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Transforming the paradigm of child welfare

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Abstract

As a founder of the field of applied developmental psychology, Dr Edward Zigler promoted public policy that translated scientific knowledge into real-world programs to improve the outcomes of high-risk children and families. Many researchers, practitioners, and public policy proponents have sought to carry on his legacy through integration of empirical research, evidence-based prevention and intervention, and advocacy to address a range of challenges facing families with young children. To advance the field of child maltreatment, a multidisciplinary team of investigators from the Universities of Rochester and Minnesota partnered with the Eunice Kennedy Shriver National Institute of Child Health and Human Development to create the **T**ranslational **R**esearch that **A**dapts **N**ew **S**cience **FOR** **M**altreatment Prevention Center (Transform). Building on state-of-the-art research methodologies and clinical practices, Transform leverages theoretically grounded research and evidence-based interventions to optimize outcomes for individuals across the life span who have experienced, or may be at risk for, maltreatment. Inspired by the work of Dr Zigler, Transform is committed to bridging science and real-world practice. Therefore, in addition to creating new science, Transform's Community Engagement Core provides translational science to a broad audience of investigators, child-serving professionals, and parental and governmental stakeholders. This article describes Transform's purpose, theoretical framework, current activities, and future directions.

Keywords: abuse, child maltreatment, developmental psychopathology, neglect, translational research

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Introduction

The life of Dr Edward Zigler, through his tireless work in the field of psychology, brought together developmental science and social policy (e.g., Zigler & Bishop-Josef, 2006; Zigler & Styfco, 2002). His pioneering work helped to catapult national efforts to create a universal preschool program and, in the 1970s, he helped launch Head Start and Early Head Start. In addition, his work contributed to the national policies that impact many of us in our current lives, such as the Family and Medical Leave Act (FMLA). There is little doubt, especially during this time when a pandemic is ravaging the world, that Ed Zigler's fingerprints remain on how parents care for themselves and their families: his impact can be seen ranging from understanding how children are responding to this pandemic through a developmental lens to how parents are taking FMLA leave to care for their children and parents. As individuals journey through homeschooling or caring for a loved one that is ill, Ed's life's work is impacting how we all cope and rely on policies designed to promote wellbeing and resilience. Often, there are giants in a field that push themselves to do more. Ed Zigler was such a giant, with over 800 publications including 40 books and memberships in elite academic institutions. However, there are few giants for whom pushing themselves is not enough. Those rare individuals become the leaders that compel others to do better as well. It was not enough to Ed that his publications sat on library shelves – it was as important that the science he and his colleagues were conducting meant something in the lives of others, especially to improve the world for our nation's children who were at risk of falling behind in their biopsychosocial health.

As we begin the next chapter in our nation's history, we still have much to learn from Ed Zigler's work to improve the lives of children by bringing together science and public policy (Zigler, 1998). Child abuse and neglect (CAN) remains a serious public health problem in critical need of attention and carrying forward Ed Zigler's efforts. In 2018, Child Protective Services (CPS) received reports for more than 3.5 million children (USDHHS, 2020). There is no one professional sector that can solely fix this problem in isolation of the others. As a country, we responded to CAN for decades considering it an individual-level problem: bad parenting, substance use, the perfect storm. However, it is now well established that CAN must be considered with a multilevel developmental lens, integrating risk factors at the individual, interpersonal, community, and societal level

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*As this paper reflects collaborative work for the Transform Center, all authors have contributed equally and are in alphabetical order.

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(Cicchetti & Lynch, 1993). While psychologists have been examining CAN for decades, other professional sectors have been slow to inculcate the CAN science into practice within the walls of schools, hospitals, child welfare, and the legal system. Despite families moving through these sectors fluidly, in many communities these professionals do not interact easily with each other. This lack of communication may be due to time restrictions, conflicting schedules, statutes that prohibit cross-disciplinary dialogue about case-specific details, and the constant need to respond to CAN in crisis situations, leaving little time for creative solution-focused prevention options.

In an attempt to address this crisis, the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) sought to change "business as usual" and move the paradigm of CAN science to one grounded in Ed Zigler's approach: to marry the science with translational efforts to inform the field (e.g., Zigler, 1998; Zigler & Styfco, 1998, 2002). The NICHD prioritized funding national centers for the prevention of CAN through three main objectives with the P50 Capstone Centers for Multidisciplinary Research in Child Abuse and Neglect: (a) the creation of new science, (b) developing junior scholars, and (c) simultaneously translating that science to end users across professional siloes. In 2017, the NICHD funded the Penn State Social Science Research Institute's Child Maltreatment Solutions Network. The following year, NICHD funded the second and third centers: one was a collaboration between the Universities of Rochester and Minnesota called the **T**ranslational **R**esearch that **A**dapts **N**ew **S**cience **FOR** **M**altreatment Prevention Center (Transform), and the other was The Center for Innovation in Child Maltreatment Policy Research and Training at Washington University in St. Louis. The purpose of this article is to describe Transform in greater detail to illustrate the ways in which current applications of developmental science can be utilized to advance social policy. To do so, we describe Transform's theoretical principles, two research projects, dissemination efforts, and future directions.

Background

Each year, children and youth are exposed to traumatic experiences, including maltreatment (neglect, physical, sexual, or emotional abuse), domestic abuse, community violence, life-threatening illness or injury, or sudden loss. In 2018, more than 3.5 million reports were made to child protection authorities in the USA (USDHHS, 2020). The most recent National Incidence Study estimates that the number of children harmed by maltreatment was 1,256,600: families, siblings, relatives, and providers are also affected by these cases, thus causing a ripple effect that can often cripple entire communities (Sedlak et al., 2010). Researchers have also noted inequalities in reporting for CPS related to race and ethnicity (Cort, Cerulli, & He, 2010; Maguire-Jack, Font, & Dillard, 2020), which can result in children being placed in care with families that they don't know, in different communities, and sometimes with families that are racially and ethnically different.

Exposure to maltreatment and trauma can incur substantial and long-term human and systems costs. For children, it can affect multiple aspects of their health and development, leading to emotional, behavioral, and learning difficulties, as well as related (and often more extended) health and mental health problems (Cicchetti & Toth, 2015a; Shonkoff, 2016). On the systems side, child maltreatment and exposure to trauma can result in increased health care system utilization, CPS involvement and foster care placement, increased risk of suicide, and increased law enforcement and judicial system costs. Complex childhood trauma and resulting post-traumatic stress reactions adversely affect the development of areas of the brain related to cognitive and attentional processing, memory, and emotional regulation (DeBellis et al., 1999). The response of the brain to childhood trauma depends on many factors, including the timing and severity of trauma experiences and the presence or absence of protective factors in the environment. It is known that complex childhood trauma, in the absence of protective factors, results in predictable emotional and behavioral outcomes including insecure attachment, poor emotional regulation, and delay in problem-solving abilities (Cicchetti & Toth, 2015a). Moreover, traumatic experiences can erode a child's resilience over time (Cicchetti, 2013; Greenough, Emde, Gunnar, Massinga, & Shonkoff, 2001; Luthar, Cicchetti, & Becker, 2000; Masten, 2014; Rutter, 1987). For children removed from their parents, childhood trauma may be further compounded by separation and loss (Simms, 1998; Szilagyi, 1998).

Child maltreatment research has become increasingly sophisticated in recent years. Current research studies are more empirically rigorous, less fraught by methodological flaws, and both intervention and social policy initiatives are increasingly informed by the results of empirical studies (Toth & Cicchetti, 2006). However, despite considerable advances in knowledge on the etiology of CAN, preventing its occurrence, and understanding and treating its sequelae, important frontiers remain. Historically, perspectives on the etiology of CAN have focused on unidimensional, single-domain determinants in which the characteristics of parents, behaviors in the child, or aspects of the community milieu were considered individually. However, as noted by the Institute of Medicine and National Research Council (2014), probabilistic relations have been consistently found among these factors and the occurrence of maltreatment. As such, no one factor has emerged as a necessary or sufficient causal agent for child maltreatment (Cicchetti & Rizley, 1981). Moreover, the majority of investigations of the causes and consequences of child maltreatment have examined neurobiological and psychological systems separately. Despite the groundbreaking policy work of Ed Zigler, the field is only now starting to work together nationally in an organized fashion to translate findings into policy and practice in real time as legislation that will protect and care for children is drafted (Crowley, Scott, & Fishbein, 2017). Transform addresses a number of these gaps by focusing on the conduct of longitudinal research that concurrently examines biological and psychological systems in a developmental framework and translating this work into policy and practice through the Community Engagement Core (CEC). In addition to multilevel investigations on basic maltreatment research, Transform scientists incorporate multilevel measurement strategies into the center's randomized control trial (RCT) of preventive intervention, which is particularly important to identify "what" works best for "whom" (Cicchetti & Gunnar, 2008; Fonagy, Target, Cottrell, Phillips, & Kurtz, 2002; Weisz & Kazdin, 2017). Such strategies highlight very diverse mediators and moderators of treatment outcome, thus allowing translation into real-world settings. Determining the multiple levels at which change is engendered through Transform's RCT (see below), which incorporates physiological and psychological assessments of intervention efficacy, provides greater insight into the change mechanisms and the potential for promotion of neural plasticity. As such, epigenetics play a large role in Transform's focus.

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Beyond inherited genetic effects, epigenetics involves the study of alterations in gene regulation through changes in transcriptional activity that result from an individual's response to environmental experiences. Epigenetics has emerged as a promising avenue for CAN research and it may serve as a critical mechanism for understanding the ways in which the chronic stress of maltreatment experiences is embedded biologically, conferring risk for physical and mental health problems (Cecil, Zhang, & Nolte, 2020; Szyf & Bick, 2013). Natural genotypic variations in the DNA sequence are not modifiable but they are important to understand for their role in increasing the potential for risky phenotypes when children experience maltreatment. In contrast, DNA epigenetic modifications in response to CAN constitute mechanisms through which the experience of maltreatment may alter gene expression and affect diverse processes related to mental and physical health. If we are to understand the mechanisms through which child maltreatment imparts maladaptation, compromised physical health, psychopathology, or resilience, then it is critical that we examine genetic variation (functional polymorphisms) and epigenetic modifications (cf. Cicchetti, Hetzel, Rogosch, Handley, & Toth, 2016a, 2016b; Klengel et al., 2013). These findings will need careful translation for lay audiences.

Despite the staggering statistic that a child is abused or neglected every 47 s in the USA (Children's Defense Fund, 2014) and the enormous human and societal costs associated with exposure to violence and trauma, relatively few child welfare and community service professionals are trained in empirically supported best practices around trauma-focused services for children, let alone the biological consequences. Too often, such knowledge and training remain available to only a select group of providers and do not reach the broader child welfare service delivery system. The unfortunate result is that child-serving professionals (teachers, child welfare workers, judges, attorneys, and health providers) may lack understanding of the developmental presentation of trauma or of its profound and lasting effects on children, well into adulthood. Well-intentioned but underprepared, they select from a range of treatments (based on available training and/or regional variation) that may not be trauma-informed, culturally competent, evidence-based or well implemented, and they lack training in the appropriate modification of existing treatment protocols, which can mean the difference between effective or ineffective intervention. Thus, legal providers may be unable to make evidence-informed decisions and often use discretion without understanding the science, sometimes placing children in unsafe environments. Further, there is little understanding on the intersectionality of age, race, gender, culture, and sexual orientation for children and caregivers in terms of screening, assessment, and referral for CAN. Research has documented an over-reporting of children of color to CPS (Cort et al., 2010; Maguire-Jack, Font, & Dillard, 2020; Raz, 2020). It is imperative for research to be used by child-serving professionals to make the best decisions informed by science. As an example, consider the following case scenario.

Case scenario

A White, suburban, professional couple accepted their first non-White, non-Hispanic foster child into their care in 2017. The family kept in touch with the child's biological mother, visiting and facilitating a relationship between her and her child, as well as themselves. After a short period, child welfare informed the foster parents that the child's mother was surrendering her rights and was happy with the foster placement. She believed the child would remain with the foster family that had, by that point, provided care for 3 years and move towards adoption. The government deported the biological father due to a criminal offense and he was not in a position to provide care. Right before the adoption procedure was scheduled, the child welfare worker called to inform the fostering-now-adoptive parents that a relative resource had been found and they were removing the child to place her accordingly. The relatives share the biological father's race and ethnicity. There was no transition plan for the 3-year-old child. Covid 19 was ravaging the community and the foster–adoptive parents shared concerns that the new foster family was not abiding by health regulations promulgated by the state after observations during a few videoconferences. The child welfare worker cited the reason for the abrupt turn of events was that the original foster placement was inter-racial and the child was better off with her biological family – albeit very distant relatives of the now-absent birth father and no connection to the biological mother. The child welfare team argued in favor of genetic relatedness over attachment – to the point of not having an actual transition plan until the foster–adoptive parents secured private counsel to argue on behalf of their foster daughter. After many stressful months and a prolonged court proceeding, the foster–adoptive family won a legally precedent-making case that they have standing to seek custody trial after arguing the science of attachment. Would this case have gone differently if the parties involved had understood attachment and the literature on how race, culture, and attachment intersect? According to therapy reports, this child had established a trusting and loving relationship with the foster family. The notion that attachment cannot happen across racial and ethnic boundaries is not founded in science.

Compounding the problem, most practitioners lack access to the science for myriad reasons. Some cannot access empirical literature due to some journals requiring paid subscriptions. For others with access to the literature, they may not understand the nuances due to scientists using field-specific jargon and complicated analytics. Furthermore, practitioners may not be able to access the science through mentors as they often lack supervisors with expertise to address issues related to trauma from an organizational as well as individual clinician level. Lack of adequate training and support leads to provider burnout and turnover in most child-serving fields, thus creating a revolving door of child welfare workers and therapists that costs the system money and may make situations even worse for children in need, for the agencies trying to serve them, and for the community as a whole. High staff turnover also adversely affects the ability of agencies to retain staff who have been trained in evidence-based interventions, thereby decreasing the sustainability of evidence-based models. As a result, these children remain embroiled in myriad court procedures, often without having outcomes that improve their health, and a constant stream of new providers with whom they must meet and interact. Awareness among providers of the specific need for training in evidence-based programming for childhood trauma is also growing, in part as funding bodies increasingly focus their investment portfolios on community service organizations' utilization of evidence-based protocols. Although the availability of trauma-specific treatment is an essential component of children's services, it is not sufficient unless it is delivered within the context of a trauma-informed, culturally sensitive system of care. As violence and trauma often underlie youths' juvenile justice involvement, educational difficulties, mental health challenges, and substance use, a comprehensive, cross-system approach is imperative to affect lasting culture change. One of the fundamental challenges to treating trauma is that it often goes unrecognized. When an intentional, trauma-informed culture is fully integrated comprehensively from policy level through daily practice, the potential for healing and recovery emerges. Unless successful efficacy trials are followed by a commitment to dissemination, valuable treatment may languish in academic settings.

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Since such research was initiated approximately 50 years ago, knowledge on the sequelae of CAN has increased exponentially. The development and implementation of exciting and effective prevention and intervention strategies have been significantly advanced by recent technological advances that can elucidate the interplay of complex multilevel mechanisms that contribute to the deleterious consequences associated with maltreatment. However, although understanding of the consequences of CAN has improved, insufficient progress has been made in its prevention, leaving far too many children victimized by child maltreatment.

For over 40 years, Transform investigators have conducted research in child maltreatment and Transform builds on this foundation. Examples of reaching outside the university walls include studies via federally funded summer day camps that have included over 2,500 maltreated and demographically matched non-maltreated children (Vachon, Krueger, Rogosch, & Cicchetti, 2015). Over the years, Transform researchers have had extensive experience successfully implementing research programs on child maltreatment. The children have been predominantly from minority racial/ethnic groups (80%); the findings from this research are thus largely based on developmental processes in children who are typically underrepresented in the developmental research literature. The innovative 35-hr, week-long summer research camps implemented at Harvard University and Mt. Hope Family Center provided a naturalistic setting in which to collect data (Cicchetti & Manly, 1990), including physiological measures of neuroendocrine regulation, immune function, DNA samples for genetic and epigenetic analysis, neurophysiological processes (emotion-potentiated startle, EEG hemispheric asymmetry, event-related potentials), neurocognitive functions (attention networks, executive functions, and intelligence), and physical health markers, as well as counselor ratings, child self-report and observational data on peer and dyadic interactions, perceptions of relationships, behavior ratings, symptoms of psychopathology, emotion regulation, self-esteem, resiliency, cognitive assessments, self-system processes, representational development, personality organization, and exposure to violence. School record data, family demographics, and assessment of family functioning through parent reports were also obtained.

Researchers carefully assessed the participants regarding maltreatment status, including documented CPS record data coded with the Maltreatment Classification System developed by members of the Transform team (Barnett, Manly, & Cicchetti, 1993) and parent interviews about past and current maltreatment (Cicchetti, Toth, & Manly, 2003). Children without a maltreatment record were screened for the absence of any CPS or parent-report of maltreatment and were closely matched on demographic variables to create a low-income comparison group of children who were not maltreated. There was a high representation of people of color in the sample (60% African American, 31% European American, 9% other racial groups, 15% Latinx ethnicity). The children and families were followed for 2–6 years (depending on age at enrollment and the design of the particular year of camp study) and the team reviewed updated maltreatment records annually. Subsets of these participants were followed into adolescence and emerging adulthood through two grants funded by the National Institute on Drug Abuse to address longitudinal effects of maltreatment, with a particular emphasis on risk for substance abuse (Handley, Rogosch, & Cicchetti, 2015; Rogosch, Oshri, & Cicchetti, 2010). Furthermore, an MRI study with 100 adults who were former camp attendees examined brain processes affected by childhood maltreatment (Demers et al., 2018, 2019). Across these studies, a large corpus of comparable data yielded potential for evaluating maltreatment effects across an unusually large sample of adults maltreated during childhood. To date, this body of research has yielded seminal publications in maltreatment in relation to developmental psychopathology, Gene × Environment (G × E) interactions, neuroendocrine regulation, neurophysiological functioning, neurocognitive processes, personality organization, emotion regulation, peer relationships, school adaptation, resilience, and risk for psychopathology and substance use. Because many of the participants in the summer camp studies have now entered adulthood, Transform's team is well positioned to continue its groundbreaking research by following a subset of the camp sample to collect data on adult physical and mental health outcomes (see the section on the Adult Health Study below).

Through extensive, well-established, local and national collaborative relationships with mental health clinicians, professionals in the child welfare and legal systems, educators, and law enforcement, Transform is translating research findings across multiple stakeholder groups to improve the wellbeing of maltreated children and their families.

To conduct innovative multilevel investigations that move the field forward and to engage the community with current and future research and cutting-edge methodologies to professionals in child-serving systems, Transform – as a Capstone Center for Multidisciplinary Research in Child Abuse and Neglect (P50) – was established. Transform is a national resource to build on an extensive corpus of research and advance translational research in child maltreatment. Findings from diverse fields – including developmental science, genetics, neuroscience, prevention and intervention science, child welfare, and court systems – are disseminated as a national resource for individuals in diverse disciplines and professional arenas.

Transform has the following major goal – to change the paradigm of child maltreatment from reactive to proactive. To accomplish this field-changing goal, Transform has the following three overarching aims.

Aim 1. To develop a multidisciplinary team where investigators share a conceptual framework to synthesize theoretical and methodological perspectives and analytics on child maltreatment, creating innovative approaches that will foster the formulation of intervention designs that meet the needs and preferences of stakeholders.

Aim 2. To foster a community–academic collaborative enterprise that includes education, training, technical assistance, and career development for the next generation of child maltreatment professionals (e.g., graduate students, postdoctoral fellows, and early career investigators), including underrepresented minority researchers and professional development across multiple disciplines for those in child-serving systems.

Aim 3. To strengthen the capacity of a sustainable network of service providers who partner with Transform investigators to implement evidence-based treatment with maltreated and high-risk populations. Within this collaborative network, we infuse a culture of participation that fosters consensus among researchers, community providers, and engaged stakeholders in the way interventions are delivered and evaluated, while maintaining the utmost scientific rigor.

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Given the Covid 19 pandemic and the Black Lives Matter movement, Transform's efforts are even more timely. The pandemic has resulted in children being isolated from their peers and separated from child-serving systems. The need for minority representation in the realms of CAN research and service provision is essential and gaining greater attention from funders.

Theoretical Model

To accomplish its goal, Transform operates under the overarching theoretical and methodological perspective of developmental psychopathology. This perspective integrates Bronfenbrenner's (1979) ecological approach to understanding environmental contexts, organizational perspectives on development (Cicchetti & Toth, 2015a; Cicchetti & Valentino, 2006), Belsky's (1980) nested, interactive systems of influence on parenting, and Cicchetti and Rizley's (1981) model of transactions among risk and protective factors. In addition, Zigler's integration of child development and social policy informs Transform's preventive intervention and dissemination approaches. Equifinality and multifinality in developmental processes are seen as central for understanding normative and atypical development. From its inception, the developmental psychopathology framework proffered the mutually informative transactions that can occur between basic and applied research, with the ultimate goal of advancing both knowledge of developmental processes and informing the provision of prevention and intervention initiatives. Within this framework, preventive interventions can provide important information on developmental processes to examine modifiable risk factors through a treatment lens. Thus, both basic and applied research shapes our understanding of etiological factors, the sequelae of child maltreatment, and change mechanisms. A multilevel analytical approach incorporates multiple influences, including psychosocial and neurobiological processes that impact development. Increasingly, the role of the stress response system through the hypothalamic–pituitary–adrenal (HPA) axis, as well as genetic and epigenetic factors, are being examined in high-risk populations to better understand its developmental impact and the opportunity it provides to assess treatment effects. Dysregulations in HPA axis activity and G × E interactions have been documented in publications on maltreated children (Cicchetti & Rogosch, 2001; Cicchetti, Rogosch, Gunnar, & Toth, 2010; Hart, Gunnar, & Cicchetti, 1995, 1996). Although advances in science and technology have permitted more detailed examination of the processes impacting the development of maltreated children, they also have uncovered variability and transactional challenges for which simplistic solutions have proven inadequate. In our schools and courts, many child-serving professionals continue to treat CAN as homogeneous – unaware that each child's developmental stage, resilience, protective factors, and coping mechanisms play a role in how that child responds to CAN. It is imperative that we, as researchers, translate our findings for use in everyday settings – not just how to implement actual interventions to prevent and respond to CAN, but also to inform practitioners, funders, and policy makers regarding the lifelong deleterious effects of CAN in the absence of prevention and intervention.

Transform not only facilitates ongoing and concerted life span research to further elucidate the impact of CAN on the biopsychosocial health of children, through their adulthood, but also translates that work. We describe two innovative studies in greater detail below. The first study examines an intervention initiated prenatally for pregnant women facing economic disparities as an opportunity for preventive intervention to reduce the emergence of harsh parenting and promote healthier outcomes for families. This study builds on the team's prior work with clients facing social determinants of health, including the provision of a multi-tiered preventive strategy (e.g., a multicomponent home visitation program for young families entitled "Building Healthy Children"; Demeusy, Handley, Manly, Sturm, & Toth, this issue).

The second study follows, into adulthood, a large cohort of individuals who attended summer research camps in childhood. We build on a unique and extensive database of psychosocial and physiological data from the day camp's childhood assessments to provide an in-depth analysis of the long-term impacts of CAN and of processes that affect physical and mental health in adulthood. This provides important knowledge for the nation in determining future directions for mental and physical health care and court reform, as well as redesigning court procedures to be more responsive to these vulnerable litigants' needs.

The results of these two investigations provide a life span developmental approach and are relevant to the community: multidisciplinary professionals and stakeholders across child welfare, and the mental and physical health, legal, and educational systems that serve children who experience CAN.

At Transform we are creating a scholarly culture of innovation to inform the next generation of scientists who will advance knowledge on the effects, treatment, and prevention of child maltreatment. This culture builds on discoveries in multilevel analyses and is further informed by new research in prevention and intervention science, parenting, infant attachment, neuroscience, genetics and epigenetics, cultural differences, and consumer and marketing psychology. We leverage theoretically grounded evidence-based programs developed by researchers supported by the National Institutes of Health. Although programs demonstrate the efficacy of prevention for populations at high-risk for child maltreatment, considerable challenges remain to strengthen their effects, elucidate processes by which positive outcomes are achieved, increase their incorporation into child-serving systems, and extend their reach and uptake to diverse populations. Although child maltreatment research has advanced in recent decades, there continue to be discrepancies in the assessment, methodologies, foci, populations, and approaches in studies of maltreated children and their families. One example is the lack of court utilization and uptake of such science in considering the best interests of children in custody, visitation, and child welfare cases, as elucidated in the case scenario presented earlier in the paper. Dissemination of intervention approaches requires attention to real-world factors that impact uptake, as well as implementation factors and training needs that influence sustainability. Accordingly, an evaluation of the preventive interventions in the RCT described below will explore mediators and moderators of treatment, ascertain when the provision of intervention is most efficacious, and what type of intervention is most effective based on characteristics of pregnant women.

As detailed below, the research agenda unfolds in a series of steps. At each step, Transform investigators are consulting and collaborating with two groups of national experts – a National External Advisory Board (NEAB) and a National Community Advisory Board – that focus on dissemination and advancing science, both comprising interdisciplinary scientists, practitioners, and junior faculty members. Transform embraces a multidisciplinary approach that encourages investigative collaboration across disciplinary boundaries using a shared common conceptual framework that synthesizes and extends scientific discoveries

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into the development of more effective and efficient intervention models. This "team science" model brings together professionals with different backgrounds, including basic and applied scientists who provide much of the theoretical grounding for project hypotheses, program developers who are the architects of evidence-based programs, research methodologists who advise on the appropriate experimental designs for testing the models, measurements for assessing key constructs, and analytical methods for evaluating results, and child-serving professionals who are participating in Transform's dissemination activities.

Approach – Organizational Framework

Prior to discussing the core research projects, we briefly discuss Transform's structure. The NEAB comprises national experts in the science and practice of child welfare. These experts review Transform's progress, with a focus on any recent national data on trends in child maltreatment issues and updates on lessons learned from research and initiatives across the country, and discuss how Transform can spearhead innovation and be most responsive to recent trends and national needs. A specific area of discussion includes methods for communicating research findings to stakeholders and best approaches for sharing information across multidisciplinary audiences. When designing Transform, we identified the need to include faculty members from a variety of perspectives, particularly as our theme of "bridging the gaps" requires that we assemble and engage individuals and groups who infrequently encounter one another during their daily work. We are equally committed to diversity of our experts in terms of race, ethnicity, gender, sexual orientation, and specific discipline. We thus built this diversity at different "levels" of Transform – among the core faculty members who compose the Internal Advisory Board, the affiliated faculty members who will participate in future research, and the members of the NEAB. The NEAB expertise and linkages across several national organizations (e.g., the National Child Traumatic Stress Network, the Academy on Violence and Abuse, and the American Academy of Pediatrics; Cloitre et al., 2009; Pynoos, Steinberg, & Piacentini, 1999) has yielded rich discussions of needs and strategies to work across systems and perspectives. It was also important that CAN survivors are also NEAB members.

The complementary Internal Advisory Board provides support to the Steering Committee and includes senior and junior investigators, as well as students. This workgroup promotes transparency in implementation of policies, procedures, and operations, advises the Transform director on relevant issues that impact the allocation of resources and the implementation of research and intervention strategies, and facilitates working toward common goals to advance the Transform center. As already noted, the membership reflects our commitment to diversity and promotes the next generation of scholars who will move the field forward.

The Three Cores

There are three main Transform cores – administration, research, and the CEC. We will now further discuss the two research cores and the CEC.

Research project one – Promise

As Ed Zigler (1995, p. 6) emphasized "If a child is to have the best possible chance to grow to full potential, we must pay attention to the early childhood environment." The first research project does just that, with a focus on infants, fostering positive parenting, and preventing CAN among socioeconomically disadvantaged families. Infants under 1 year of age have the highest rate of victimization (26.7 per 1,000) and 70.6% of child fatalities occur between birth and age 3 years (USDHHS, 2020). Because of formative and rapid physiological and brain development, infancy is a particularly vulnerable period, and maltreatment in infancy may set the stage for a cascade of negative developmental processes (Masten & Cicchetti, 2010). Moreover, in families experiencing socioeconomic disadvantage, community violence, racial discrimination, health inequities, and other associated significant stressors, parenting can become increasingly strained and dysfunctional parenting and child maltreatment can occur.

Multidisciplinary approaches to prevention that incorporate developmental understanding within a context of ecological and transactional processes are needed to leverage advances in developmental science to prevent lifelong negative outcomes for maltreated children (Shonkoff et al., 2012). Parents with a history of maltreatment and trauma may have negative sequelae (e.g., emotional dysregulation, mental health disorders, social isolation, and violent relationships) that disrupt the parent–child relationship and pose risks for harsh parenting and maltreatment (Sturge-Apple, Toth, Suor, & Adams, 2019). Parental negative perceptions of their children, combined with difficulties in coping with the stresses of rearing young children, in the context of poverty, may also exacerbate risks of maltreatment. Negative representations of the fetus have implications for parenting and parent–child relationships, and predict less sensitive and involved Mother×Child interactions in the months following birth (Goodman, Bakeman, McCallum, Rouse, & Thompson, 2017; Siddiqui & Hägglöf, 2000). Attachment theory suggests these parental and familial factors impact intergenerational patterns of relationships in which caregiving perceptions and behaviors may be transmitted from parental histories into relationships with their own children; this dynamic provides a compelling and substantiated framework for understanding processes impacting risk for maltreatment as well as providing opportunities for intervention (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Moss et al., 2011; Toth, Gravener-Davis, Guild, & Cicchetti, 2013). In concert, relationally based approaches to intervention have demonstrated efficacy in ameliorating risk, especially for women with histories of maltreatment, above and beyond parenting skills training approaches (Stronach, Toth, Rogosch, & Cicchetti, 2013; Toth, Petrenko, Gravener Davis, & Handley, 2016). However, methodologically rigorous models incorporating multiply-determined risk and protective factors are needed to determine optimal prevention strategies that reduce risk for perpetrating maltreatment among families experiencing socioeconomic disadvantage. Moreover, the optimal timing of intervention provision during infancy to prevent harsh parenting and maltreatment is not established. Finally, the efficacy of shorter interventions versus those of longer duration is unknown. To address these critical gaps, this project explores the potential for child–parent psychotherapy (CPP) – an evidence-based trauma treatment model that facilitates change through promoting positive relationships to foster a strong foundation for positive family functioning early in development (beginning in the prenatal period) and subsequently prevent the occurrence of child maltreatment.

CPP is based on the work of Selma Fraiberg and colleagues (Fraiberg, Adelson, & Shapiro, 1975), and the current model

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has been elaborated on and developed by Alicia Lieberman and colleagues (Lieberman, Diaz, Castro, & Bucio, 2020; Lieberman, Ghosh Ippen, & Van Horn, 2015). CPP is based on the fundamental assumption that parent–child relationship challenges are not the result of a deficit in parenting knowledge or skill. Rather, CPP recognizes that a caregiver's insensitivity or lack of appropriate responsivity to a child is likely the result of their own childhood experiences with caregivers. With a supportive and collaborative stance, CPP aims to help parents recognize the role that their own childhood experiences with caregiving may have in their current parenting practices. CPP aims to foster a secure parent–child attachment by helping parents become more responsive, sensitive, and attuned to their child.

Research documents CPP as effective at promoting attachment security in maltreated infants (Cicchetti, Rogosch, & Toth, 2006). Outcomes include improved maternal empathy and interactiveness toward their infants (Lieberman, Weston, & Pawl, 1991), sustained security of attachment, positive self-representations in maltreated preschoolers (Toth, Maughan, Manly, Spagnola, & Cicchetti, 2002), improved maternal mental health, and improved mental health among preschoolers exposed to intimate partner violence (IPV) (Ghosh Ippen, Harris, Van Horn, & Lieberman, 2011; Lieberman, Ghosh Ippen, & Van Horn, 2006; Lieberman, Van Horn, & Ghosh Ippen, 2005). Improvements in parent–child relationships in maltreating families following CPP intervention were significantly better than those with the provision of parenting skills treatment (Stronach et al., 2013; Toth et al., 2002). When CPP was implemented beginning during pregnancy, it was associated with improved maternal mental health and adaptive child-rearing attitudes, with the greatest improvements among mothers with low fetal attachment in pregnancy (Lavi, Gard, Hagan, Van Horn, & Lieberman, 2015).

Traditionally, CPP is conducted over a 12-month period. The time and cost accompanying a year-long course of CPP highlight the importance of investigating whether shorter length CPP treatment might be comparably efficacious. We are evaluating whether a shortened course of CPP (6 months in duration) has similar outcomes to a 12-month course. In addition, we are evaluating whether beginning prenatally or postnatally provides stronger child maltreatment prevention effects. Therapists trained and supervised by national CPP trainers meet weekly with families during home-based sessions (or via telemedicine during Covid 19). During the sessions, therapists and parents engage in joint discussions about perceptions of children when CPP begins prenatally and observations of infants after they are born.

The therapists' warm and empathic approach with the parent–child dyads sets the stage for parents to reflect on maladaptive beliefs regarding the child, reexamine past intimate relationships and differentiate them from current relationships, and develop positive internal representations of themselves, themselves as parents, and their children. Parents are encouraged to recognize the impact of trauma, to understand and redefine their children's behavior, to improve emotion regulation abilities, and to bolster their role as a protective shield to their child. The aims and hypotheses of this study are as follows.

Aim 1. To evaluate whether CPP delivered prenatally, postpartum, or both to high-risk low-income women promotes sensitive and responsive parenting, fosters a secure mother–infant attachment relationship at child age 15 months, and protects against child maltreatment. **Hypotheses**. Mothers who receive CPP will demonstrate more sensitive and responsive parenting and their infants will evince more secure mother–infant attachment and developmental competencies and fewer instances of child maltreatment at child age 15 months, as compared with the enhanced community standard (ECS) described below.

Aim 2. To evaluate the efficacy of different implementation strategies for CPP. **Hypotheses**. Each of the three individual CPP intervention strategies (i.e., 12-month CPP, brief prenatal CPP, brief postnatal CPP) will demonstrate superior outcomes compared with the ECS. Overall, mothers/infants in the 12-month CPP condition will show more positive outcomes than those in the 6-month CPP condition. In addition, CPP that begins prenatally is expected to be superior to CPP initiated postpartum.

Aim 3. To identify the significant mechanisms of CPP preventive intervention effects. We will investigate three primary pathways of CPP efficacy: mothers' improvement in (a) internal representations, (b) parenting cognitions, and (c) stress responsivity. **Hypotheses**. The CPP group will show greater improvements in secure maternal attachment representations, parenting cognitions, and stress reactivity, which will protect against child maltreatment and predict superior parenting and child outcomes at 1 year post-intervention follow-up compared with the ECS.

Aim 4. To increase precision in identifying for whom each CPP intervention strategy (i.e., 12-month CPP, brief prenatal CPP, brief postnatal CPP) may be particularly efficacious, we will examine whether maternal characteristics at baseline (e.g., maternal depression, trauma history, and IPV) moderate the efficacy of implementation strategies. **Hypotheses**. Mothers without a history of maternal maltreatment, depression, or IPV will benefit from the shortened versions of CPP whereas mothers with higher levels of risk will require more intensive (12 months) CPP preventive intervention.

The current CPP longitudinal RCT includes a four-arm design: (a) 12-month CPP beginning in the prenatal period; (b) 6-month CPP beginning in the prenatal period; (c) 6-month CPP beginning in the postpartum period; (d) the ECS (includes referrals to community health worker agencies and other support services in the community). The evaluation addresses when the delivery of CPP is optimal (beginning prenatally or postnatally), the duration of optimal services (6 vs. 12 months), mechanisms of effect (mediator analyses), and which intervention strategy works best for mothers with varying risk factors (moderator analyses).

Consistent with models of the determinants of maladaptive parenting and child maltreatment (Belsky, 1980; Cicchetti & Rizley, 1981), the Promise study takes a multilevel perspective on potential processes underlying treatment effects through providing a systematic test of the relative role of three conceptually rich mediators (maternal internal representations of infants, maternal cognitions, and maternal stress response system reactivity) in the parenting context. Our examination of three potential pathways advances the next generation of novel research questions and hypotheses for the prevention of child maltreatment as well as for clinical initiatives aimed at providing interventions to high-risk families.

Internal representations pathway

Representational frameworks suggest that previous histories of emotional experiences are organized into affective schema that serve as guides for efficiently processing, interpreting, and

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responding to subsequent interpersonal events (Baldwin, 1992; Bretherton, 2005; Olgilvie & Ashmore, 1991; Waters & Roisman, 2019). Translated to understanding the etiology of harsh/insensitive parenting and child maltreatment, parental representations of caregiving and their caregiving figure arise from repeated childhood interactions. These coalesce into an organized working model of how relationships unfold and serve as interpretive filters of environmental cues and guide actions in parent–child contexts (e.g., McGillicuddy-DeLisi, 1982). Two separate meta-analytic studies have documented associations between caregiver representations of childhood attachment experiences and offspring attachment classification (van IJzendoorn, 1995; Verhage et al., 2016). Thus, a mother's internal representations of caregiving experiences may promote sensitive/responsive caregiving behaviors and reduce the likelihood of maltreatment with offspring.

Maternal cognitions pathway

Another proposed mechanism of CPP effects on child maltreatment prevention is via changes in maternal negative parenting cognitions. Research on social cognitive processes among maltreating parents has highlighted errors in emotion recognition, sensitive/empathic responding, perceptual and attributional biases of child behavior, and behavioral reactivity to child-rearing situations (for a review, see Camilo, Garrido, & Calheiros, 2016). Overly simplistic or culturally and developmentally inappropriate child-related schemas (such as viewing children as adults) increase the likelihood of negative or developmentally inappropriate attributions and evaluations of child behavior, which in turn guide the selection of poor caregiving practices (Azar, Robinson, Hekimian, & Twentyman, 1984; Azar, Stevenson, & Johnson, 2012). Maltreating mothers may have poorer empathic ability (Rodriguez, 2013) and negative attributional errors in interpersonal situations (e.g., child blaming) that may exacerbate her faulty attributions of child behavior and lead to higher rates of annoyance to stressful child and non-child related noises (e.g., infant cries) (Bauer & Twentyman, 1985).

Stress response system pathway

The stress response system plays a pivotal role in orchestrating how environmental conditions influence individual psychosocial functioning (e.g., McEwen & Wingfield, 2010; Repetti, Taylor, & Seeman, 2002). There are two primary pathways of the stress response – the autonomic nervous system and the HPA axis – which have been shown to be associated with perturbations in parenting and child maltreatment. In particular, parasympathetic functioning in the autonomic nervous system (e.g., respiratory sinus arrhythmia) has been shown to be involved in the regulation of emotion and behavioral responsiveness within the context of stressful caregiving situations (Skowron, Cipriano-Essel, Benjamin, Pincus, & Van Ryzin, 2013; Sturge-Apple, Skibo, Rogosch, Ignjatovic, & Heinzelman, 2011), with maltreating parents displaying irregularities in their autonomic stress reactivity (Reijman et al., 2014; Wolfe, Fairbank, Kelly, & Bradlyn, 1983). Research on how autonomic activity may contribute to the etiology of different forms of maladaptive caregiving and maltreatment is relatively scarce (Reijman et al., 2016).

As a second component of the stress response system, elevated cortisol reactivity in stressful parenting contexts has been associated with harsh and intrusive parenting practices (Martorell & Bugental, 2006; Mills-Koonce et al., 2009). Moreover, trauma-informed interventions with children have shown effectiveness in recalibrating cortisol reactivity (e.g., Cicchetti, Rogosch, Toth, & Sturge-Apple, 2011; Fisher, Stoolmiller, Gunnar, & Burraston, 2007). Specifically, Toth, Sturge-Apple, Rogosch, and Cicchetti (2015) reported that trauma-focused child–parent interventions such as CPP (Lieberman et al., 2015) may reduce child-related stress experienced by neglectful mothers, which in turn may "reset" the HPA axis activity.

Moderating conditions

Open systems conceptualizations of family functioning in developmental psychopathology highlight the importance of examining characteristics that may alter cascade mechanisms. Thus, the form and magnitude of intervention effects may vary depending on pre-existing attributes in the family system. We are examining the role of three potentiating factors – maternal trauma history, maternal psychopathology, and family interpersonal violence. Understanding what works best for whom will inform the preventive intervention strategy (i.e., type, timing, and duration) that will be most effective for mothers with various risk characteristics.

We are obtaining measurements during the third trimester of pregnancy, at 6-month intervals after baseline, and at post-intervention follow-up when children are 15 months old to provide a multilevel assessment of maternal and child wellbeing and attachment in response to interventions. We are collecting data on maternal mental health, attachment representations, cognitions, physiological reactivity, parenting behaviors, and infants' development. We hypothesize that the CPP groups will improve sensitive and responsive parenting and secure attachment relative to ECS alone, thereby reducing risks for child maltreatment. We also hypothesize that improvements in maternal attachment representations, parenting cognitions, and stress reactivity will mediate treatment outcomes. To determine differential responses to intervention (what works for whom?) in order to facilitate tailored preventive intervention strategies, moderators such as maternal histories of trauma, psychopathology, and IPV will be tested. Identification of timing, dosage, and intensity of service delivery, along with mediators and moderators, is innovative and will facilitate the development of targeted prevention and intervention strategies that support parenting and decrease child maltreatment for this vulnerable population.

While the goal of the Promise study is to prevent future CAN, Transform is also examining the effects of childhood maltreatment into adulthood.

Research project two – Adult Health Study

The Adult Health Study is integrated into Transform to promote the next generation of research on child maltreatment, the translation of research findings into clinical and preventive interventions, and the dissemination of research and practice knowledge/skills to varied stakeholders. The developmental psychopathology perspective, through emphasizing a multiple levels of analysis approach across the life span, serves as a unifying foundation for the research. As already noted, child maltreatment frequently results in serious adverse consequences to multiple biological and psychological systems over the developmental course, with long-term deleterious consequences for physical and mental health. Thus, increasing knowledge of the mechanisms through which child maltreatment impacts health and wellbeing, and advancing effective interventions, are of crucial public health significance.

Contrary to the usual course of development in response to an average expectable environment, experiences of trauma and

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deprivation and adverse ecological conditions associated with maltreatment may engender probabilistic ontogenic pathways for maltreated children in which difficulties in the resolution of stage-salient developmental issues promote maladaptation. These failures may be concentrated in specific domains of functioning or they may extend across multiple other domains. Beginning early in life, research demonstrates that maltreated children are likely to exhibit atypical physiological regulation, atypicalities in affect differentiation and regulation, insecure and disorganized attachment relationships, compromises in self-system development, anomalies in representational processes, conflictual peer relationships, trouble adapting successfully to school, associations with deviant peers, school failure, difficulties with employment, and adult relationship dysfunction. The aggregation of these acquired developmental liabilities generates a matrix of relatively enduring vulnerability, increasing the probability for maltreated individuals of maladaptation across the life span (Cicchetti & Lynch, 1995). It is imperative that this information be relayed across sectors to help explain behaviors observed by parents, teachers, coaches, and all who touch the lives of children. These child-serving professionals need to know what they are seeing may not be intrinsic to the child – it may not be "what's wrong with you?" but rather "what happened to you?"

Historically, psychosocial outcomes have dominated the majority of research on the sequelae of child maltreatment. Nevertheless, developmental psychopathologists in recent decades have emphasized the need for research on normal and atypical populations to incorporate a multiple levels of analysis approach (Cicchetti & Dawson, 2002; Cicchetti & Toth, 2009). Consequently, multilevel investigations of biological and psychosocial consequences of child maltreatment have become increasingly prominent (Cicchetti & Toth, 2015b; Curtis & Cicchetti, 2013; DeBellis, 2001, 2005; McCrory, De Brito, & Viding, 2010; McLaughlin, Sheridan, Alves, & Mendes, 2014; Pollak, Cicchetti, Klorman, & Brumaghim, 1997; Shenk, Noll, Putnam, & Trickett, 2010; Sheridan & McLaughlin, 2014).

As toxic stressors (Shonkoff, Boyce, & McEwen, 2009), CAN is implicated in the disruption of biological systems, including neuroendocrine and immune functioning, neurobiology, and physical and mental health outcomes. Behavioral, physiological, and neural adaptations to the deprivation and trauma of maltreatment are interrelated and collectively alter the organization of developmental systems, promoting the development of psychopathology and physical disease. Early maltreatment may jeopardize the foundational organization of neural networks, resulting in cascading effects through the course of later development. As a result, a child's capacity to adapt flexibly to new challenging situations and environmental demands may be constrained and atypical (Cicchetti & Tucker, 1994; McLaughlin, Peverill, Gold, Alves, & Sheridan, 2015), thereby contributing to impaired emotion regulation, risky decision making, dysfunctional relationships, and other forms of maladaptation.

The concepts of allostasis and allostatic load provide an integrative framework for understanding how exposure to chronic stress, such as child maltreatment, may embed the experience of chronic stress across multiple biological systems and potentiate liabilities for physical and mental health across the life span (Danese & McEwen, 2012). Allostasis is a normative, adaptive process that involves the activation of multiple interactive physiological systems (e.g., HPA axis, sympathetic–adrenal–medullary axis, cardio-vascular, immune, and metabolic systems) in response to acute stressors. In the short term, mobilization of these systems exerts a protective effect on biological functions, promoting an adaptive response to stress. In contrast, with chronic activation, physiological reactions to constant stress become less efficient in protecting the individual. Ensuing damage to the body results in allostatic overload, which in turn contributes to changes in brain structure and function and to the development of various disease states.

Thus, the Adult Health Study is important for understanding and clarifying how the frequency and severity of CAN occurring at different developmental stages affect the natural life course of individuals. In this regard, the timing of periods of severe stress may be critical. For example, the timing of maturation of brain structures (including the hippocampus, prefrontal cortex, and the amygdala) varies and may differentially affect adaptive functioning and health later in development (Lupien, McEwen, Gunnar, & Heim, 2009; Shonkoff et al., 2009). During sensitive periods in the development of these brain structures, excess glucocorticoids may result in neurotoxic effects that give rise to compromises in the structural and functional integrity of these structures, thus increasing vulnerability as the life course unfolds. Moreover, accumulation of chronic exposures to stressful experiences and ensuing dysregulation of the HPA axis result in wear and tear on these brain structures. Because these brain structures have dense concentrations of glucocorticoid receptors, chronic stress may engender progressive inefficiency of brain structure and function. Consequently, the impact on children experiencing CAN and socioeconomic adversity may be more detrimental and promulgate vulnerability for compromised health outcomes over the life course.

Comparable to psychological growth, geneticists realize that gene action remains active across the life span and is not solely influential during the early stages of life (Goldsmith, Gottesman, & Lemery, 1997). Consequently, both psychological experiences and genetic processes continue to influence developmental change across the life course. Moreover, as is the case for psychologically mediated effects, consequences that are genetically mediated may be modified both by later experience as well as through subsequent mechanisms of gene action (Szyf & Bick, 2013). The effects of some genes may be enduring, whereas the effects of others may be transient. Genes may be activated or deactivated at different stages of development, and diverse processes regulating gene activity are likely to change over development. Early in ontogenesis, genes may be fundamental to the creation of particular brain structures (e.g., specific neurotransmitter receptors) whereas, subsequently, the functioning of these structures contributes to the emergence of various typical and pathological behavioral characteristics (e.g., negative affectivity, impulsivity, cognitive flexibility). Furthermore, it is likely that gene action occurring at any period of the life span may alter these structures or evoke a physiological process that influences individual behavioral features.

Investigation of genetic moderation of the consequences of child maltreatment on adult allostatic load, epigenetic modifications, and physical and mental health is thus an important and innovative research endeavor. For example, Cicchetti, Rogosch, and Oshri (2011), within an allostatic load framework, investigated the effect of G × E interactions on diurnal cortisol regulation and internalizing symptomology. Variation in the corticotropin-releasing hormone receptor 1 (*CRHR1*) TAT haplotype and the serotonin transporter linked polymorphic region gene (*5-HTTLPR*) was determined in a sample of children who had experienced maltreatment and a comparison sample of children

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who had not had these experiences. G × E effects for *CRHR1* haplotypes and early abuse occurring prior to age 5 on diurnal regulation of cortisol were found; *CRHR1* variation was related to cortisol dysregulation only among children who had been maltreated. Early abuse and high internalizing symptoms also interacted and were associated with atypical regulation of cortisol across the day. The interaction of *CRHR1*, *5-HTTLPR*, and child maltreatment (G × G × E) identified a subgroup of maltreated children with higher internalizing symptoms who shared a common combination of the genetic variants (two copies of the *CRHR1* TAT haplotype and the long–long *5-HTTLPR* genotype). These findings are consistent with an allostatic load perspective on the effects of the toxic stress associated with child maltreatment on cortisol regulation and internalizing symptomatology as moderated by genetic variation.

Exposures to chronic stress contribute to modifications of the epigenome. Methylation is an epigenetic process through which exposures to chronic stress such as child maltreatment may engender – through hyper- or hypo-methylation – alterations in gene expression, thereby increasing disease risk. GeneGo Metacore software analysis of genome-wide epigenetic changes in maltreated versus non-maltreated children revealed linkages to select diseases, disease biomarker networks, and process networks, all indicating broad risk for negative health outcomes in the maltreated group (Cicchetti, Hetzel, Rogosch, Handley, & Toth, 2016b). Epigenetic modifications by methylation of specific genes involved in processes related to physical and mental health also hold promise for understanding mechanisms related to early health decline. Investigation of epigenetic indices of premature aging (i.e., DNA methylation age, telomere shortening) is also likely to provide insight into enduring maltreatment health risks. Likewise, examining the influences of variability in childhood maltreatment experiences on adult allostatic load, epigenetic modifications, and physical and mental health will elucidate the mechanisms underlying the intergenerational transmission of child maltreatment as well as the pathways to positive and negative developmental outcomes.

Although research on the sequelae of child maltreatment has focused extensively on mental health outcomes across the life span, research on CAN effects on physical health demonstrates that maltreatment is related to adverse physical health outcomes associated with allostatic overload, leading to increased morbidity and mortality. For example, maltreatment has been linked to increased hospital-based treatment of asthma, cardiorespiratory, and infectious disease in childhood (Lanier, Jonson-Reid, Stahlschmidt, Drake, & Constantino, 2010). Early CAN has been linked to more health-related symptoms (e.g., sleeping, eating, general health status), higher body mass index, obesity, and compromised immune system functioning in childhood and adolescence (Danese & McEwen, 2012; Ehrlich, Miller, Rogosch, & Cicchetti, in press; Miller, Chen, & Parker, 2011; Rogosch, Dackis, & Cicchetti, 2011; Shirtcliff, Coe, & Pollak, 2009). Furthermore, health liabilities extend into adulthood, with child maltreatment associated with adult cardiovascular disease, elevated inflammation levels, type II diabetes, HIV risk, self-reported physical symptoms across a range of organ systems, and decreased longevity (Carroll et al., 2013; Danese, Pariante, Caspi, Taylor & Poulton, 2007; Felitti et al., 1998; Widom, 2012; Wilson & Widom, 2011). Moreover, child maltreatment has been associated with shortened leucocyte telomere length and advanced cellular aging (Asok, Bernard, Rosen, Dozier, & Roth, 2014; Drury et al., 2014; Shalev et al., 2013; Tyrka et al., 2010).

Understanding adult health outcomes within a developmental, life span, framework holds substantial promise for determining the progression of liabilities ensuing from child maltreatment. The proposed research capitalizes on an existing large cohort of individuals with comprehensive child maltreatment determinations and multidomain, multi-informant, multilevel (biological and psychological) assessments of functioning in childhood. Linking parameters of child maltreatment to variations in childhood adaptation and subsequent multilevel adult outcomes (allostatic load, epigenetic modifications, physical and mental health) has high public health significance. The specific aims of the Adult Health Study are as follows.

Aim 1. To evaluate the effects of CAN on adult cumulative stress, personal resources, allostatic load, epigenetics, physical health, and mental health in a sample of children with maltreated and non-maltreated histories followed longitudinally. In addition, to the influence of variation in child maltreatment experiences (onset age, chronicity, subtypes). **Hypotheses**. Adults who experienced CAN will have higher cumulative stress, fewer personal resources, higher allostatic load, greater epigenetic modifications (methylation/methylation age, telomere shortening), and poorer physical and mental health status than individuals without a history of child maltreatment.

Aim 2. To examine the inter-relationships among cumulative stress, personal resources, allostatic load, epigenetics, physical health, and mental health in adults with and without childhood maltreatment histories. **Hypotheses**. Allostatic load and epigenetic modifications will be more strongly related to physical and mental health outcomes in adults who were maltreated compared with those without maltreatment. Latent profiles characterized by patterns of high cumulative stress, low personal resources, high allostatic load, greater epigenetic modifications, and poor physical and mental health will be more prevalent within the maltreated group.

Aim 3. To evaluate genetic moderation of the effects of child maltreatment on adult allostatic load, epigenetic modifications, physical health, and mental health. **Hypotheses**. Genotypic variation will moderate the effects of CAN on adult allostatic load, epigenetic modifications, physical health, and mental health, with specific gene variants related to more compromised outcomes within the maltreated group.

Aim 4. To examine childhood psychosocial adaptation markers and neuroendocrine regulation as prospective mediators of CAN effects on adult physical health and mental health outcomes. **Hypotheses**. Childhood psychosocial adaptation and neuroendocrine regulation will serve as mediators between child maltreatment history and adult cumulative stress, personal resources, allostatic load, epigenetic modifications, and physical and mental health.

The Adult Health Study evaluates the long-term consequences of child maltreatment on adult physical and mental health through longitudinal follow-up of individuals initially assessed in childhood. Out of a larger existing sample, we have randomly selected a target group for reassessment with the goal of participation by 600 individuals aged 25–45 years. During their school-age years, these adults participated in a research summer camp conducted by the Mt. Hope Family Center, and we obtained comprehensive measurements of diverse aspects of maltreatment since birth, providing a more in-depth coverage of maltreatment experiences than adult retrospective self-report. Multidomain,

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multi-informant measurements of childhood adaptive/maladaptive functioning were assessed, providing a rare opportunity to evaluate models of long-term predictors of adult mental and physical health.

To assess this, we are obtaining a comprehensive battery of measures from participants. In addition to current life status, we are assessing cumulative life stress and history of trauma, as well as personal adaptive resources (i.e., self-efficacy, self-esteem, emotion regulation, personality). To also assess biological markers, we are asking participants to provide hair samples to assess cortisol regulation. We are obtaining anthropometric and cardiac measurements as multiple biomarkers and immune functions via blood samples. Blood draws provide DNA to determine targeted genotypes and epigenetic modifications. Finally, we are assessing physical and mental health by structured interviews and questionnaires. We are analyzing the long-term consequences of child maltreatment on cumulative stress, personal resources, allostatic load, epigenetic modifications, and physical and mental health outcomes. We are also evaluating, developmentally, how earlier quality of childhood adaptation may mediate adult outcomes and the genetic and epigenetic moderation of these mediational processes. This work will provide the foundation for the next generation of advances in child maltreatment research and insight into new prevention and intervention targets.

We anticipate that the results of this research will demonstrate the substantial developmental contributions of CAN across multiple levels of analysis to long-term physical and mental health. To prevent and intervene in the sequelae of maltreatment, early intervention is of utmost importance. Consolidated, multisystemic intervention approaches beginning early in development are necessary to reduce environmental stress exposure, child maltreatment, and allostatic overload to improve physical and mental health.

Findings from this research will be informative for multiple child-serving systems. Ed Zigler was a staunch advocate for using knowledge gained from developmental science to better inform stakeholders and influence social policy (e.g., Zigler & Bishop-Josef, 2006; Zigler & Styfco, 2002). Consistent with this stance, for example, if attorneys for children and judges understood the deleterious developmental impacts of CAN on psychological and biological organization more clearly, perhaps there would be different decisions made daily in courtrooms. Decision makers would begin to understand that multiple attempts at reunification with biological parents, long delays into permanent placements for children in foster and kinship care, and inflexibility in the systems for implementing interventions can lead to long-term physical and mental health consequences, potentially further victimization, and a further drawdown on county, state, and federal resources for child welfare responses.

The consequences of CAN on communities and the importance of intervention must be appreciated – not only to mitigate the intergenerational cycles of violence as discussed in the section describing the Promise study but also financially, as many of the survivors of CAN become patients for both acute and chronic conditions requiring medical intervention, long-term medication use, and disability leading to unemployment

Through incorporating increased knowledge of the cascade of psychological and biological liabilities ensuing from CAN and what interventions may work to reverse these effects, imagine the hope that victims would feel knowing that the consequences they live every day are not simply psychosomatic complaints – but perhaps the sign of advanced aging that, with possible interventions, could be appeased. As our populations age nationally and require care via home visits and residential facilities, this research may reduce the long-term consequences of CAN, leading to a healthier nation. Thus, for the work of the CEC, it is even more imperative that this information be shared with providers serving people across the life span.

The Community Engagement Core (CEC)

The goal of the CEC is to provide effective outreach and dissemination for Transform's evidence-based and evidence-informed knowledge to foster the next generation of child maltreatment prevention scholars and reach a broad range of stakeholders in the child maltreatment community. The CEC is accomplishing this through a cohesive series of activities focused on bridging maltreatment research and practice, expanding the pool of maltreatment researchers via mentoring and research training, and leveraging existing resources to reach large numbers of diverse stakeholders across child-serving systems. Our target audiences include students, junior investigators across different disciplines, child welfare leaders, practitioners (physical and mental health providers, legal professionals), parents, educators, and policy makers. Transform disseminates work nationally via webinars, podcasts, social media, publications, and presentations at national meetings. The current CEC dissemination and outreach efforts include: (a) a multiple levels of analysis framework in understanding the impact of maltreatment on children (i.e., the importance of recognizing the impact of maltreatment on a broad range of biobehavioral functioning across development, including epigenetic findings); (b) evidence-based screening and interventions to identify, prevent, and ameliorate the impact of maltreatment on child adjustment and development, and (c) systems approaches to working with maltreated/traumatized children (i.e., trauma-informed practice) across the health, education, and legal fields. The CEC's multifaceted approach brings to bear a new way of considering dissemination – a three-dimensional approach across multiple professions, geographical locations, and social media platforms. This is occurring via the following aims.

Aim 1. To *immediately disseminate* Transform's research methodologies, findings, and implications for CAN research, as well as to prevent the sequelae of physical and mental health consequences. Dissemination includes incorporating the extant literature on child maltreatment into all trainings, materials, and policy discussions.

Aim 2. To link current *community of practice* efforts (child abuse and prevention, IPV, and injury and suicide prevention) to understand the morbidity and mortality associated with CAN and, importantly, the role that biological and psychological processes play in the development of resilience.

Aim 3. To provide *education and training* to multidisciplinary scholars and practitioners regarding rigorous research methodologies to improve child welfare practices using multimedia.

Given the extensive record and resulting corpus of work and data from Transform researchers, engagement efforts were begun *immediately* in year 1 by translating already existing findings and methodological insights into the field to foster future research. The Transform team provides innovative, coordinated, and comprehensive outreach resources and services to build

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national capacity to translate CAN prevention and intervention research into effective practice. At this level, we engage a broad audience, including professionals involved in child welfare, legal and court proceedings, mental health, and medicine, as well as teachers, parents, and child advocates. In addition to traditional scholarly mechanisms (e.g., conference presentations, peer-reviewed publications, press releases), we build on our past successes and existing partnerships to reach these audiences by engaging with multimedia tools. We currently use three main social media tools – a website, Twitter, and webinars and podcasts (each detailed below) – to connect to professionals in key organizations (American Bar Association, American Academy of Pediatrics, National Child Traumatic Stress Network, American Psychiatric Association, American Psychological Association, American Medical Association, Judicial Institutes, etc.) and lay audiences.

Website

Transform maintains an easily navigable website (http://thetransformcenter.org) that serves multidisciplinary professionals who work with children and adolescents, organizes helpful content for these diverse audiences, and provides centralized links to all of our partners. In addition to developing new content, we connect multidisciplinary audiences to content and work already created by the National Child Traumatic Stress Network, of which Mt. Hope Family Center is a member. We provide continuing professional education credits, for no or minimal cost, to facilitate engagement and provide for practitioners who work for agencies with limited budgets. We are analyzing our website presence in several ways, including being able to count the number of people that view webinars and so on using Google Analytics.

Twitter

The CEC builds on the success of the (@TheTRANSFORMctr) Twitter campaigns by the Susan B. Anthony Center to promote and extend the reach of Transform's efforts to engage the community and increase evidence-based knowledge and practices. The Susan B. Anthony Center is focused on translating science into practice to improve the social determinants of health to individuals who are disenfranchised, with limited or little access to services, in order to improve their quality of life. For Transform, we have used Twitter with specific hashtags to engage viewers to join and follow our campaigns. Transform faculty students and staff select messages in advance to align with pubic events, important holidays, and campaigns, and intermittently tweet when there is an important article in the field being released. We also maintain a Twitter focus on helping parents deal with Covid 19, which was developed after speaking with young parents struggling to juggle their jobs and childcare while under quarantine. The goal is tweet information relevant to child welfare, abuse and neglect prevention, and promising interventions that build on children's resilience. Using Twitter Analytics, we assess the number of people viewing our tweets and how often our viewers retweet or otherwise engage. We use this information to improve the content and timing of future tweets. We have also created "stories" that are tweeted throughout the day and included graphics and photos to increase viewer activity.

Webinar and podcasts

Transform-affiliated members, through the NEAB and faculty, have produced webinars and a podcast called Promoting Resiliency. Guests include psychologists, health services researchers, public health advocates, educators, foster parents, childcare providers, CEOs of child-serving agencies, and experts who help us understand implicit bias. These cross-sector guests help to disseminate CAN science by informing viewers and listeners how they create or use the science in daily practice. The work products are available, for free, on our website to be shared within organizations serving children. We have also partnered with Lawline to create and disseminate webinars that provide continuing legal education credits to a national audience of attorney subscribers.

The ultimate goal of these activities – in addition to CEC members regularly attending conferences across different fields (child maltreatment, suicide, violence, etc.) – is to grow communities of practice (CoP) at local or state levels comprising practitioners, scientists, and parents. CoP teams can participate in the podcasts and webinars as a team to discuss the delivery and content together. We encourage the participation of (a) key governmental agency staff, (b) CAN prevention experts, (c) representatives from CAN-prevention coalitions, councils, or advisory boards, (d) researchers, and (e) parent representatives and child advocates. Transform's podcasts and webinars deliver in-depth presentations on CAN research and/or practice to facilitate discussions at a local level. The CoP can also facilitate junior scientists' connections with senior research mentors, as well as with their own community practitioners and government agencies involved in child welfare. The CoP provide opportunities for attendees to ask questions, become familiar with secondary analysis opportunities, and learn from professionals they may seek out as future advisors, consultants, or mentors. The CEC faculty identifies research scholars and practitioners who serve as presenters, representing the diverse disciplines we engage. We are monitoring our webinar activity through counting the original enrollees, who participates in the live event, and how many view the webinar after the event is publicly posted. In addition, Lawline provides quarterly reports for our national audience of attorneys seeking education credits for the webinars. To date, we have reached 50 states and 11 countries with our marketing strategies.

Webinars and podcasts address the following major issues in child maltreatment research and practice, emphasizing the ways in which new knowledge is incorporated into practice: (a) evidence-based and promising practices, including an overview of CPP; (b) data and evaluation, including sharing results from research projects as they become available; (c) collaboration among researchers, practitioners, and stakeholders; (d) education and engagement of policy makers and other stakeholders; and (e) critical issues in prevention and intervention research and practice. The Lawline webinars provide court-related professionals (i.e., judges, lawyers, court clerks, court deputies, probation staff), who interface with maltreated children and families daily, with fundamental knowledge about child development, the deleterious consequences of CAN, and evidence-based strategies for fostering positive outcomes for affected individuals.

Conclusions and Lessons Learned

The opportunities afforded to the Transform team, in conjunction with the initiatives being undertaken by the two other NICHD-funded National Centers on Child Abuse and Neglect, are providing the field of child maltreatment with a much needed capacity to foster system-wide change and inform the next generation of professionals committed to combatting the deleterious consequences of child maltreatment. As Transform begins its

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third year, we have made significant progress and also learned some important lessons for continued and future implementation.

Perhaps first and foremost, it has become clear that incorporating technological advances into more traditional systems of dissemination can greatly enhance the broad reach of research initiatives. Through the CEC, we have already shared critical knowledge with far more stakeholders than typically occurs. It also has become clear that there is great interest in learning from research and that if scientific findings can be translated in ways that are accessible to non-academic audiences, there is receptivity to utilizing the knowledge. We believe this is a legacy Ed Zigler would be proud to acknowledge and embrace.

Not surprisingly, when we developed our aims for Transform, we did not envision that our work would be disrupted by a pandemic. Covid 19 has posed significant challenges, but we also believe it has promoted creativity and changes that are likely to endure in years to come. We have learned that providing clinical services via telemedicine is possible and that, in some instances, participants are even more likely to "attend" scheduled appointments. The availability of telemedicine also enables the provision of evidence-based services to individuals in geographic regions that would be less likely to access such services. Ultimately, advances in telemedicine may help to decrease the disparities now present in low-income and racially/ethnically diverse populations.

Despite the significant challenges posed during the pandemic, we also have gained considerable insight into the resilience that can emerge, extending yet another thread of Ed Zigler's legacy. In the midst of lockdowns and social distancing requirements, families have found ways of staying in touch and supporting each other and communities have rallied to volunteer and ensure access to food and shelter. Although we cannot know what the long-term consequences of the pandemic and the national turmoil around racial disparities related to Covid 19 mortality and racism will be, we hold hope that the resilience of the human spirit will prevail.

We also became very innovative during the pandemic in conducting our research interviews remotely and developed methods that enabled laboratory-based measurement strategies to be continued. Again, particularly when working with vulnerable and highly stressed populations, such methodologies may increase the range of participants and decrease attrition from longitudinal investigations.

With the support of a community committed to establishing trauma-informed systems that align policies and service-delivery systems to improve the standard of care, conditions are ripe to engage in transformational research and social policy change that could have a lasting impact. It is imperative that multisystemic initiatives such as Transform inform the field of child maltreatment research while ensuring that the lessons learned are disseminated to society more broadly. Only with greater community engagement at all levels – from policy makers to the lay public – will we achieve true success in addressing the tragedy that all too often accompanies child maltreatment and affects victims throughout their lifetimes. Transform utilizes best practices for disseminating current research findings in child maltreatment into language and communication systems that facilitate the greatest uptake among professionals across broad audiences.

Transform allows the sum of its parts – cross-institution collaboration, networks of national experts, and a dedicated team seeking to eradicate CAN – to come together synergistically to change the paradigm of child welfare research and practice. Utilizing decades of research regarding the connections between CAN, mental health, and IPV, such multidisciplinary efforts can promote rigorous research to inform child welfare practice and help children in a way that no one involved partner could do on its own. However, we must translate research knowledge into the community making CAN prevention and response everybody's job. Similar to Ed Zigler's application of developmental science into social policy, our national priorities need to focus on advancing new science to inform (a) effective child maltreatment prevention and intervention and (b) effective implementation and large-scale dissemination of these programs to ameliorate the short and long-term consequences of child maltreatment.

State-of-the-science translated into practices that transform children's lives will truly carry forward Ed Zigler's legacy.

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