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The Biological Embedding of Child Abuse and Neglect
Implications for Policy and Practice

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Abstract

Each year within the US alone over 770,000 children are victimized by abuse and neglect (US Department of Health and Human Services, 2010), and this figure is likely to underestimate the extent of the problem. Researchers have long recognized that maltreatment has adverse effects on children's mental health and academic achievement. Studies of adults show that adverse childhood experiences like maltreatment increase risk for chronic diseases of aging, including Type II diabetes and cardiovascular disease. What the field does not fully understand is why maltreatment has such pervasive effects. Studies on the neuroscience of maltreatment have begun to offer some clues. Victims of maltreatment differ from non-victims with respect to brain structure and function, hypothalamic-pituitary-adrenal-(HPA) axis and autonomic nervous system function, immune function, and epigenetic markers. These studies identify potential mechanisms by which maltreatment increases risk for poor mental and physical health and poor school performance by affecting systems that subserve memory, attention, the response to stress, and inflammation. The findings highlight the importance of broadening the scope of child welfare beyond child protection to include child well-being. A focus on child well-being would require integrated services, wherein comprehensive mental and physical health care are routinely offered to victims of maltreatment and case workers, pediatricians, and psychologists would work as teams to determine how best to deliver care to children and families in the child welfare system. In working with the family, such efforts could potentially reduce the risk of re-victimization which commonly jeopardizes long-term gains in child well-being.

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From the Editors

There are many risk factors that negatively impact the brain development of a young child, one of which is child abuse and neglect or child maltreatment. Children who experience maltreatment in the early years are at risk for a variety of poor outcomes, including school failure, problem behaviors, and psychological stress. The emerging field of neuroscience is beginning to provide insight on *how* maltreatment impacts the development of children's brain and neurological functioning. Uncovering this would facilitate appropriate and effective interventions for children who experience maltreatment and prevent child abuse.

This *Social Policy Report* is based on the proceedings of an expert panel meeting convened by the Administration on Children, Youth and Families, Department of Health and Human Services (DHHS) in partnership within the National Institute on Drug Abuse (NIDA) and *Eunice Kennedy Shriver* National Institute on Child Health and Human Development (NICHD), with the National Institutes of Health, DHHS. The proceedings encouraged the translation of science leading to innovative approaches to addressing the needs of children who experience maltreatment. In addition to providing comprehensive research linking maltreatment to change in children's neurodevelopmental behavior and functioning, the authors, Jaffee and Christian, call attention to interventions that can prevent child abuse and support children who are maltreated, highlighting the importance of comprehensive and integrated services for these children.

From a federal research vantage point, Boyce, Maholmes, and Widom stress the importance of translational research with the goal of seeking long-term evidence-based interventions for children exposed to abuse. Orr and Kaufman remind us of the importance of new discoveries in the field of epigenetics in uncovering the resiliency of children who experience abuse and the implications for interventions. Dozier and Fisher highlight current neuroscience evidence with their review of one strategy to address maltreatment is by helping caregivers support the biobehavioral regulation of children who have experienced abuse. Finally, Samuels and Blitz provide insight on how the child welfare system can be strengthened to support children who experience maltreatment and the importance of neuroscience to inform child welfare practice.

April is Child Abuse and Prevention Month. The authors of this SPR issue remind us of the long-term and detrimental consequences of children who are not protected from abuse and neglect, particularly the impact on brain and behavioral development and poor functioning overall. While the abuse and neglect of children may be unfathomable, the authors of this issue and commentators provide hope and optimism that with increased attention, integration of neuroscience, funding, and effective programming and policies, children who experience maltreatment can benefit from effective policy and interventions.

—Iheoma U. Iruka (Issue Editor)
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The Biological Embedding of Child Abuse and Neglect
Implications for Policy and Practice

In 2011, 676,000 children in the United States were victimized by abuse and neglect (US Department of Health and Human Services [USDHHS], 2012). Child Protective Services (CPS) agencies in the US receive over 3 million reports of abuse and neglect annually. Sixty-65% of these reports are investigated, and approximately 20% of investigations result in the substantiation of at least one child as an abuse or neglect victim (USDHHS, 2012). Over 1,500 annual child deaths are attributed to child abuse or neglect (USDHHS, 2012).

Although it has long been understood that maltreated children are at risk for emotional and behavioral problems, peer problems, and deficits in multiple cognitive domains (Cicchetti & Valentino, 2006; Gilbert et al., 2009), only more recently have researchers begun to describe correlations between adverse childhood experiences like abuse and neglect and poor adult health, including chronic diseases of aging like cardiovascular disease, cancer, and chronic lung disease (Anda et al., 2008; Brown et al., 2010; Dong et al., 2004; Felitti et al., 1998). Conservative estimates of the total costs related to medical and mental health services, lost productivity, and crime for all new cases of maltreatment in a given year range from approximately $80 billion (Gelles & Perlman, 2012) to $124 billion (Fang, Brown, Florence, & Mercy, 2012). These costs—most of which are shouldered by taxpayers—have raised calls for more effective prevention of maltreatment (Shonkoff, Garner, The Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care & Section on Developmental and Behavioral Pediatrics, 2012), and a better understanding of the mechanisms by which adverse childhood experiences result in poor mental and physical health.

In this *Social Policy Report*, we briefly review the evidence on how adverse childhood experiences like maltreatment become "biologically embedded" (Hertzman, 1999) to shape biological systems that are designed to respond to the environment. To what degree are children's brains shaped by exposure to maltreatment? Does exposure to maltreatment shape the development of the immune system or the neuroendocrine system? If exposure to maltreatment is associated with alterations in these biological systems, do these changes underlie the social, emotional, cognitive, and behavioral problems that often characterize victims of maltreatment? What implications does this research have for how we should invest in children and care for those within the child welfare system?

Abuse and Neglect Are Toxic Stressors

Abuse and neglect are considered "toxic" stressors. According to a 2005 working paper from the National Scientific Council on the Developing Child, toxic stressors are chronic and uncontrollable events resulting in "strong, frequent, or prolonged activation of the body's stress management system" (p. 1) and experienced without recourse to caring adults who could help the child cope with the event (National Scientific Council on the Developing Child, 2005). Researchers have identified toxic stress in childhood as an important contributor to adult chronic disease. There is an increased risk that children exposed to toxic stress will adopt unhealthy lifestyles in adolescence and adulthood and to the long-lasting effects of toxic stress on physiological systems (Shonkoff, Boyce, & McEwen, 2009). As a result, the American Academy of Pediatrics has advocated for systematic policy changes to minimize children's exposure to toxic stress and to promote child and family health. These changes include, but are not limited to, significant investments in early childhood health and education, as well as strengthening public and private policies that promote child and adult health through employment support and cash assistance for parents, parental leave, flexible working hours, and provision of nutritious food (Shonkoff et al., 2012).

A Neurobiological Framework Linking Toxic Stress in Childhood to Adult Health

Exposure to toxic stress early in development affects the functioning of three highly integrated systems: the immune system (which protects against disease), the neuroendocrine system (which releases hormones to control important bodily functions), and the central nervous system (which comprises the brain and spinal cord) (Danese & McEwen, 2012). Potential threats in the environment are detected by a region of the brain called the amygdala (Ledoux, 2000). Whether or not the amygdala identifies a situation as threatening depends partly on inputs from the hippocampus, which is involved in learning and memory, and partly on inputs from the prefrontal cortex (PFC), which is involved in attention, inhibition, and other higher-order cognitive processes.

In response to perceived threat, the organism produces a coordinated response involving several systems. In the short term, the coordinated stress response is adaptive: (a) activation of the cardiovascular system facilitates "flight" from threat by increasing blood pressure and heart rate and diverting blood to muscle; (b) activation of the metabolic system mobilizes stored energy via increases in glucose levels that are mediated by catecholamines, glucagon, growth hormone, and glucocorticoids; and (c) activation of the immune system protects against infection (Sapolsky, Romero, & Munck, 2000). However, chronic activation of the stress response system can have deleterious mental and physical health consequences (McEwen, 1998; Sapolsky et al., 2000).

The immune, neuroendocrine, and central nervous systems (CNS) are rapidly developing over the first few years of life and responsive to variations in the environment, with parts of the CNS (e.g., prefrontal cortex) maturing through the second decade. This suggests that these systems will develop very differently in children who experience chronic abuse or neglect as opposed to children who grow up in safe, stable, and nurturing environments. However, because central nervous, neuroendocrine, and immune systems are highly inter-connected via positive and negative loops, there is no simple story about how adversities like maltreatment affect physiological development. For example, under some circumstances, exposure to chronic stress can cause the failure of a system like the hypothalamic-pituitary-adrenal (HPA) axis to "shut off" once a threat has abated, resulting in high levels of circulating glucocorticoids (cortisol in humans) which can have detrimental effects on neural development (McEwen, 1998). Alternatively, exposure to chronic stress can cause a system (like the HPA axis) to fail to respond to new stressors. The failure to produce glucocorticoids in response to stress can result in chronic inflammation because the immune system—which is counter-regulated by glucocorticoids—will be left unchecked (McEwen, 1998). Thus, as we discuss the effects of maltreatment on specific systems in the following sections, it is important to bear in mind that the findings are mixed and the field is in its infancy in terms of understanding how the chronicity, severity, or timing of maltreatment influences the functioning of a given system. It is also unclear why the effects of early adversity on physiological systems can depend on whether or not a person is currently experiencing psychiatric symptoms.

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Maltreatment Alters the HPA Axis Function

The HPA axis is activated in response to physical and psychosocial stressors such as maltreatment, resulting in release of corticotropin releasing factor (CRF) and vasopressin from the hypothalamus. CRF stimulates the release of adrenocorticotropic hormone (ACTH) from the anterior pituitary which in turn stimulates the release of cortisol from the adrenal gland. Cortisol terminates the stress response through feedback at the level of the hypothalamus and the pituitary (Gunnar & Vazquez, 2006).

The literature on how the HPA axis is shaped by exposure to early life stress is complex, with disparate findings depending on which level of the HPA axis is being probed, whether the HPA axis is being stimulated in response to psychosocial or pharmacological challenge

(i.e., synthetic glucocorticoids), and whether participants are currently depressed or experiencing symptoms of post-traumatic stress disorder (PTSD). Nevertheless, the existing literature suggests two hypotheses about how the HPA axis is shaped by exposure to early adversity. The first is known as the glucocorticoid cascade hypothesis, and it proposes that hyper-secretion of glucocorticoids in response to stress damages a part of the brain called the hippocampus, resulting in the loss of neurons containing receptors which receive the glucocorticoid signal to terminate the HPA axis response (Sapolsky, Krey, & McEwen, 1986). As a result, glucocorticoid levels remain high even after a stressor has terminated, ultimately resulting in physical and mental health problems that stem from damage to the hippocampus and dysregulation of the immune system (McEwen & Seeman, 1999).

The second hypothesis is that early life stress results in insufficient glucocorticoid signaling, meaning either that there is not enough cortisol available to terminate HPA axis and immune responses to threat (i.e., hypocortisolism) or that glucocorticoid receptors become less responsive to chemical signaling and, consequently, the negative feedback loop by which glucocorticoids shut down the HPA axis and the immune response becomes impaired (Raison & Miller, 2003). Evidence for hypocortisolism is provided by laboratory studies showing that exposure to psychosocial stressors (e.g., social stress during public speaking tasks) is associated with blunted cortisol reactivity in children and adults with histories of maltreatment compared with non-maltreated controls (Carpenter, Shattuck, Tyrka, Geracioti, & Price, 2011; Heim et al., 2000; MacMillan, Georgiades, et al., 2009). Evidence for glucocorticoid receptor insensitivity derives from studies in which participants are administered synthetic glucocorticoids which, under Kertes, Gunnar, Madsen, & Long, 2008), whereas moderately severe maltreatment and severe emotional abuse (compared with no abuse) are associated with higher cortisol levels and a steeper cortisol slope (Bruce et al., 2009; van der Vegt et al., 2009). Children in foster care typically have lower morning cortisol levels and a flatter cortisol slope (Dozier et al., 2006; Fisher, Stoolmiller, Gunnar, & Burraston, 2007), although interventions to promote sensitive caregiving in a foster care context have been shown to normalize diurnal variation in cortisol (Dozier et al., 2006; Fisher et al., 2007; Fisher, Van Ryzin, & Gunnar, 2011). Interestingly, dysregulation of diurnal variation in cortisol is more pronounced among young children who continue to live with their birth parents after investigation by Child Protective Services than in children who are placed in foster care (Bernard, Butzin-Dozier, Rittenhouse, & Dozier, 2010).

Finally, maltreatment may also affect the neuroendocrine system by leading to changes in the chemical markings that turn genes on and off (Labonte, Suderman, et al., 2012; Yang et al., 2013). These epigenetic changes are associated with attenuated cortisol responses to synthetic glucocorticoids (Tyrka, Price, Marsit, Walters, & Carpenter, 2012) and reduced glucocorticoid receptor expression (Labonte, Yerko, et al., 2012; McGowan et al., 2009) which could underlie impairments in the negative feedback loop by which glucocorticoids shut down the HPA axis and the immune response when a threat has abated.

In summary, both glucocorticoid insufficiency and excess could have contrasting but equally adverse effects on the organism. They could describe different profiles of HPA axis dysregulation in different people, or they could reflect profiles of HPA axis dysregulation at different times within the same individual. For example, the onset of a stressor is associated with heightened activation of the HPA axis; but then as time passes, the glucocorticoid levels fall to below-normal levels (Miller et al., 2007). There is recent evidence that the mechanisms underlying glucocorticoid insufficiency and excess might be found in epigenetic changes to genes that express the glucocorticoid receptor (Labonte, Yerko, et al., 2012; McGowan et al., 2009).

Maltreatment Alters Immune Function

A recent hypothetical model of stress and health has proposed that toxic stress in early childhood alters the behavior of macrophages which are cells that are rapidly activated in response to infection, causing these cells to mount an excessive inflammatory response to infection (Miller, Chen, & Parker, 2011). Excessive cytokine release impairs glucocorticoid receptor functioning, making the immune system ever less sensitive to negative feedback and increasing the risk for autoimmune disorders and chronic inflammation (Chrousos, 1995; Raison & Miller, 2003).

There is indeed evidence that various serum immune markers like C-reactive protein (CRP) are elevated in adults who have a history of maltreatment (e.g., Danese, Pariante, Caspi, Taylor, & Poulton, 2007) or who grew up in families characterized by elevated levels of abusive, rejecting, and neglectful parental behavior (Taylor, Lehman, Kiefe, & Seeman, 2006; but see Car-

penter, Gawuga, Tyrka, & Price, 2012 for a null effect). Proinflammatory cytokines that are released in response to immune challenge are also elevated in maltreated youth and in adults with a childhood history of maltreatment (Bertone-Johnson,Whitcomb, Missmer, Karlson, & Rich-Edwards, 2012; Kiecolt-Glaser et al., 2011; Slopen, Kubzansky, McLaughlin, & Koenen, 2013).

Not only do the data support the hypothesis that exposure to uncontrollable stress results in chronic inflammation, but the data are also consistent with the hypothesis that the immune response is heightened in response to new stressors, including psychosocial stressors (e.g., Carpenter et al., 2010; Kiecolt-Glaser et al., 2011) and in vitro bacterial challenge (Miller & Chen, 2010). It is hypothesized that the excess immune response underlies the association between chronic and uncontrollable stress (e.g., maltreatment) and immune-related conditions, including depression, cardiovascular disease, and asthma (Miller et al., 2011).

Maltreatment Alters the Brain

The "cascade model" of early life stress (Sapolsky et al., 1986; Teicher, Andersen, Polcari, Anderson, & Navalta, 2002) hypothesizes that exposure to stress hormones—in particular, glucocorticoids—affects many aspects of brain development. Because of the key role played by the amygdala, the hippocampus, and the prefrontal cortex in mediating an individual's response to threat as well as learning, memory, and cognitive control, structural and functional imaging studies have focused largely on how these areas are affected by exposure to abuse or neglect.

We note that many of the imaging studies (like many of the neuroendocrine studies) involve children and adults with maltreatment-related post-traumatic stress disorder (PTSD), making it difficult to determine whether differences between maltreated and control groups are a function of maltreatment per se or psychiatric impairment (De Brito et al., 2013). Although we focus here on the hippocampus, prefrontal cortex, and amygdala, we note that maltreatment-related differences have also been observed in other areas of the brain (Bauer, Hanson, Pierson, Davidson, & Pollak, 2009; Teicher et al., 2004).

There is some evidence that the hippocampus (e.g., Andersen et al., 2008; Bremner et al., 1997) and areas of the prefrontal cortex (e.g., De Bellis et al., 2002; Tomoda et al., 2009) are smaller in size in maltreated versus non-maltreated individuals, which may be indicative of neuronal loss (De Bellis et al., 2002). There is also evidence that white matter (which coordinates communication among regions of the brain) and gray matter in the hippocampus (Dannlowski et al., 2012; Frodl, Reinhold, Koutsouleris, Reiser, & Meisenzahl, 2010; Thomaes et al., 2010) and in the prefrontal cortex (Andersen et al., 2008; De Brito et al., 2013) are reduced in size in maltreated vs. non-maltreated individuals. Although most studies have not found that maltreatment history is associated with amygdala volume in children or adults (Woon & Hedges, 2008), two recent studies have detected differences. Both found that youth who had spent their early years in orphanages where they had experienced gross neglect had larger amygdala volumes compared with non-institutionalized youth (Mehta et al., 2009; Tottenham et al., 2010).

Functional Differences

Functional imaging and electrophysiological studies have primarily focused on whether maltreated and non-maltreated children differ with respect to how the brain responds to emotional stimuli (e.g., angry, sad, happy, or neutral faces), which may underlie hyper-vigilance to threat, and how the brain responds to rewarding stimuli. It is hypothesized that these patterns of emotional responding and response to reward might explain the elevated risk for depressive and substance use disorders as well as PTSD in individuals with a childhood history of maltreatment (Guyer et al., 2006).

With respect to emotional stimuli, there is behavioral evidence that maltreated children are quicker than non-maltreated children to recognize angry faces when, for example, facial expressions include blends of emotions (e.g., angry and sad) or when the image resolution of a facial expression is relatively poor (Pollak & Sinha, 2002). Consistent with these perceptual differences, maltreated children also show greater activation of the right amygdala to angry faces (but not sad faces) versus neutral faces (McCrory et al., 2011), even when the presentation of these stimuli falls outside conscious perception (McCrory et al., 2013). Moreover, event-related potential (ERP) studies have shown that children with a history of physical abuse are more attentive to angry cues (versus other negatively-valenced cues) and have more difficulty disengaging from angry vs. happy cues (e.g., Curtis & Cicchetti, 2011; Pollak, Klorman, Thatcher, & Cicchetti, 2001; Shackman, Shackman, & Pollak, 2007). Such hyper-attention to threat has been shown to mediate the association between a history of maltreatment and current symptoms of anxiety (Shackman et al., 2007).

Although there is relatively little behavioral data to suggest that maltreated and non-maltreated children are differentially sensitive to reward (Guyer et al., 2006), there are maltreatment-related differences in electroencephalogram (EEG) activity consistent with the hypothesis that maltreated youth are less likely to experience positive emotions. For example, one study found that in maltreated adolescent girls, resting EEG activity was relatively greater in the right (versus the left) frontal cortex, but in non-maltreated adolescent girls, this hemispheric asymmetry was less pronounced (Miskovic, Schmidt, Georgiades, Boyle, & MacMillan, 2009). Because the right frontal region is involved in withdrawal-related behaviors and emotions (Davidson, 1992), the finding suggests that maltreated youth may be less responsive than non-maltreated youth to positive (or rewarding) stimuli.

Maltreatment-related alterations in reward processing or in brain regions that subserve anticipation of reward have also been observed in *functional magnetic resonance imaging* (fMRI) studies. For example, one study found that adolescents who spent their early years in severely deprived institutional settings (and were subsequently adopted) showed significantly lower levels of ventral striatal activation in anticipation of moderate- and high-value monetary rewards compared with control youth (Mehta et al., 2010). Another study found that young adults who had been maltreated in childhood rated monetary rewards less positively than controls and showed lower levels of activation in the globus pallidus region of the left basal ganglia which receives projections from dopaminergic circuits (Dillon et al., 2009). Thus, these findings are consistent with the hypothesis that adverse childhood experiences result in dysfunction in dopaminergic systems that project to regions of the brain involved in the processing of reward (Dillon et al., 2009) and that may underlie reward-related disturbances in depressive and substance use disorders that are commonly observed in individuals who were maltreated in childhood.

Together, these studies suggest that children who are victims of maltreatment may be hyper-vigilant to perceived threat in the form of angry stimuli, and although this response may be adaptive in the context of an abusive environment (Mead, Beauchaine, & Shannon, 2010), it may predispose children to anxiety and reactive aggression if the response is generalized. Moreover, changes in dopaminergic circuitry may result in a relatively weak response to positive stimuli, thus increasing risk for depression. Thus, children who have repeatedly been exposed to violence may perceive relatively non-threatening or ambiguous situations as threatening because they have learned from past experience that social interactions are frequently dangerous and that heightened vigilance promotes their own safety.

Thus, children who have repeatedly been exposed to violence may perceive relatively non-threatening or ambiguous situations as threatening because they have learned from past experience that social interactions are frequently dangerous and that heightened vigilance promotes their own safety.

Neuroendocrine, Immune, and CNS Involvement in Mental and Physical Health

Children and adults with a history of maltreatment are less mentally and physically healthy than children and adults without a history of maltreatment (Cicchetti & Valentino, 2006; Christian & Schwarz, 2011; Lanier, Jonson-Reid, Stahlschmidt, Drake, & Constantino, 2010). Emerging studies show that maltreatment-related alterations in neuroendocrine, immune, or central nervous system structure or function are related to mental and physical health. For example, among youth who have been bullied or maltreated, relatively lower levels of cortisol reactivity to a psychosocial stressor are associated with higher levels of social and behavioral problems (Ouellet-Morin et al., 2011). Work by Pollak and colleagues (Bauer et al., 2009; Shackman et al., 2007) has demonstrated that maltreatment-related structural and functional changes in the brain are associated with both cognitive outcomes (Bauer et al., 2009) and anx-

ious behavior (Shackman et al., 2007). Finally, Miller and Cole (2012) showed that adolescents who experienced a depressive episode over the course of their study also had elevated CRP and Interleukin 6 (IL-6) levels if they had experienced childhood adversity. Moreover, CRP levels remained elevated in this group even after symptoms of depression abated, suggesting a possible immune pathway by which depression might forecast inflammation-related health problems like cardiac disease. Despite these promising leads, more work is needed to show that the neurobiological sequelae of maltreatment have functional consequences for emotions, cognition, behavior, and health.

Translational Implications of the Neurobiology of Maltreatment

There is ample evidence that maltreatment is associated with alterations in neuroendocrine, immune, limbic, and prefrontal systems. Although researchers are beginning to show that these changes are associated with maltreatment-related variation in children's mental health and cognitive abilities, much more work is needed in this area. At the most basic level, a clearer temporal ordering of events is required. This would require following children at high risk for abuse and neglect over time to confirm that those who become victims of abuse and those who do not are similar with respect to immune, neuroendocrine, or brain function (or structure) prior to the maltreatment. Given the likelihood that children who become victims of abuse or neglect were likely exposed to a very different prenatal environment than children who are never maltreated, differences between the groups may be apparent from the outset and may simply be amplified by exposure to maltreatment or other toxic stressors.

This prospective approach could also address questions about whether and how the timing or chronicity of maltreatment matters for the development of various biological systems (e.g., Andersen et al., 2008). By following children from a wide range of socioeconomic backgrounds, such an approach could also address questions about the specificity of the effects of maltreatment on these biological systems. For example, because maltreatment is highly correlated with other potentially chronic and severe stressors (e.g., poverty, parental psychopathology), its effects on neuroendocrine, immune, or brain systems may not be unique. One approach currently embraced by the field is to consider cumulative childhood adversity in the form of parental psychopathology and criminality, adult domestic violence, parental separation, as well as maltreatment (e.g., Felitti et al., 1998; Finkelhor, Shattuck, Turner, & Hamby, 2013). The alternative approach has been to isolate the effects of maltreatment on health and behavior by comparing maltreated youth with sociodemographically matched controls (Manly, Cicchetti, & Barnett, 1994; Widom, 1989).

To the extent that cumulative adversity broadly and maltreatment specifically produce a sense of uncontrollability and physical or psychological threat, the mechanisms by which they act on physiological systems and increase risk for disease in the long-term may be identical. Indeed, Johnson and colleagues (2013) have noted that efforts to prevent children's exposure to toxic stress are likely to be more cost-effective in the long-term than popular public health efforts like immunization programs because the former will target a common physiological pathway implicated in a wide range of physical diseases whereas the latter must be administered on a disease by disease basis.

Finally, the degree to which children show resilience to stressors like maltreatment depends on the balance of risk and protective factors to which children are exposed. In the same way that there is substantial heterogeneity in the effect of maltreatment on children's mental health, behavior, and cognitive capabilities, there may also be heterogeneity in the extent to which maltreatment is biologically embedded, although this question is relatively unexplored. It is worth considering that the balance of risk and protective factors is highly dynamic (Maikovich, Jaffee, Odgers, & Gallop, 2008) and, as a result, sustained competence in terms of either behavioral or biological "resilience" may be difficult for children to maintain.

Implications of New Research: Prevent Incidence and Recurrence of Maltreatment

Given the documented adverse effects of maltreatment on neuroendocrine, immune, and central nervous system functioning, and the potential for dysregulation of these systems to produce chronic mental and physical health problems, renewed and expanded efforts should be made to prevent the incidence and recurrence of maltreatment. In this respect, the implications of new findings on the neurobiology of maltreatment are not all that new. The same recommendations have been made for more than 20 years by researchers who have long recognized that maltreatment has adverse effects on children's mental health, academic achievement, and risk for delinquency and crime (e.g., Cicchetti & Rizley, 1981; Helfer & Kempe, 1968).

The good news is that rates of reported maltreatment *are* declining, although it is not clear how much this can be attributed to maltreatment prevention efforts. As we will review below, the bad news is that a relatively small number of maltreatment prevention programs are effective and have been scaled up to work in the community. There is even less evidence for programs designed to prevent the recurrence of maltreatment (MacMillan, Wathen, et al., 2009).

Preventing the Emergence of Maltreatment

Though popular, home visitation programs for at-risk families have been only modestly successful at reducing child maltreatment rates (Howard & Brooks-Gunn, 2009; MacMillan, Wathen, et al., 2009; Scribano, 2010). The recent review of Home Visiting Evidence of Effectiveness (HomVEE) found limited evidence of effectiveness for various home visiting program models designed to serve families with pregnant women and children from birth to age 5 years to inform the Maternal,Infant, and Early Childhood Home Visiting Program (MIECHV) established by the Affordable Care Act (Avellar et al, 2013). However, some, like the Nurse-Family Partnership (NFP), have been rigorously evaluated in randomized control trials and demonstrated substantial reductions in rates of child maltreatment over a 15 year period (Olds et al., 1997) and reductions in child injuries and hospitalizations (Olds, 2006) in intervention versus control families. Although the NFP program is implemented by highly trained registered nurses, the program has been shown to be cost-effective (and more effective generally) particularly for at-risk mothers (e.g., young, single parents) versus older, socioeconomically advantaged, married mothers (Olds, 2006). Although NFP does not focus on child maltreatment per se, it does (a) provide mothers with social support and attempt to reduce parental stress, (b) train parents to increase the use of positive parenting strategies and reduce the use of harsh discipline, and (c) encourage the creation of physically safe spaces for children (Scribano, 2010). Nevertheless, beneficial effects of NFP are not always detected when it is rolled out on a larger scale. For example, in evaluating a statewide implementation of NFP, Matone and colleagues (2012) found that the intervention did not reduce rates of serious childhood injuries.

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Targeted interventions like NFP rely on primary care doctors (e.g., obstetricians) for referrals. Physicians, both pediatricians and family physicians, may feel they do not have adequate training to assess psychosocial risk factors nor to meet the needs of "risky" families enrolled in their practices (Lane & Dubowitz, 2009). The Safe Environment for Every Kid (SEEK) program is an enhanced pediatric primary care program that trains health professionals, working in conjunction with a social worker, to target specific risk factors for children's health and behavioral development that have been identified by parents in a brief screening questionnaire (i.e., parental depression, substance use, interpersonal violence, and major stressors) (Dubowitz, Feigelman, Lane, & Kim, 2009). Once pediatricians have assessed potential risks to the child, they can discuss with the family whether services are needed, and the family can meet with an on-site social worker who can provide referrals to relevant services. In a study of a low-income, inner-city sample, Dubowitz et al. (2009) found that SEEK participation (versus standard pediatric practice) resulted in a third fewer families being referred to CPS by 12 month follow-up. In a subsequent study of a middle-income sample (in which there was a low rate of referrals to CPS), SEEK participation resulted in reduced psychological aggression and minor physical assaults as measured by the Conflict Tactics Scale-Parent-Child version (Dubowitz, Lane, Semiatin, & Magder, 2012).

In contrast to NFP, which is most effective as a targeted intervention, The Positive Parenting Program (Triple P) is a universal intervention designed to prevent children's problem behaviors and reduce coercive parenting practices (Foster, Prinz, Sanders, & Shapiro, 2008). Triple P utilizes a tiered system of interventions that range from media messages designed to reach a large segment of the population to intervention modules targeted at families of children with borderline or clinically-significant levels of behavior problems. In recent years, Triple P has been evaluated in terms of its effects on child maltreatment

(Prinz, Sanders, Shapiro, Whitaker, & Lutzker, 2009), the logic being that efforts to reduce harsh discipline, promote positive parenting, and alter the community context for parenting should have downstream effects on child maltreatment rates. In a randomized control trial of Triple P (administered by the local workforce) versus services as usual in 18 counties in the southeastern US, counties that were assigned to the intervention condition had significantly lower rates of substantiated maltreatment, out-of-home placements, and hospital and emergency room visits than counties that were assigned to the control condition, with effect size differences that were large in magnitude (Prinz et al., 2009). Moreover, Triple P was shown to be highly cost-effective, with rough estimates indicating that program costs could be recovered in a single year by as little as a 10% reduction in the rate of abuse and neglect (Foster et al., 2008)–an achievable figure given that the actual reduction in maltreatment rates associated with Triple P was approximately double that estimate (Prinz et al., 2009).

One reason that programs like Triple P and SEEK may be successful is because they train service providers from multiple disciplines who, in the case of SEEK, work together as a team. Although primary care physicians are increasingly being asked to advocate for their patients to be referred to evidence-based services (Donelan-McCall, Eckenrode, & Olds, 2009), primary care physicians may feel that they lack sufficient knowledge to recognize families who would potentially benefit from more intensive intervention or to make suitable referrals. Moreover, they may fear involvement in court proceedings if the families they refer for intervention are subsequently investigated for allegations of abuse or neglect (Christian & Schwarz, 2011). Programs that link physicians with social workers, teachers, and legal professionals are likely to produce better outcomes for children and families because they facilitate communication among individuals with complementary expertise and shared knowledge of the child and family.

Preventing Maltreatment Recurrence

Recidivism among families involved in the child welfare system is a significant problem, with estimates of approximately 40% of families re-entering the system within five years of an index event (DePanfilis & Zuravin, 1999; Way, Chung, Jonson-Reid, & Drake, 2001). Preventing the recurrence of maltreatment among families already involved in the child welfare system has proved more difficult than preventing new cases of child abuse (MacMillan, Wathen, et al., 2009). There has been some success at reducing maltreatment recidivism among parents with multiple referrals to CPS by using Parent-Child Interaction Therapy (Hembree-Kigin & McNeil, 1995) combined with self-motivational approaches (Chaffin et al., 2004; Chaffin, Funderburk, Bard, Valle, & Gurwitch, 2011).

Implications of New Research: Informing Existing Services for Maltreated Children

In a nationally representative sample of children involved with the child welfare system in the United States, between 18% and 22% had clinically-significant scores on parent-, teacher-, or youth-reports of emotional and behavioral problems, compared to 8% of children in the general population (Casanueva, Dolan, Smith, Ringeisen, & Dowd, 2012). Moreover, children with histories of abuse have more physical health problems than demographically-matched children without histories of abuse (e.g., Flaherty et al., 2006; Hansen, Mawjee, Barton, Metcalf, & Joye, 2004; Lanier et al., 2010), differences that can be attributed partly to the experience of abuse and neglect and partly to co-occurring family poverty, parental psychopathology, family violence, prenatal and postnatal exposures, and a lack of routine health care (Christian & Schwarz, 2011). Thus, there are significant unmet health care needs in the population of children involved with the child welfare system and the question is how best to meet those needs in terms of (1) how services are provided and (2) which services are provided. With respect to the first point, we add our voice to recommendations for integrated services for children and their families in the child welfare system. With regard to the second point, we suggest that research on the neurobiology of maltreatment focus on mental health services for maltreated children that addresses trauma, using evidence-based approaches that have shown success, along with appropriate psychiatric assessment for children who may benefit from adjuvant pharmacotherapy.

Offering Integrated Services and One-Stop Shopping

There have been calls from the Children's Bureau (Mitchell et al., 2012), from Congress (H.R. 6893/P.L. 110-351), and from researchers dating back at least to 2002 (Corbett & Swartz, 2002; Stagner & Lansing, 2009) for state welfare agencies to provide integrated and coordinated systems of care for children in the child welfare system. As implemented, integrated services have taken different forms. For example, the interdisciplinary Child Advocacy Center (CAC) model for the investigation of child sexual

abuse has become a standard approach to investigation in communities across the US CACs have been shown to improve law enforcement participation in sexual abuse investigations, improve interdisciplinary coordination of investigations, increase access to medical examinations for victims, and improve family satisfaction with the investigative process (Cross et al., 2008). Recognizing that schools are a relatively easy place to reach children, the Children's Bureau issued a discretionary grant in 2011 for school-based initiatives that implemented multidisciplinary interventions for at-risk children (Mitchell et al., 2012).

Integrated services may also refer to continuity in health care delivery for children involved in the child welfare system and provision of a medical home or patient-centered medical (PCMH) (http://pcmh.ahrq.gov/). The benefits of a medical home include consistency of care by physicians whose knowledge of the child's medical history and current health status can make them effective advocates for children in decisions about what is in the child's best interest. Efforts to coordinate health care and monitor prescription drug use for children in foster care as mandated by the 2008 Fostering Connection to Success and Increasing Adoptions Act (H.R. 6893/P.L. 110-351) has proved particularly difficult, although the American Academy of Pediatrics has begun to address these challenges (Task Force on Health Care for Children in Foster Care, 2005). Historically, child welfare agencies have not focused efforts on child health outcomes, and workers are generally unfamiliar with medical management issues. Communication between child welfare and health care providers is often lacking, perhaps due to perceived or real barriers created by the Health Insurance Portability and Accountability Act (HIPAA). Physicians are often wary of child welfare effectiveness and may not see child welfare involvement as effective (Jones et al., 2008). Frequent caregiver changes are often accompanied by changes in health care providers who may not have ready access to children's medical records or who may not have sufficient knowledge of a child's current status to advocate effectively for the child (Christian & Schwarz, 2011; Mekonnen, Noonan, & Rubin, 2009). These challenges highlight the importance of integrating nurses and physicians within the child welfare system and establishing medical health passports which are transferable electronic health records that are maintained until the child exits the foster care system (Mekonnen et al., 2009).

Finally, integrated services may refer to the fact that meeting the needs of caregivers in the child welfare system will foster positive developmental outcomes in children. A nationally-representative study of families involved with the child welfare system found that approximately a fifth had mental health, drug, or alcohol problems (Libby et al., 2006). Only 29% of those who had mental health or substance use problems were referred for services and only 21% actually received services, with substantially higher rates of service provision to White and Hispanic parents than to African-American or Native American parents (Libby et al., 2006). Parental mental health and substance abuse problems are consistent predictors of maltreatment recidivism (Jaffee & Maikovich-Fong, 2011; Jonson-Reid, Emery, Drake, & Stahlschmidt, 2010). Thus, mental health and substance use problems are common among parents involved with child welfare services, and inadequate (or nonexistent) treatment puts children at risk for recurrent abuse or neglect.

Evidence-Based Interventions for Victims of Maltreatment

Common components of trauma-focused interventions include psycho-education, trauma narration, enhancing emotion regulation skills, developing parenting skills, addressing grief and loss, promoting safety skills, and maximizing patient and family engagement while addressing barriers to service-seeking. As reviewed by Saunders, Berliner, and Hanson (2004), many trauma-focused interventions are deemed empirically supported and acceptable. These include, for example, cognitive-behavioral and dynamic play therapy for children with sexual behavior problems and their caregivers (group therapies); cognitive processing therapy; eye movement desensitization and reprocessing therapy; multi-systemic therapy; and parent-child interaction therapy. The strongest empirical support is for trauma-focused cognitive behavioral therapy which is grounded in behavioral principles that assume learned behavioral responses and maladaptive cognitions facilitate symptom development and maintenance (Brewin, 1989; Deblinger, Mannarino, Cohen, & Steer, 2006).

Findings on the neurobiology of maltreatment suggest that for some children, psychotropic medications might be helpful alongside psychotherapeutic approaches in reducing psychiatric symptomatology and potentially reducing risk for physical health problems related to dysregulation of the immune system. Antidepressant treatment has been shown to normalize glucocorticoid-mediated feedback of the HPA axis and the immune system in adults with major depression (Holsboer, 2000;

Pariante & Miller, 2001). Children and adolescents in foster care, however, are prescribed psychotropic medications at rates two to four times that seen in non-foster care Medicaid populations, with little evidence of improved mental health outcomes (Kutz, 2011). Whether these high rates of medication use reflect improper prescribing or are an appropriate reflection of need, data suggests that in addition to high usage rates of psychotropic medication, children in foster care are prescribed doses of the medications that exceed recommendations, are more likely to be prescribed multiple psychotropic medications. In some cases infants and young children in whom there is no evidence of psychotropic medication efficacy are treated with medications (Bellonci & Gleason, 2012). Additionally, non-pharmacological therapies, including those that may improve a child's psychophysiologic regulation (Dozier, Peloso, Lewis, Laurenceau, & Levine, 2008), are not widely available in large regions of the country. To the extent that changes in neuroendocrine and immune function directly and indirectly (via changes in brain structure and function) produce symptoms of psychiatric disorder, children who are victims of maltreatment are at high risk for psychopathology. They require universal mental health screening and access to evidence-based behavioral therapies paired with appropriate psychiatric assessment for the need for potential adjuvant pharmacotherapy.

Data on the neurobiology of maltreatment show that child abuse and neglect alters brain development and is associated with alterations in neuroendocrine and immune function that are implicated in adult chronic diseases.

Conclusion

Data on the neurobiology of maltreatment show that child abuse and neglect alters brain development and is associated with alterations in neuroendocrine and immune function that are implicated in adult chronic diseases. Treatment of these diseases costs American taxpayers billions of dollars annually. Children are at the greatest risk of being victimized by abuse and neglect before the age of 3 years (US Department of Health and Human Services, 2012) which is *exactly* the point when the brain is undergoing rapid neuronal proliferation and pruning, synaptogenesis, and white matter development (Webb, Monk, & Nelson, 2001). Research on the neurobiology of maltreatment is in its infancy and more work is needed to demonstrate conclusively that maltreatment-related alterations in central nervous, endocrine, and immune function underlie the physical and mental health problems commonly observed in individuals who were exposed to childhood maltreatment. The data suggest that the period from 0 to 3 years is likely to be a critically important window in which to identify families at risk for abuse and neglect and to provide rapid treatment for child victims using evidence-based practices.

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Commentary

Neuroscience and Child Maltreatment Research
Discovery through Translation

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We are at a time of rapid neuroscience discoveries from epigenetics, neuroimaging, biomedical technologies, computational methods and behavioral science developments. Research priorities at the National Institutes of Health (NIH) such as the NIH Blueprint for Neuroscience Research (National Institutes of Health [NIH], 2014b) exemplify model efforts to foster collaborations and resources for innovative neuroscience. The NIH National Center for Advancing Translational Sciences (NCATS) was established to improve rapid translation of basic neuroscience discoveries into clinical applications (National Institutes of Health [NIH], 2014a). In view of the significant research directions in translational research, the challenge for child maltreatment research remains the transformation of neuroscience knowledge and discovery into future research, policy and practice. The Institute of Medicine initiative on *New Directions in Child Abuse Research* appeals for a public health response that includes research priorities on causes and consequences and services in complex systems and policy (Diaz & Petersen, 2014; Institute of Medicine, 2013a, 2013b). The report recommends that research capitalize not only on the existing knowledge base of child abuse and neglect research but also related fields. Research studies have integrated neurodevelopment, genetics, and socioenvironmental factors to understand child maltreatment (e.g., Byrd & Manuck, 2014; Nikulina, Widom, & Brzustowicz, 2012). Yet the integration of neuroscience and maltreatment is still novel and has been relatively slow, particularly for evidenced-based interventions.

To hasten translational research, the Office of the Commissioner, Administration on Children, Youth and Families, Administration for Children and Families, the National Institute on Drug Abuse and the Eunice Kennedy Shriver National Institute on Child Health and Human Development, NIH all within the Department of Health and Human Services (DHHS), gathered experts across multiple disciplines to consider neuroscience and child maltreatment. In this *Social Policy Report: Neuroscience and Child Maltreatment*, the authors expand upon the proceedings of this meeting and the current research to deliberate how neuroscience can elucidate differential outcomes of maltreated children and to suggest better targets for novel interventions. Jaffee and Christian provide a thoughtful analysis of the research evidence on mechanisms by which maltreatment affects mental and physical health and cognitive and academic functioning. They present evidence to support a broader child well-being approach for children affected by abuse and neglect to improve health trajectories across the life span. Orr and Kaufman consider the complex role of epigenetics for risk or resilience among maltreated children to guide potential targets for interventions during sensitive periods of neurodevelopment. Through an understanding of the neurobiological mechanisms of stress and the hypothalamic-pituitary-adrenal (HPA) axis, Dozier and Fisher describe novel interventions which target the parent and influence parent-child interactions to improve emotion regulation and behavior among maltreated children.

From a national vantage point, Blitz and Samuels highlight the complexity and scope of child maltreatment in the US to heed urgency for neuroscience findings that facilitate evidenced based and effective interventions. Notably collaborations such as the Federal Interagency Workgroup on Child Abuse and Neglect

and its Research Subcommittee guided by the NIH Child Abuse and Neglect Working Group have supported translational research grants and dissemination activities for over a decade (Children's Bureau: Administration for Children and Families, 2012). Research consortia were created which increased translational research specifically on child neglect through multidisciplinary grants exploring basic, risk factor, longitudinal, epidemiologic, intervention, and service systems research as well as training new and early career research investigators.(Boyce & Maholmes, 2013; Widom, 2013) For example, ambitious translational research by Johns (2012) integrates pre-clinical and clinical research on maternal-child (offspring) interactions and development, particularly for drug abuse and maltreatment. Definitive longitudinal studies led by Widom have followed children and their health and justice outcomes for decades and examined the role of genes and environment (Nikulina et al., 2012). Child maltreatment research has yet to be fully realized with "more complete investigations of specific topics and (support) to provide for long-term studies" (Institute of Medicine, 2013a, pp. 6-9). Nonetheless, the emerging approaches in this policy report inspire rapid translation of neuroscience for research, practice, policy and *action*.

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Commentary

Neuroscience and Child Maltreatment

The Role of Epigenetics in Risk and Resilience in Maltreated Children

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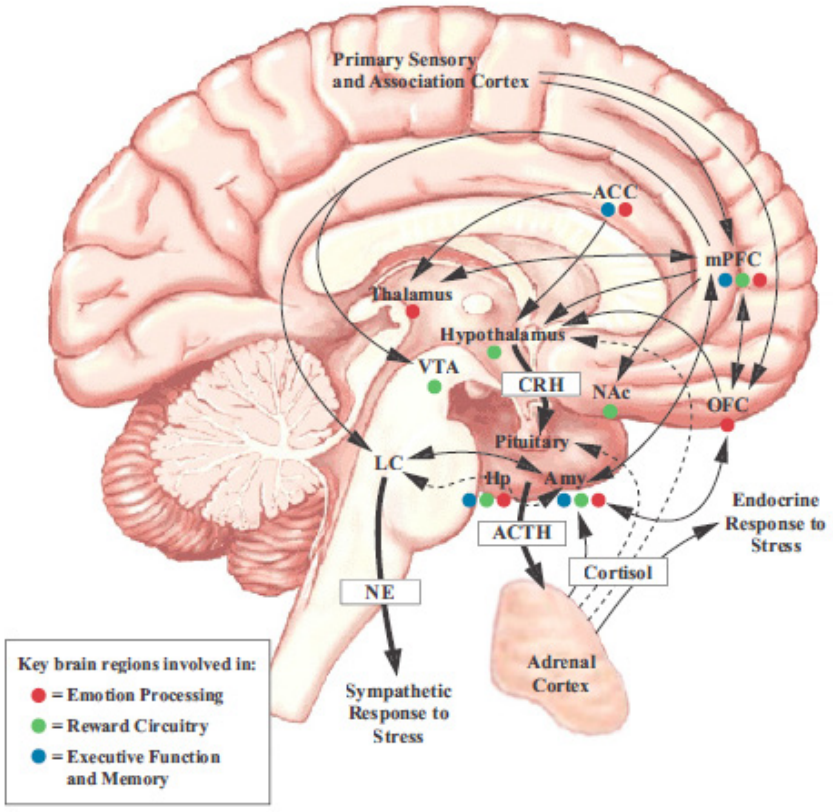
Children who experience maltreatment are at high-risk for developing psychopathology (Afifi, Henriksen, Asmundson, & Sareen, 2012). Survivors of childhood trauma experience high rates of Posttraumatic Stress Disorder (PTSD: Grasso et al., 2009), substance misuse disorders (Afifi et al., 2012), and treatment resistant, recurrent and persistent depression (Nanni, Uher, & Danese, 2012). These conditions are associated with pathophysiological changes to the structure and function of brain regions involved in the stress response; regions that are also implicated in the pathophysiology of anxiety, mood, and substance use disorders (Figure 1; Kaufman & Weder, 2010).

There is emerging evidence that alterations in stress-reactivity, and many of the structural and functional neural changes that result from early adversity and are observed in trauma-related psychiatric disorders, are mediated by epigenetic mechanisms (Curley, Jensen, Mashoodh, & Champagne, 2011; McGowan et al., 2009; Yang et al., 2013; Zhang & Meaney, 2010). Epigenetics refers to functionally relevant modifications to the genome that do not involve a change in



Codes: ACC, anterior cingulate cortex; ACTH, adrenocorticotropin hormone; Amy, amygdala; CRH, corticotropin- releasing hormone; Hp, hippocampus; LC, locus coeruleus; mPFC, medial prefrontal cortex; NAc, nucleus accumbens; NE, norepinephrine; OFC, orbitofrontal cortex; VTA, ventral tegmentum area. Reprinted from Kaufman and Weder, 2010.

Figure 1. Brain regions involved in the stress response overlap with regions implicated in the pathophysiology of anxiety, mood, and substance use disorders.

DNA nucleotide sequence (Zhang & Meaney, 2010). These modifications can alter gene activity and play a role in acute regulation of genes in response to changes in the environment (Nestler, 2009; Rutten & Mill, 2009). Although our understanding of gene regulation and epigenetics is in its infancy, emerging research offers significant promise in understanding risk and promoting resiliency in maltreated children.

Firstly, while epigenetic changes are frequently long lasting, they are not necessarily permanent. The notion that early deviant experience can lead to permanent changes in brain development and behavior stems partly from the groundbreaking experiments on monocular deprivation in cats by Wiesel and Hubel (Wiesel & Hubel, 1963). The development of central visual pathways in several mammalian species is known to be experience-dependent. Wiesel and Hubel deprived kittens of vision in one eye for different lengths of time and at different ages. They found that after suturing one lid during the first 3 months of life, there was no vision in that eye later in development after the sutures were removed, and the visual cortex did not develop normally. The effects of visual deprivation on subsequent brain development and visual processing was evident only in kittens, not in adult cats, which led to the conclusion that vision development in kittens has a *critical period*, and if the eyes are not exposed to the required stimuli during that period, vision would be lost and associated brain structures altered permanently. Emerging findings, however, are challenging previous understandings of the impact of early experience on brain development and behavior. Further studies revisiting the initial experiments of Wiesel and Hubel have shown that the brain changes associated with monocular deprivation are due to epigenetic changes, and the effects can be reversed with pharmacologic interventions and environmental enrichment (Kaufman & Weder, 2010; Weder & Kaufman, 2011). What was previously deemed to be permanent brain damage secondary to adverse early experiences during formative periods of development has now been shown to be amenable to treatment, allowing complete function to be restored.

Secondly, emerging data suggests that the window of opportunity for intervention is wider than initially perceived. It is now appreciated that while there are *sensitive periods* when the brain is more susceptible to environmental influences, the opportunity to promote positive brain and behavioral changes persists into adulthood (Curley et al., 2011; Weder & Kaufman, 2011). Positive adaptation can be promoted with interventions that focus on: 1) developing secure attachment relations (Dozier et al., 2012; Dozier, Peloso, Lewis, Laurenceau, & Levine, 2008; Huot, Gonzalez, Ladd, Thrivikraman, & Plotsky, 2004; Kaufman et al., 2004); 2) facilitating enrichment opportunities (Curley et al., 2011; Kessler et al., 2008); and 3) providing clinical interventions to address child *and* parent psychopathology (Cohen, Mannarino, & Deblinger, 2006; Kircher et al., 2013; Northwestern University Mental Health Services and Policy Program, 2008; Oliveros & Kaufman, 2011; Weissman et al., 2006).

While a history of abuse is frequently associated with persistent psychiatric and substance use disorders, not all abused individuals develop these sorts of problems. This brief commentary highlighted emerging insights on the role of epigenetic mechanisms in conferring risk for psychiatric and substance use disorders, and noted promising opportunities for intervention to reverse deleterious outcomes. Ongoing translational and multidisciplinary research with maltreated cohorts will help to further elicit the mechanisms by which adverse early experiences confer risk, and will inform the development of novel psychosocial and pharmacological interventions to help each maltreated child reach his or her potential.

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Commentary

Neuroscience Enhanced Child Maltreatment Interventions to Improve Outcomes

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Infants and young children are dependent on parents for help regulating behavior, emotions, and physiology. In terms of our evolutionary history as altricial organisms requiring supportive nurturing care, human infants cannot survive without a parent or caregiver, and thus a number of biological and behavioral systems have evolved to be dependent upon input from parents. In the case of maltreating parents, that input is often problematic or insufficient.

Effects of maltreatment can be seen at the neurobiological systems level, as described by Jaffee (in this issue). One of the systems especially sensitive to early caregiving is the hypothalamic-pituitary-adrenal (HPA) axis. When experiencing available, competent parenting, children appear buffered from showing a cortisol response to routine stressful conditions (Gunnar & Donzella, 2002). However, when competent parents are not available, children do not show this stress buffering effect (e.g., Bernard & Dozier, 2010; Hertsgaard, Gunnar, Farrell, Erickson, & Nachmias, 1995).

This stress buffering effect may be important in protecting the developing brain from high levels of circulating glucocorticoids. This has been argued as a possible mechanism for effects on the hippocampus and prefrontal cortex, among other areas that have high numbers of glucocorticoid receptors (e.g., Tottenham & Sheridan, 2009). Associations between high levels of circulating glucocorticoids and damage to the hippocampus and prefrontal cortex have been demonstrated in other species (Sapolsky, Uno, Rebert, & Finch, 1990), though to our knowledge, not directly in humans.

Although the stress reactive function of the HPA axis has been studied most extensively, the diurnal pattern provides a different way to study effects of adversity on the HPA axis. This diurnal function is relatively orthogonal to the stress reactive function of the HPA axis. Several studies have shown that children with histories of adversity have a blunted diurnal pattern of cortisol production (Bernard & Dozier, 2010; Fisher & Kim, 2007; Kroupina et al., 2012). Relative to low-risk children who show high wake-up values of cortisol and low bedtime values, high-risk children show blunted slopes with, most especially, lower wake-up values.

We suggest that the primary target of intervention for both the infant and preschool interventions is the parent or caregiver rather than the child. Therefore, our interventions are directed at enhancing the parent's capacities to help the child develop regulatory capabilities. We emphasize that we are asking the parent to provide not only competent care, but indeed therapeutic care.

Intervening with Parents of Infants: Attachment and Biobehavioral Catch-Up (ABC) for Infants and Young Children

The *Attachment and Biobehavioral Catch-Up* (ABC) *for Infants and Young Children* (Bernard, Dozier, Bick, & Carlson, 2012) was designed for the parents of infants and young children who have experienced early adversity. The ABC intervention has three primary intervention targets, which target the biological and behavioral regulatory challenges these children face. The intervention seeks to enhance children's behavioral and biological regulation by helping parents: (a) behave in nurturing ways when children are distressed, (b) follow their children's lead when children are not distressed, and (c) avoid behaving in frightening ways.

The ABC intervention is implemented through ten sessions in

parents' homes with children and parents included in sessions. Key components of the intervention involve providing very clear feedback to parents regarding nurturance and following their child's lead (i.e., making "in the moment" comments at a very high rate), and providing specific video-feedback regarding intervention targets (i.e., carefully reviewing brief video-clips in which the parent nurtured the child or followed the child's lead).

Through a randomized clinical trial, the intervention was found effective in enhancing children's physiological regulation. Children in the ABC Intervention showed a steeper slope of cortisol production, with higher wake-up values, relative to children in the control intervention (Bernard, Dozier, & Simons, 2013). These effects were seen several months after the intervention and again three years after the intervention. Further evidence of effects on biology was seen in changes in mothers' brain activity (Bernard et al., 2013). Mothers from the ABC intervention showed more typical ERP (N170 and LPP) responses to children's emotional expressions, relative to control mothers.Combined, these effects are exciting in pointing to the power of a behavioral intervention in changing biology and behavior.

Intervening with Caregivers of Preschoolers: Multidimensional Treatment Foster Care for Preschoolers (MTFC-P)

The *Multidimensional Treatment Foster Care for Preschoolers* (MTFC-P) (Fisher & Chamberlain, 2000) is designed to enhance children's regulatory capabilities through helping parents learn and practice effective behavior management strategies. Foster parents are helped to provide a highly predictable and contingent environment. Children thus experience the environment as more controllable, and are expected to show more normative regulation of behavior and physiology.

Foster parents are trained extensively prior to child placement in behavioral management techniques. After the child is placed, program staff members are accessible 24 hours a day to ensure that parents maintain a highly structured behavior management program. Several additional supports, including a support group and a daily call to assess and monitor behavior problems, are key components of the intervention. In instances in which children are returning to biological parents, training is provided to birth parents to ensure that they will continue to provide reliable contingencies to the child upon placement. Children are also included in a weekly therapeutic playgroup that helps children practice self-regulatory skills (Pears, Fisher, & Bronz, 2007). This integrated intervention typically lasts 9 to 12 months.

As was found for the ABC intervention with younger children, MTFC-P affects cortisol regulation (Fisher, Stoolmiller, Gunnar, Burraston, 2007). Specifically, among foster children who did not receive the MTFC-P intervention, cortisol became increasingly blunted over time, whereas cortisol levels of those receiving MTFC-P remained relatively stable (Fisher et al, 2007). Children who received the MTFC-P intervention showed blunter patterns specifically associated with transitions from one home to another (Fisher, Van Ryzin, & Gunnar, 2011), as well as in connection with levels of foster parent stress experienced as a result of managing children's problem behavior (Fisher & Stoolmiller, 2008).

Conclusion

These results provide evidence for the powerful effects of social interventions on children's physiological regulation. We have not focused in this review on the behavioral effects of these interventions, but they are, as would be expected, impressive. There are several pressing issues to be addressed in work within this area. First, in spite of the burgeoning evidence base documenting the effectiveness of social interventions for maltreated children, the implementation of such interventions within public-sector programs and other community settings has been slow. When compared to the significant progress that has been made, for example, in scaling evidence-based programs to prevent child maltreatment, such as the Nurse-Family Partnership (www.nursefamily partnership.org), or programs to reduce delinquency in adolescents (such as Multisystemic Therapy (mstservices.com) and Multidimensional Treatment Foster care (www.mtfc.com), the investment of resources and number of successful implementations of evidence-based intervention programs for maltreated infants and young children is noticeably quite limited. Efforts are needed to understand why this is the case and to reverse these trends, especially given the empirical evidence for early intervention to mitigate the effects of early adversity. In addition, one area of scientific investigation that continues to need attention is in understanding the associations between changes at the behavioral

and biological levels observed in maltreated children, both following adversity and in response to interventions. Although the physiological changes that have been reported are exciting, their importance will only increase if we can explicate how such changes might (or even might not) relate to changes in psychosocial adjustment. To date, physiological changes have been presented in parallel to behavioral changes, but their inter-relationships are not yet well understood.

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Philip A.Fisher is co-owner of TFC Consultants, Inc., which provides training, consultation and technical assistance to agencies, government entities, and communities aiming to implement Multidimensional Treatment Foster Care (MTFC) programs.

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Commentary

A Call to Action

Promoting Effective Interventions for Children in Child Welfare Using Neuroscience

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There may not be any population that could benefit more from the translation of neuroscience findings to changes in policies, practices and interventions than children in the foster care system. While the last 10 years has seen a proliferation of neuroscience literature on the impact of trauma on neurobiology, the findings of this work have not been well translated to child welfare practice and intervention development. Members of the Administration on Children, Youth and Families' (ACYF) Neuroscience and Child Maltreatment Expert Panel are engaged in a process to: 1) facilitate better understanding between neuroscientists and child maltreatment researchers/interventionists about each others' work; 2) identify critical issues in translating research from basic neuroscience to the design of child maltreatment interventions; and 3) culminate in the development of a set of principles, strategies, and papers. The aim of this work is to inform the development of more effective child maltreatment policies, practices, and interventions that can advance the field and yield better outcomes for children and families. This *Social Policy Report Brief* includes a paper and commentaries from members of the expert panel on the intersection of neuroscience and child maltreatment. This commentary provides background for the development of the expert panel and suggests future directions.

*When this commentary was written, Bryan Samuels was the Commissioner at the Administration on Children, Youth and Families. He is currently the Executive Director of Chapin Hall at the University of Chicago.

Not Just Smaller, But Better

In the last fourteen years, the child welfare system has become 27% smaller, declining from 559,000 children in foster care in 1998 to just under 400,000 in 2012, the most recent year for which data are available (US Department of Health and Human Services, [USDHHS], 2002-2012). Nearly all states have been able to reduce the number of children in foster care significantly by providing necessary support services to families that prevent children from coming into care, and, when they do come into care, moving them more quickly to permanency. These reductions have occurred with no meaningful change in re-reporting or reentry.

By these measures, child welfare systems have improved over the last decade. But progress in child welfare must be about more than getting smaller; it must be about doing better. As the system continues to decrease in size, the children who remain in foster care are more likely to have emotional and behavioral problems that derail normal development, hinder healthy functioning, and make it difficult to achieve permanency. Research has demonstrated that, in the wake of abuse and neglect, permanence is not a panacea. Whether children in foster care are reunified with their biological parents (Bellamy, 2008), go into kinship care (Fechter-Leggett & O'Brien, 2010), or are adopted (Simmel, Barth, & Brooks, 2007), their problems persist and in some cases worsen due to the pervasive and long-lasting impact of trauma. For children who have experienced this type of complex trauma, doing better means giving them the skills and resources they need to overcome the social and emotional impact of abuse and neglect so they can heal, recover, and thrive.

Children with a serious emotional disturbance (SED[1]) face the most serious barriers to safety, permanency and well-being, and many children enter foster care with SED at rates considerably higher than the general population (Burns et al., 2004). Akin, Bryson, McDonald, and Walker (2012) found that children with SED are 3.6 times more likely to experience long-term foster care than children without an SED.

Yet despite the significant prevalence of serious mental health problems among the child welfare population, a large disparity exists between those identified as needing mental health services and those that receive them (Bai, Wells, & Hillemeier, 2009; Burns et al., 2004; Horwitz et al., 2012). Clinical guidelines and practice principles from the American Academy of Pediatrics (2002) and the American Academy of Child and Adolescent Psychiatrists and Child Welfare League of America (2003) recommend the use of evidence-based psychosocial interventions as first-line treatments for the majority of childhood mental health disorders. When psychotropic medications are indicated, it is generally as a complement to these therapies. Over the past two decades, however, there has been a dramatic increase in the use of anti-psychotic medication for children and adolescents. And while prescription rates have risen across-the-board, a recent 16-state study found that foster children received antipsychotic medications at a rate almost nine times that of other children covered by Medicaid (Medicaid Medical Directors Learning Network and Rutgers Center for Education and Research on Mental Health Therapeutics, 2010). Other published research suggests that these powerful psychotropic drugs are being overused to manage emotional problems and disruptive behavior that might better be addressed by non-pharmacological treatment approaches (Crystal, Olfson, Huang, Pincus, & Gerhard, 2009; Zito et al., 2008).

Efforts undertaken to ensure the appropriate use of psychotropics must be accompanied by increased availability of evidence-based psychosocial treatments that meet the complex needs of children who have experienced maltreatment[2]. Increased access to timely and effective screening, assessment, and non-pharmaceutical treatment will reduce the potential for over-reliance on psychotropic medication as a first-line treatment strategy and increase the likelihood that children in foster care will exit to positive, permanent settings, with the skills and resources they need to be successful in life. Of course the most important intervention is having a caregiver—whether a biological parent, a guardian, or a foster or adoptive parent—who is able to understand and respond to the needs of a child who has experienced trauma. USDHHS Data from the National Survey on Child and Adolescent Well-Being (NSCAW) indicates that, compared to adults nationally, in-home caregivers have much higher rates of substance abuse, intimate partner violence, and major depression (Wilson, Dolan, Smith, Casaneueva, & Ringeisen, 2012). These data demonstrate that caregivers may have a great need for services, even in cases where children are not removed from the home, and that interventions that address challenges of both the caregiver and child are the most likely to yield positive child well-being outcomes.

Under the Obama Administration, we realized that ACYF needed to fundamentally change the focus of child welfare policy by elevating the best available science to achieve better outcomes for the children, youth and families it serves. To that end, ACYF published an Information Memorandum (IM) in April 2012, *Promoting Social and Emotional Well-Being for Children and Youth Receiving Child Welfare* Services (USDHHS, 2012). These elements include: screening and assessment, including functional assessment; use of evidence-based and evidence-informed interventions; simultaneously scaling up effective interventions while decommissioning ineffective interventions; and building workforce capacity for effective implementation of evidence-based interventions. While we recognized the challenge of asking the field to do more, this shift in federal policy moves the child welfare field towards an evidence-based and evidence-informed strategy to systematically incorporate what is now known about the centrality of trauma children who have been maltreated and the importance of social and emotional well-being into its work.

[1] SED is defined as a diagnosable mental, behavioral, or emotional disorder of sufficient duration to meet diagnostic criteria specified in the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) that results in functional impairment that substantially interferes with family, school, or community activities.

[2] The following are some websites that provide examples of evidence-based interventions for mental health and trauma symptoms: California Evidence-Based Clearinghouse, www.cebc4cw.org; National Child Traumatic Stress Network, www.nctsn.org; National Registry of Effective Programs and Practices, www.nrepp.samhsa.gov.

The Importance of Neuroscience to Inform Child Welfare

One concept that has emerged from the neuroscience research that is particularly relevant to the development of new and more targeted interventions is *neural plasticity* –the adaptive capacity of the nervous system. Researchers argue that understanding the basic principles of neuroplasticity that govern learning in both the intact and damaged brain can help us to identify the critical behavioral signals that drive recovery (Kleim & Jones, 2008) and develop methods and models for brain training that are particularly relevant for children and families that have experienced negative outcomes as a result of exposure to toxic stress and trauma (Bryck & Fisher, 2012). Neuroscience is often used to demonstrate the detrimental impact of maltreatment on the brain; however, the concept of neural plasticity tells us that, with the right intervention, such damage is not necessarily permanent. For example, with the right interventions, the brain of a child with heightened reactivity resulting from maltreatment can change, such that the child develops a healthier and more normative response to stress. For example, interventions like Attachment and Biobehavioral Catch-Up and Multidimensional Treatment Foster Care (see Dozier & Fisher, this issue) support and strengthen the relationship between a child and his or her parent (or caregiver) as a vehicle for restoring the child's sense of safety, attachment, and appropriate affect and improving the child's cognitive, behavioral, and social functioning.

Another application of neural plasticity concerns caregivers. With interventions that capitalize on the plasticity of the adult brain, many caregivers who abuse or neglect their children can learn positive parenting practices. Enhanced Triple P Positive Parenting Program, Combined Parent-Child Cognitive Behavioral Therapy, and Parent-Child Interaction Therapy are just a few examples of evidence-based interventions that have demonstrated effectiveness with parents who have previously abused or neglected their children. Core components shared by these interventions include parent psychoeducation on the negative impacts of violence, child development and appropriate expectations; coping skills training; coaching on child behavior management strategies and alternative methods of conflict resolution; skills to establish or strengthen nurturing relationships of parents with their children; and joint sessions with parents and children for skills practice.

Conclusion

The research is clear that the experience of child abuse and/or neglect have an impact on the development of children that we cannot ignore if we are to meaningfully improve the life trajectories of maltreated children. Facilitating healing and recovery through trauma-informed and neuroscience-informed interventions can help to ensure that children and youth cultivate the skills and competencies needed for positive development and long-term well-being.

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Cindy W. Christian holds The Children's Hospital of Philadelphia (CHOP) endowed Chair in the Prevention of Child Abuse and Neglect, is a Professor of Pediatrics at the Perelman School of Medicine at The University of Pennsylvania and serves as an Assistant Dean in the medical school's Program of Diversity and Inclusion. Dr. Christian completed her pediatric residency and child abuse pediatrics fellowship at CHOP, where she has spent her career. Dr. Christian devotes much of her clinical and academic work to the care of abused children. For more than two decades, she directed the child abuse program at CHOP and is currently a faculty director of the Field Center for Children's Policy, Practice and Research at The University of Pennsylvania. She is a member of the American Academy of Pediatrics' (AAP) section on Child Abuse and Neglect, and presently serves as the Chair of the AAP's Committee on Child Abuse and Neglect. In 2007, Dr. Christian was named Pennsylvania Pediatrician of the Year by the PA Chapter of the American Academy of Pediatrics. In 2010, Dr. Christian was appointed as the first medical director for the Philadelphia Department of Human Services, leading the development of policies and strategies to improve the health of Philadelphia's dependent children. Dr. Christian's research and educational efforts are related to the medical evaluation and care of abused children.

Cheryl Anne Boyce is the Chief of the Behavioral and Brain Development Branch and Associate Director for Child and Adolescent Research within the Division of Clinical Neuroscience and Behavioral Research, National Institute on Drug Abuse (NIDA), National Institutes of Health (NIH), Department of Health and Human Services (DHHS). Dr. Boyce completed her doctoral studies in clinical psychology at the University of North Carolina at Chapel Hill. After clinical and research fellowships at the Children's National Medical Center and the Department of Psychiatry, University of Maryland, she began her federal career as a Society for Research in Child Development (SRCD)/ American Association for the Advancement of Science (AAAS) Executive Branch Policy Fellow. As an expert in child maltreatment and trauma, she has testified before Congress and led an expert consultation to South Africa in collaboration with the US Department of State. Currently, she is co-chair of the NIH Child Abuse and Neglect Working Group and Federal Inter-agency Work Group on Child Abuse and Neglect, Research Subcommittee. In recognition of special detail work assignments, she has been awarded a Special Recognition Award for Exemplary Professionalism and Commitment to Excellence, Executive Office of the President, Office of National Drug Control Policy, Office of the Deputy Director and NIH Office of the Director Merit Award. Other recognitions include the APA Meritorious Research Service Citation and Society for Clinical Psychology's Lifetime Award for Distinguished Contribution to Diversity in Clinical Psychology. Her recent scientific initiatives include a focus on integrating developmental neuroscience advances into drug abuse interventions. She is a co-author for the revised edition of the book on grantsmanship entitled, *How to Write a Successful Research Grant Application: A Guide for Social and Behavioral Scientists* (2nd edition) (Pequegnat, Stover, & Boyce, 2011). As public service to her local community, Dr. Boyce is serving an appointment as the Vice Chair for Washington D.C. Mayor's Advisory Committee on Child Abuse and Neglect. She previously served as the President of Safe Shores: The DC Children's Advocacy Center and is a licensed psychologist in DC and Maryland.

Valerie Maholmes is the Chief of the newly formed Pediatric Trauma and Critical Illness Branch at the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) at the National Institutes of Health (NIH). In this capacity she sets the vision and priorities for research that addresses the continuum of psychosocial, behavioral, biological, and physiological influences that affect child health outcomes in trauma, injury, and acute care. Previously, she managed the Child and Family Processes/Child Maltreatment and Violence Research Program at NICHD. In these capacities she provided scientific leadership on research relevant to normative development in children from the newborn period through adolescence, and on the impact of specific aspects of physical and social environments on the health and psychological development of infants, children, and adolescents. Dr. Maholmes co-chairs the NIH Child Abuse and Neglect Working group and is a member of several Federal Interagency working groups that address such issues as teen dating violence, bullying, and orphans and vulnerable children. She is the lead program official on the Trans-NIH initiative for research on children in military families. Before joining the NICHD, she was a faculty member at the Yale Child Study Center where she served in numerous capacities including director of research and policy for the School Development Program. In 1999 she was named the Irving B. Harris Assistant Professor of Child Psychiatry. In 2003, she was awarded the prestigious Science Policy Fellowship sponsored by the Society for Research in Child Development (SRCD) and the American Association for the Advancement of Sciences (AAAS). Most recently, Dr. Maholmes edited a text titled, *Applied Research in Child and Adolescent Development: A Practical Guide* (Maholmes and Lomonaco, 2010) and has co-edited a comprehensive volume based on the NICHD supported Science and Ecology of Early Development (SEED) initiative which examined the impact of poverty on children's development. This volume, entitled *The Oxford Handbook of Poverty and Child Development* (King and Maholmes, 2012), was published by Oxford University Press in April 2012.

Cathy Spatz Widom is a Distinguished Professor in the Psychology Department at John Jay College of Criminal Justice and a member of the Graduate Center faculty of the City University of New York. A former faculty member at Harvard University, Indiana University, University at Albany–SUNY, and New Jersey Medical School of Rutgers University, she has served on the editorial boards of psychology, criminology, and child maltreatment journals and recently stepped down as co-editor of the Journal of Quantitative Criminology. Dr. Widom and her colleagues have published over 100 papers on the long-term consequences of child abuse (physical and sexual) and neglect and have received numerous awards for this research. She is an elected fellow of the American Psychological Association, American Psychopathological Association, and American Society of Criminology and has been invited to testify before congressional and state committees. Dr. Widom held a leadership position in the Translational Research on Child Neglect Consortium and she currently serves on the Committee on Law and Justice at the Commission on Behavioral and Social Sciences at the National Research Council. She was a member of the 1993 National Research Council panel on child abuse and neglect and a member of the recent *Institute of Medicine Committee on Child Maltreatment Research, Policy, and Practice for the Next Decade*. Dr. Widom received her PhD in psychology from Brandeis University.

Catherine Orr is a Postdoctoral Research Associate in the Vermont Center for Children, Youth, and Families at the University of Vermont. Catherine received her PhD and Masters in Clinical Neuropsychology at the University of Melbourne. Her research is motivated by a desire to understand those factors that place children and adolescents at risk for developing psychopathology and utilizes structural and functional MRI to reveal neurological mechanisms of cognitive and emotional competencies.

Joan Kaufman is an Associate Professor in the Department of Psychiatry at Yale University School of Medicine, and Director of the Child and Adolescent Research and Education (CARE) Program. The CARE Program focuses on two areas of investigation: 1) Studies in support of the National Institute of Mental Health's Research Domain Criteria (RDoC) initiative which aims to develop the necessary database to derive a new psychiatric nomenclature informed by neuroscience, genetics, and psychology; and 2) Research on risk and resilience in maltreated children. These two lines of research are synergistic and interrelated, with the study of maltreated children having a number of advantages for the RDoC project, including: the study of a subset of patients that are frequently treatment resistant to standard clinical interventions; examination of a relatively homogenous sample with the onset of psychopathology proposed to be associated with stress-related mechanisms; and well-established relevant animal models to facilitate translational research. Dr. Kaufman and colleagues utilize clinical assessment, neuroimaging (e.g., structural, fMRI fear conditioning paradigm, resting state connectivity), and genetics (e.g., polymorphisms, epigenetic markers) research methods, with many of the clinical assessments obtained collected at a day camp devised specifically for their research purposes. Dr. Kaufman is also the Director of the Child Welfare Unit of the Zigler Center for Child Development and Social Policy, and collaborates actively with several child advocacy organizations working to affect state and national child welfare and family violence policies.

Mary Dozier is Amy E. du Pont Chair of Child Development and Professor of Psychology at the University of Delaware. She obtained her PhD from Duke University in 1983. Over the last 20 years, she has studied the development of young children in foster care and young children living with neglecting birth parents, examining challenges in attachment and regulatory capabilities. Along with her graduate students and research team, she developed an intervention, Attachment and Biobehavioral Catch-up, that targets specific issues that have been identified as problematic for young children who have experienced adversity. This intervention has been shown to enhance children's secure attachments, ability to regulate cortisol normatively, and executive functioning, among other things. Dr. Dozier is currently conducting randomized clinical trials examining the effectiveness of this intervention with high-risk birth children, foster children, and internationally adopted children, work that has been supported by the National Institute of Mental Health since 1989. She recently served on the *Institute of Medicine Committee on Child Maltreatment Research, Policy, and Practice for the Next Decade* (2013). Dr. Dozier was an associate editor of *Child Development*, and serves on a number of advisory and editorial boards.

Philip A. Fisher is a Professor of Psychology and Research Scientist at the Prevention Science Institute at the University of Oregon. He is Science Director for the *National Forum on Early Childhood Policy and Programs* and a Senior Fellow at the Center on the Developing Child, both based at Harvard University. He is also a Senior Research Scientist at the Oregon Social Learning Center. Dr. Fisher's work on disadvantaged and maltreated children includes (a) studies to understand the effects of early stress on the developing brain; (b) the development of two-generation prevention and treatment programs to improve high-risk children's (and their caregiver's) well-being and brain functioning; and (c) advocacy for science-based policy and practice to improve early learning and healthy development in high-risk children. His work has been funded by a number of institutes of the National Institutes of Health. He serves on a number of national advisory groups related to prevention science and community based research. His intervention programs are being implemented at sites throughout the United States and Europe. He is the recipient of the 2012 Society for Prevention Research Translational Science Award.

Bryan Samuels is the Executive Director of Chapin Hall at the Univeristy of Chicago, one of the nation's leading research and policy centers focused on improving the well-being of children and youth, families, and their communities. Before joining Chapin Hall, he was appointed by President Barack Obama as Commissioner of the Administration on Children, Youth, and Families (ACYF), making him from 2010–2013 the highest-ranking federal child welfare policymaker in the country. As ACYF Commissioner, he emphasized the importance of child well-being and the use of data-driven approaches to improve the welfare of vulnerable children and youth. His career includes over twenty years of experience in child welfare, including having served as the Chief of Staff of Chicago Public Schools under Arne Duncan and as Director of the Illinois Department of Children and Family Services. He was also a lecturer at the University of Chicago's School of Social Service Administration from 1997 to 2003. He has a bachelor's degree in economics from the University of Notre Dame and a master's degree from the University of Chicago Harris School of Public Policy.

Caryn Blitz is a Senior Program Analyst in the Office on Data Analysis, Research and Evaluation, Office of the Commissioner, Administration on Children, Youth and Families (ACYF), at the US Department of Health and Human Service. She is responsible for advising the Commissioner and supporting the agency on the effective implementation and evaluation of evidence-based and evidence-informed interventions and related activities—screening and assessment, capacity building, planning, implementation and dissemination—to reduce the impact of trauma and improve the behavioral, emotional and social well-being of the children, youth and families served by ACYF. Prior to joining ACYF in 2011, Dr. Blitz was a consultant and goverment contractor providing technical assistance to states and communities on evidence-based substance abuse and violence prevention research, policy and practice. In 2002, she was recruited to serve as the Deputy Director for Evaluation and Research at the new White House Office of National Drug Control Policy (ONDCP)-funded National Community Anti-Ddrug Coalition Institute at Community Anti-Drug Coalitions of America (CADCA). Prior to coming to Washington, DC, Dr. Blitz was a Research Scientist at the Social Development Research Group, University of Washington, directing projects involving epidemiological surveillance and prevention infrastructure development in States and communities. She was an American Psychological Association (APA)/ American Association for the Advancement of Science (AAAS) Congressional Fellow in the Office of Senator Christopher Dodd, a National Institute on Alcoholism and Alcohol Abuse (NIAAA) Postdoctoral Research Fellow at the University of Connecticut School of Medicine, and a predoctoral clinical intern at the Yale University School of Medicine. She holds Master of Arts and Doctorate degrees in Clinical and Community Psychology from DePaul University.

Social Policy Report is a quarterly publication of the Society for Research in Child Development. The *Report* provides a forum for scholarly reviews and discussions of developmental research and its implications for the policies affecting children. Copyright of the articles published in the *SPR* is maintained by SRCD. Statements appearing in the *SPR* are the views of the author(s) and do not imply endorsement by the Editors or by SRCD.

Purpose

Social Policy Report (ISSN 1075-7031) is published four times a year by the Society for Research in Child Development. Its purpose is twofold: (1) to provide policymakers with objective reviews of research findings on topics of current national interest, and (2) to inform the SRCD membership about current policy issues relating to children and about the state of relevant research.

Content

The *Report* provides a forum for scholarly reviews and discussions of developmental research and its implications for policies affecting children. The Society recognizes that few policy issues are noncontroversial, that authors may well have a "point of view," but the *Report* is not intended to be a vehicle for authors to advocate particular positions on issues. Presentations should be balanced, accurate, and inclusive. The publication nonetheless includes the disclaimer that the views expressed do not necessarily reflect those of the Society or the editors.

Procedures for Submission and Manuscript Preparation

Articles originate from a variety of sources. Some are solicited, but authors interested in submitting a manuscript are urged to propose timely topics to the lead editor (slodom@unc.edu). Manuscripts vary in length ranging from 20 to 30 pages of double-spaced text (approximately 8,000 to 14,000 words) plus references. Authors are asked to submit manuscripts electronically, if possible, but hard copy may be submitted with disk. Manuscripts should adhere to APA style and include text, references, and a brief biographical statement limited to the author's current position and special activities related to the topic.

Reviews are typically obtained from academic or policy specialists with relevant expertise and different perspectives. Authors then make revisions based on these reviews and the editors' queries, working closely with the editors to arrive at the final form for publication.

The Committee on Policy & Communications, which founded the *Social Policy Report*, serves as an advisory body to all activities related to its publication.