to violence – clinically oriented research on PTSD and neurobiology of “fear circuitry” in response to threat

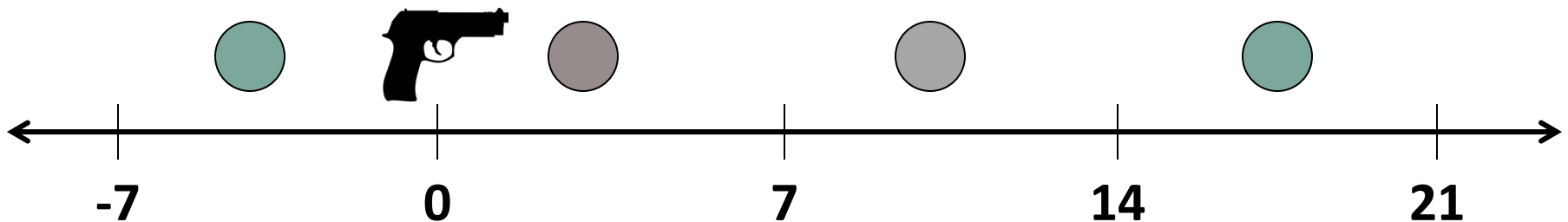
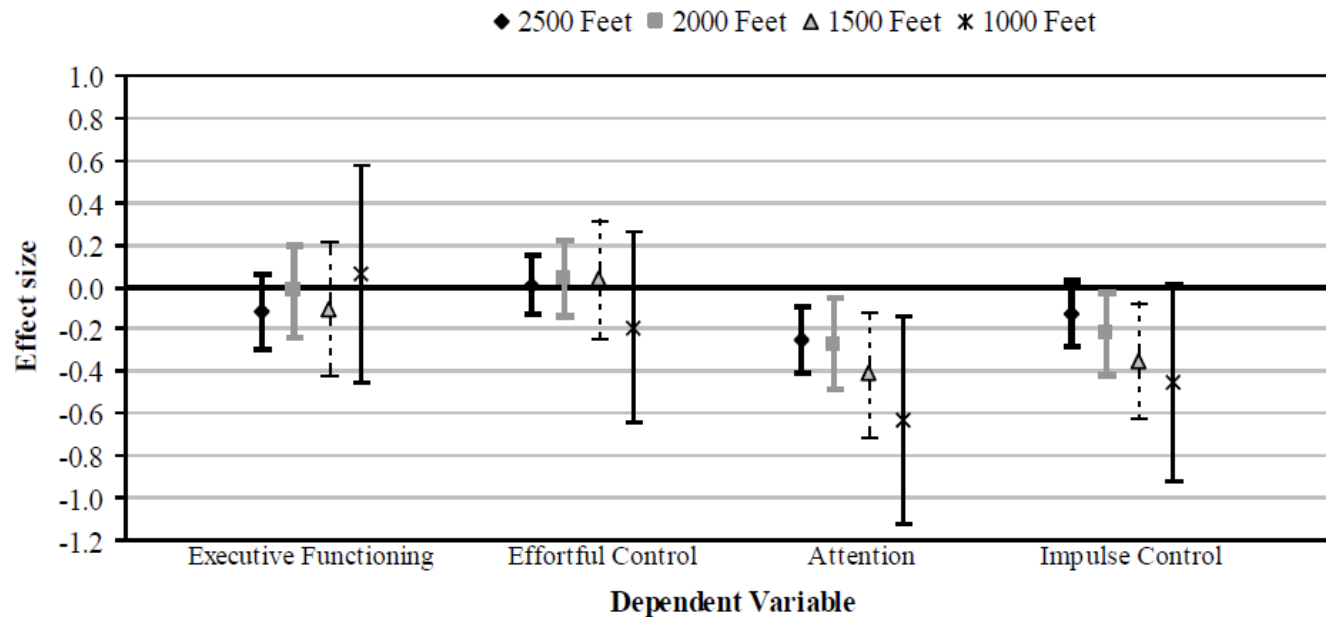
Chronicity

FIGURE 10. Chronicity of risk exposure: Sociodemographic Risk Cluster



Testing the role of community violence

Re-analysis of CSRP data from Head Start. We exploited variation in exposure to local violence among children living within the same geographic area who were assessed at different times (Sharkey, Tirado-Strayer, Papachristos, & Raver, 2012).



The role of violence in 5th grade: McCoy, Sharkey & Raver, in press.

We were able to relocate most of CSRP children in 5th grade.

n = 359 children

M age = 9.89 yrs

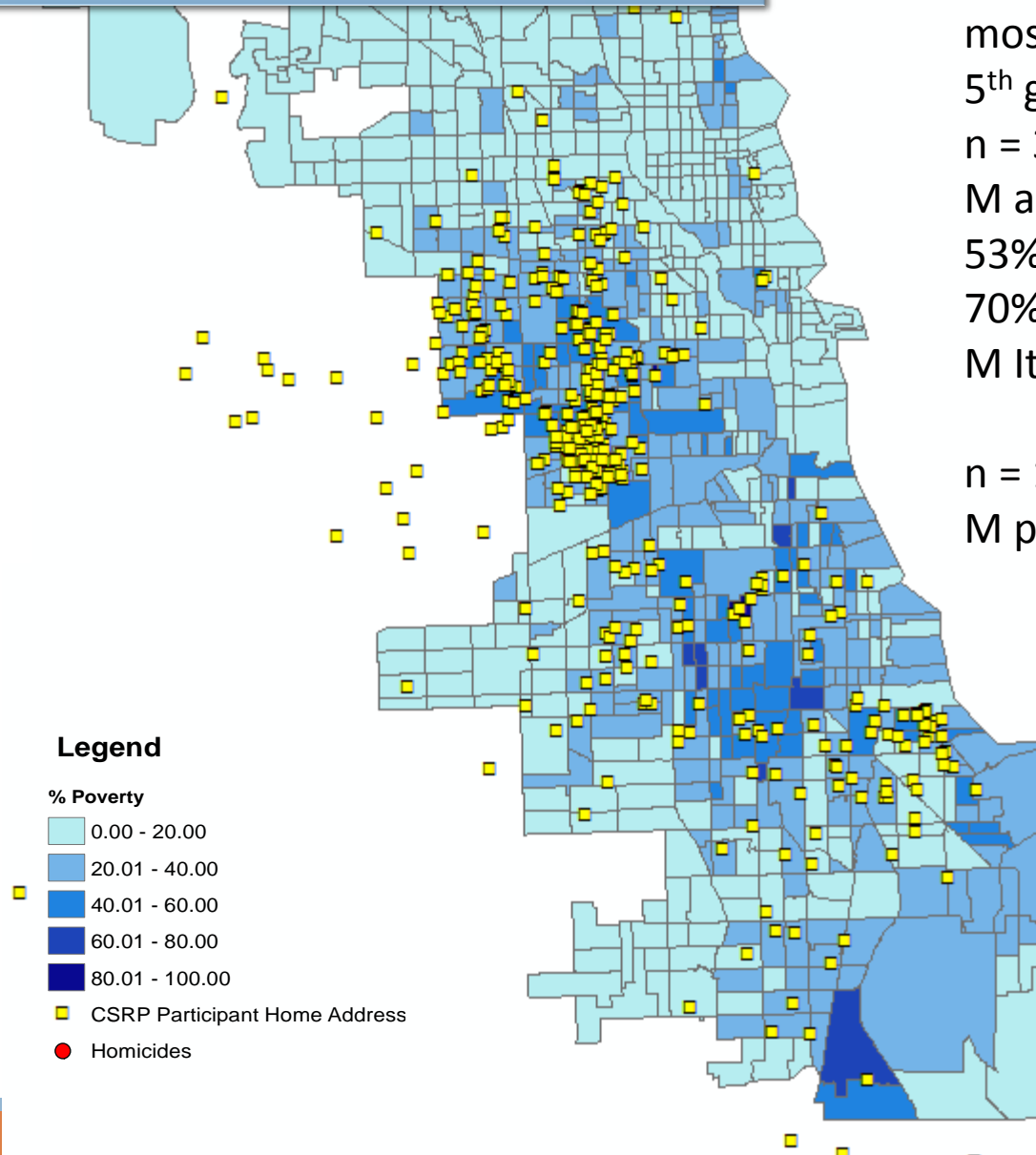
53% female

70% black

M ItoN = 0.83

n = 188 Census tracts

M poverty = 30%



Dana McCoy mapped crime data for the year, and was able to compare the timing of crimes relative to the timing of our neuropsychological “dot probe” assessments of each CSRP student.

n = 917 homicides
n = 58,088 violent crimes

Legend

% Poverty

0.00 - 20.00

20.01 - 40.00

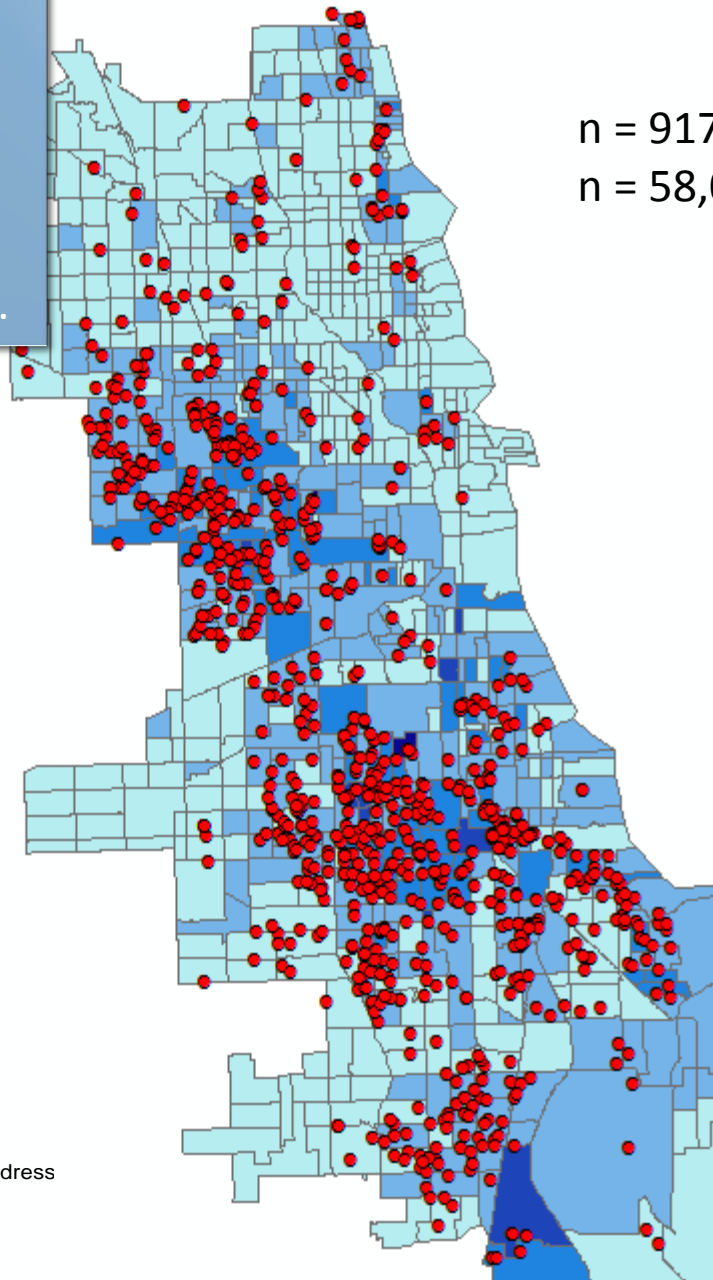
40.01 - 60.00

60.01 - 80.00

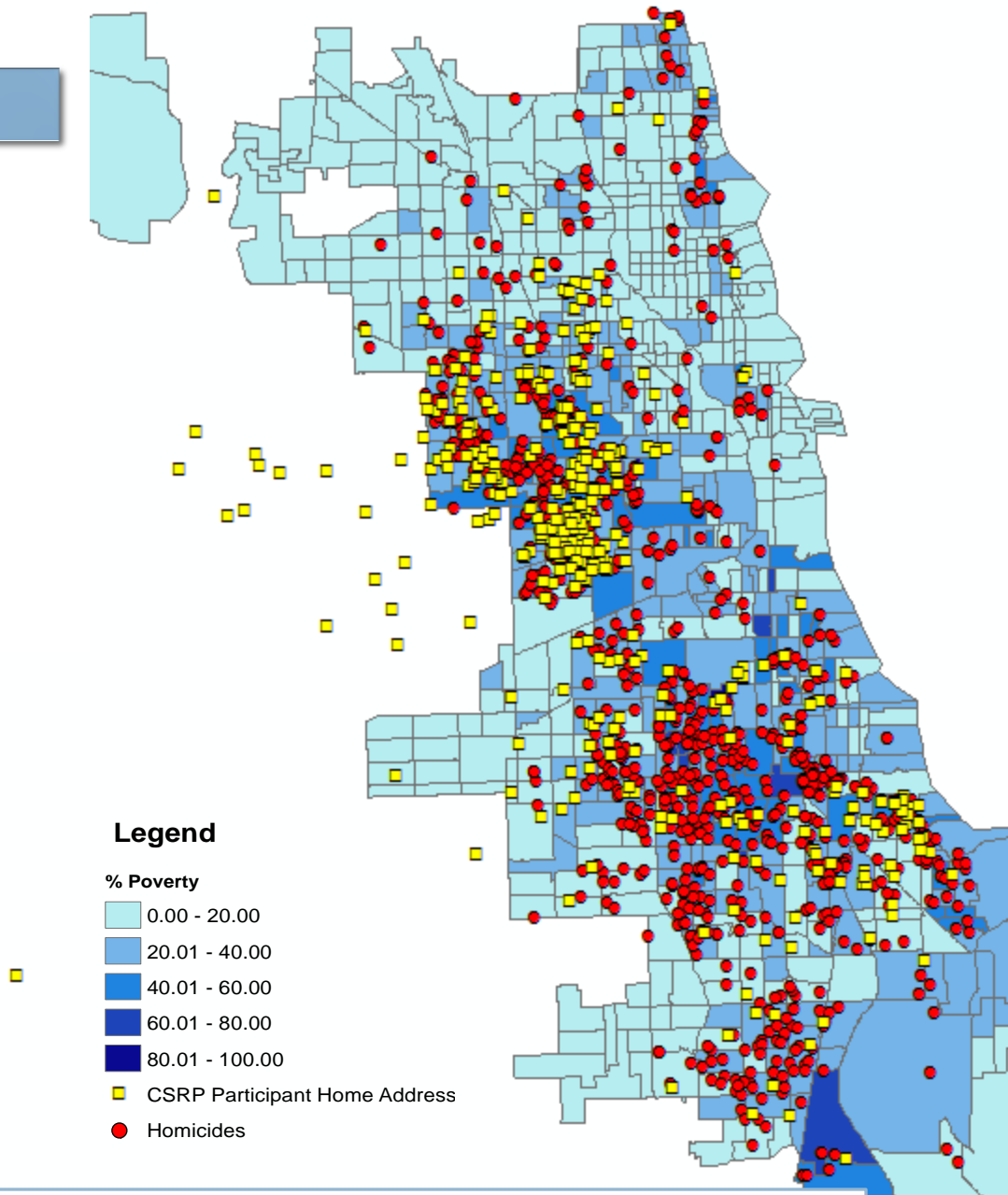
80.01 - 100.00

■ CSRP Participant Home Address

● Homicides



The overlap



Results confirm that

- Students experiencing higher exposure to crime had more difficulty with attention and impulsive behavior on “dot probe” task.
- Children who were more anxious/sad were especially vulnerable.

Scientific support for poverty-related risks as “depleting”

Children’s emotions, attention are more biased toward (“hijacked” by) more negative stimuli

- Raver, Blair, et al (2014). Poverty, household chaos, and interparental aggression predict children's ability to recognize and modulate negative emotions. *Development and Psychopathology*

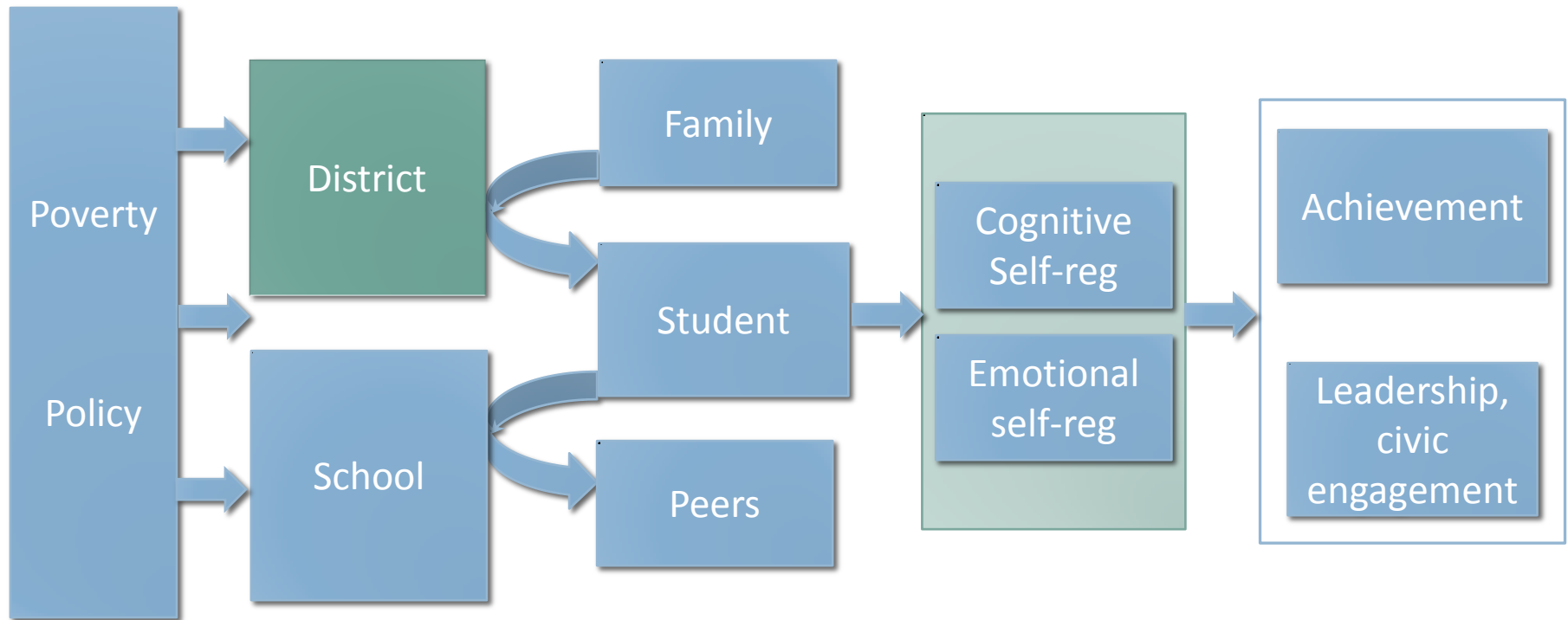
Executive functions are disrupted by exposure to poverty + stressful conditions in neighborhood and in school.

- Threatening
- Turbulent –some children experience high levels of disruption both at home and through elementary schooling
 - McCoy, D. C., & Raver, C. C. (in press). Household instability and self-regulation among poor children. *Journal of Children and Poverty*.

Places students’ academic achievement, emotion regulation, health in jeopardy-

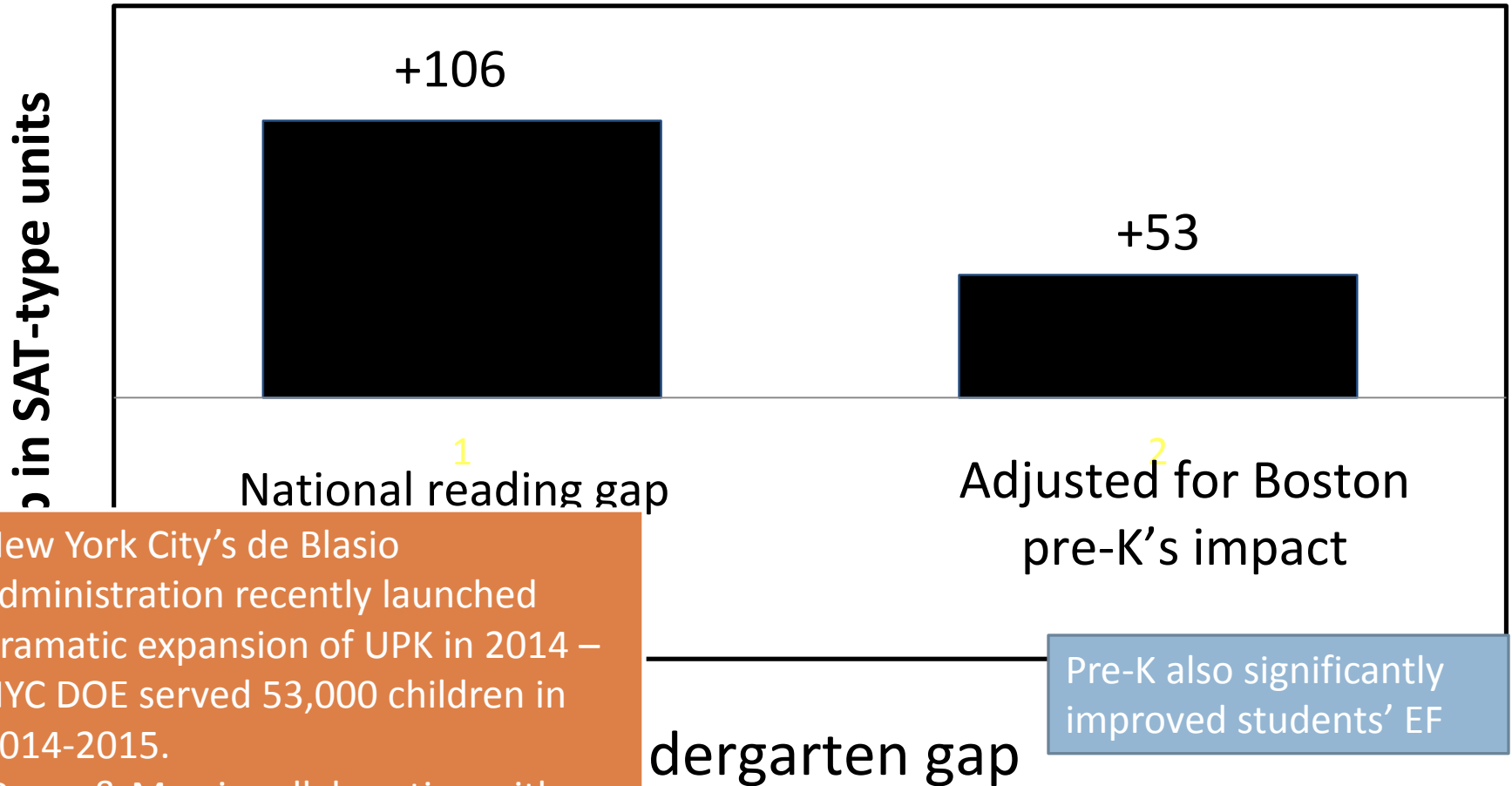
- Ursache, A. & Raver, C. C. (in press). IGT + EF predict early adolescents’ risky behaviors. *Personality and Individual Differences*.
- Aligns with teachers’ and school leaders’ experiences of “rowing against the tide” of poverty-related stressors in students’ lives.

What can districts do?



More “oars in the water” - Districts can maximize children’s opportunities to learn in physically and emotionally safe, stable settings

district-level investment in preschool provides students with stronger chance of resilience in face of risk during sensitive period of brain development.

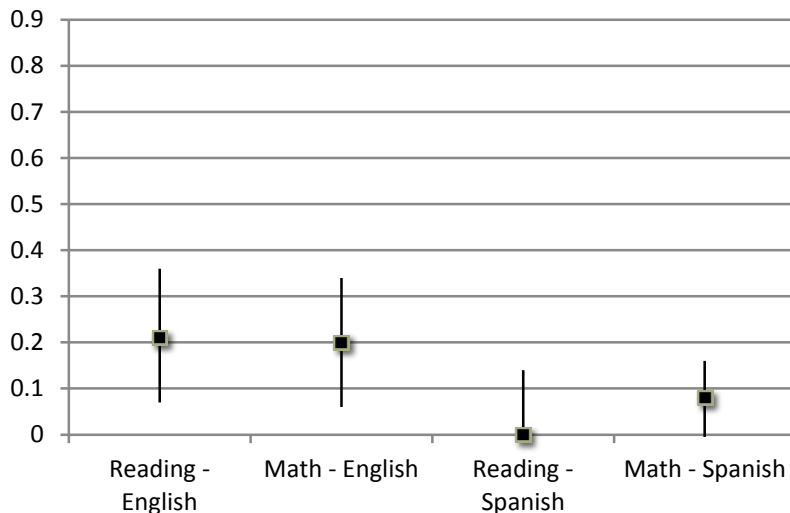


New York City's de Blasio administration recently launched dramatic expansion of UPK in 2014 – NYC DOE served 53,000 children in 2014-2015.

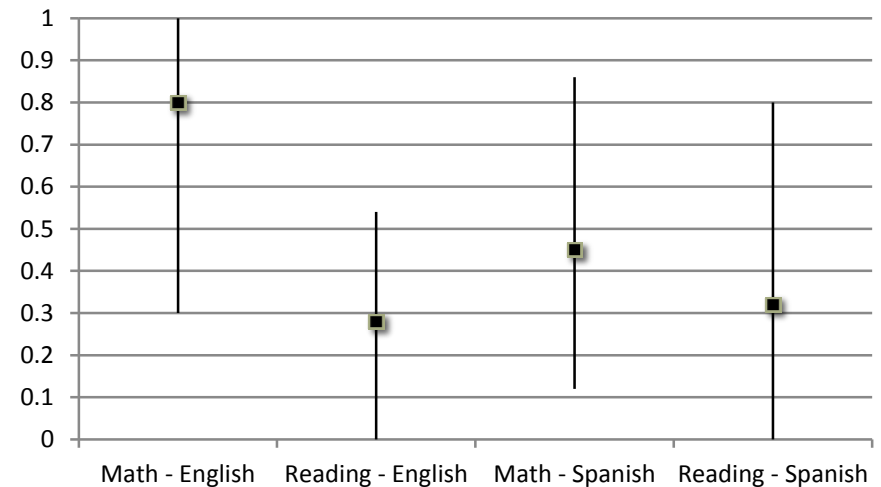
Raver & Morris collaborating with Westat to provide comprehensive research support

Continuing investment through k-3rd – evidence from Tools of the Mind NYC K

Main effects in the spring of Head Start on Math and Reading in English

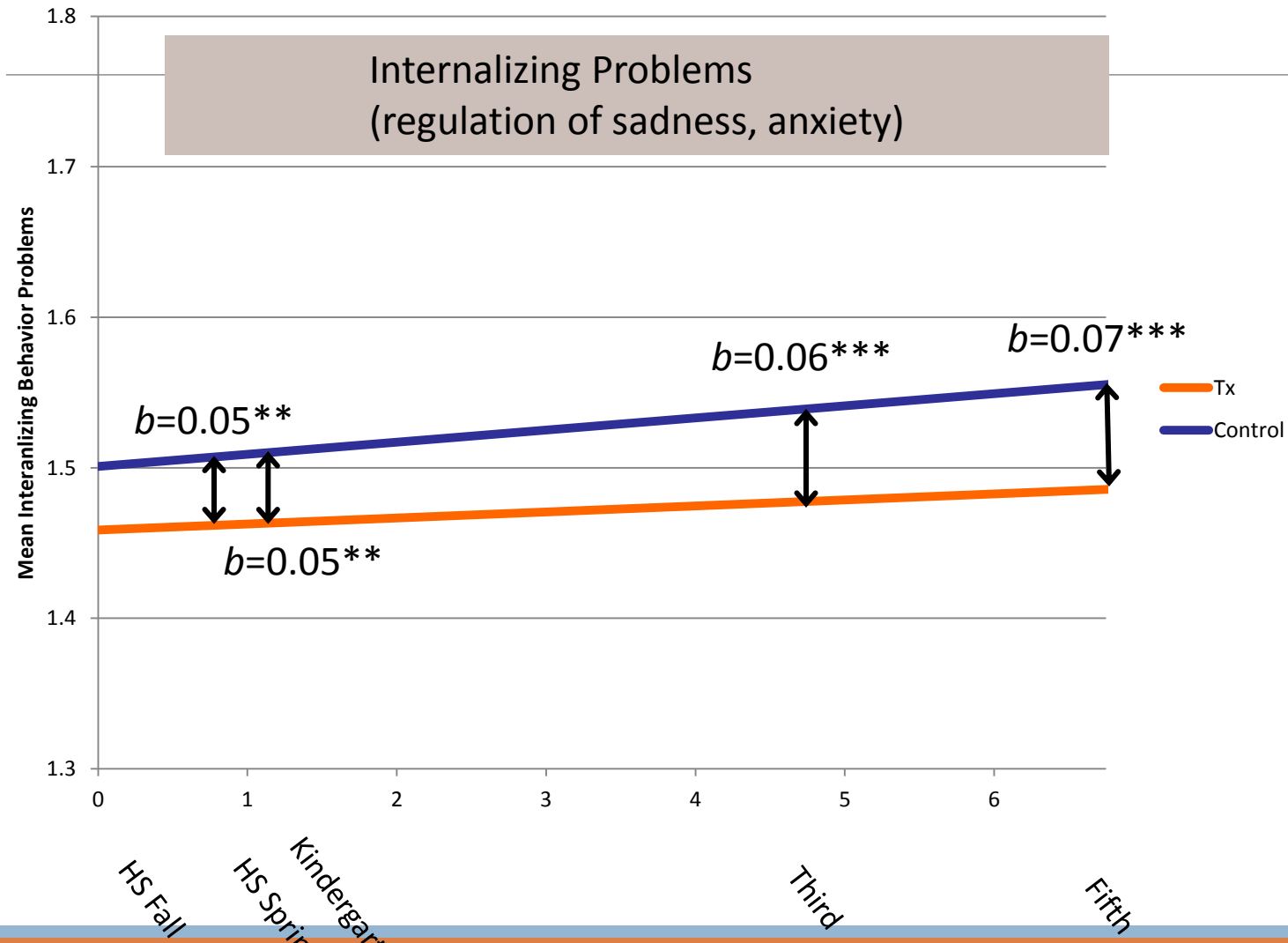


Larger effects in the spring of Head Start for children who are predominantly Spanish speaking



Blair, C. & Raver, C. (2014). Closing the achievement gap through modification of neurocognitive and neuroendocrine function: Results from a cluster randomized controlled trial of an innovative approach to the education of children in kindergarten. *PLOS ONE*.

Preschool can have long-term benefits even though students face high levels of subsequent “toxic stress”



What do these findings tell us about resilience?

- High quality preschool is one of many steps district can take to invest in children's safety, stability, and security.

PreK sets children on a more positive emotional and neurocognitive trajectory, supporting resilience in the face of chronic exposure to toxic stressors.

- Additional “2Gen” anti-poverty implications of early investment through preschool:
 - Recent evidence from analysis of Head Start data suggest that access to 2 years of preschool led to increased enrollment and school completion for low-income parents (Sabol & Chase-Landsdale, 2015).
 - Fully 35% of CSRP parents went back to school while their child was in preK through elementary school. For those families, we found substantial increase in monthly income and movement out of poverty (Pressler, in prep).
- School districts as key agents to “turn the tide.”

What do CSRP (and other intervention programs) tell us about resilience?

Policies and programs serving children ages 0-5 can actively capitalize on classic neuroscientific finding: The “social buffer” hypothesis –

- The presence of supportive adult dramatically reduces
- biological stress response as well as experience of anxiety for individuals facing major challenge or stressor

Capitalizing on social buffers earlier, “upstream”

- Video feedback-based parenting intervention for children prior to preK



The ABC Study (Blair & Raver)

U.S. Dept of Health and Human Services, Administration for Children and Families, Buffering Toxic Stress

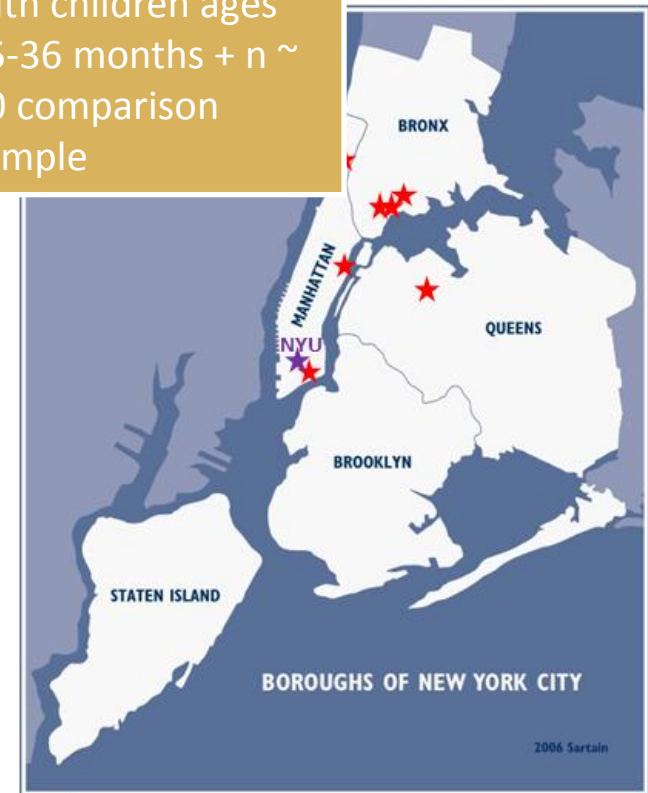
Aim 1: What is the biobehavioral “cost” of “toxic stress” to low income parents and children?

- Higher poverty-related stress expected to predict
- Greater risk of depressive symptomatology + anxiety among mothers
- Greater disruptions in maternal and child stress physiology
- Disruptions in parenting, adult and child attention regulation, emotion regulation, and executive function

Aim 2: Does ABC intervention lead to “repair” in children’s (and mothers’) stress reactivity and neurocognitive function?

Aim 3: Do practitioners and parents like it? Can agencies use it?

n~ 150 Latino very low income recently immigrated families with children ages 15-36 months + n ~ 50 comparison sample



“Tiered” models for parenting support

Using a public health- based approach to “get the message out”

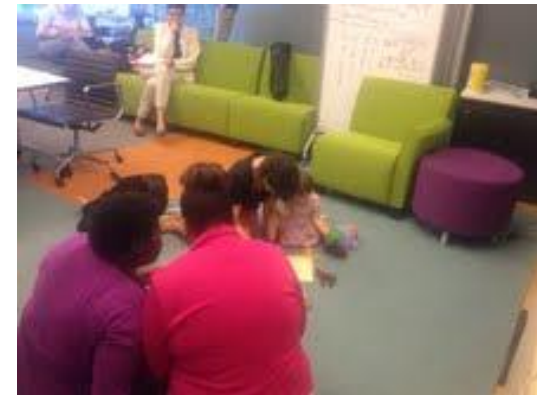
Boosting moderate-intensity services:

- Access to *and enrollment in* high quality, free preschool services.
- PALS, VIP, ParentCorps, Nurse-Family Partnership, Harlem Children’s Zone’s “Baby College”

Higher-intensity services: Trauma-informed support for families at higher risk

- Web-enhanced parent training (14 weeks) for NG and Reserve troops returning from deployment
- “video lesson,” journal, “knowledge check,” discussion forum

(Foster care -Fisher, Watamura, Chamberlain; Military families – Fogatch et al, Gewirtz)



How bold do we dare to be?

Turning the tide

Significant support for student resilience through “more oars in water” is possible:

- Yoking student mental health, trauma-informed support, and self-regulation-focused intervention with academic achievement
- Yoking neighborhood safety to student educational outcomes

Both prevention science and policy leaders can be bold in *lowering students' exposure to toxic stressors* by “turning the tide:”

- Yoking district-level investments in early education to 2-generation anti-poverty effort.
- Understanding community safety and empowerment as central to child and parent success.

Thanks!

Thanks to all of our collaborators, funders, and to the students and families in our research projects as we continue this work. We are:

Working to support universal access to high quality preK

- <http://steinhardt.nyu.edu/ihdsc/>

Actively seeking high school partners for “mindset” interventions

- http://steinhardt.nyu.edu/ihdsc/neuroscience_lab
- <https://vimeo.com/106586718>

Engaged in 2-generation projects to support family mobility out of poverty as well as student resilience.

Email: cybele.raver@nyu.edu

CSRP-related work funded by National Institute of Child Health and Human Development (NICHD), Spencer Foundation

ABC-related work funded by Administration for Health and Families, Department of Health and Human Services