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Toxic stress and children's outcomes

African American children growing up poor are at greater risk of disrupted physiological functioning and depressed academic achievement

Report • By Leila Morsy and Richard Rothstein • May 1, 2019

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Executive summary

"Stress" is a commonplace term for hormonal changes that occur in response to frightening or threatening events or conditions. When severe, these changes are termed "toxic" stress and can impede children's behavior, cognitive capacity, and emotional and physical health.

Frightening or threatening situations are more sustained and are experienced more frequently by African American and socially and economically disadvantaged children, who also have less access to protective resources that can mitigate their stress to tolerable levels. This report describes the relative frequency of toxic stress by race and social class, and shows how it depresses children's outcomes and contributes to the "achievement gap." We conclude by suggesting policy and practice recommendations that can reduce the cognitive, behavioral, and health harm that toxic stress provokes.

Key findings

- **Social class and childhood stress.** Beginning in infancy, lower social class children are more likely to have strong, frequent, or prolonged exposure to major traumatic events, the frightening or threatening conditions that induce a stress response.
- **Income and childhood stress.** The lowest-income children are more likely to be exposed to frightening or threatening experiences than other children.
- **Race and childhood stress.** Black children are more likely than white children to be exposed to frightening or threatening experiences.
- **Childhood stress and depressed outcomes.** Independent of other characteristics, children exposed to more frightening and threatening events are more likely to suffer from academic problems, behavioral problems, and health problems.

These attributes present challenges to children's school and life trajectories.

SECTIONS

Policy recommendations

Ultimately, larger social change is needed to address the economic and social conditions at the root of children's toxic stress. But given that these larger social problems will not be remediated easily or quickly, policymakers must find other ways to improve current outcomes for children who are at high risk for toxic stress. We suggest the following interventions in policy and practice:

- **Provide supports for parents.** To promote protective parenting—which can mitigate children's toxic stress—we recommend implementation of support programs such as home visits and/or therapy services by community health workers, nurses, and other health specialists. These programs can offset the damaging effects of exposure to frightening or threatening conditions by building the capacity of caregivers to provide children with safe, stable, and nurturing relationships that help to develop children's adaptive and positive coping skills.
- **Train school staff to support children.** To prepare trauma-informed staff and improve how preschools and schools support children exposed to frightening or threatening experiences, adults in these settings should receive training to help them understand how such experiences affect students' learning and behavior.
- **Address racially disparate policies and practices in schools.** Schools should be especially careful to eliminate in-school experiences that can be so stressful that they themselves can generate a toxic stress response. Racially discriminatory discipline policies—indeed, racially disparate treatment of any kind, even if unintentional—can induce stress in children.
- **Engage health care professionals in screening and treatment.** Health care professionals can contribute to preventing and treating the harmful effects of frightening or threatening experiences. All children should be routinely screened for such experiences. Health care professionals should be trained to understand how frightening or threatening experiences impact children's cognitive, behavioral, and physical health outcomes, and screen and treat children for any resulting complications.

Introduction

Since the Coleman Report's release in 1966, education policymakers have grappled with the fact that, on average, African American children's academic and behavioral outcomes are depressed relative to those of white children (Coleman et al. 1966). Because African American children disproportionately come from low-income families, it is generally understood that the disadvantaged social and economic conditions from which many of these children come to school predict these depressed outcomes.

Seeking to improve outcomes for these children, education reform efforts have focused mostly on how higher-quality teaching can overcome the force of social and economic challenges; however, these efforts have failed to make a meaningful dent in the black–white achievement gap. Many policymakers continue to be perplexed that background characteristics should be so powerful, so resistant to offset by better schooling. Their puzzlement, however, results from a failure to understand the pathways by which socioeconomic disadvantage translates into worse performance and from a failure to devote sufficient attention to addressing these pathways directly. Some attention has been paid to differences in parenting styles, early childhood literacy experiences, health conditions like lead poisoning or asthma, and some other background characteristics, each of which prevents disadvantaged children from taking full advantage of what even the best schools have to offer (Rothstein 2004; Morsy and Rothstein 2015a, 2015b, 2016). But much remains unexplained or insufficiently understood.

Toxic stress and whole child policy

One of the plausibly powerful factors that blocks better performance for disadvantaged children is toxic stress response. The research literature is rich with discussions of how toxic stress response in children predicts depressed outcomes across a range of areas, including academic performance, behavior, and health.[1] And yet educators have only recently begun to pay attention to the relationship between toxic stress and how children fare in school, and to consider interventions that could possibly diminish its power.

In this report, we draw upon research in medicine, public health, epidemiology, economics, sociology, and psychology to show that across educational, behavioral, and health outcomes, children exposed to more frightening and threatening events are at a greater risk of the damaging effects of toxic stress.

We then offer recommendations for interventions that can help mitigate the effects of frightening and threatening events on children—reducing the likelihood they will develop toxic stress and suffer depressed outcomes.

Methodological notes

This report does not attempt to isolate the effect of toxic stress on children's outcomes.

The factors affecting disadvantaged children—including toxic stress, risk factors for toxic stress, and consequences of toxic stress—overlap and are often interdependent. There are no available databases by which the relative importance of toxic stress as a cause of lowered cognitive and behavioral outcomes can be assessed. But informed professionals, whose work we present in this report, judge that it is an important cause for a significant share of disadvantaged children.

Furthermore, this research reports population averages. Not all children exposed to frightening and threatening events will suffer from depressed outcomes. Some will achieve at rates that are higher than typically observed. Such achievement is not impossible for children with high exposure to frightening or threatening events, but it is less likely.

What is toxic stress?

"Stress" is a natural response to frightening or threatening events or conditions. These can be of greater or lesser severity and the resulting stress can lead to changes in behavior, emotional health, and cognitive capacity. We refer to the stress induced by infrequent events or conditions of lesser severity as "tolerable stress." Stress can also be made tolerable when severe conditions are experienced in the presence of various emotional supports ("protective factors") upon which otherwise secure children can rely. Tolerable stress can contribute to better performance if individuals react by heightening their focus on the fright or threat without distraction. But the stress can become toxic when the events or conditions precipitating it are severely frightening or threatening—especially when they are sustained or frequently repeated—and when protective factors are insufficient to mitigate the stress to tolerable levels. Then, toxic stress can produce not heightened focus but the opposite result, a decrease in performance levels.[2]

How threatening experiences stimulate stress

A normal response to a frightening or threatening situation is the production of adrenaline, cortisol, and related hormones by the amygdala, hypothalamus, and adrenal and pituitary glands. When released, these hormones can affect almost every tissue and organ in the body (Dhabhar 2009, 216; HHP 2018). They send the brain a signal to attack the threat or escape from it. This "fight or flight" response is an essential survival mechanism in the face of a frightening or threatening situation. The stress hormones increase the body's heart rate, blood pressure, and breathing. They dilate the blood vessels and the bronchioles in the lungs, so that more oxygen reaches the brain, muscles, and vital organs. This sharpens a person's senses, including sight and hearing. Until the danger passes, cortisol keeps a person on high alert, limiting access to the parts of the brain responsible for memory and deliberative decision-making. Instead, a person's attention is placed on responding aggressively to the danger or escaping from it. After the threat is over, the body's physiological and behavioral functions can return to normal.

In these ways, the physiological and behavioral response is protective in the face of

infrequent and tolerably stressful situations. But when frightening or threatening situations occur too frequently, stress becomes chronic and disrupts the brain's and body's responses. The body can over- or underproduce necessary hormones, and the body's physiology can fail to return to normal. This is a toxic stress response (Shonkoff et al. 2012, 236).

Examples of events that can produce toxic stress—because they are severe, frequent, or sustained—are psychological, physical, and sexual abuse; having a parent or close family member be incarcerated; witnessing domestic violence; physical or emotional neglect; family financial hardship; homelessness; exposure to neighborhood violence; discrimination; parental divorce or separation; placement in foster care or kinship care; property loss or damage from a fire or burglary; or having a family member become seriously ill or injured, be hospitalized, or die.[3]

Toxic stress and its associated hormone disruption can stunt brain growth and diminish brain activity in the prefrontal cortex, a region that controls executive function, learning, memory, attention, anxiety, and emotional regulation (Shonkoff et al. 2012, 236; Kim et al. 2013). It can elevate blood pressure for a sustained and unhealthy period and disrupt the metabolic system, and it can compromise the immune system, increasing vulnerability to infection and inflammation (Evans and Kim 2013, 44).

Protective factors

Exposure to frightening or threatening events or conditions does not necessarily result in toxic stress. Children's susceptibility to toxic stress can be reduced by protective neighborhood, family, or school conditions, as these can help children develop effective self-regulation, i.e., the ability to respond constructively to emotions and to manage behavior in response to frightening or threatening events.[4] Conversely, *negative* neighborhood, family, or school conditions can diminish protective factors and compound toxic stress.

Neighborhood

Living in a neighborhood that residents experience as orderly can be protective. Living in a neighborhood that children and their parents are more likely to experience as disorderly—with characteristics such as excessive litter, vandalism, deteriorated and overcrowded housing, graffiti, noise, public drug and alcohol use, and conflict with neighbors in close quarters—can exacerbate children's toxic stress response to frightening or threatening events and impede parents' ability to protect children from that response. Living in a neighborhood that residents experience as more orderly can be protective (Evans 2004, 86, citing Evans 2001; Kleinhans and Bolt 2014, 420). Noise, litter, graffiti, conflict with neighbors, or any of these factors, when isolated or occasional, are unlikely to be frightening or dangerous but, when compounded, they can exacerbate a feeling of disorder and lack of control over one's environment.

In neighborhoods that are perceived as orderly, it is also more likely that parents have safe

spaces to congregate, improving their sense of social connection (Shonkoff 2012, 17305). By supporting residents' overall sense of collective efficacy, such neighborhoods can enable parents to help their children cope with frightening or threatening conditions (Sampson, Raudenbush, and Earls 1997, 924; CWW 2013; Evans and Kim 2013). Such neighborhoods improve parents' sense of well-being, supporting their ability to be warm and responsive toward their children and thus helping the children to regulate their stress responses. As Robert Sampson has demonstrated, collective perceptions of neighborhood disorder are self-fulfilling prophecies, predicting future neighborhood poverty and segregation levels. Therefore, perceptions of neighborhood disorder impact not only residents' present lived experience, but by perpetuating racial and economic segregation, also influence the trajectory of their neighborhood, and thus influence the residents' ability to manage threatening or dangerous experiences (Sampson 2009, 24).

High concentrations of parental incarceration in a neighborhood can not only diminish the protective capacity of affected families, it can also erode the overall protective capacity of the neighborhood. Parental incarceration, more concentrated in segregated, low-income African American neighborhoods, contributes to the disruption of normal family support systems (Kramer and Hogue 2009, 182; Morsy and Rothstein 2016).[5] Incarceration often means the loss of an income for a family, and the ensuing economic instability can be disruptive for children and their parents.

This is a problem of both race and felony status: In terms of employment, the consequences of a criminal record are greater for black workers than for white workers. White job candidates who report a criminal conviction on an employment application get called back for interviews more frequently than demographically similar African American job candidates *without* a conviction. White prospective employees are favored even more in comparisons with black prospective employees when *all* applicants have criminal convictions (Pager 2003).

When a parent is incarcerated, the remaining parent may have to work longer hours to make up for the loss of income while also having to maintain primary responsibility for the care of the family and the household. The strain of normal daily pressures can be exacerbated by having an incarcerated family member. Partners and children of the incarcerated are more likely to suffer from mental health problems: For example, children of incarcerated fathers are 51 percent more likely to suffer from anxiety, 43 percent more likely to suffer from depression, and 72 percent more likely to suffer from post-traumatic stress disorder. And because of the emotional toll of having a spouse or partner incarcerated, a parent may be less able to give his or her child the positive attention and supervision that is supportive of healthy mental, behavioral, and physical development (Morsy and Rothstein 2016).

In segregated neighborhoods, where the incarceration of young black men is concentrated, the negative effects of imprisonment—deteriorated mental health and increased poverty, homelessness, and housing mobility—are multiplied and can damage the social fabric of a community, thus reducing the chances that the community can prevent children's stress from becoming toxic (Sampson and Loeffler 2010; Von Hoffman 2015).

Family

When children have a network of stable, responsive relationships and caregivers with the financial, psychological, and social resources to nurture and protect them, they are more likely to cope successfully with frightening or threatening events. Such resources facilitate the return to normal of a child's stress hormones (Shonkoff et al. 2012, 235). Above, in the "Neighborhood" section, we discussed some of the factors that influence protective capacity in both families and neighborhoods. Below we discuss additional factors that predict whether families will have the capacity to act as protective buffers against children's toxic stress.

Family household stability is a protective factor. Living in an uncrowded home, or having fewer life transitions like moving homes or having family members move away from home, can protect children against developing a toxic stress response.[6] When children experience transitions, or have to cope with poor living conditions, they must find ways to adapt in order to mitigate their stress response. The effect of such events and conditions are cumulative, and when children experience fewer of them, they can more easily make such adjustments and decrease their risk of a toxic stress response.

Parental emotional stability is a protective factor. Emotional stability of parents can also protect children from toxic stress in response to frightening or threatening childhood experiences. Parents who are less stressed themselves are more likely to be able to listen, to problem-solve, to give and receive affection, and to provide children with cognitive stimulation, such as by reading, asking questions, encouraging discussion, playing games indoors and out, or doing arts and crafts projects with their children (Gershoff et al. 2007, 87, 95: Table 5). Such practices constitute the warm and responsive parenting that can provide a buffer against toxic stress. Unpredictable and inconsistent schedules can be distressing for children and can exacerbate a vulnerability to toxic stress, as can physical punishment (Gershoff 2016; Odgers and Jaffee 2013). Parents who are not stressed themselves are less likely to use corporal punishment to control their children's behavior or as a reactive response to misbehavior. They are also more likely to establish predictable and consistent schedules, including rules and routines around children's TV watching, meals, and bedtimes (Gershoff et al. 2007, 89–90: Figures 2 and 3).

Family economic security can also be protective. Economic strain can lead to material hardship, including food insecurity, residential instability, and inadequacy of medical care, all of which can be associated with increased stress for parents as well as for children (Wadsworth et al. 2008; Gershoff et al. 2007, 87, 95: Table 5).

Stable parental employment can be a protective factor. Parents who are regularly employed are more likely to have strong and supportive social networks and less likely to experience worry and strain (Lindsay 2010; Paul and Moser 2009; Roelfs et al. 2011, 841). As a result, they are likely better able to parent their children in ways that promote self-regulation and adaptive coping behaviors. Such parenting is characterized by being consistent, predictable, and nurturing of children's self-confidence and self-worth (Odgers and Jaffee 2013, 37–38).

Parental experiences of racial discrimination can diminish their protective capacity. Frequent and systematic racial discrimination, even when subtle or difficult to prove, has a damaging effect on psychological well-being. While systematic discrimination or verbal attacks are obvious and common, even more commonplace is chronic, everyday discriminatory treatment (frequently termed "micro-aggression") that takes the form of frequently unintentional, subtle behavioral or verbal exchanges. Racial discrimination exacerbates psychological distress that results from adverse life events, job difficulties, and financial strain. Psychological distress makes it more difficult for parents to have a high-quality and nurturing relationship with their child, thereby decreasing their ability to protect their child from developing a toxic stress response to frightening or threatening childhood experiences (Murry et al. 2001, 921).

School

A school's climate can contribute to protection against toxic stress. Children are better able to develop the skill of self-regulation in schools and classrooms that are emotionally supportive of and responsive to all students, and where there are positive teacher–student relationships, with teachers maximizing students' feelings of autonomy, influence, competence, and social connectedness (Wang 2009, 242; Kaplan, Gheen, and Midgley 2002, 203–204; Solomon et al. 2000). Intentional schoolwide strategies to create a positive school climate and nurture social-emotional learning can provide children with a favorable environment for the self-regulation of stress hormones.

Racial and social class differences in the prevalence of toxic stress

Popular discourse frequently conflates lower social class status with low income. This is sociologically naïve. For children, lower social class status is the result of many interacting conditions—not only low family income, but inadequate household wealth, low parental educational levels, low parental occupational status, the intergenerational persistence of these conditions, and membership in a minority group suffering systematic discrimination. Nonetheless, most data sources do not report the full range of these conditions, and sometimes report family income alone.

Beginning in infancy, lower social class children are more likely to have strong, frequent, or prolonged exposure to major traumatic events, the frightening or threatening conditions that induce a stress response (Shonkoff et al. 2012, 240, 242; Halfon et al. 2017, S70–S78).

Table 1 shows that the lowest-income children are more likely to be exposed to frightening or threatening experiences than other children. A study of children from families with incomes below $20,000 (in 2003, 2004, or 2005, when families were surveyed) found that such children were 18 percent more likely than children from higher-income families to have been exposed to a frightening or threatening experience; 15 percent more likely to have been exposed to two frightening or threatening experiences; and 74 percent more likely to have been exposed to three or more frightening or threatening experiences.

Table 1

Low-income and African American children are more likely to have stressful childhoods

Share of kindergartners exposed to frightening or threatening childhood experiences, by family income and by race

Number of frightening or threatening experiences:	0	1	2	≥ 3
By family income				
≥ $20,000	50%	26%	15%	10%
< $20,000	36%	30%	17%	17%
% more/less likely	-28%	18%	15%	74%
By race				
White	52%	22%	14%	12%
Black	36%	32%	18%	14%
% more/less likely	-31%	45%	29%	21%

Notes: Data are based on a study sample of 1,007 children who were born between 1998 and 2000 and were age 5 at the time these data were collected (2003–2005). Frightening or threatening experiences include physical abuse, sexual abuse, psychological abuse, neglect, living with someone with substance abuse problems or mental illness, seeing their caregiver treated violently, or having a parent incarcerated.

Source: Manuel E. Jimenez et al., "Adverse Experiences in Early Childhood and Kindergarten Outcomes," *Pediatrics* 137, no. 2 (2016), 1–10, https://doi.org/10.1542/peds.2015-1839, Supplemental Table 6

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Table 1 also shows that black children were 45 percent more likely than white children to have been exposed to one frightening or threatening experience; 29 percent more likely to have been exposed to two frightening or threatening experiences; and 21 percent more likely to have been exposed to three or more such experiences.[7] This incongruity in part reflects the intersection between race and income: Since children from low-income families are more likely to experience frightening or threatening events, and since African American families fall disproportionately lower on the income distribution than white families,[8] it is more likely that black children will experience such events (Gould 2019; Wilson and Rodgers 2016).

Outcomes for children exposed to chronically stressful conditions

Children exposed to frequent or sustained frightening or threatening events that are likely to induce toxic stress have more depressed academic, behavioral, and health outcomes than other children.

Association of stress with children's cognitive outcomes

Figure A summarizes research comparing the academic outcomes of children exposed to three or more frightening or threatening life experiences with the academic outcomes of children not exposed to such experiences.

The share of children in their last month of kindergarten who could not independently read a simple book was nearly 50 percent greater for those who had been exposed to three or more frightening or threatening life experiences than for those who had not been exposed to frightening or threatening life experiences but were otherwise similar. The share of children who had below average reading and math skills was more than 70 percent and nearly 80 percent greater, respectively, for those who had been exposed to frightening or threatening experiences than for those who were otherwise similar but who had not been exposed to any frightening or threatening experiences. Nearly 90 percent more did not understand basic conventions of print. More than twice as many did not understand a story that was read to them, and nearly 2.4 times as many were unable to name the letters of the alphabet (Jimenez et al. 2016, 5).[9]

Association of stress with children's behavioral outcomes

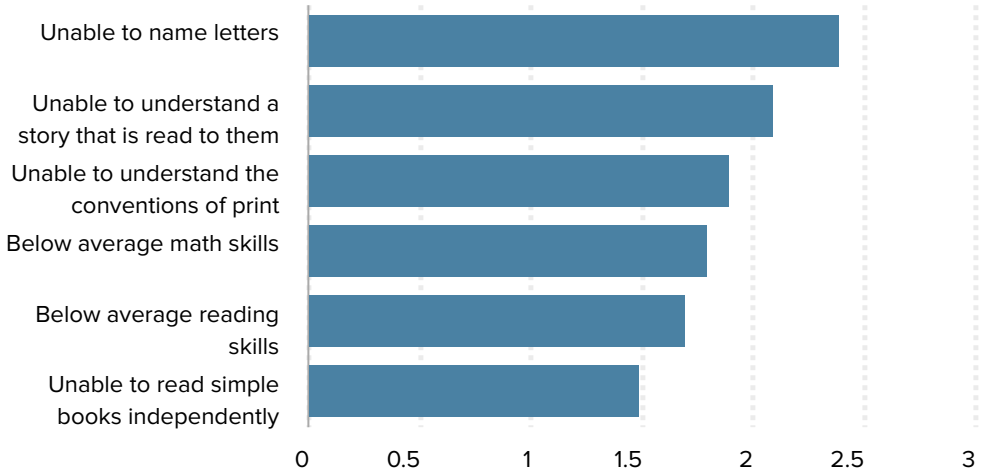
Figure B summarizes research comparing the behavioral outcomes of children exposed to frightening or threatening life experiences with the behavioral outcomes of children not exposed to such experiences.

The share of children in their last month of kindergarten who had social problems (such as acting younger than is appropriate for their age, being clingy, having difficulty getting along with peers, and preferring to play with younger children) was over 150 percent greater for children who had been exposed to frightening or threatening experiences than for those who were otherwise similar but with no such experiences (Jimenez et al. 2016, 6: Table 5).[10] The share of children who displayed attention problems in the classroom was over 200 percent greater for those who had been exposed to frightening or threatening life experiences than for those who were otherwise similar but with no such experiences (Jimenez et al. 2016, 6).[11] The share of children who were aggressive and broke rules at

Figure A

Children with more stressful life experiences have a greater likelihood of suffering from academic problems

Ratio of the share of kindergartners with three or more frightening or threatening childhood experiences to the share of kindergartners with no such childhood experiences who have the condition



Notes: Data are based on a study sample of 1,007 children who were born between 1998 and 2000 and were age 5 at the time these data were collected (2003–2005). The study data cannot be used to determine whether the poorer outcomes resulted from exposure to frightening or threatening experiences, or from other conditions connected with low socioeconomic status. However, in this study, comparisons were made across children who were similar in age, gender, race, maternal education, parent relationship status, and household income—so there is a suggestion of causality. Children who had been exposed to three or more frightening or threatening experiences were compared with children who had had no frightening or threatening life experiences. Frightening or threatening experiences include physical abuse, sexual abuse, psychological abuse, neglect, living with someone with substance abuse problems or mental illness, seeing their caregiver treated violently, or having a parent incarcerated.

Source: Manuel E. Jimenez et al., "Adverse Experiences in Early Childhood and Kindergarten Outcomes," *Pediatrics* 137, no. 2 (2016), 1–10, https://doi.org/10.1542/peds.2015-1839, Tables 3 and 4

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school was nearly 140 percent greater for those who had been exposed to frightening or threatening life experiences than for those who were otherwise similar but with no such experiences (Jimenez et al. 2016, 6).

Association of stress with children's health outcomes

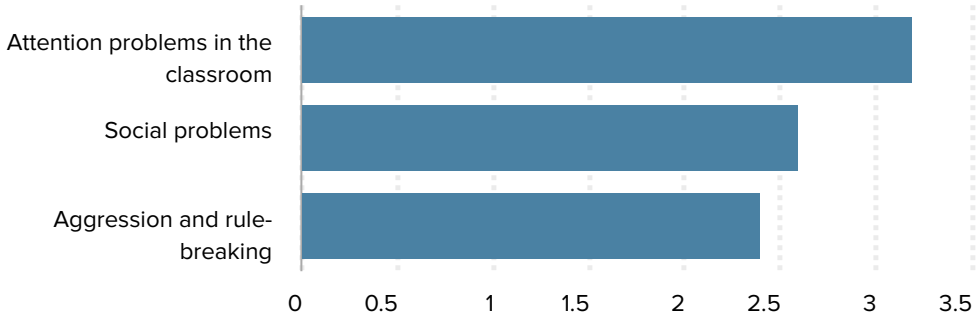
Figure C compares specific health vulnerabilities of children exposed to frightening or threatening experiences with specific health conditions of children with no such experiences.

The share of children who suffered from ear infections and acute respiratory infections was greater by roughly 20 and 30 percent, respectively, for children who had been

Figure B

Children with more stressful life experiences have a greater likelihood of suffering from behavioral problems

Ratio of the share of kindergartners with three or more frightening or threatening childhood experiences to the share of children with no such childhood experiences who have the condition



Notes: Data are based on a study sample of 1,007 children who were born between 1998 and 2000 and were age 5 at the time these data were collected (2003–2005). The study data cannot be used to determine whether the poorer outcomes resulted from exposure to frightening or threatening experiences, or from other conditions connected with low socioeconomic status. However, in this study, comparisons were made across children who were similar in age, gender, race, maternal education, parent relationship status, and household income—so there is a suggestion of causality. Children who had been exposed to three or more frightening or threatening experiences were compared with children who had had no frightening or threatening life experiences. Frightening or threatening experiences include physical abuse, sexual abuse, psychological abuse, neglect, living with someone with substance abuse problems or mental illness, seeing their caregiver treated violently, or having a parent incarcerated.

Source: Manuel E. Jimenez et al., "Adverse Experiences in Early Childhood and Kindergarten Outcomes," *Pediatrics* 137, no. 2 (2016), 1–10, https://doi.org/10.1542/peds.2015-1839, Table 5

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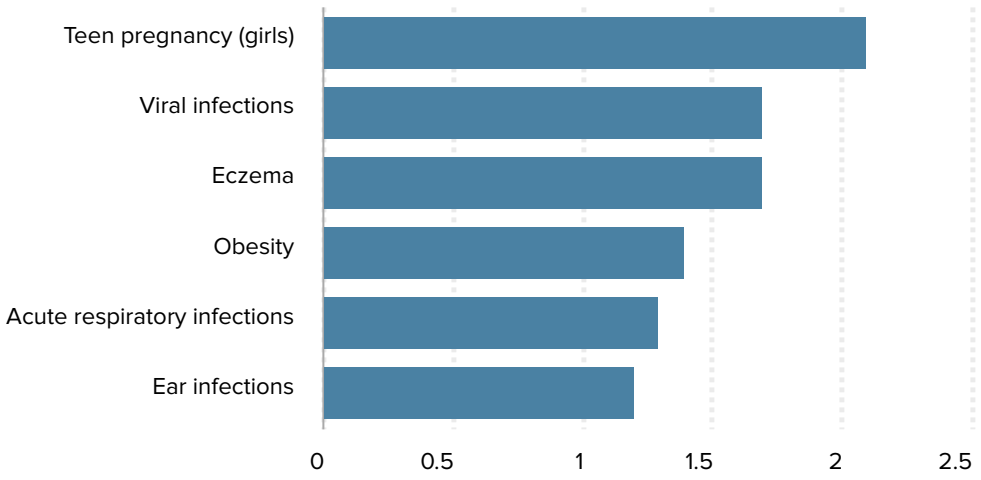
exposed to frightening or threatening experiences than for otherwise similar children who had had no such experiences. The share suffering from eczema was 67 percent greater, and the share suffering from viral infections was 73 percent greater.[12] The share of children suffering from obesity was close to 45 percent greater for children who had been exposed to frightening or threatening experiences than for otherwise similar children with no such childhood experiences.[13] The share of teenage girls who became pregnant was more than twice as great for those who had had frightening or threatening experiences than for those who had not and were otherwise similar.[14]

Boys with more pronounced physiological indications of prolonged stress were more likely to develop asthma.[15]

Figure C

Children with more stressful life experiences have a greater likelihood of suffering from health problems

Ratio of the share of children with three or more frightening or threatening childhood experiences to the share of children with no such childhood experiences who have the condition



Notes: Different rows in the figure compare children with different numbers of experiences with children with no experiences. For ear infections, acute respiratory infections, eczema, and viral infections: Children in this study were Swedish, and of similar age (10 years) and birth weight. They had been exposed to three or more frightening or threatening experiences. They were compared with similar children who had no frightening or threatening experiences (Karlén et al. 2014, e1454). For obesity: Children in this study were under 21 years old and low-income. They had been exposed to four or more frightening or threatening experiences. They were compared with children of the same gender and similar in age and ethnicity who had had no frightening or threatening experiences (Burke et al. 2011, 411). For teen pregnancy: This study compared girls who had been exposed to three or more frightening or threatening experiences with girls of the same race, age, and education level who had had no frightening or threatening experiences (Hillis et al. 2004, 323).

Sources: Karlén et al. 2015, Table 2; Burke et al. 2011, 411; Hillis et al. 2004, 323. For ear infections, acute respiratory infections, eczema, viral infections: Jerker Karlén et al., "Early Psychosocial Exposures, Hair Cortisol Levels, and Disease Risk," *Pediatrics* 135, no. 6 (2015), e1450–e1457, Table 2, e1454. For obesity: Nadine J. Burke et al., "The Impact of Adverse Childhood Experiences on an Urban Pediatric Population," *Child Abuse and Neglect* 35, no. 6 (2011), 408–413, 411. For teen pregnancy: Susan D. Hillis et al., "The Association Between Adverse Childhood Experiences and Adolescent Pregnancy, Long-Term Psychosocial Consequences, and Fetal Death," *Pediatrics* 113, no. 2 (2004), 320–327, Table 4, 323.

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Plausible causes of disproportionate toxic stress among African American children

A frightening or threatening experience can lead directly to worse outcomes for children. For example, frequent moves and unstable housing can result directly in excessive absences that cause achievement to fall. But—as shown above—in addition to these direct effects, a toxic stress response because of frightening or threatening conditions or events is independently likely to lead to worse outcomes.

Toxic stress may not be the only or even the most powerful reason that achievement declines because of frightening or threatening events. Other factors may contribute to depressed outcomes. Racial discrimination and poverty increase the likelihood that lower social class children will experience such adverse conditions. Residential housing segregation exacerbates the likelihood that children will be exposed to some forms of racial discrimination, poverty, and unstable housing. As far as we know, current research is unable to isolate the independent effects of racial discrimination, poverty, unstable housing, or residential segregation, on toxic stress. But the research findings cited in the previous section of the report suggest that each may be a contributing factor.

Below we examine the potential pathways by which discrimination and housing segregation may lead to toxic stress response in children.

Discrimination

As attention to police violence has increased over the last few years—in response to incidents in Baltimore, Baton Rouge, Ferguson, and St. Paul (among many others)—there is now a wider spotlight on what African American communities have long known: Interaction between police and residents in African American neighborhoods of concentrated disadvantage can be frequently contentious. Discriminatory criminal justice practices affect bystanding children. Indeed, African American children are more likely to be exposed to police violence, racial profiling by law enforcement officers, and unwarranted attention by police to their caregivers, even if the children themselves are not the victims of these police practices. Such exposure increases the likelihood of children suffering from toxic stress (Boyd, Ellison, and Horn 2016).

Discriminatory practices are not limited to the criminal justice system, but occur across all contexts of life, including schooling. To understand whether nonwhite students are treated differently from their white peers because of their race, researchers must rule out other factors, not merely observe racial differences in treatment. A large body of evidence supports the conclusion that, compared with otherwise similar white peers and for similar infractions, black students are suspended more frequently, for longer periods of time, and receive greater punishment (Nance 2015, 1068; Skiba et al. 2011). An African American

student from a low-income family is 10 percent more likely to be suspended than a white student from the same school and grade level for a similar infraction. At 16 percent, the difference in the rate of suspension is even greater between similar black and white students who are not eligible for free or reduced-price lunch (Gordon 2018). Discipline of black children is more frequently complemented by the use of metal detectors, random searches, and/or student referral to law enforcement, none of which are supportive of a safe and protective learning environment (Nance 2015, 1068).

Schools with a higher proportion of African American students tend to criminalize student misbehavior. They have higher rates of suspensions and expulsions, while concomitantly having a lower rate of students enrolled in services covered by the Individuals with Disabilities Education Act and Section 504 of the 1973 Rehabilitation Act. These laws codify certain behaviors as symptoms of medical conditions that interfere with student learning, and require access to services that provide support to students with such symptoms (Ramey 2015, 189, 196). When students who need these services are not enrolled in them, the students are more likely to express symptoms of medical conditions that can mistakenly be viewed as criminal misbehavior by school staff. Failure to receive appropriate services may increase African American children's risk of suffering from toxic stress.

Housing segregation

Many neighborhoods of concentrated poverty are disproportionately African American (Rothstein 2017). No other racial or ethnic group in the United States has lived in low-income, racially segregated neighborhoods over multiple generations at such a rate (Sharkey 2013).[16] Residential racial segregation, the result of a history of deliberate federal, state, and local policies and practices, tends to dilute factors that can protect children against developing a toxic stress response (Rothstein 2017).

In low-income African American segregated neighborhoods, it is more difficult to access health care, and even more difficult to access high-quality health care (Hahn 2017, 3; Morsy and Rothstein 2015a). It is harder to get around—public transportation is not as accessible or reliable, increasing social isolation and restricting access to employment opportunities beyond the immediate area. These factors are associated with parenting that results in less adult protective behavior (Hahn 2017).

In racially segregated black neighborhoods, men tend to experience high rates of incarceration, which is damaging to the mental and physical health of those incarcerated, their children and other family members, and their neighbors (Morsy and Rothstein 2016; Kramer and Hogue 2009, 182).

Segregation concentrates poverty (and, conversely, wealth, in white neighborhoods) by controlling who has access to resources. It restricts access to basic human needs. Communities tend to adapt to poverty by adopting behaviors that are socially dysfunctional. Joblessness, welfare dependency, substance abuse, single parenthood, and violence are concentrated in low-income segregated neighborhoods. Social

dysfunction increases levels of strain in all adults, including parents (Massey 2004, 17). Concomitantly, parents in low-income segregated neighborhoods have fewer social and financial resources to create buffers against difficult surrounding conditions. Because parents are more likely to be under strain themselves, they are less likely to be able to parent in ways that support their child's self-regulation, safeguarding the child against toxic stress.

Policy recommendations

Clearly, the most effective way to reduce the greater likelihood of toxic stress in children from racially segregated low-income communities is to eliminate the conditions—discrimination, poverty, and socioeconomic isolation—that support social dysfunction, neighborhood violence, unstable housing, economic insecurity, and excessive rates of incarceration, each of which can stimulate a toxic stress response; in combination, these conditions are even more likely to stimulate such a response. Short of that, social work, educational practice, and health policy can attempt to strengthen the protective factors that can prevent frightening or threatening events from provoking toxic stress in a child.

Recommendation: Promote protective parenting

Even in chaotic, low-income environments, parents and close adults can help to protect babies and children from developing a toxic stress response by being responsive, nurturing, supportive, and protective (Hillis et al. 2010, 20; CWW 2013, 21; Osher et al. 2018, 17). Support programs such as home visits and/or therapy services by community health workers, nurses, and other health specialists can offset the damaging effects of exposure to frightening or threatening conditions by building the capacity of caregivers to provide children with safe, stable, and nurturing relationships that help to develop children's adaptive and positive coping skills (Garner 2013). Examples of such programs are described below.

The ChildFIRST initiative: In-home interventions for at-risk families

The ChildFIRST initiative is a program that seems to have succeeded in decreasing the damaging impact of challenging environmental conditions on children through supporting strong child–parent relationships. The program identifies at-risk families and aims to improve the outcomes of children in these families with personalized, in-home, early childhood interventions. Parents and children receive home visits from mental health clinicians who provide them with resources and support to promote a responsive and nurturing relationship between parent and child. Strong parent–child relationships can help to decrease children's learning and behavioral problems, mitigate emotional disturbance in children, and reduce the incidence of abuse and neglect.

The program has shown encouraging results. One evaluation found that the share of children with language delays was smaller by 68 percent for children who received ChildFIRST services than for a demographically similar group of children who received no such services. The share of children who were overactive or defiant, who acted aggressively toward their peers, or who had other behavioral problems was smaller by 57 percent for children who received the ChildFIRST services. The share of mothers who reported clinical levels of parenting stress was smaller by 52 percent for mothers who received ChildFIRST services (Lowell et al. 2011, 193). This intervention seems to positively impact how a child fares in school by promoting protective parenting that helps children develop self-regulation.

Child–parent psychotherapy services

Another promising type of publicly provided support is child–parent psychotherapy in which parents and children jointly meet with a clinical psychologist to nurture a strong emotional bond between parent and child. This type of therapy, designed to address children's exposure to traumatic events, helps parents support a child's emotional regulation by responding to their child's stress signals. Sessions can take place at the health care provider's work site or at the child's home. They aim to promote feelings of safety and trust, improve parent and child self-regulation, and support developmentally appropriate goals and activities (Lieberman and Van Horn 2009, 439; Lieberman, Ippen, and Van Horn 2006, 914–915; Renschler et al. 2013, 120; CWW 2013, 10–11).

The Nurse Family Partnership: Nurturing the infant–maternal bond

The Nurse Family Partnership (NFP) is a program in which registered nurses visit women before and after childbirth, help coordinate physician and hospital visits, and provide guidance on healthy behavior during pregnancy. Nurses continue their visits for two years after delivery, helping mothers understand the infant–maternal bond, read baby and toddler communication signals, and engage in activities that promote babies' and toddlers' healthy development. The nurses also teach mothers self-care strategies, how to plan subsequent pregnancies, and how to seek employment effectively.

Home visits by nurses trained in community medicine or child and maternal health improve parent–child interactions by helping parents provide more sensitive and responsive care (Olds et al. 2002, 493). Visits help decrease children's exposure to child maltreatment, a risk factor for developing a toxic stress response (Eckenrode et al. 2017). By improving children's environment with better maternal health—including fewer subsequent pregnancies, and greater intervals between births—home visits create conditions that protect against children's toxic stress that can result from their exposure to frightening or threatening experiences.

Recommendation: Prepare trauma-informed school staff

While teachers cannot fix what has been caused by discrimination, poverty, and segregation, there are school-based approaches that can offset some of the effects of toxic stress on children's academic achievement, behavior, and health.

To improve how preschools and schools support children exposed to frightening or threatening experiences, adults in these settings should receive training to help them understand how such experiences affect students' learning and behavior. Because students might act in counterproductive ways in the classroom as a result of exposure to frightening or threatening experiences, adults should be trained to respond appropriately and to support students' self-regulation skills and social and emotional learning. For example, when a child is behaving in a confrontational way, or has withdrawn, adults can deescalate unproductive behavior by emotionally connecting with the child and removing the child from the overwhelming context before redirecting the child toward schoolwork. Staff should also be trained in how to communicate with caregivers and children who have experienced frightening or threatening situations by, for instance, providing them with confidential ways to communicate with school staff. Adults in schools should support all students (not just those who have experienced frightening or threatening situations) in developing strong relationships with adults and other students. This can include building supportive teams around students of concern.

Such protective approaches should be integrated into the curriculum, daily academic and nonacademic activities, and how adults relate to children (Cole et al. 2013, 18–19; Blodgett and Dorado 2016, 22). A focus on children's social-emotional health can improve school climate and create school and classroom conditions propitious for reducing children's risk of poor social and behavioral outcomes (Blodgett and Dorado 2016, 17; Adelman and Taylor 2006).

To mitigate racially discriminatory practices in schools that can contribute to toxic stress in children, educators should understand the characteristics, prevalence, and effects of racially biased school disciplinary practices. Teachers and administrators should collect and publicly report on school disciplinary data, including demographic information about who is removed from classrooms and from schools, and for how long and on what basis. Reflecting on these data and aggregating them at the district and state levels can help educators challenge bias in schools. To contribute to better learning conditions for children and improve their academic, social, and behavioral outcomes, school staff should be trained to offset school- and classroom-based racial discrimination. Training educators to offset racial discrimination in schools can contribute to better school conditions for children, improving their academic, social, and behavioral outcomes.

To reduce the number of students—especially African American students—who are unjustly removed from schools, and to reduce the incidence of other intentional and unintentional racially discriminatory school discipline practices, civil rights agencies should employ a disparate impact standard. By this standard, they would consider practices that

result in race-based intentional or unintentional adverse impact on students, recognizing that school policies and practices may be unlawful if their effects are racially biased, even in the absence of discriminatory intent. Federal policy should create incentives for educators, schools, districts, and states to develop or improve behavior management approaches that mitigate racial bias and focus on keeping children in classrooms and schools (Losen 2011).

Two programs that show promise are described below. Careful replication of such programs with ongoing evaluation is warranted. To have the greatest impact on offsetting the effects of children's toxic stress response to frightening or threatening events and conditions, educators should adopt such approaches in schools of concentrated disadvantage.

The Chicago School Readiness Project

In the Chicago School Readiness Project, preschool teachers received training in how to support students' self-regulation, including encouraging positive behavior and deescalating conflictual behavior. Educators received the help of a mental health consultant in and out of the classroom to improve the classroom's emotional climate and children's social-emotional skills, to lower children's level of conflict with their peers, and to minimize teacher stress (Raver et al. 2011, 365).

As educators addressed the symptoms of toxic stress and provided an environment that was protective, children in the program were able to sit quietly for longer periods of time, follow directions more attentively, and have better impulse control. By improving students' self-regulation, children in such environments gained skills in vocabulary, letter naming, and math (Ursache, Blair, and Raver 2012, 126; Raver et al. 2011).

Healthy Environments and Response to Trauma in Schools (San Francisco and Oakland)

The University of California, San Francisco, developed an initiative called Healthy Environments and Response to Trauma in Schools, which operates in partnership with the San Francisco and Oakland school districts. The initiative designs and implements interventions in schools for children who have experienced frightening or threatening events; provides psychotherapy for these children; uses workshops and professional development to build the capacity of parents and employees to help students; and helps develop and implement trauma-sensitive district-level policies, such as universal behavior referral forms, so that schools and districts are able to collect student behavior data and use it to develop prevention strategies. These include having predictable classroom and school routines, establishing school health or wellness centers, and incorporating regular calming practices for students and staff (UCSF 2018a; OUSD 2014).

The program seems to have led to a decrease in serious school disciplinary events, including a 43 percent decrease in events involving physical aggression. Students in participating schools were more engaged in their academic work, with a 27 percent

increase in students spending time on academic work and a 36 percent increase in how much time students spent in the classroom. Student attendance increased by 34 percent. Children displayed fewer symptoms of toxic stress: they were better able to function in daily life, had a stronger capacity to identify and modulate their emotions, were better able to relate to others and develop healthy relationships, and were less likely to display symptoms of dissociation, in which children emotionally and mentally detached themselves from their present experiences and reality (Dorado et al. 2016, 171–172; UCSF 2018b).

Recommendation: Develop supportive health policy

Routine screening for frightening or threatening experiences

Health care professionals can contribute to preventing and treating the deleterious effects of frightening or threatening experiences. All children should be routinely screened for such experiences. Health care professionals should be trained to understand how frightening or threatening experiences impact children's cognitive, behavioral, and physical health outcomes, and screen and treat children for any resulting complications. To that end, a standardized risk profile for children who have been exposed to frightening or threatening experiences should be developed. This can help pediatric health professionals make more accurate diagnoses and provide clearer treatment options (Harris et al. 2017).

High-quality initiatives in this area exist and warrant careful expansion or replication. Two of these initiatives are described below.

The National Child Traumatic Stress Network. Using collaborative groups, liaison teams, and information sharing, the National Child Traumatic Stress Network supports partnering clinics and hospitals to develop and implement approaches to treating children who have experienced frightening or threatening events. The network collects data across partnering clinics and hospitals to conduct research and disseminate information about evidence-based practices, such as cognitive behavioral therapy, trauma assessments, and interventions that develop children's self-regulation (Van der Kolk 2011, A25; NCTSN 2018a, 2018b).

The Center for Youth Wellness, in partnership with the Bayview Child Health Center in San Francisco, is a pediatric care center that applies research on how exposure to frightening or threatening experiences impacts children. Children who are screened and found to have been exposed to frightening or threatening experiences are treated with health, mental health, and behavioral interventions. These treatments include child–parent psychotherapy, individual psychiatric care, and biofeedback, which is a way for children and caregivers to identify what the symptoms of a toxic stress response feel like so that they can learn to offset them (Harris et al. 2017; CYW 2018).

School-based mental health services

High-quality school-based health centers offering mental health services are another protective initiative to support children at risk of developing a toxic stress response. Such centers can be staffed by mental health professionals, including counselors, psychologists, and nurses. School-based mental health center staff can offer psychological support in the form of psychological crisis intervention teams (mental health professionals who act together to help a child cope with a psychiatric emergency), counseling, peer-to-peer modeling of effective coping strategies, and parent education and support. Some programs operate outside of the classroom—in a clinic on school grounds, for instance—while other programs are part of the class curricula and are integrated into in-class teaching. Students can access mental health services to treat psychological issues, including depression, anxiety, anger, conflicts, and family problems.

Evaluations of high-quality centers provide convincing evidence of their effectiveness (Kataoka et al 2012; Rones and Hoagwood 2000). Adolescents in schools with a mental health center are up to 10 times more likely to initiate a mental health visit than otherwise similar students with no such in-school resource (AAP 2004, 1841; Kaplan et al. 1998, 29). School-based mental health centers are especially important for children in disadvantaged schools who tend to need such services more than students from higher-income families, and concomitantly have more limited access to professional mental health support than their higher-income peers (Bains and Diallo 2016, 15).

School-based mental health services are related to improvement in students' grades (Suldo et al. 2014). Students who use school-based mental health services tend to start out with a lower grade point average than those who never access the services. After students begin using the services, their GPAs increase steadily over time (Walker et al. 2010, 255).

Medical–legal partnerships

Another model to offset the causes and consequences of pediatric toxic stress is medical–legal partnerships in which physicians and lawyers collaborate to provide underserved children with clinical pediatric services and legal advocacy. In these partnerships, medical health practitioners are trained to identify issues that can be addressed by legal aid attorneys.

Medical–legal partnerships can help families mitigate the consequences of frightening or threatening experiences or prevent them altogether. For instance, to address learning disabilities, in some cases perhaps a result of toxic stress, medical–legal partnerships can make it easier for families to request a school evaluation or access to special education services for their child.

To stabilize families' housing, medical–legal partnerships can help families access housing benefits, such as subsidies or access to housing mobility programs, that they would otherwise be denied or unable to claim. To address poor housing quality and protect tenants from lease agreement violations, medical–legal teams can help families escrow

rent—paying their rent to an escrow account with the local court instead of to the landlord—when housing quality violates the landlord's health and safety obligations. This can help motivate a landlord, legally and financially, to undertake required repairs and maintenance, or adhere to the terms of a lease agreement (Klein et al. 2013; Henize et al. 2015). When families are evicted or threatened with eviction, such teams can provide legal assistance when those evictions violate tenant rights, they can help families access temporary housing, and they can connect families with services that address the mental and emotional challenges associated with evictions. It is notable that poor, black, single mothers are most likely to be evicted, among all groups of tenants. In fact, even after accounting for other factors, being black and having children are, on their own, risk factors for eviction (Desmond et al. 2013; Desmond 2015, 1).

Finally, medical–legal teams can help identify and address problems with denial or delay of other public benefits (in addition to housing benefits) to which families might be entitled, including difficulties obtaining medical services and access to Medicaid benefits for children.

Two models, described below, offer successful examples of how such partnerships work.

The Peninsula Family Advocacy Program (FAP). At FAP, located in Palo Alto, California, the staff include an attorney, a project coordinator, and a medical director. FAP partners with local law firms to offer pro bono services for cases in which legal aid workers do not have sufficient expertise to help the people involved (Weintraub et al. 2010).

The Health and Legal Partnership (HeLP). HeLP is based at Cincinnati Children's Hospital. HeLP's model is similar to FAP's; they have one full-time attorney, one half-time attorney, and one full-time paralegal on site. To enable better identification of problems that need medical and legal advocacy solutions, residents at the clinic where HeLP is based learn from legal advocates and community partners about the complex issues that low-income children face (Klein et al. 2013, 1066–1067).

Conclusion

In any classroom, in any school, in any neighborhood of concentrated disadvantage, it is likely that a disproportionately high number of students suffer from the effects of toxic stress. It is more demanding for an educator to teach a single child with such symptoms, and when children suffering from the effects of toxic stress are concentrated in one classroom, or in one school, the effect is compounded, making it more likely that the achievement of all children in that classroom or school will be depressed.

As health care professionals have started to turn their attention to this important problem, so should educators and education policymakers. Short of changing the conditions in which low-income children live, high-quality support for parents and parents-to-be should be accessible. Programs to offset the effects of toxic stress should be deployed in schools of concentrated disadvantage, including programs to effectively support educators. Policymakers should improve public awareness of this insidious morbidity.

About the authors

Leila Morsy has been a research associate with EPI since 2015. She is the co-author of three EPI studies, *Five Social Disadvantages That Depress Student Performance: Why Schools Alone Can't Close Achievement Gaps*; *Mass Incarceration and Children's Outcomes: Criminal Justice Policy Is Education Policy*; and *Parents' Non-Standard Work Schedules Make Adequate Childrearing Difficult: Reforming Labor Market Practices Can Improve Children's Cognitive and Behavioral Outcomes*. Dr. Morsy's research interests include race, socioeconomic inequality, and health inequities and children's outcomes. Dr. Morsy can be contacted at leila.morsy@flinders.edu.au.

Richard Rothstein is a Distinguished Fellow of the Economic Policy Institute and a Senior Fellow, emeritus, at the Thurgood Marshall Institute of the NAACP Legal Defense Fund and of the Haas Institute at the University of California (Berkeley). He is the author of *The Color of Law: A Forgotten History of How Our Government Segregated America*. The book recovers a forgotten history of how federal, state, and local policy explicitly segregated metropolitan areas nationwide, creating racially homogenous neighborhoods in patterns that violate the Constitution and require remediation. He is also the author of *Grading Education: Getting Accountability Right* (2008); *Class and Schools: Using Social, Economic and Educational Reform to Close the Black–White Achievement Gap* (2004); and *The Way We Were? Myths and Realities of America's Student Achievement* (1998). Other books include *The Charter School Dust-Up: Examining the Evidence on Enrollment and Achievement* (co-authored in 2005); and *All Else Equal: Are Public and Private Schools Different?* (co-authored in 2003). He welcomes comments at riroth@epi.org.

Endnotes

1. Toxic stress in children can also cause physiological disruptions that lead to depressed adult health outcomes later in life. These include hypertension, cardiovascular disease, viral hepatitis, liver cancer, and chronic obstructive pulmonary disease (Shonkoff 2012). However, adult outcomes as a result of childhood toxic stress are beyond the scope of this report, and we do not address them here.

2. Research in this area sometimes describes the frightening or threatening events that can often result in toxic stress as "adverse childhood experiences" (ACEs). However, for the purpose of this report we prefer "frightening or threatening experiences." While "ACEs" are well understood by many professionals in the field as a defined set of experiences (e.g., see the ACE module questionnaire at CDC 2016), the term ACE is not sufficiently descriptive for policymakers. Many experiences of a healthy childhood can be "adverse," whether it is losing a soccer match or having a disagreement with a sibling or friend. Excessive concern with experiences that are simply "adverse" runs the danger of medicalization of such normal, character-building experiences. There is no clean line that can distinguish such normal experiences from those that can lead to toxic stress. Because children differ in many unobservable ways, what is frightening to some children may be simply challenging to others, even when the children have similar social and economic circumstances. So, while a term like "frightening or threatening" runs the risk of underestimating the possibility of toxic stress response, "adverse childhood experience" runs the risk of overestimating it. Inasmuch as concern with toxic stress has only recently become widespread

among medical professionals, and has barely penetrated educational practice, we hope that this concern will grow prudently and gradually and be restricted, in the beginning, to the more clear-cut cases.

3. For psychological, physical, and sexual abuse, see Mersky et al. 2009, 81; Coulton et al. 2007, 1134; Saul et al. 2014, 260; and Jimenez et al. 2016, 2. For having a family member incarcerated, see Morsy and Rothstein 2016; Jimenez et al. 2016, 2; and Slopen et al. 2016, 48, 50: Table 1. For witnessing domestic violence, see Jimenez et al. 2016, 2; and Slopen et al. 2016, 48, 50: Table 1. For neglect, see Mersky et al. 2009; Coulton et al. 2007, 1134; Saul et al. 2014, 260; and Jimenez et al. 2016, 2. For financial hardship, see Slopen et al. 2016, 48, 50: Table 1. For exposure to neighborhood violence, see Slopen et al. 2016, 48, 50: Table 1; and Evans and Kim 2013. For discrimination, see Slopen et al. 2016, 48, 50: Table 1. For parental divorce or separation, see Slopen et al. 2016, 48, 50: Table 1. For placement in foster care or kinship care, see Zlotnick, Tam, and Soman 2012. For property wrecked or damaged because of a fire or burglary, see Attar, Guerra, and Tolan 1994, 395: Table 3. For having a family member become seriously ill or injured, be hospitalized, or die, see Attar, Guerra, and Tolan 1994, 395: Table 3.

4. Age may also be a factor in whether frightening or threatening events precipitate a toxic stress response. This is because, at certain developmental stages of childhood, the brain is more sensitive to changes in external environmental conditions, such as frightening or threatening experiences. See Immordino-Yang, Darling-Hammond, and Krone 2018.

5. Although more whites than blacks are incarcerated (in absolute numbers, not as a share of their respective racial populations), incarcerated whites do not originate from single neighborhoods to the extent that incarcerated blacks do, in part because white poverty is not as concentrated as black poverty—whites experiencing poverty tend to be more dispersed throughout the white population (see "Consequences for Communities" in NRC 2014, beginning on page 283). By age 14, approximately 25 percent of African American children will have had a parent, usually a father, incarcerated for some period of time. The comparable share for white children is 4 percent (see Morsy and Rothstein 2016).

6. For life transitions, see Attar, Guerra, and Tolan 1994, 395: Table 3. For home crowding, see Evans 2004, 86.

7. These data come from a study with a sample size of over 1,000 children and their families (Jimenez et al. 2016). Another study with a larger sample (close to 85,000 children) finds similar results. It concludes that black children were more likely to have been exposed to frightening or threatening childhood experiences than white children. Black children were 27 percent more likely to have been exposed to one frightening or threatening experience than white children, and were 51 percent more likely to have been exposed to two or more frightening or threatening experiences. They were one-third less likely than white children to have been exposed to no such childhood experiences (Slopen et al. 2016, Table 1, on page 50). In addition to the list of frightening or threatening childhood experiences included in the Jimenez et al. study (physical abuse, sexual abuse, psychological abuse, neglect, living with someone with substance abuse problems or mental illness, seeing a caregiver treated violently, or having a parent incarcerated), the Slopen et al. study also includes children's exposure to neighborhood violence, racial discrimination, financial hardship, and parental divorce or separation.

8. In 2005, the last year for which study data were collected, 12 percent of white families had incomes below $20,000, compared with 29 percent of black families (U.S. Census Bureau CPS-ASEC 2006). See also Wilson and Rogers 2016.

9. The study data do not allow us to determine whether the poorer outcomes resulted from

exposure to frightening or threatening experiences, or from other conditions connected with low socioeconomic status. However, in this study, comparisons were made across children who were similar in age, gender, race, maternal education, parent relationship status, and household income—so there is a suggestion of causality. Children who had been exposed to three or more frightening or threatening experiences were compared with children who had had no frightening or threatening life experiences (Jimenez et al. 2016, 5).

10. See note 8, above.

11. Related to attention problems, another study found that children who had been exposed to three, or four or more, frightening or threatening experiences, respectively, have 1.8 and 2.7 times the odds of being diagnosed with attention deficit hyperactivity disorder (ADHD) by age 9 than children who had been exposed to no such experiences. Children in this study were similar in mother's race, education, marital status, number of children, prenatal substance use, age at her child's birth, and whether the focal child was the mother's first birth. The children were of the same gender and of similar birth weight. The study also controlled for family income, the number of other children and adults living in the home, and whether the focal child's grandmother was living in the household. Children who had been exposed to three frightening or threatening experiences and children who had had four or more such experiences were separately compared with children who had had no such experiences (Hunt, Slack, and Berger 2017, 398, and Table 2 on pages 397–398).

12. For ear infections, acute respiratory infections, eczema, and viral infections, see Karlén et al. 2015, e1454: Table 2. Children in this study were Swedish, and of similar age (10 years) and birth weight. They had been exposed to three or more frightening or threatening experiences. They were compared with similar children who had no frightening or threatening experiences (Karlén et al. 2015, e1454).

13. For obesity, see Burke et al. 2011, 411. Children in this study were under 21 years old and low-income, and similar in age, gender, and ethnicity. They had been exposed to four or more frightening or threatening experiences. They were compared with children of the same gender and similar in age and ethnicity who had had no frightening or threatening experiences. The measure of obesity was taken from a two-year retrospective review of children's medical charts (Burke et al. 2011, 411).

14. For teen pregnancy, see Hillis et al. 2004, 323: Table 4. This study compared girls who had been exposed to three or more frightening or threatening experiences with girls of the same race, age, and education level who had had no frightening or threatening experiences. Pregnancies were considered "teenage" if they occurred between the ages of 11 and 19 (Hillis et al. 2004, 323).

15. See Bahreinian et al. 2013, 146. Researchers measured stress-related physiological dysregulation, or "weathering," using a set of biomarkers: fasting glucose, total cholesterol, high-density lipoprotein cholesterol, dehydroepiandrosterone sulfate (a naturally occurring steroid), cortisol, systolic and diastolic blood pressure, and waist-to-hip ratio. Cumulatively, these biomarkers indicate a person's lifelong level of exposure to stress-inducing conditions, and the aggregate measure is called the "allostatic load." Generally, people with higher allostatic loads have experienced more stressful events and conditions throughout their lives than those with lower allostatic loads. The study compared boys who had high allostatic scores (scoring in the highest quartile for three or more stress-related biomarkers) with boys who had low allostatic scores (scoring in the highest quartile for two or fewer stress-related biomarkers). The study reports that after accounting for the usual predictors of asthma—including boys' age and ethnicity, whether boys are allergically hypersensitive or allergic, and whether their parents have or have had asthma—boys with high biomarkers of stress are four times as likely to have asthma as their

counterparts with low biomarkers of stress (Bahreinian et al. 2013, 144).

16. There are neighborhoods of concentrated disadvantage that are primarily Hispanic. However, on average, Hispanic Americans have greater social mobility than African Americans. Hispanic Americans suffer from contemporary discrimination, and yet the consequences of historic discrimination against African Americans—including slavery and legally ratified race-based segregation, compounded with contemporary discrimination—has resulted in extremely low social mobility for African Americans, and high levels of neighborhood deterioration and poverty concentration.

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