

CHILDREN'S MENTAL HEALTH AND THE LIFE COURSE MODEL

A VIRTUAL WORKSHOP SERIES

PROCEEDINGS OF A WORKSHOP

Megan Snair, Rapporteur

Forum for Children's Well-Being: Promoting
Cognitive, Affective, and Behavioral Health for Children and Youth

Board on Children, Youth, and Families

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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the content of the proceedings, nor did they see the final draft before its release. The review of this record of proceedings was overseen by Patrick H. DeLeon, F. Edward Hebert School of Medicine and the Graduate School of Nursing, Uniformed Services University of the Health Sciences. He was responsible for making certain that an independent examination of this record of proceedings was carried out in accordance with standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the rapporteur and the National Academies.

Preface

A better understanding of the developmental origins of and influence on children's behavioral and mental health is especially important now, given a number of rapidly changing patterns observed in society and an increasing level of morbidity. This includes the growing prevalence of mental health disorders and a growing appreciation of the role and impact of neurodevelopmental health problems. This webinar series aimed to both raise awareness about these alarming trends and activate stakeholders, advocates, researchers, practitioners, and partners to implement change strategies that can effectively address these trends.

The Forum for Children's Well-Being expresses its appreciation to Neal Halfon, University of California, Los Angeles, and the teams at the Life Course Research Network and the Life Course Intervention Research Network for their extensive support in the planning and hosting of this webinar series.

The Forum also thanks Stephen Buka, Brown University, and Matthew Biel, Georgetown University, for the time and expertise they have offered in developing this webinar series.

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Introduction

With rapidly rising rates of mental health disorders, changing patterns of occurrence, and increasing levels of morbidity, the need for a better understanding of the developmental origins and influence of mental health on children's behavioral health outcomes has become critical. This need for better understanding extends to both the growing prevalence of mental health disorders as well as the role and impact of neurodevelopmental pathways in their onset and expression. Addressing these changes in disease patterns and effects on children and families will require a multifaceted approach that goes beyond simply making changes to clinical care or adding personnel to the health services system. New policies, financing, and implementation can put established best practices and numerous research findings from around the country into action.

The Maternal and Child Health Life Course Intervention Research Network¹ and the Forum for Children's Well-Being at the National Academies of Sciences, Engineering, and Medicine jointly organized a webinar series to explore how mental health disorders develop over the life course, with a special emphasis on prenatal, early, middle, and later childhood development. This series centered on identifying gaps in our knowledge, exploring possible new strategies for using existing data to enhance understanding of the developmental origins of mental disorders, reviewing potential approaches to prevention and optimization, and proposing new ways of framing how to understand, address, and prevent these disorders from a life course development perspective. The series is a high-level overview

¹For more on this effort, see <http://www.lcrn.net>.

of these topics, and does not include specific information on diagnosing or treating mental health disorders, nor does it explore the full range of mental health disorders that affect children and youth. Organizers hope to use the series to raise awareness about the developmental origins of these alarming mental health trends and offer appropriate strategies to implement effective change.

ORGANIZATION OF WEBINARS

A series of six virtual webinars was conducted between September 2019 and May 2020 covering various topics related to children's mental health and the life course model. A detailed listing of all webinar topics and speakers can be found in Appendix A. The first webinar in the series in September 2019 provided an overview that laid out current trends in children's mental health. Speakers included Neal Halfon, professor of pediatrics, public health, and public policy and director of the UCLA Center for Healthier Children, Families, and Communities, and Kimberly E. Hoagwood, the Cathy and Stephen Graham Professor of Child and Adolescent Psychiatry at New York University's School of Medicine. For the second webinar in this series in October 2019, Stephen Buka, professor of epidemiology at the Brown University School of Public Health, hosted a discussion about the epidemiology of children's mental health disorders. The third webinar took place in November and featured a discussion about scientific advances in the developmental origins of children's mental health disorders led by Pilyoung Kim, director of the Family and Child Neuroscience Lab at the University of Denver. The series continued in February 2020, starting with a multifaceted discussion on comprehensive policy responses to children's changing mental health needs. This webinar featured Benjamin Miller, chief strategy officer at Well Being Trust, Alex Briscoe, principal at California Children's Trust, and Nathaniel Counts, assistant director of Montefiore Health System. April's webinar presented arguments from Laurel Leslie, vice president for research at the American Academy of Pediatrics, and Tom Boat, director of CFWELL at Cincinnati Children's Hospital Medical Center, and suggested approaches for transforming the pediatric care system. Finally, Erin Dunn, assistant professor at Harvard Medical School and Massachusetts General Hospital, concluded the series in May with a discussion on sensitive periods in development linked to risk for depression and other brain health challenges in children and adolescents.

ORGANIZATION OF PROCEEDINGS

This proceedings document is organized into seven chapters. Following the introduction with background on the forum's related work and

organization of the webinar series, Chapter 2 presents an overview that lays out trends in children's mental health. Chapter 3 describes the developmental origins of children's mental health disorders, including links between adverse childhood experiences, biological mechanisms of stress pathways, and opportunities for intervention. Chapter 4 provides new ways of thinking about the field, as well as opportunities and challenges for ways to improve health systems. Comprehensive policy responses and solution ideas are offered in Chapter 5, while Chapter 6 describes transformations within pediatric care and Chapter 7 offers potential areas of research based on suggestions by speakers and participants throughout the initiative. Copies of the speaker slides and recordings of the workshop can be viewed on the forum website at <https://nationalacademies.org/ccab>.

This record of proceedings has been prepared by the workshop rapporteur as a factual summary of what occurred at the workshop. The planning committee's role was limited to planning and convening the workshop. The views contained in the proceedings are those of individual workshop participants and do not necessarily represent the views of all workshop participants, the planning committee, or the National Academies.

Overview and Trends in Children's Mental Health

The first webinar in this series, led by Neal Halfon, director at the UCLA Center for Healthier Children, Families, and Communities, began by reviewing current and emerging trends in mental health disorders among children and youth. Halfon and Kimberly Hoagwood, Cathy and Stephen Graham Professor of Child and Adolescent Psychiatry at New York University's School of Medicine, presented data on the state of children's mental health and the need for viewing health development across the entire life course. The second webinar, featuring Stephen Buka, professor of epidemiology at Brown University School of Public Health, complemented the initial discussion with perspectives on changing epidemiology in the field. This chapter summarizes sections of both discussions, focusing on the drivers of change behind the shift in the epidemiology, the reasons behind the increasing numbers of mental health disorders among children and youth, and the important developmental implications these disorders represent for our society. It also includes a presentation during the February webinar by Alex Briscoe, principal at California Children's Trust, in which participants discussed how children's mental health is financed and administered, and the consequences of the fragmented and underresourced strategies for promoting the social and emotional health of children.

SHIFTING EPIDEMIOLOGY AND DRIVERS OF CHANGE

Introducing participants to the motivation behind the webinar series and the desire for a better system, Halfon shared that mental health disorders are the leading cause of disability in individuals between the ages

of 15 and 44 (Friedrich, 2017). He also described mental health disorders as an important contributor to the recent decline of life expectancy in the United States, as what he described as the “deaths of despair” continue to increase. Three-quarters of mental health disorders begin to exhibit themselves by age 24, making the first few decades of life an important strategic target for mental illness prevention and mental health promotion. Additionally, Halfon demonstrated that the significant increases in mental health disorders for children and adolescents reflected in several national studies and data sets result in increasing rates of suicide, self-harm, anxiety disorders, and depression among young people. This relatively rapid shift in the epidemiology of mental health disorders, he said, suggests an underlying shift in the ecosystem of risks that results from four deep drivers of human ecosystem change:

1. *Changeover in historical eras.* Having previously transitioned from being an agrarian society to being an industrial society, we are now transitioning toward becoming a technological-digital society.
2. *Major ecosystem disruptions.* This transition is tremendously disrupting ecosystems that influence human development and is significantly altering cultural scaffolding, relationships with the environment and planet, and global economic production models.
3. *Agents accelerating change.* Globalization, digital technology, and climate change all interact and require rapid, highly responsive adaptation.
4. *Increasing pace of change.* Change seems to be happening faster than we can adapt to it.

All of these drivers converge to present society with a serious adaptive challenge (see Figure 2-1).

INCREASING MENTAL HEALTH DISORDERS IN CHILDREN AND ADOLESCENTS

Hoagwood elaborated on these statistics as well, saying that one in six children between 6 and 17 years old suffers from a treatable mental health disorder. Of these children, 32 percent have anxiety, 19 percent have behavior disorders, and 14 percent have diagnosed depression. Among young people between the ages of 15 and 24, suicide is the second most common cause of death. She pointed out that these numbers have gotten worse, and that even with all of the research and knowledge accumulated over the last few decades, trends in youth suicide rates have risen.

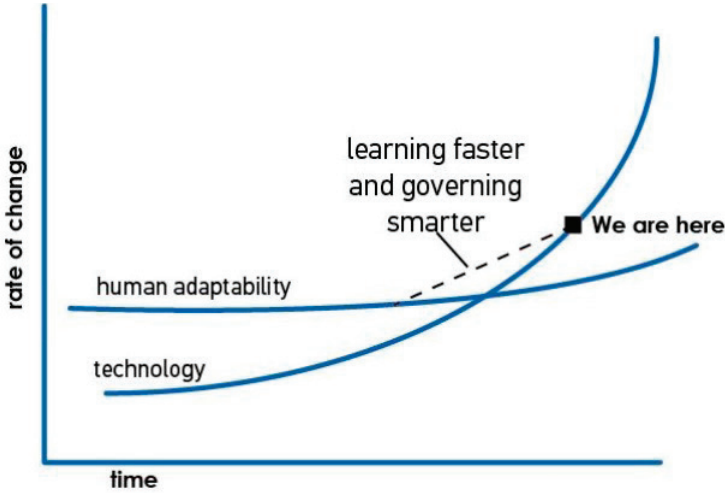


Figure 2-1 The adaptive challenge of our age.
 SOURCE: Graph—Ability of Humans to Adapt to Change from “That Other Line” from “What the Hell Happened in 2007?” from *THANK YOU FOR BEING* by Thomas L. Friedman. Copyright © 2016 by Thomas L. Friedman. Reprinted by permission of Farrar, Straus and Giroux.

Using Available Data to Track Prevalence

During his presentation at the October webinar, Buka reinforced the notion that mental, emotional, and behavioral disorders are becoming more common and are fundamentally different from children’s diseases in the 1970s and 1980s such as infectious disease and nutritional problems. These “new morbidities” are rooted in social difficulties, behavioral problems, and developmental issues, he said. Though the number of children with mental, emotional, and behavioral disorders has increased, the lack of long-term longitudinal cohort data on the subject makes it difficult to understand causes and develop strategic and responsive policies and interventions. Unfortunately, there is no dedicated surveillance system for mental health in children in the United States, he said, so it is difficult to provide an overall estimate of prevalence for all childhood mental disorders. He suggested there is some evidence that this prevalence is increasing.

Buka shared a systematic review from 2014 that compared data from the 21st century with similar data from the 20th century. Exploring changes in internalizing and externalizing factors, it showed that one in five children now experience mental health problems. Researchers concluded that the burden of internalizing symptoms is increasing in adolescent girls, an increase not restricted to Western countries (Bor et al., 2014). Another study, in which he participated, examined the odds of serious depressive symptoms associated with different types of negative experiences on Facebook.

They found that any type of adverse experience on Facebook actually doubled the risk of depression (Rosenthal et al., 2016).

In an effort to better understand this potential rise in children's mental disorders, Buka described a Morbidity and Mortality Weekly Report (MMWR) Supplement from the Centers for Disease Control and Prevention (CDC) in 2013 (Centers for Disease Control and Prevention, 2013). The authors summarized mental health surveillance among children from 2005–2011 and identified an increasing prevalence of attention-deficit and hyperactivity disorder (ADHD), autism spectrum disorders, and bipolar disorder, as well as changes in drug use patterns in children compared to 1994. One CDC survey indicated a 21.8 percent increase in ADHD diagnoses from 2003–2007, while another data set revealed a nearly four-fold increase in autism rates from 1997–1999 to 2006–2008. While some of these increases could be attributed to case definitions or changes in methodology, he noted, deaths are a clear outcome that can be counted without variability. After a relatively stable period from 2000–2007, Buka shared that suicide rates for ages 10–24 increased from 2007–2017, even as homicide rates were decreasing (Curtin and Heron, 2019). Most alarming, the data showed that in the younger part of the cohort, those between 10 and 14 years of age, suicide rates decreased from 2000–2007 but then nearly tripled from 2007–2017.

Disparities Between Populations

When the data were segmented by different population groups, other varying trends emerged. Buka presented the findings of a 5-year study on racial disparities in pediatric mental health emergency department (ED) visits, which looked at more than 293,000 patients from 2012–2016 (Abrams, Goyal, and Badolato, 2019). While the rates increased significantly overall for all groups, the rate of increase for non-Hispanic black children was nearly double that of non-Hispanic white children. Demographic patterns from the CDC MMWR show higher estimates of ADHD among boys, children living in households where the highest level of education was high school, and those living below the federal poverty level. Similarly, for students aged 14–18, feeling sad or hopeless every day for 2 weeks was more likely among girls than boys. Hispanic students similarly experienced higher rates compared to white or black non-Hispanic students.

In summarizing 21st-century mental health research trends, Buka pointed out that even without a singular surveillance system, the aggregate testimony of published literature, insurance claims, and ED visits paint a picture of increasing rates of mental disorders in children. This includes increased numbers of adverse childhood experiences, increased anxiety among females, dramatic increases in completed suicides since

2007, increases in reported ADHD and autism, and increases in ED visits for mental disorders. He again also emphasized the evidence showing that negative Facebook experiences such as bullying, meanness, unwanted contact, and misunderstandings are associated with increased rates of depressive symptomatology.

DEVELOPMENTAL IMPLICATIONS

It is clear from a variety of sources that rates of mental illness in children and adolescents are increasing, Buka noted, but what are the developmental implications of that? How concerned should we be as a society? The immediate burden is important, but there is also a need to examine the consequences that will continue later in life and to understand the etiology of these diseases, especially if we want to develop, implement, and fund increasingly effective prevention and mental health promotion interventions.

Mental Health Costs

While health care costs in the United States have grown massively in recent years due to several factors, Buka cautioned that there should be a great amount of economic concern related to these increases in mental illness. Half of all mental illnesses begin by the age of 14, and 75 percent of them are diagnosed by the time a person reaches their middle 20s (Kessler et al., 2007). Other evidence demonstrates the increasing rate of childhood mental illness and its associated health care costs in the United States. Tkacz and Brady found the incidence of mental illness increased 19 percent and prevalence increased 30 percent from 2011–2017 (Tkacz and Brady, 2019). Over this same period, the prevalence of depression, anxiety, attention disorders, and developmental disorders all increased. They found a clear economic link as well, with the presence of a mental health diagnosis being associated with at least double the annual health care costs compared to similar families with unaffected children for the years assessed (see Figure 2-2).

During his presentation, Briscoe also warned participants about the costs of mental health, saying that everyone—individuals, hospitals, and society—pays a high price. This makes finding solutions a fiscal and moral imperative. Briscoe also detailed the uncapped and unfulfilled federal entitlement that children in Medicaid enjoy under the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) benefit and the financing opportunity that can be leveraged with its creative application. Between 2006 and 2011, \$11.6 billion was spent on hospital visits for mental health. Mental health and substance abuse disorders are now the leading causes of disease burden in the United States, and while everyone pays, he said, the burden is not equally shared

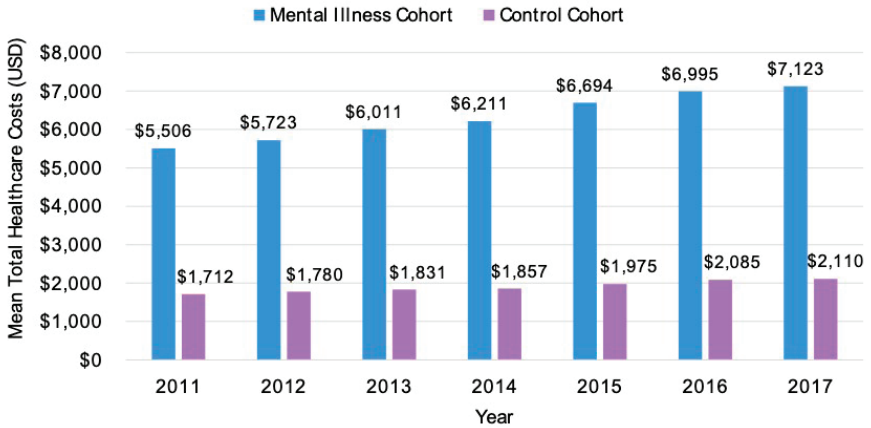


Figure 2-2 Health Care costs associated with mental illness.
SOURCE: Tkacz and Brady, 2019.

across populations. The “price” is higher for certain racial groups in terms of economic and life costs. Seventy-five percent of children on Medicaid in California are black or Hispanic, meaning they often get the wrong services at the wrong time in highly restrictive settings, and there are important race and class divides between providers and beneficiaries. The suicide rate for black children ages 5–12 is double that of their white peers in the same age range. These realities demand action that goes far beyond a mere tweaking of the system, he said. More details on the rest of Briscoe’s presentation and his proposed solutions are described in Chapter 5.

Genetic and Environmental Roles in Mental Health

While some mental illness has always been understood to have a genetic component, the rise in rates and newer technological abilities to conduct genetic research has led to studies that better highlight the critical interface between environmental factors and manner in which these exacerbate the genetic risk for certain diseases. Buka described a 2014 study exploring biological insights from schizophrenia-associated loci that examined nearly 37,000 cases (Ripke et al., 2014). In addition to genes involved with brain development, the study found possible connections between genetic risks and brain tissue involved in immunity, demonstrating the speculated link between the immune system and schizophrenia. A related 2018 study demonstrated how the intrauterine environment modulates the association of schizophrenia with genomic risk (Ursini et al., 2018). They concluded that a subset of some of the most significant genetic variants associated with schizophrenia “converged on a developmental trajectory sensitive to events that affect the placental response to stress.” Risk for schizophrenia

was much higher—sometimes as much as 800 percent higher—if there were in-utero complications during the mother’s pregnancy such as diabetes, obesity, pre-eclampsia, or smoking. Conversely, conditions that would produce a “high-risk” genetics score would raise the risk by 50 percent if the pregnancy was healthy. Researchers posit that the placental stress results in an inflammatory response that can then “turn on” genes related to immune response, increasing the risk, but polygenic risk scores account for less than 2 percent of the risk for schizophrenia, Buka said. He agreed with the study authors that a new risk score is needed for schizophrenia that also incorporates placental health (Begley, 2018). He called for a greater emphasis on surveillance, understanding the course and costs of disease, and overall prevention.

Leveraging Research to Optimize Development

Buka shared the strategic plan for the National Institutes of Mental Health and the Substance Abuse and Mental Health Services Administration, the mission of both is to address serious mental illnesses and emotional disturbances, improve data collection, optimize outcomes, and test interventions for effectiveness in community settings. Commenting on the potential environmental influences, Buka said that even with schizophrenia, a mental illness with a strong genetic component, we now know that the genetic risk can remain low with a healthy pregnancy. It took decades to figure this out, he said, but we cannot wait another 30 years to make the same discovery for depression and anxiety.

Halfon mentioned new longitudinal cohort studies in other countries with built-in interventions where children are followed developmentally and the state tries to optimize that development through tested interventions. Recognizing that early interventions are critical to improving life chances for children and reducing inequalities, the lack of research and long timelines needed for randomized control trials led to the innovative experimental cohort of Born in Bradford’s Better Start in England (Dickerson et al., 2016). The research team began recruiting participants between January 2016 and December 2020 and planned to implement 22 interventions to improve outcomes for children ages 0–3 in ethnically diverse inner-city areas of Bradford. Similarly, Halfon mentioned, GenV, a research initiative in Melbourne, Australia, is striving to answer persistent questions regarding preterm birth, mental illness, obesity, and other issues facing children today (GenV, 2019). Launched in 2013, the GenV researchers have sought to discover links and find answers in a smarter and faster way than traditional research that only focuses on one singular aspect of child development at a time. While these are both exciting developments, Halfon said that we are still a long way from understanding if activities such as teaching young children meditation and yoga constitute adequate tools for protecting children’s mental health.

Developmental Origins of Children's Mental Health Disorders

The third webinar in this series was led by Pilyoung Kim, director of the Family and Child Neuroscience Laboratory at the University of Denver. Kim reviewed some of the scientific advances in the developmental origins of children's mental health disorders, especially in relation to their environment and their experiences with adverse childhood experiences (ACEs). The sixth and final webinar featured Erin C. Dunn, assistant professor at the Harvard Medical School and Massachusetts General Hospital, who made a case for identifying sensitive periods in development linked to greater risk for depression and other brain health challenges among children and adolescents and how using shed teeth could possibly do so (Davis et al., 2020). This chapter first defines ACEs and their associations with mental health challenges in children, then outlines the biological mechanisms responsible for these associations through various developmental stages of a child's life, discusses the reasons for studying timing of an exposure and ways of measuring when a child may be most affected. It concludes with discussing opportunities for intervention.

ADVERSE CHILDHOOD EXPERIENCES AND MENTAL DISORDERS

Kim began saying that, historically, research often focused on individual adversity factors people may have experienced, such as maltreatment or neglect, but more recently, the concept of ACEs has emerged with a growing research base. This concept focuses instead on the many different

adversities people experience during childhood and the ways in which they relate to mental disorders later in life.

Defining Adverse Childhood Experiences

To understand how these ACEs relate to various mental disorders, it is first necessary to define them and understand what type of experiences could be categorized as ACEs. Kim explained that ACEs are potentially traumatic events that occur in childhood and can include 10 different negative experiences across categories of abuse, neglect, and household dysfunction (see Figure 3-1). In one of the first and largest studies of ACEs done by Kaiser and the Centers for Disease Control and Prevention (CDC) from 1995–1997, researchers found that nearly two-thirds of adults surveyed reported experiencing at least one ACE, and most who reported one reported multiple (Felitti et al., 1998).

Almost one out of six surveyed reported experiencing four or more ACEs during childhood, Kim explained. This is concerning because the relationship is dose-dependent, meaning that the experience of more ACEs exerts a greater effect on things like health, behaviors, and life potential for adults. This can include things like obesity, diabetes, depression, smoking, alcoholism, lower graduation rates, and lost time from work. Additionally,

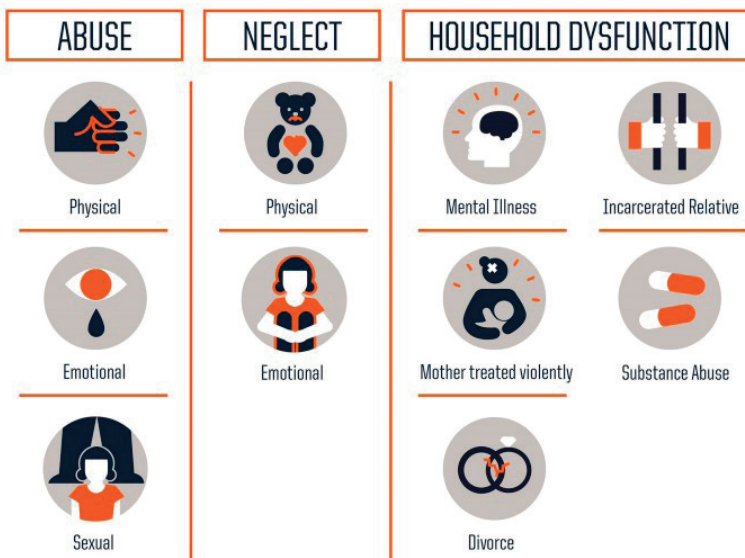


Figure 3-1 The 10 defined adverse childhood experiences.

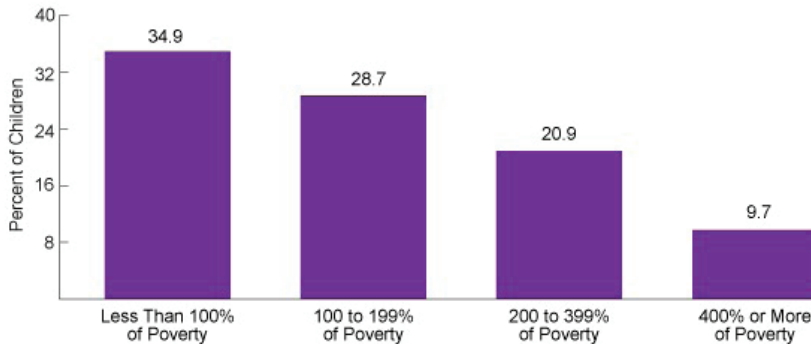
SOURCE: Robert Wood Johnson Foundation, 2013. *The Truth About ACEs*. Used with permission from the Robert Wood Johnson Foundation.

the effects of ACEs encountered early in life go even further than poor health. According to the CDC, at least five of the top 10 causes of death are associated with ACEs (Centers for Disease Control and Prevention, 2019).

Secondary Poverty Interactions

Similar to other disparities being uncovered due to systemic failures, research also shows a somewhat unsurprising interaction between poverty and ACEs. The federal poverty level (FPL) for a family of four in the United States in 2019, Kim said, was \$25,750. Looking at 2016 data, 19 percent of children were living in poverty and another 22 percent were living at twice the FPL (around \$50,000 per year for a family of four). These two groups are collectively classified as part of the low-income category, and they capture 41 percent of children living in the United States (Jiang and Koball, 2018). As an age demographic, Kim explained, children younger than 18 are most likely to experience poverty compared to adults and seniors over 65 years of age. This is additionally concerning because children living in poverty are more likely to experience ACEs than their wealthier counterparts. Data from the CDC and Health Resources and Services Administration (HRSA) show that nearly 35 percent of children living in households earning less than 100 percent of the FPL experience two or more ACEs from birth onward, compared to 28.7 percent of those living between 100–200 percent of FPL, and just 9.7 percent for those living at 400 percent of FPL (see Figure 3-2).

Kim went on to describe the high level of chronic, multiple risks that children are exposed to when living in poverty compared to children living in wealthier households. Quoting a review paper, she noted that income and socioeconomic status tend to differentiate people systematically, which affects the quality of their environments, and often dictates the levels of pollution, toxins, crowding, noise exposure, and exposure to violence (Evans and Kim, 2010). In addition to these physical effects on living conditions for people in lower socioeconomic statuses, she said, people in these conditions often have more psycho-social risk factors and worse relationships with family members and their community. When both types of these risk factors come together—especially for children—health outcomes can worsen as well. This was clearly demonstrated by examining the number of specific risks children were exposed to by being exposed to poverty (Evans and Kim, 2010).



*Based on the U.S. Department of Health and Human Services poverty guidelines, poverty was \$23,050 for a family of four in 2012.

Figure 3-2 Children aged 0–17 years experiencing two or more ACEs, measured by poverty status,* 2011–2012.

SOURCE: U.S. Department of Health and Human Services, 2015.

STRESS PATHWAYS IN THE BRAIN AND IMPACTS ON DEVELOPMENT

While the linkages seem to be clear and increasingly well established between stressful environments and child development, Kim also expanded on why childhood adversity leads to negative mental health outcomes and the things that happen in the body such as the development of stress pathways in the brain and the neurobiological mechanisms that affect a person across their life course.

Overview of Biological Mechanisms

Stress and adversity affect development in the brain, Kim said, namely in the amygdala and the prefrontal cortex, which are the signature brain regions involved in emotional and self-regulation. If someone is living in an environment that is always stressful, the amygdala is constantly activated, she explained, which over a period of time leads to hyperactivity of the amygdala. This hyperactivity results in hypervigilance, where the brain is always on and conducting threat assessments so it can protect itself from negative cues. Clinically, this is also linked to high levels of anxiety. Normally, when the amygdala is activated, the rest of the brain helps to evaluate what an appropriate reaction to the negative cue should be. The brain takes information from past experiences and the current context and makes a decision. For individuals exposed to chronic stress, Kim added, the exposure to stress can result in ineffective emotional regulation.

Repeated exposure to stress leads to synapse loss and changes in dendritic branching of neurons, leading to impaired morphology and functional connectivity in the amygdala and prefrontal cortex, Kim explained. These become early neural markers for emotion dysregulation and are commonly observed in psychiatric disorders across the life course (Klumpp et al., 2014).

Prenatal Period

Now that we have such advanced technology, Kim said, researchers can track brain activity in the womb. During the third trimester of pregnancy, the brain is forming 40,000 synapses per minute. Even before birth, the baby's brain is already developing programming so that it can be ready to detect threats from the environment. During the first year of life, the brain volume subsequently increases by 100 percent. Biological systems like these that have such rapid developmental changes are also especially vulnerable to adversity.

Research has found that maternal anxiety, inflammation, and the presence of cortisol during pregnancy are associated with altered amygdala and prefrontal cortex functionality in newborn babies. Additionally, maternal depression during pregnancy has been associated with decreased amygdala functional connectivity with the prefrontal cortex in newborns (Posner et al., 2016), and lower white matter organization in the right amygdala (Rifkin-Graboi et al., 2013). This suggests a prenatal transmissibility of vulnerability to depression. Such exposure to adversity during infancy and this period of rapid brain development can lead to more hyperactivity in the amygdala of the infant. Even just being exposed to more angry voices can have this effect, Kim noted. To demonstrate the point, she referenced a 2013 study by Hanson and colleagues that measured brains of young children across the socioeconomic spectrum (Hanson et al., 2013). They found that children living in households with lower socioeconomic status had slower trajectories of brain growth compared to other income levels and lower volumes of gray matter.

Childhood and Adolescence

Research has also tracked the impacts of poverty on brain development during childhood and adolescence, said Kim. She referenced a 2015 study which demonstrated that among lower-income households, even small differences in family income corresponded to relatively large differences in cortical surface area, which was further linked to poor cognitive development among children (Noble et al., 2015). These data indicate that brain structure is influenced most by income level among the most disadvantaged

children. A similar study found that low family income levels were associated with a lower level of organization in the white matter involved in cognitive and emotional function for children at age 9 (Dufford and Kim, 2017). This same association was found for those children exposed to multiple stressors such as violence, family conflict, separation, and housing problems.

As children progress into adolescence, their brain begins to change. The prefrontal cortex is not quite mature enough in children to down-regulate the amygdala when needed, Kim explained, but that typically switches once they reach adolescence. For children who experience maternal deprivation, however, this development is accelerated. When compared to children in a control group, those who had a history of early adversity had brain structure more similar to adolescents with more mature connectivity (Gee et al., 2013), but the communication between systems is not effective enough, so these children still have higher levels of anxiety. Studies have also corroborated this developmental period as children age. Shaw and colleagues found a negative correlation between intelligence and cortical thickness in early childhood, shifting to a positive correlation in late childhood (Shaw et al., 2006). This plasticity is even more pronounced in children with high levels of intelligence, who typically have delayed development of the prefrontal cortex and try to first take advantage of all input from the environment before devising a reaction.

Long-Term Impacts into Adulthood

Childhood is a sensitive period of development, Kim said, and research now shows that exposure to socioeconomic disadvantages during childhood is associated with poor health outcomes in adult life. Cohen and colleagues found that socioeconomic status exposures during childhood can be predictors of all-cause mortality, as well as specifically cardiovascular mortality and morbidity (Cohen et al., 2010). This comes at a cost to society too, with aggregate costs of childhood poverty estimated in 2008 at \$500 billion each year (Holzer, Schanzenbach, and Duncan, 2008). Authors also estimate that each year, childhood poverty reduces productivity, raises the costs of crime, and raises health expenditures, all by more than 1 percent of the U.S. gross domestic product.

Kim presented the findings of a 2005 neuroimaging study in which 49 participants were followed from ages 9 to 24 years old. Half of the participants lived in poverty throughout childhood, but many moved out of poverty by the age of 24. During the study, participants were shown images intended to elicit a negative emotional response and were instructed to either “maintain” by naturally reacting, or “reappraise” by voluntarily regulating emotions. By following this emotional regulation paradigm,

researchers were able to observe the prefrontal cortex and the amygdala, areas of the brain that are active in emotion regulation. Compared to the participants who did not grow up in poverty through the age of 9, participants in households below the poverty line displayed lower activity levels in the prefrontal cortex. In the same participants that displayed lower levels of prefrontal cortex activation, a higher brain activity pattern was observed in the amygdala, which could be responsible for their ineffective regulation of emotions. Additionally, the study found an association between lower prefrontal cortex activity and exposure to multiple stressors from ages 9 to 17 years old, Kim explained. The results yield a significant association between childhood income and brain activation in adulthood, while current adulthood income was not noted to have an impact on neural activity. The study's findings further support the association between childhood adversity and lifelong emotional regulation (Phan et al., 2005). Kim has conducted further research on the impact of childhood income on the structure of the brain, yielding similar patterns emphasizing the association between childhood income and the increase in exposure to multiple stressors which leads to lost surface areas in the adult brain (Dufford and Kim, 2017).

Adaptation and Vulnerability

In summary, Kim explained that this neural embedding of childhood adversity contributes to producing mental health disorders. Multiple stressors, in other words, lead to altered morphology, function, and connectivity in the amygdala and prefrontal cortex, which in turn increase the risks for emotional and behavioral dysregulation across a person's life course. Childhood being such a sensitive period, the opportunities for preventing many of these downstream effects lie in reducing early-life adversity. Modifying the environment through interventions can play a role because the timing and duration of these ACEs make a difference.

Kim provided examples of this modification, saying that the number of years living in poverty between ages 11 and 18 were associated with lower amygdalar volumes and a more negative association with resting-state functional connectivity in emotion regulation networks (Brody et al., 2017). For those whose parents participated in a "supportive parenting" intervention, though, this association between poverty and amygdalar gray matter volume was not present (Brody et al., 2019). At age 25, in other words, these individuals had similar emotional regulation function as those who did not live in poverty during adolescence. The timing and duration of exposure are also factors to consider.

When addressing adverse exposure, Kim presented two models: the biological embedding model and the accumulative model. Throughout her presentation, Kim referenced the biological embedding model perspective

the most, which focuses on the influence of risk exposures during sensitive periods such as the prenatal period and also brain development as a means to inform interventions. One limitation of this model is not considering life experiences outside of the sensitive period (Finch and Crimmins, 2004; Hertzman, 1999). Accumulative models also show that early adversity can lead to modifications in an individual's later environment and behavior. Kim said, "Adversity begets adversity," noting that a consequence of prolonged exposure to adversity and the resulting accumulated chronic stress on the body can lead to more severe damage in neurobiological systems (Kuh, Ben-Shlomo, and Ezra, 2004).

While research has now demonstrated the plasticity of the brain, its adaptiveness or maladaptiveness can determine what kinds of pathways are being created. The allostatic load model says that the wear and tear on the body from chronic stress causes negative disruptions of brain structure and function that are precursors of later impairments in learning and behavior, resulting in chronic physical and mental illnesses (McEwen, 2012). For example, Kim explained, if children develop hypervigilance in response to discriminatory threats in their living environment, a focus on reducing their hypervigilant responses will not be helpful since it is a response to the threat. The active calibration model of stress responsiveness extends this theory of the stress-health relationship, stating that these tradeoffs between response to threats and costs to mental and physical health are actually life-stage-specific, adaptive decision strategies in the allocation of behavioral and physiological resources (Ellis and Del Giudice, 2014). Kim explained that this series of decision nodes can optimize the individual's adaptation to and resulting fitness for a particular environment, whether threatening or nurturing. The two models are only partially complementary and sometimes may support different approaches to intervention. The models should be applied on a case-by-case basis when developing interventions to address the developmental origins of mental health disorders in targeted individuals.

IMPACT OF STRESS DURING PERIODS OF DEVELOPMENT

To begin her presentation, Dunn commented that boys and girls experience similar rates of depression as young children, but once they begin approaching adolescence, rates for girls increase disproportionately. This gender difference is associated with numerous downstream consequences including anxiety, suicide, or other comorbidities. Depression is the leading cause of disability worldwide, she said, so finding ways to prevent it is key, because once depression does emerge, it recurs very frequently

(three-quarters of people experience relapse). The time of onset is significant, she continued: We know that 20–40 percent of people with a major depressive disorder experience the first onset before the age of 18. She argued, based on these empirical data, that there is a need to better understand the etiology of this disease process so that we can do a better job of targeting prevention and intervention.

In its efforts to target policies and interventions appropriately, the mental and emotional health field, Dunn said, generally tends to focus mainly on who is most at risk. She noted that we spend a lot of energy determining what types of therapies to recommend and where these services should take place. Increasingly, the field has also started to consider how therapeutic services are delivered, face to face, virtually, or otherwise. Dunn explained that her work has really focused more on the still much neglected question of when interventions should occur. This type of research can help identify better ways to prevent mental health problems in children because it could enable us to use interventions in ways that make the most effective use of limited public health dollars by tailoring them to life stages when experience matters even more.

Varying Theoretical Models to Describe the Relationship between Adversity and Depression Risk

There are at least four life course theoretical models in the literature that explain how exposure to childhood adversity increases risk of depression, Dunn explained. Each of these models also points to different opportunities for intervention. The *exposure model* simply suggests that people who are exposed to adversity have an increased risk of depression compared to people who are unexposed. When we have data that maps to the exposure model, this suggests, we can intervene at any time by identifying people with lifetime exposure. The *accumulation model* suggests that there is a dose-response relationship between adversity and the risk for depression. If the data are more consistent with the accumulation model, then we should intervene early to prevent accumulated exposure. The *recency model* suggests that risk for depression following exposure to adversity is elevated for a short time right after the exposure, but this risk disappears over time. The recency model urges quick interventions, but also acknowledges that children may naturally recover over time without intervention. Finally, the *sensitive period model* suggests intervention during or shortly before sensitive periods of development. These sensitive periods constitute windows of vulnerability in which the risk of depression is more acute, but conversely they can also be windows of opportunity where protective factors might be

just as beneficial.¹ Dunn's goal is to identify precise recommendations about when to intervene, using a high-resolution time scale so that interventions can be targeted and uniquely timed for greatest efficiency and effectiveness in preventing depression and other brain health conditions.

To achieve this goal, there are four primary unanswered questions remaining that Dunn's research group is seeking to answer. Finding the solutions will be key to understanding the mechanisms that underlie the risk of depression. These remaining questions include:

- When are the developmental periods of greatest vulnerability to depression following exposure to stress and adversity?
- What matters more: exposure, accumulation of exposure, recency of exposure, or developmental timing?
- How does exposure to stress and adversity during sensitive periods increase the risk for depression (in other words, what are the biological mechanisms)?
- Do genes regulate the occurrence of sensitive periods, and if so, which genes are involved, and do these genes play a role in shaping the risk of depression?

Importance of Timing of Exposure

Dunn described a retrospective study of young adults in which respondents were asked whether or not they had been exposed to sexual or physical abuse and how old they were when it first happened. This information was used to calculate the odds of experiencing elevated depressive systems in adulthood, and Dunn et al. found that generally people exposed to physical abuse had higher odds of depressive symptoms compared to those who were never exposed to abuse. On the other hand, when they compared the timing of exposure, they found that children who first experienced physical abuse as preschoolers had a 77 percent higher risk of depression compared to youth who were first exposed as adolescents. Children who had been sexually abused faced increased odds of depression compared to those who were unexposed, but after examining timing differences, they found that those respondents first exposed to sexual abuse in early childhood experienced a 146 percent increase in the odds of suicidal ideation compared to respondents who were abused as adolescents (Dunn et al., 2013). Other

¹These life span theoretical models are summarized here: Dunn, E.C., Soare, T.W., Raffeld, M.R., Busso, D.S., Crawford, K.M., Davis, K.A., Fisher, V.A., Slopen, N., Smith, A.D.A.C., Tiemeier, H., & Susser, E.S. (2018). What life course theoretical models best explain the relationship between exposure to childhood adversity and psychopathology symptoms: recency, accumulation, or sensitive periods? *Psychological Medicine*, 48(15), 2562–2572. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6109629>.

studies she shared that found measurable biological effects in response to adversity also emphasized that the timing of the exposure really mattered. If we had just looked at exposed cohorts versus unexposed cohorts, we would have completely missed important results, she said.

As an example, she summarized the results of a study examining the time-dependent effects of childhood adversity on DNA methylation, which is a type of epigenetic mechanism known for decades to affect gene expression and has been posited to explain how childhood adversities “get under the skin” to increase subsequent risk for depression. For one of the first times, her study revealed that the effects of childhood adversity on epigenetic patterns were not simply due to the presence versus absence of exposure. Instead, the biggest driver of epigenetic changes was based on *when* the adversity occurred, with the period from birth to age 3 emerging as a sensitive period serving as a precursor to further epigenetic changes at age 7 after continued exposure to adversity. (Dunn et al., 2019).

Current measures of exposure have serious limitations, Dunn commented. Many rely on retrospective reports that have a tendency to introduce different types of recall bias and susceptibility to interview quality. Conversely, she said, prospective reports also have problems, including the unawareness of parents to some exposures and parental reluctance to share this information.

Using Teeth as a Biomarker

To address the limitations of current measures of childhood adversity and potentially provide new information, Dunn posed this question: “Can children’s shed teeth serve as a biomarker of ACE exposure?” She referenced a conceptual model exploring the use of this strategy to prevent mental illness by targeting interventions during sensitive periods of children’s development (Davis et al., 2020). Starting in prenatal development, she explained, ameloblasts (the cells that form enamel) lay down enamel in daily intervals. As that matrix of enamel is formed, a record of that process is permanently recorded in the tooth, a physical trait humans share with other mammals and even with trees, which mark their age with growth rings. We also know that teeth record insults or disruptions that occur during their development that result from illness, malnutrition, and heavy-metal toxicity.

To date, most of the research on teeth has focused on physiological stressors to the almost complete exclusion of work that examines psychosocial stressors. The existing literature, which studies primates, suggests that teeth can capture psycho-social stress. A range of studies in gorillas and monkeys have measured stressors such as separation from mothers, caregiving disruptions, or separation from social groups, and these studies

found evidence of that social disruption in teeth. Additionally, human studies have examined the associations of environmental toxicants with mental health outcomes. These stressors recorded in teeth have been shown to predict neuropsychiatric risk. Given all of this information, Dunn said that teeth may provide enormous and unique opportunities for primary prevention of mental health disorders. She said each time point when teeth are lost represents an opportunity to intervene. The first chance would be around ages 5–6 (when teeth are naturally falling out), the second at ages 10–12 (when kids often have teeth removed for orthodontic work), and a third during wisdom teeth removal between ages 18–22. To marry all of these concepts and identify whether teeth can in fact be used as a powerful new biomarker, Dunn said she has become the “Science Tooth Fairy.” Her group recently launched a study in December 2019 at Massachusetts General Hospital called the STRONG (Stories Teeth Record of Newborn Growth) study, which is studying kids of moms who were pregnant during the 2013 Boston Marathon bombing.² In addition to studying this specific population, she said that they are also trying to better understand the dosing of exposure and answer conceptual and empirical questions, as well as piece together feasibility studies to examine what the social and cultural factors will allow for a more frequent use of teeth in research.

OPPORTUNITIES FOR INTERVENTION

Neal Halfon, director of the UCLA Center for Healthier Children, Families, and Communities, led the discussion with Kim on opportunities for intervention to try and offset some of the adverse consequences of ACEs for children and families. Following a question on recommended clinical and societal interventions, Kim stressed that these findings highlight the importance of early life intervention, especially in the family and environment. There are usually multiple stressors involved, though, and even identifying a positive, effective intervention for one source of adversity is a challenging task. She suggested first identifying the individuals who are at higher risk and then designing interventions to be as effective as possible for those populations that cut across multiple systems such as family, neighborhood, and society.

While the associations between exposure, health, and brain development are becoming clear, the research identifying the types of interventions that are most successful and the populations in which they work best is unfortunately much less uncertain, Kim said. Current neuro-imaging literature lacks the depth sufficient enough to distinguish between cultural differences and provide specific brain evidence for different racial or ethnic groups. Nonetheless, she noted, a broad ongoing effort to include more

²For more on the STRONG Study, see <https://teethforscience.com>.

diverse groups of children is under way, so hopefully in the future, these nuances will gain greater clarity. Similar to cultural differences, varying differences exist between the challenges facing rural and urban populations. Kim referenced a study that examined challenges encountered by children in urban and rural poverty settings. One risk factor identified in urban settings is high levels of mobility in the family versus the geographical stability of children in rural settings. The unique challenges of both cultural and poverty differences are understudied, Kim said, and should be better understood. While neuro-imaging literature has successfully contributed to identifying mechanisms that link stressful experience and maternal health outcomes as well as those that link sensitive, region-specific developmental periods to adversity exposure, further research could help identify risk factors related to culture and demographics, as well as factors that may protect children from risk.

Another participant asked about individual resilience and was wondering whether any existing research has explored why some children faced with many ACEs in early life go on to become very successful and healthy as an adult. Kim acknowledged this, saying that it is an area that certainly needs more study, as there is huge individual variability. Just because you have encountered adversity as a child, she said, does not mean you are destined to have mental illness later in life. She added that brain plasticity plays a big role and can change in response to different things that happen even while the ACEs are present. For example, children may move out of poverty after a period of time or may have a strong network of supportive relationships in their life, so their brain may look different than others in similar situations who do not have those advantages. In similar ways, Dunn added, the COVID-19 pandemic may help us to develop more policies at the societal level to help share understandings of social determinants of health in a way that can promote child mental health and well-being.

Despite the serious lack of attention given to this area, Dunn presented an encouraging example, describing the Brain Health Initiative in Florida. In response to the state's national ranking in relation to mental health issues—50th in per capita spending on mental health support and 44th in the number of available mental health providers per capita (Florida Behavioral Health Association, 2018)—the Brain Health Initiative has sought to identify, develop, and implement interventions across the life course to optimize brain health. They are working to study the role of genes and lifestyle factors in shaping brain health, as well as to understand how certain interventions can reduce the risk of brain-related diseases and promote optimal brain health. Once they determine how all of these factors impact development, they can more effectively identify the right time for intervention in order to have the best and most valuable impact.³

³For more information, see www.brainhealthinitiative.org.

New Ways of Thinking about Children's Mental Health

During the September webinar, Neal Halfon, director of the UCLA Center for Healthier Children, Families, and Communities, and Kimberly Hoagwood, professor of child and adolescent psychiatry at the New York University School of Medicine, led participants through an overview of challenges and trends, introducing analytical frameworks to provide methods for tackling these problems. Halfon argued that a new way of thinking is needed, given the changing epidemiology of children's mental health, the numerous hidden factors and disparities that play a role, and the projected health, family, and economic costs of this burden. This chapter's outline of these various analytic frameworks focuses on explaining the Three Horizons perspective on improving health systems and gives examples of mental health programs that have implemented this approach across the country. Finally, it concludes by explaining future opportunities and challenges in order to give direction to the Forum on Children's Well-Being and other invested stakeholders on future steps.

ANALYTICAL FRAMEWORKS

Halfon offered three frameworks that can help to make sense of complex systems and problems: life course health development, 3.0 health system transformation, and three horizons.

Life Course Health Development

Life course health development (LCHD) provides a new way of thinking about the origins and development of children's mental health and well-being, Halfon explained. Instead of looking at health as discreet episodes, LCHD illuminates how health and disease develop across the life course and even across generations (Barry, 2019). As a framework, it focuses on multiple ways that risk and protective factors can impact a person during sensitive periods of development and condition behaviors and biology. The dynamic relational environment encompassing the family of the individual, their community, their environment, and the policies influencing them can result in different physiological and developmental adaptations that should be taken into account. LCHD also takes into account multiple factors and time-specific, time-dependent effects leading to different patterns of health development trajectories.

By using LCHD, Halfon said, we want to figure out ways to reduce the risk factors and increase the protective factors over an individual's life from the prenatal period through old age. For those children that fall into the at-risk category, this could include things like parent training, language stimulation, and high-quality early childhood education. Focusing on these can help improve the health development trajectory for an individual as a child ages (see Figure 4-1).

3.0 Health System Transformation

Over the last several years, the health care system has been evolving from an infectious-disease response system to a system that focuses on chronic disease, noted Halfon. The first era of health care, what we might refer to as Medical Care 1.0, focused on acute infectious disease, short time frames for care, and insurance-based financing, the main goal being to reduce the number of deaths. As the system progressed, it transitioned over the last few decades into a second era, Health Care 2.0, which increasingly focused on chronic disease, longer time frames, chronic disease management and prevention, and the extension of a disability-free life in addition to simply reducing deaths. Halfon urged a transition toward a third era, a Health System 3.0, that will shift the focus toward achieving optimal health instead of just reducing disease. Using the LCHD framework, this new system would monitor health across a person's life course, invest in population-based prevention, and reach toward the overarching goal of optimizing health for all. Importantly, Halfon pointed out, this 3.0 transformation framework does not assume that change is linear in every case, even though it implies a sequential evolution of the complex system (Halfon et al., 2014). Realistically, the transformation itself is subject to

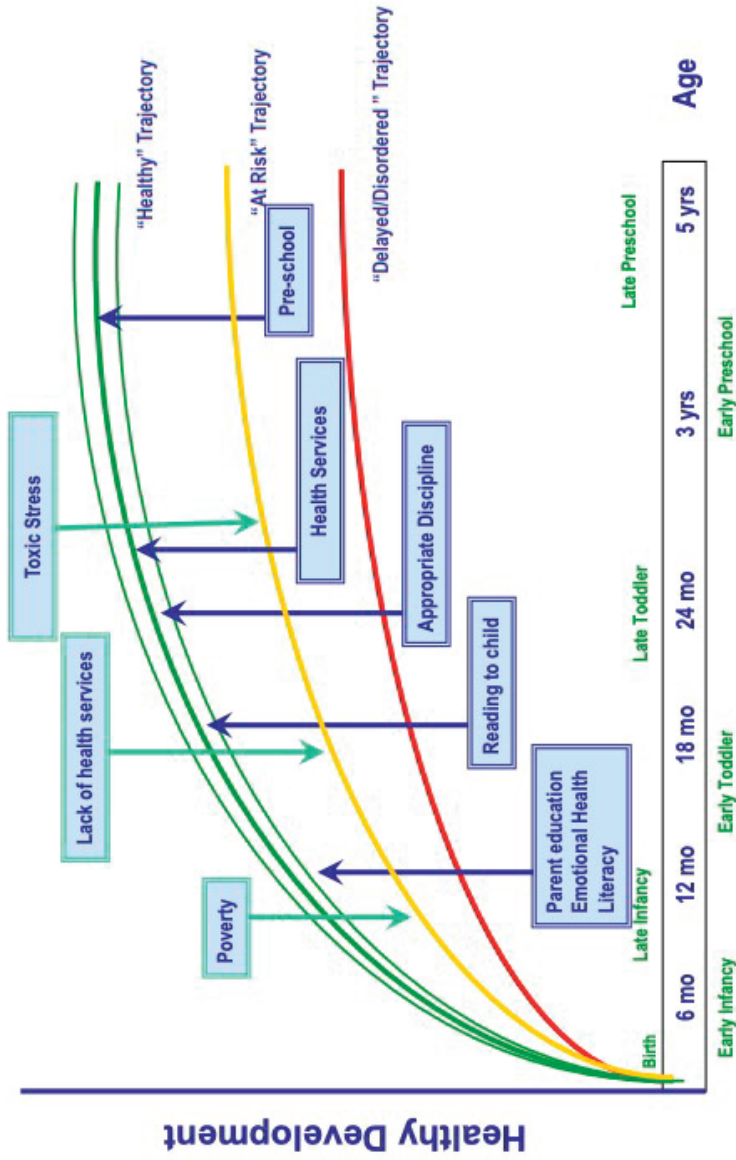


Figure 4-1 Reducing risk and optimizing protective factors.
 SOURCE: Neal Halfon presentation, September 16, 2019.

external pressures from the surrounding environment such as technological advances and changes in health care policies such as the Affordable Care Act and changes to Medicare and Medicaid financing. A system transformation approach has stimulated a redesign of population-based strategies in order to improve early childhood health and mental health by addressing the social and developmental determinants of mental health (Darling, 2020; Sederer, 2015).

Three Horizons

Hoagwood introduced the Three Horizons model, saying that the search for the right framework not only aids the improvement of children's mental health, it builds our systems of knowledge, which promotes the design of better health systems.

There are multiple layers of influences on mental, emotional, and behavioral health that include embedded contextual factors that can affect children over time (see Figure 4-2).

She explained the varying levels of influence, saying that the environment influences gene expression and can shape neurodevelopment. While this is a newer area of knowledge, Hoagwood added, the National Institutes of Health (NIH) is currently doing a lot of exciting work on neurogenesis that is worth following. Experiences at the individual level as well as family and community characteristics can affect the conception, gestation, child-birth, and development of a child. Even conditions in the broader society that are created through policy-driven factors, racism, systemic inequality, and poverty can have a significant impact on development at various levels.

Hoagwood described the Three Horizons approach to studying global problems, an interdisciplinary approach to transformation that leads to systemic change through tapping different types of knowledge (Sharpe et al., 2016). It is designed for complex problems with uncertain predictive models and can be explained as follows:

- *Horizon 1.* A pattern of incremental change that is losing its fit with the direction things are going.
- *Horizon 2.* A turbulent domain of disruptive transformation and innovation in response to a changing landscape.
- *Horizon 3.* An emerging pattern that is appearing and growing on the fringes of the existing system.

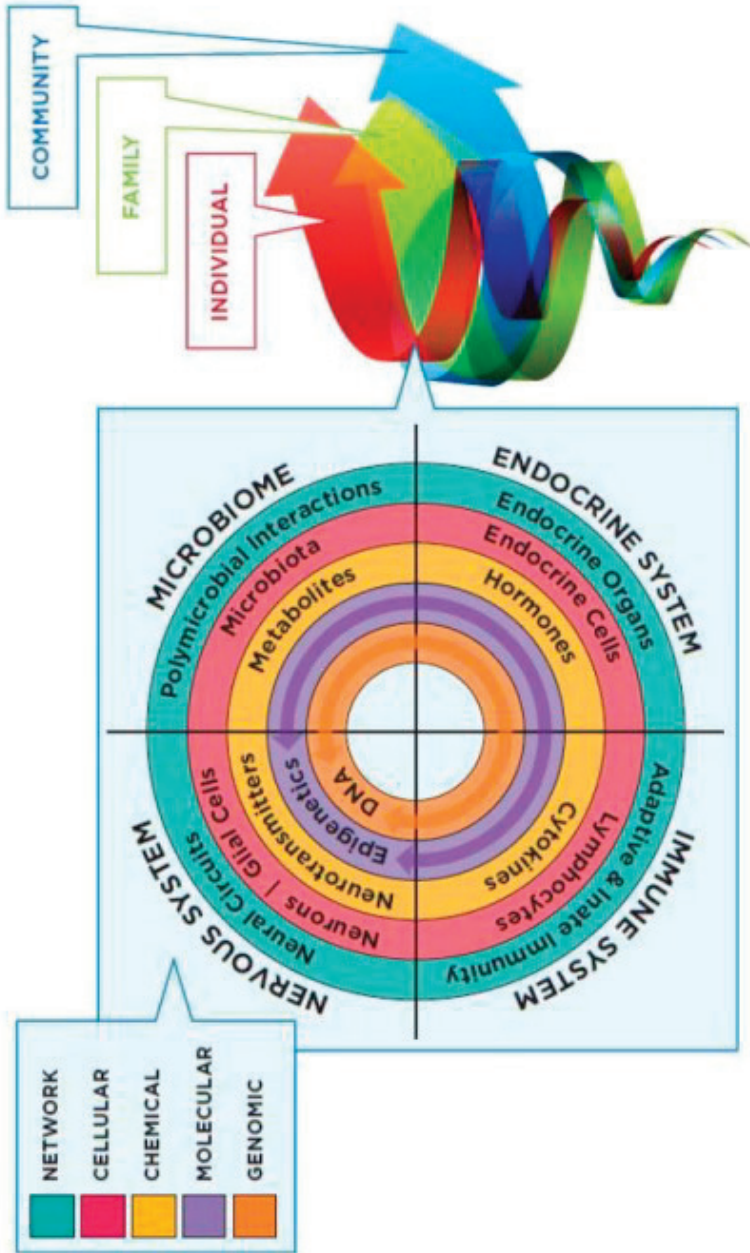


Figure 4-2 Influences on mental, emotional, and behavioral health.
 SOURCE: National Academies of Sciences, Engineering, and Medicine, 2019, Figure 2-2.

Challenging Trends for Improving Health Systems: Three Horizons View

To help clarify these concepts, Hoagwood provided details and examples for each of the three horizons and applied this framework to issues related to children's mental health (see Figure 4-3).

Horizon 1 – Knowledge Expansion

Horizon 1 centers around knowledge expansion, and its positive aspects include an abundance of evidence-based practices, data on cost-benefit ratios, and an amplification of the LCHD model. Hoagwood underscored that implementing this approach is challenging and that barriers, such as costs and the burden of additional training, should be expected. There are also approximately 61 different implementation frameworks but very few practical tools or examples to leverage. She also noted several disruptive changes in children's mental health systems, including a 42 percent drop in funding from the National Institutes of Mental Health (NIMH) for children's mental health research since 2005. Overall investment in children's services research hovers around 2 percent of the overall NIMH budget, but even at the state level, she said, investment in children's mental health is just absent.

Horizon 2 – Disruptive Changes

Horizon 2 focuses more on disruptive changes such as the digital domination of health care, which includes changing mental health models. Other disruptive changes include seeing the entire family as a service unit, developing quality indicators for children's services to improve continuous accountability in quality improvement, and the breakdown of boundaries between fields, leading to a multidisciplinary approach to policy making that includes science. This explosion of knowledge and increased accessibility to information has also included misinformation that hinders good decision making and has slowed down progress in certain areas. As an example of this type of disruptive change, Hoagwood described the 2019 Core Set of Children's Health Care Quality Measures for Medicaid and Children's Health Insurance Program (Centers for Medicare and Medicaid Services [CMS], 2019). She said that there are far fewer quality indicators related to children's mental or behavioral health. Since the core set will be mandated by CMS in 2024 for reporting by states, these measures will be an important lever for changing provider behavior.

Children's Mental Health

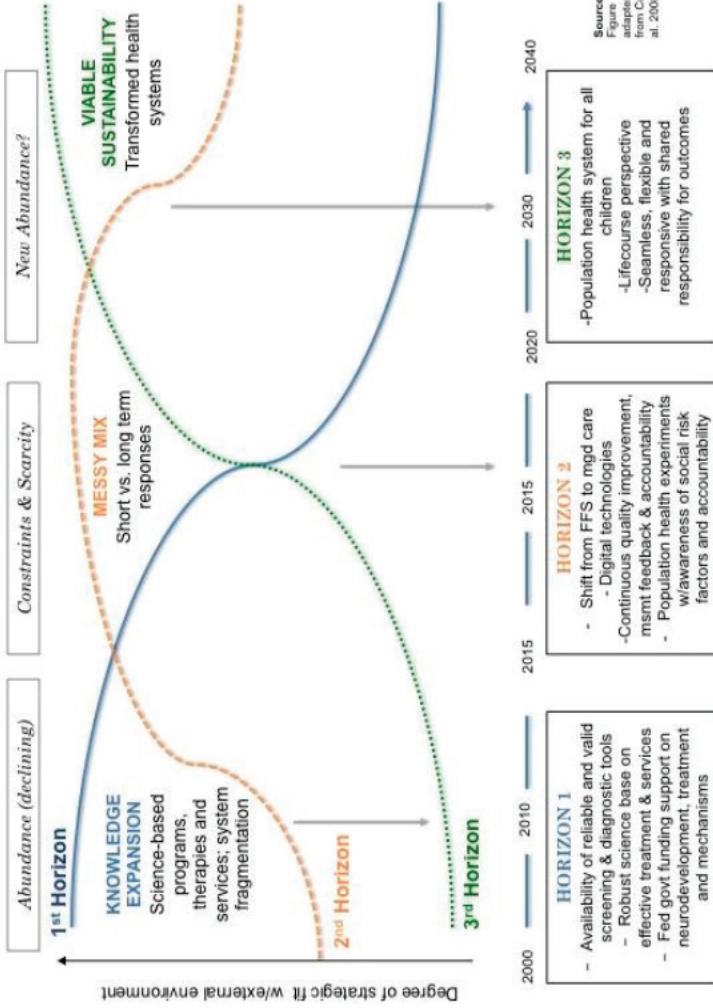


Figure 4-3 Three Horizons thinking for children's mental health.
 SOURCE: Curry and Hodgson, 2008.

Horizon 3 – Transformative Changes

Horizon 3 reflects a transformative change approach. Current trends that are pointing toward this horizon include the increasing focus on promoting children's well-being rather than just treating pathology as a population-level responsibility. This is similar to what Halfon described in the Health System 3.0 model. This third horizon will focus not only on clinical disorders but on social determinants of health as well as on local experimentation. One example of an initiative that utilizes this perspective focuses on the first 3 years of children's lives (that is, their first 1,000 days), the development of community-level support and services for children and their families, and close monitoring for the purposes of mitigating adverse experiences (Darling et al., 2020). An idea of this scale and focus would likely not have been possible 15 years ago.

Another example Hoagwood featured was the National Children's Hospital in Columbus, Ohio, and its 2017–2022 strategic plan called *Journey to Best Outcomes*. To carry out the plan's mandate to improve assistance for high-need families, the hospital adopted neighborhoods in low-income and minority neighborhoods in their area where residents faced the highest risk. Recognizing the embedded nature of children within families and the effect natural, manmade, and social environments can have on their overall mental and emotional health, the hospital partnered with businesses to invest in employment and housing. The housing vacancy rates decreased in areas they focused on and hiring rates increased, both of which are factors that influence family and child well-being.

In closing, Hoagwood said the third horizon provides a road map to health policies and community interventions that cross development trajectories across the life course (see Figure 4-4). This integrated approach can also provide the change in thinking necessary to enable the provision of intergenerational services, as well as policy strategies that cross systems and use creative financing options. If providers can take the evidence base that exists and put it into play at different parts of the continuum, she explained, then hopefully we can start to see better outcomes for these children and families.

FUTURE OPPORTUNITIES AND CHALLENGES

Following Hoagwood's presentation, participants discussed opportunities and challenges to supporting children's mental health. Children's mental health policy research has been a neglected area of science thus far. This is changing with several new NIH-funded studies and centers focused directly on these issues. Policy impact studies—comparing outcomes associated with different kinds of policies—have not been undertaken in this country yet

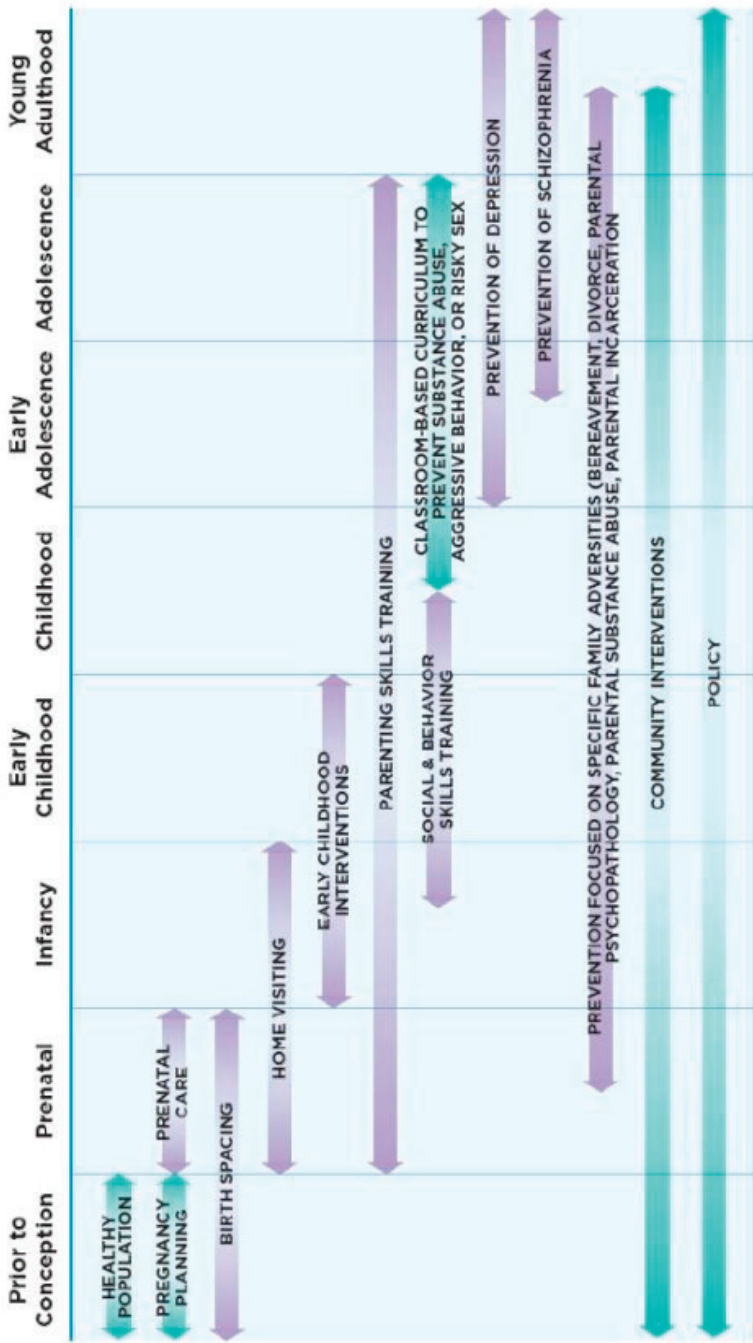


Figure 4-4 Interventions across the life course.
 SOURCE: The National Academies of Sciences, Engineering, and Medicine, 2019, Figure 1-4.

(although they have in Europe), making it difficult to know what policy choice will be beneficial under which conditions. These kinds of studies will be valuable in the future. In addition, Hoagwood said, there is a need for research on innovative financing options, especially as there are numerous states and local communities engaged in innovative thinking about these issues.

One participant noted that the lack of physical exercise and unstructured play, as well as the sometimes difficult culture and climate in public schools posed challenges for children's mental health. Hoagwood suggested using the National Training and Technical Assistance Center within the Substance Abuse and Mental Health Services Administration as a resource for guidance. Creating treatment models specific to local contexts can be challenging and may depend on the community resources that are not adequately equipped to support the communities. Hoagwood also mentioned an alternative approach of a telemedicine model being implemented by the University of Utah to address mental health in school systems.

Hoagwood added that the new and emerging knowledge is shifting the understanding of how to decide where to direct interventions. Research in the past decade has largely focused on individuals instead of relational issues, but now, early relational health (ERH) models are disrupting current models of treatment. These emerging models emphasize the influence of relationships at all levels on mental health such as relationships between parents and children, families and neighborhoods, and the microbiome and the environment. Such models fit well with current trends that emphasize intergenerational approaches and the context of embedded environments, she explained. Advancing knowledge about early relational health is critical and may well lead to new models for both promotion, prevention, and treatment of children's mental health.

Halfon mentioned the work being done by the Life Course Intervention Research Network in which groups of researchers are focusing on life-stage-specific issues and interventions. Within the network, he said, Mark Feinberg from Penn State is focusing on family-level co-parenting interventions aimed at influencing life trajectories, which will then positively impact the health development of children (Feinberg, 2003). Feinberg is building on Family Foundations, an intervention program that implements co-parenting skills to reduce intrafamily conflict (Feinberg and Kan, 2008; Feinberg and Jones, 2018). A school group led by Mitchel Wong, professor of medicine and public health, and Rebecca Dudovitz, professor of pediatrics at UCLA, is also forming to rethink the effect schools can have on life course health development trajectories through redesign and restructuring of the school environment.

Halfon highlighted responsiveness as an important aspect of the Three Horizons approach, saying that if we know that early childhood

development is based on the relational contexts in ERH and that is being threatened, then how do we respond? Do we respond through a service system or with an ecosystem approach? For example, he described the International Futures Forum in Scotland, which addresses complex issues and uses the Three Horizons model.¹ When confronted with high rates of elderly hospitalizations in the winter months due to loneliness and isolation, they tried to alter the pattern instead of just dispatching social workers to reduce hospitalizations. They had more people in the neighborhoods take on caregiving roles and used a people-powered solution instead of the service system. In an analogous way, prevention of mental health disorders and the promotion of optimal mental health trajectories may emerge from new ways (or third-horizon approaches) to transforming the ecosystems where children live, learn, grow, and develop.

One participant asked about communication and messaging challenges in this area. Hoagwood highlighted the promising use of youth peer-support specialists, saying that kids who have already been through the system and lived through trauma can be tremendous leaders once they are able to process their own challenges and grow. Halfon also added that youth movements around the country are driving change, pointing to the 2018 Parkland High School shooting and the resulting student-led gun control movement that emerged as an example.

Halfon continued, addressing innovations in finance that involve payment bundling. By moving payment systems to Accountable Health Communities programs, he said, services could potentially be bundled into life course ecosystem bundles that would package services for community members that range from 9 months to 5 years of age. Doing this would allow family resource centers to be created that could provide ERH services. Model accountable health community programs are already in place, but the length of implementation time and the specific tailoring of such model designs to fit the community it serves creates barriers to scaling them up (Counts et al., 2018; Roiland et al., 2020).

¹For more on the International Futures forum, see <https://www.internationalfuturesforum.com>.

Policy Responses to Support Children’s Mental Health

The fourth webinar in the series featured three speakers from different backgrounds who focused on the best ways to generate a comprehensive policy response to children’s changing mental health needs. Benjamin Miller, chief strategy officer at Well Being Trust, Alex Briscoe, principal at California Children’s Trust, and Nathaniel Counts, senior vice president of behavioral health innovation at Mental Health America, emphasized the downstream negative effects of the current mental health epidemic, highlighted ways to integrate children’s mental health more sustainably into the overarching system, and proposed ways to change methods to transform outcomes. Neal Halfon, founding director of the Center for Healthier Children, Families and Communities at the University of California, Los Angeles, moderated the discussion. This chapter discusses national-level policy solutions and plans for action, examples of state-level practices, and finally emphasizes the need for in-depth system changes in order to reach the desired goals and outcomes.

NATIONAL-LEVEL POLICIES

Miller opened his remarks by noting, “Our country has a mental health problem right now, but the solutions are as fragmented as the problems that created it.” He presented data showing raw number increases in all-age deaths from drugs, suicide, and alcohol over the last several years, with 2017 deaths reaching nearly 152,000 (see Figure 5-1).

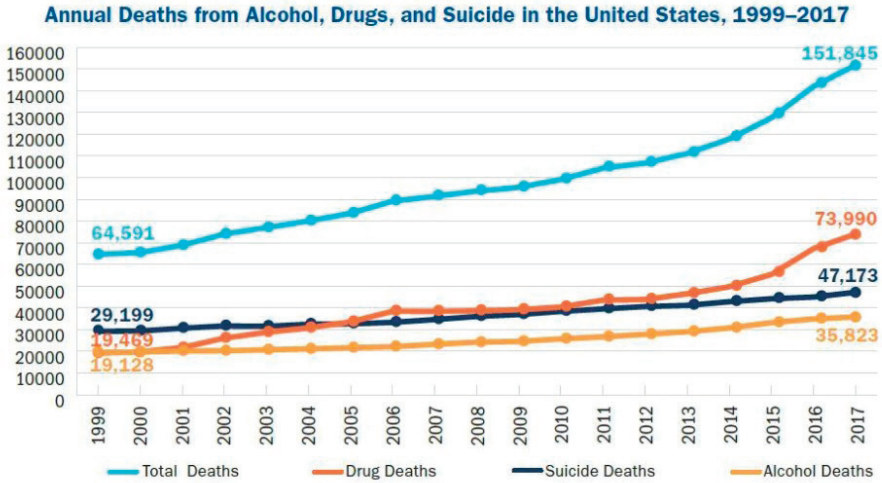


Figure 5-1 Annual deaths from drugs, alcohol, and suicide in the United States.
SOURCE: Trust for America's Health and Well Being Trust, 2020.

Miller noted a combination of individual-level factors (loneliness and isolation), systemic elements (fragmented care delivery and a lack of access to health services), and social and community conditions (housing and food insecurity, racism, intergenerational trauma, and economic exclusion) have together resulted in “deaths of despair.” For the past 3 years, Miller explained, Americans have died at increasingly lower ages, primarily due to deaths from drugs, alcohol, and suicide. There have been some glimmers of success with recent declines in life expectancy, he said, but the battle against the opioid crisis shows how fragmented and narrow the approach to urgent needs still remains (Auberach and Miller, 2020). This crisis will not be solved by business as usual, he said, calling for a comprehensive, systemic response to address these complex issues. There is a need for short- and medium-term actions immediately, as well as longer-term investment in intergenerational work. The country’s approach should be broadened, reducing risk factors such as trauma and the impact of poverty and racism.

Guidance for Congress

To more clearly lay out comprehensive solutions for Congress, Miller shared a guide that was created by Well Being Trust, called *Healing the Nation* to advance mental health and addiction policy (Well Being Trust, 2019). There is a clear need to shift the focus further upstream to focus on root causes and meet people where they are, so they created downloadable

policy briefs keyed to different sectors like health care, education, the judicial system, the workplace, and unemployment.¹ They provide actionable solutions, highlighting that there are multiple entry points where mental health can be addressed, enabling a multifaceted approach. As part of their solutions, Well Being Trust also developed a framework for excellence in mental health and well-being, which focuses on health promotion through the creation of vital community conditions, as well as prevention, treatment, and maintenance for those at greater risk.

Miller reiterated the importance of using the life course health development (LCHD) perspective in pursuing efforts to promote mental health and well-being, which defines health as a developmental process and is built on a rapidly expanding evidence base. It not only goes beyond connecting early exposures to later disease states, he said, but elucidates the ways in which physical, social, and emotional environments are embedded into developing biobehavioral regulatory systems (Halfon, 2014). Emerging models have proved able to provide a synthesis of several different fields and an understanding of the mechanisms and dynamics of interactions. If we do not address issues early in life, he added, they will have an even bigger impact downstream in later decades, resulting in outcomes such as school failure, obesity, depression, hypertension, diabetes, and eventually memory loss and premature aging. We need a systems lens across the life course to fully address these complex issues, he concluded.

Leveraging the Congressional Budget Office

Counts began his presentation with a question: What is holding us back from investing in children's mental health? It is not a politically contentious issue, he said, and the economics of prevention, which highlights the fiscal savings resulting from mental health services, should be in our favor, but we still don't see meaningful levels of investment. One of the biggest issues, he continued, is that budget neutrality dominates the political process, as both parties try to avoid increasing fiscal deficits.

To determine whether or not a policy that increased spending through such preventive investment has actually saved money in the long run, Counts explained, the Congressional Budget Office (CBO) analyzes the economic effects of federal policy options they might potentially fund on the federal budget over 10 years. Their findings determine whether or not a potential policy or program may increase or decrease the federal deficit, which can affect the likelihood of getting supporting legislation passed. Counts provided some background on the issue of "dynamic scoring,"

¹These briefs are available for download from the Well Being Trust website: <https://healingthenation.wellbeingtrust.org/>.

the process of calculating the secondary effects of a spending decision.² In federal budgeting, direct effects amount to program expenditures, whereas secondary effects constitute the savings that accrue from that spending. Determining the downstream economic benefits of interventions for health and well-being programs, then, would require CBO to consider the secondary effects. Counts explained that CBO typically defines “prevention” in terms of things like increased screenings and costly diagnostic devices rather than the typical LCHD interventions that are often more oriented toward development and behavior. CBO put out several guidance documents to help understand their process for examining preventive health programs in which they ask a series of questions, comb the literature for answers, and create an economic model to see what they can find.³ While this might work in some areas, Counts said that LCHD literature does not really utilize the kinds of clear studies that show that if you do X in childhood, Y will occur decades later. This makes it difficult for CBO to provide clear analysis that can fully validate LCHD approaches as certain and trustworthy. Further, there is evidence that many of the greatest budget effects may arise from the macroeconomic effects of large-scale LCHD investments, but there is even less literature tying LCHD interventions to potential changes in the larger economy.

CBO is willing to use different modeling and simulation approaches, but they do not currently have the resources to build necessary models for LCHD. If they were able to create a model similar to the one used by Washington State Institute for Public Policy (WSIPP) that could begin to answer some of these questions, it would be much easier to score budget impacts for LCHD-related policies. Unfortunately, Counts said, CBO has not been able to create something like that because it lacks additional resources, which has been one of the biggest barriers to scoring health prevention policy at the national level. If at some point it was possible for them to demonstrate the savings accruing from prevention policy, then the government would be more willing to pay for investments in LCHD interventions and services proposed in legislation. As an example, he presented a WSIPP estimate from a Triple P Positive Parenting Program, a multi-tiered family-support and intervention program that, evidence demonstrated, was effective at reducing childhood maltreatment. The economic models created to evaluate Triple P’s cost effectiveness found it to be very effective: it showed a 9:1 benefit-to-cost ratio (Washington State Institute for Public Policy, 2019). This model was also able to determine where the benefits would

²For more information, see <https://www.taxpolicycenter.org/briefing-book/what-are-dynamic-scoring-and-dynamic-analysis>.

³See <https://www.cbo.gov/system/files/2020-06/56345-CBO-disease-prevention.pdf>.

be realized, and because of the program's multifaceted nature, the benefits were spread out across multiple sectors.

While CBO does not have the right models currently in place, Counts said, there is still a lot that can be done to bring about positive change. For starters, he explained, we must ensure that the people advising the many academics on CBO's advisory panels understand prevention science. We also need people who understand how to compile the LCHD literature in a way that makes modeling easier for them. The CBO staff is required to be accessible and available to meet and consult with experts, he added. When a particular issue is not a congressional priority and the modeling and compilation takes too much time, it just often does not get finished. If they were able to create a WSIPP-type model, it would be much easier to pass policies, he added.

Alternative Payment Models to Capture Return on Investment

While urging mental health professionals to work with CBO to establish new funding through congressional legislation, Counts also encouraged the participants to simultaneously take advantage of money already being spent. We are on a path to spend close to \$4 trillion each year in health care, he said, but it is distributed poorly, and the majority of spending goes toward specialized treatments and end-of-life care with almost nothing going toward prevention. As the Centers for Medicare and Medicaid Services (CMS) and other health care institutions around the country continue to shift to more value-based payment models, Counts said the entire field is realizing there are other ways to finance health care. He explained the CMS framework, the goal of which is to move up categories, incentivizing organizations to increase provider accountability and focus on population health management (see Figure 5-2). He said he and Halfon are exploring ways to extend this category framework to better capture life course health.

Miller offered suggestions for payment recommendations, noting that the main issue is not the way we pay for mental health, but the need to change the way we pay for overall health care and medical practice, which includes mental health. One way to doing this is to move as quickly as possible away from fee-for-service reimbursement toward ensuring payment for the delivery of services to keep the patient healthy instead of charging per patient visit, similarly to how the CMS framework works. Additionally, he urged the creation of established incentives to encourage clinicians to work closely with mental health providers. In doing so, this can increase the accountability of the general physician for certain behavioral health conditions.

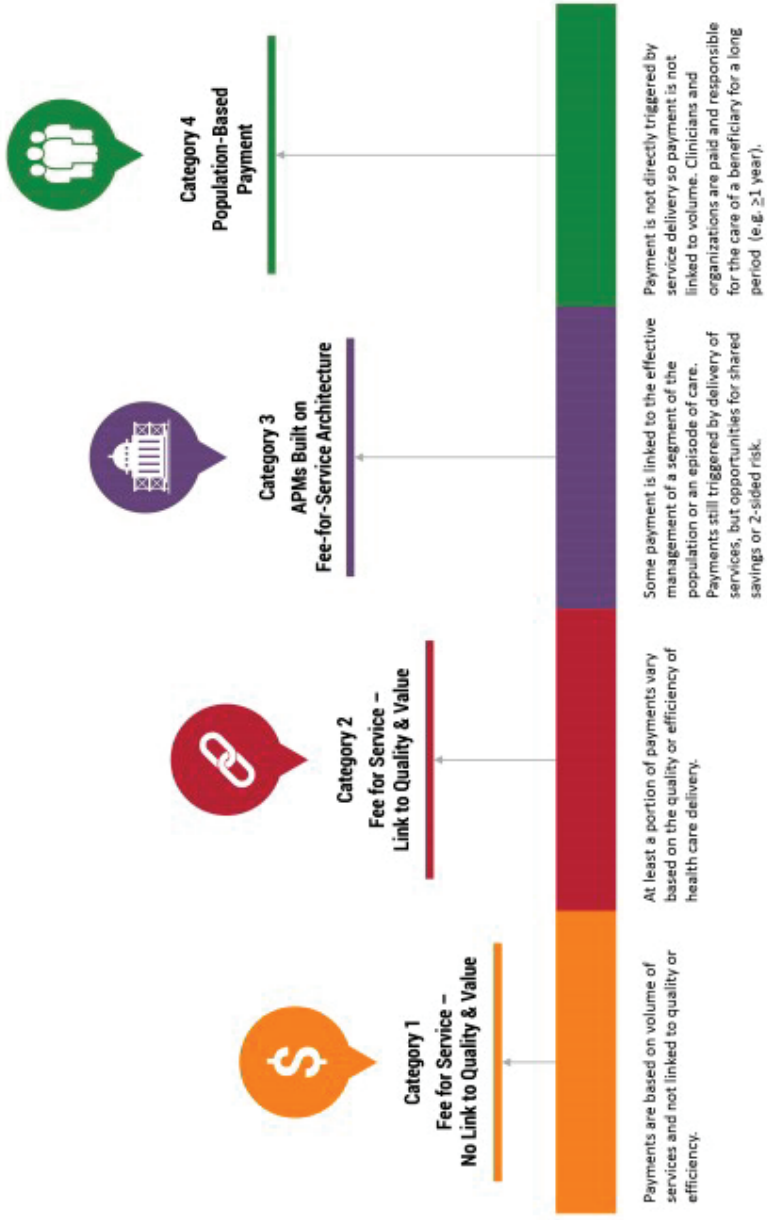


Figure 5-2 Centers for Medicare and Medicaid Services payment model.
 SOURCE: Health Care Payment Learning & Action Network, 2017.

In addition to these alternative payment models, Counts also introduced the concept of pay-for-success models and social-impact bonds. While these are typically found more in the realm of social services and not health care, there are plenty of situations in which their use could be applicable. Investors will have to fund projects or interventions up front in places where intermediaries and direct-service providers deliver services to target populations. The outcomes for this project would be measured and validated by an independent evaluator and the results forwarded to a back-end payer. If the project successfully saves money, a portion of that shared savings would go back to the original investors, while another portion would stay with those implementing the project. Both of these examples do have their problems, Counts cautioned. Pay-for-success projects are often a one-off deal, are difficult to scale up, and can backfire if they do not work, threatening investors with financial losses. Such high-stake ventures force people to think myopically and miss important nuances within a mental health context.

Combining concepts from both pay-for-success ventures and alternative payment models can offer a path forward by engaging more sectors over longer time periods, but in a more iterative way that supports long-term incentive realignment. Alternative payment models are often structured to run in fiscal-year increments, which is too short a time to show improved outcomes or savings. Counts did highlight the benefits, though, saying that whether they are administered through Medicaid, state, or local health plans, most of these types of contracts are just that: contracts. They consequently do not require full policy change or legislative action, giving people on the ground an opportunity to bring investors together to take action if they see a strong prospect. Both types of contracts—pay-for-success and alternative payment models—have benefits that communities can build from, and together they represent what's missing in LCHD financing. A blend of contracts that borrow from pay-for-success and alternative payment models can align finances on the ground for LCHD (Counts, 2018). Overall, Counts said, the money exists somewhere, and life course health promotion has a positive return on investment, but we as a sector need to get creative about capturing this value at the national and local levels to better tell the story.

STATE-LEVEL POLICY

To solve the challenge of integrating mental health more sustainably into a nontraditional medical setting, Miller suggested looking more closely at the financial roots of the problem and offered some examples of how programs are working across the country.

Colorado SHAPE

One Colorado program launched a novel payment model called Sustaining Healthcare Across Integrated Primary Care Efforts (SHAPE), a partnership between Collaborative Family Healthcare Association, Rocky Mountain Health Plans, Colorado Health Foundation, and the University of Colorado School of Medicine's Department of Family Medicine. Miller described the program as "liberated from fee-for-service," and it demonstrates what can happen when primary care has a budget to manage everything they need. They see comprehensive care as contributing to cost savings, and an analysis comparing practices that received SHAPE payments with those that didn't found those receiving SHAPE payments generated \$1.08 million in net cost savings for their public payer population over an 18-month period, primarily through reducing downstream hospitalizations (Ross et al., 2019). They had improved screenings and diagnoses in addition to cost savings. "You have to always think of the person in the context of the family, and the family in the context of the community," Miller added.

California's Vision for Change

Briscoe discussed another state-level example being tested in California that highlighted the true mental health crisis happening across the country. Between 2006 and 2014, mental health hospital days for children have increased by 50 percent. Inpatient visits related to suicide, suicidal ideation, and self-injury by children 17 years old and younger have increased 104 percent, and the increase for children ages 10 to 14 has been even greater. Everyone pays a high price for this, he added, making the search for solutions to this crisis fiscally and morally imperative. Reiterating Miller's introductory points, Briscoe stated that mental health and substance-abuse disorders are the leading causes of disease burden in the United States. As an example, he pointed to the fact that 37 percent of high school students with mental illness drop out of school, the highest dropout rate of any disability group.

To inject some optimism into the conversation, Briscoe suggested that California has arrived at a once-in-a-generation opportunity in which public opinion, community support, policy agendas, political will, and an economic rationale have all converged to enable support for funding and investing in children's mental health. Even though it has the fifth-largest economy in the world, California has realized that the problem has become so dire that the state cannot bring transformational change simply by providing more therapists or stigma reduction. The leader in this statewide reform, California Children's Trust, has cast a bold vision that urges that

“every child in the state has a fair and intergenerational opportunity to attain their full health and development potential free from discrimination,” but there are four challenges that stand in the way:

1. *Addressing the root causes of social inequality and racism.* One in two children in California live in or near poverty. The systems we live in corrode human relationships (see Figure 5-3).
2. *Bridging the access gap.* Eligibility has increased, but access has declined.
3. *Fixing a broken model.* No common framework for defining and understanding behavioral health exists, and there are fewer providers than needed.
4. *Integrating a fragmented children's health service system.* Children receive services from multiple different systems with little connectivity or continuity.

Briscoe added that California Children's Trust is working to find solutions to the problem of fragmented systems and presented the framework as a means to achieving this vision (see Figure 5-4). They have three strategic priorities, centered on equity and justice. First, they plan to maximize funding through state and local administrative reform, fully claim the federal match, and follow Medicaid dollars to find money that's been “left on the

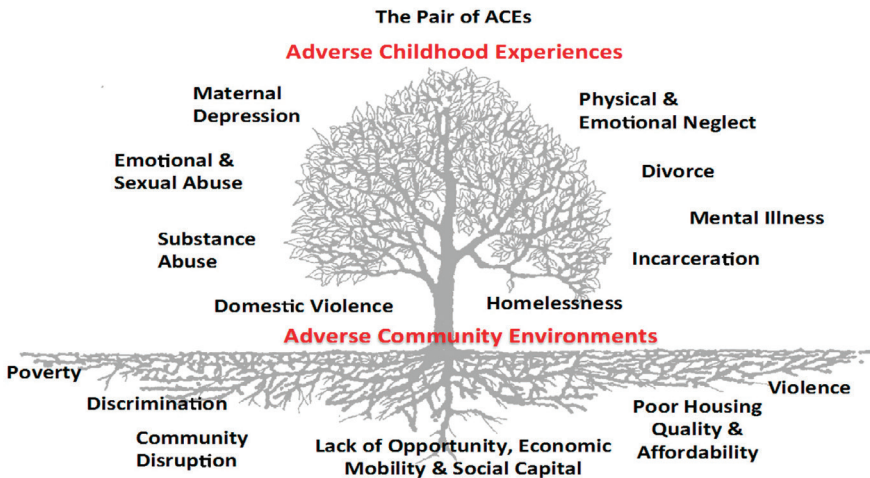


Figure 5-3 Impacts and examples of individual and structural adversity.
SOURCE: Center for Community Resilience, 2020. Reprinted with permission.



Figure 5-4 California Children’s Trust framework for solutions.

SOURCE: Alex Briscoe presentation, February 13, 2020.

NOTE: For more on the Framework for Solutions, see <https://cachildrenstrust.org/wp-content/uploads/2019/03/framework4.pdf>.

table” due to the complex system of waivers and intermediary programs. They will also expand access and participation by redefining “medical necessity” and allow provision of services without a confirmed diagnosis. This priority will also include the integration of community-based organizations in care delivery and the expansion of peer-to-peer and social models. Finally, they want to reinvent systems to increase transparency and accountability. Briscoe said that they will address this by integrating data systems, mandating common assessment tools, defining a common set of outcomes, and creating collaborative financing models.

GOING BEYOND TECHNICAL SOLUTIONS

Halfon asked the three speakers to elaborate on where to go from here, how to prioritize action with so many challenges to tackle, and whether policy makers should seek broad and transformative priorities or focus on addressing specific things. Miller emphasized points made throughout

the webinar, saying that there is a need to be more creative in developing solutions and think differently about providing resources. Merely referring patients to other facilities or adding more clinicians to a roster will not solve the challenges. Instead, Miller suggested bringing providers into churches and other places of worship or thinking more meaningfully about task shifting. Echoing Hoagwood's third horizon approach, he stated, "We have to be disruptive in changing the culture to think about where the care is needed instead of just where we provide care right now." He also highlighted the need for a more intentional focus on recruiting and training clinicians who look like the people asking for help. Counts and Briscoe both highlighted the concept of sharing power in communities as an important next step. Counts said that they are learning and making strides in certain areas, but replicating that will be difficult. He also added that in order to build solidarity in communities and test out new innovations, participation by programs such as the Accountable Health Communities⁴ movement, the Healthcare Anchor Network,⁵ and others that feature collective impact and distributive leadership will be an important first step. Briscoe offered transformative suggestions, saying there needs to be a broad social movement to reinvent the social contract, a movement that answers such questions as what we owe each other and how we need to treat each other. The next level down from there would be reexamining the power dynamic between the system and the patient so that people receiving the services can be structurally empowered to make decisions and take ownership of their health. Thinking more incrementally, Briscoe suggested that states could remove and reform the definition of "medical necessity," allowing mental health to be reinvented as a support for healthy development, and they could formally include peers in social models in reimbursement structures and practices. Building on all three suggestions, Halfon mentioned the All Children Thrive project in Cincinnati and described their attempts to redefine "collective impact." The state of Ohio and Cincinnati together are using this approach to rethink the mental health system. He also added that, in collaboration with the UCLA Center for Healthier Children, Families, and Communities and Public Health Advocates, the California Department of Public Health is in the process of launching All Children Thrive California (ACT California). Building upon the All Children Thrive Cincinnati prototype, ACT California is engaging cities across the state to prioritize the well-being of all children. Moving upstream and working in new and different ways must involve more than the manner in which we work with

⁴For more on the Accountable Health Communities with CMS, see <https://innovation.cms.gov/innovation-models/ahcm>.

⁵For more on the Healthcare Anchor Network, see <https://healthcareanchor.network>.

the service system, Halfon said. It also involves changing the ecosystems in which children live and designing comprehensive change packages.

Leveraging Financing

As financing remains a fundamental piece for implementing any changes, Halfon also asked about the potential major policy change that would occur in spinning Medicaid off as a block grant program and what such a fundamental shift in Medicaid financing might mean for children's mental health. The Trump administration issued guidance in early 2020 under which states could apply for waivers that would convert many Medicaid programs for adults into a type of block grant, with capped federal funding and new authorities that could also cut coverage (Aron-Dine et al., 2020). Briscoe strongly voiced his opposition to using any kind of block grant device within the current levels of funding across the country. Miller added that several legal challenges to the administration's proposal are already working their way through the courts. If, he said, we fail to address underlying socioeconomic factors that cause poverty in communities while at the same time limiting the availability of resources to serve those at highest risk, then shame on us. Medicaid has strengthened itself and become a robust program over the years, said Miller. If we now limit the growth of a program that could have an effect on communities that need it without addressing underlying economic factors, we would only be setting ourselves up for major downstream negative outcomes.

Identifying and Using Factors for Growth

Children often grow up unprotected in risky environments and can spiral downward into despair and alienation, Halfon stated. On the other hand, he pointed to other protective factors at the social and individual level that can help children learn to modulate their emotions in such environments: support programs for families experiencing significant social, economic, and emotional challenges, as well as programs that enhance children's adaptive and coping skills like mindfulness, meditation, and other techniques. He asked the speakers to consider how mental health services could better address multiple types of interacting risk factors and develop better protective factors for coping with different forms of adversity that promote better health and well-being outcomes for children. Miller responded that the mental health and addiction communities have not embraced the need to address these important factors and have been slow to integrate them within an overall comprehensive and integrated strategy. "This is really at

the heart of what we have done wrong as a field,” he said. “We’ve talked about factors but haven’t done it in a comprehensive way that allows us to create a plan lifting up protective factors in a community or creating a policy with the top five risk factors in mind.” Briscoe strongly agreed, noting that reimbursement systems actually structurally deny the ability to pay for those factors that encourage social and emotional development. He mentioned the Kauai longitudinal study of risk and resilience that elevated the importance and role of resilience, identifying three protective factors that were key in enhancing that adaptive capacity: having a caring adult, maintaining hope for the future, and developing the ability to adaptively distance (separating out from your own sense of self what happened to you) (Werner, 1989). None of these are currently reimbursable, though, he said. To help measure success, our system needs to start paying for services, the enhancement of these protective factors, and techniques such as mindfulness and cognitive behavioral therapy, Counts said, because we know these will help build individual resilience and promote children’s health and welfare. Counts added that he envisions something along the lines of Communities That Care, an evidence-based, prevention-science process that brings together entire communities to help youth thrive (Oesterle et al., 2018). Many evidence-based interventions in this field were first tested in the 1980s and 1990s, so they are a bit dated, he noted. In a time of rapid technological change in which the risk factors and context have shifted, it is difficult to judge the continued validity of these interventions and somewhat dated evidence-based frameworks. Success, Counts added, requires us to lean on the wisdom of communities, and consider the changes in epidemiology as part of a “continuous quality improvement” process, which guarantees regular updates and built-in growth. Recognizing the importance of socioeconomic determinants, one of the keys to success will be a whole-community approach that involves business, the workforce, and education to ensure that all interventions and policies are working toward people’s financial health as well as socio-emotional health.

Miller described two essential takeaways. If we do not approach mental health comprehensively throughout the full life course, he said, we are failing people in their communities. We have to take into account the complexities of health and use multifaceted policy approaches to solving these complex problems, such as including friends and partners who have not always been included in health reforms before. In closing, Halfon explained that the forum had undertaken this webinar series because progress in life course health science, through landmark studies like the Kauai study have clearly demonstrated the role that risk and protective factors play in the onset and unfolding of mental health problems across a person’s life

course. Informed by ambitious and influential intervention programs like Communities That Care, new broad-based community-level initiatives like All Children Thrive Cincinnati are pushing forward with change. Halfon suggested that the real challenge is combining and bundling successful interventions into an ecosystem of services and support that can be successfully scaled up at a population level. There is much more we can and should be doing, he said.

Transforming Children’s Health Care to Improve Lifelong Behavioral Health

In April 2020, the forum hosted the fifth webinar in this series, which featured Laurel Leslie, vice president for research at the American Board of Pediatrics, and Tom Boat, director of CFWELL at Cincinnati Children’s Hospital Medical Center. Together with Neal Halfon, founding director of the Center for Healthier Children, Families, and Communities at the University of California, Los Angeles, they held a discussion on a primary care approach to preventing mental health disorders, and the reasons it is necessary for the field to transform. This chapter discusses the severity and widespread nature of the problem, potential pediatric care settings for incorporating mental health, and the importance of family-focused approaches when working to transform pediatric care.

In her opening remarks, Leslie reiterated the massive shift in epidemiology across the world in terms of increasing “deaths of despair” (also highlighted in Chapter 5) and increasing prevalence of symptoms of disorders in children. Summarizing previous webinars, she pointed out the neuroscience data that supports a life course, multigenerational approach, consideration of the effects of adverse childhood experiences (ACEs), and the importance of going beyond the medical model to focus on the promotion of emotional well-being. Leslie explained who is showing up in health care settings seeking care, saying that 10–14 percent of children under the age of 5 have socio-emotional problems, while 45 percent of children experience at least one ACE by age 18. Again emphasizing the linkage of mental health disorders to childhood, she stated that 50 percent of U.S. adults with mental health disorders had symptoms by 14–18 years of age. There are also disparities in care, depending on the availability and access a family

may have to health care coverage where they live. One study, for example, found that half of the 7.7 million children in the United States with a treatable mental health disorder did not receive needed treatment from a mental health professional, a statistic that ranged as high as 70 percent in some states (Whitney and Peterson, 2019). Given the average delay of 8–10 years from onset of symptoms to intervention, silos in care, and increased costs, less than 50 percent of mental health referrals are used to seek care, and even those people that do seek care often stop prematurely due to financial hardship, stigma, or difficulty in getting access to care. The current mental health system is not enough, she said.

TRANSFORMING CHILDREN'S HEALTH CARE

Leslie presented arguments both for and against utilizing pediatric care settings for improving the mental health system's care delivery. With the passing of the Affordable Care Act (ACA), plans are required to cover preventive care services at no out-of-pocket cost to families. These preventive services include 30 well-child visits recommended between 0 and 21 years. Additionally, this is where most childhood diseases and conditions are managed, and because of the numerous recommended preventive visits, there is typically more of a relationship formed with the provider. Primary care settings can thus serve as a link to other child-focused health, developmental, and social services. Additional challenges nonetheless face those who use these settings for addressing children's mental health needs, but while these challenges are significant, they can be addressed if we consider transforming care. The current medical model, for example, focuses more on the identification and diagnosis of disease, compared to promotion and prevention. Training around mental health conditions in children is underfunded and inadequate in many pediatric settings. There is also an inadequate supply and distribution of nonphysician providers in primary care settings, many of whom are better trained to address mental health needs of children and youth. Perhaps most importantly, the health care system overall does not support promotion, identification, and treatment of mental health issues in children in terms of time, reimbursement, and personnel within pediatric primary care settings. All of these reasons present the need to incorporate a perspective of promotion, life course, and systems integration to develop sustainable solutions and transform care.

Changing Pediatric Primary Care

Revisiting the discussion of transforming health care models from Chapter 3 (see Figure 6-1), Leslie reminded participants of the 3.0 Transformation Framework and how a 3.0 model of care is based on thinking

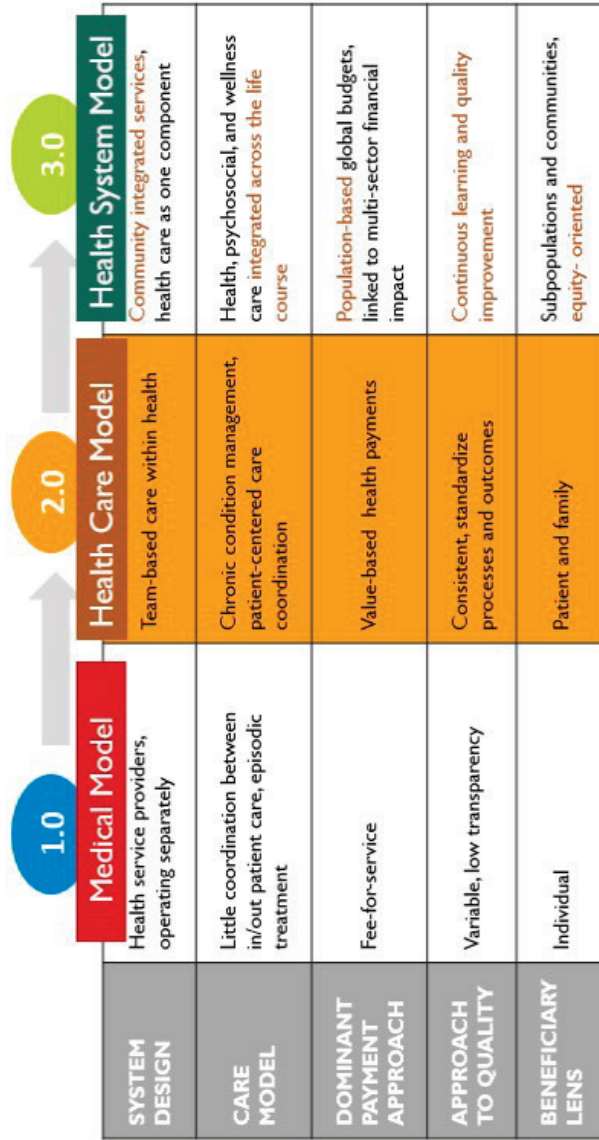


Figure 6-1 Health care model transformation.
SOURCE: Halfon, Long, Chang, et al., 2014.

about health as the “extent to which children are enabled to develop and realize their potential, satisfy their needs, and develop the capacities that allow them to interact successfully with their biological, physical, and social environments” (NRC and IOM, 2004). One major goal would be to provide integrated care.

Leslie explained that some settings integrate standardized emotional and behavioral screening programs and link to programs like home visitation or school-based services, but not even all of that will propel the pediatric health care system from the 2.0 model to an upgraded 3.0 configuration. A full transformation will require us to move boldly toward integration and draw on what we know about implementation science to figure out the best way to incorporate integrated care into practice and disseminate integrated models of care on a wide scale. She continued with examples of what integrated training and care would require (see Box 6-1). From a scientific standpoint, we have over 800 evidence-based programs that address children’s mental health, Leslie noted, but most owe their existence to research studies and are limited to certain age groups or diagnoses or include homogeneous populations. For a state, county, or health system to

BOX 6-1

Envisioning Integrated Health Care

Training:

- Psychologists, child developmental specialists, community health workers, and peer navigators embedded in training settings
- Cross-training across different disciplines and professions for true integration of care
- Shared competencies and curricula across disciplines, professions, and evaluation metrics
- Child and family emotional health and resilience attended to no matter where the health care setting is
- Patients and families integrated into care team

Care:

- Inclusion of nonmedical professionals, parent and young adult patient peers, community health workers, and office staff in the team
- Supervision models
- Cross-disciplinary records with evidence-based decision support
- Cross-disciplinary mechanisms for payment
- Cross-walk of different risk identification and treatment protocols, including the family
- Network of medical and nonmedical resources to link with

SOURCE: Laurel Leslie presentation, April 16, 2020.

try to implement these protocols, we would need to address implementation barriers they would face. Some researchers have been suggesting and studying modular-based treatments that are averse to using diagnosis in addressing these barriers.

If these actions for training and care delivery were put into place, she said, we would expect to see improved health outcomes like reduced wait times and errors, improved access to the services needed, less duplication, decreased use of emergency services, and greater accountability and awareness of responsible parties (National Alliance on Mental Illness, 2011). For families, this would manifest as regular contact with a provider, reduced stigma for certain services, improved adherence to treatments, and better convenience and satisfaction with their care.

Family-Focused Programs

There is also a growing evidence base for multilevel, family-focused programs that support parents and caregivers in promoting the well-being of children, as well as identify and manage risk factors. Leslie gave a few examples of these evidence-based programs and cited both the Annie E. Casey Foundation Blueprint program, which performed a systematic review of interventions that meet rigorous standards, and the Washington State Institute for Public Policy (also discussed in Chapter 5) that allows policy makers to review cost analyses of programs. These programs build on the promotion, life course, and systems integration perspectives to enlist the family and the broader neighborhood as partners in fostering the child's well-being. Programs may be universal (expectant parents or parents of adolescents), selective (families identified with special needs or vulnerabilities), or indicated (those already showing symptoms such as autism or anxiety). Several examples of programs exist, but they nearly always share the following common components:

- Community-based
- Culturally sensitive
- Accessible
- Developmentally appropriate
- Foster supportive relationships
- Provide peers or navigators
- Offer education and information
- Offer practice and homework
- Measure outcomes

Some states have begun funding programs like the Triple P Positive Parenting Program in Washington that has been funded through Medicaid.

Similarly, the Healthy Steps program has been made available in 130 pediatric offices across the country.

Incorporating Subspecialty Care

There is a growing recognition of the need for behavioral health in subspecialty pediatric care, Boat stated, but health care still largely targets physical health and functioning. If there are mental health programs, they are most often layered on top of other services instead of being integrated. Chronic disease is an increasingly prevalent challenge for families and our society. Around 10 percent of all children are born premature, which often leads to lifelong health issues. An estimated 5 percent of children have some type of disabling or life-threatening chronic health condition. For many, subspecialty care functions as primary care because their chronic conditions necessitate seeing their provider quite often. As the number of children with chronic care needs increases, he said, the prevalence of behavioral disorders in parents and siblings of such children is also increasing. The economic and social stresses of managing these conditions can result in the disruption of family structure and function. These difficult roles for all involved can result in lifetime risks for health and longevity (Cohn et al., 2020). Numerous studies have found that parents of chronically ill children have greater anxiety and depression scores than parents of healthy children. Costs are another factor, with data showing that children with chronic medical conditions who also had concurrent mental health or substance use disorders had nearly 2.5 times the annual medical care costs compared to those with only chronic medical conditions. Families experience increased out-of-pocket expenses and other costs, creating an economic burden (NRC and IOM, 2004). Recognizing these stresses, pediatric chronic care models have responded by incorporating social workers and behavioral professionals into care teams, as well as increasing mental health screening, diagnosis, and treatment for children, adolescents, and parents in the families since they are likely at higher risk.

Unmet Needs of the Current Model

Despite these improvements, the response to stresses from those implementing pediatric chronic care models has been partial at best, Boat stated, and there are many needs that still demand attention. He listed three overarching unmet needs that the current medical model has yet to address: the full integration of behavioral health into the care model, the promotion of child and family behavioral health, and the identification and mitigation of risks for behavioral health. "As the family goes, so goes the child," he said. He explained that for those families in situations where structure and

function are disrupted—often due to the stresses and management demands of the child's chronic disease—children do not do well. He asked how we can help families achieve a higher level of resilience and family wellness.

Importance of a Family-Focused Approach

Boat introduced CFWell, a program at Cincinnati Children's Hospital that uses a family-focused approach to promoting behavioral health and wellness when a child has a disabling or lifelong chronic illness. Key elements of the program include:

- Attention to lifestyle factors that promote health and wellness
- Managing stress
- Encouraging moments of joy and satisfaction
- Addressing adverse social and economic determinants
- Surveillance for family behavioral disorders

Paying particular attention to lifestyle factors, he discussed the importance of sleep, nutrition, exercise, and finding joy. All of these may seem like simple parts of daily life, but he elaborated on data showing how these families often struggle to meet these everyday targets. For example, he said that one-third of families of children with cystic fibrosis (CF) experience disordered sleep, and, furthermore, there is a strong correlation between the sleep patterns of the child with CF and that of the parents. Additionally, 40 percent of parents report daytime sleepiness (Byars et al., 2020), potentially impairing ability to perform necessary tasks at work and in the home. Optimal nutrition and exercise are also difficult for these families, given the time demands of chronic illness appointments and daily care routines. Many families end up eating processed food on the go and do not have time to exercise, even spending more time sitting in the car or sitting in waiting rooms and at clinics. This frequently results in excess body fat, limited skeletal muscle development, and related consequences for health, Boat explained.

There are multiple interactions among sleep, exercise, and nutrition, he continued. We know exercise can be an antidote to sleep problems in some people. Knowing what families currently experience, he said, we are trying to better help families incorporate these vitally important elements into their busy schedules by stressing the importance of lifestyle factors at the time of diagnosis, a message that is reinforced at each visit. Additionally, sleep, nutrition, and exercise consultants are made available to families when needed or desired.

Stress is another commonly experienced factor that plays a major role in a family's ability to manage these conditions. Some worries are general

ones, such as those that concern the child's health or money to pay for care, while others are more situational like those experienced during periods of testing or hospitalization. Even school engagement can be an extremely stressful experience for families of children with chronic illness. Looking at school engagement for students with CF, the average number of school missed each year was more than 25. More than 75 percent of parents felt stress over how to advocate for necessary accommodations for their child, and many schools and teachers are simply at a loss over the best ways to support a CF student's social and academic needs. School success is a critical precursor to successful independent adult life, Boat emphasized, so it's clear that thinking about holistic needs must go well beyond the hospital and physical health.

Possible Recommendations for Subspecialty Programs

Boat shared his recommendations for improving and protecting the mental, emotional, and behavioral health of children and families in these situations:

- Address demands, stresses, and their behavioral consequences from the time of diagnosis.
- Incorporate attention to lifestyle factors and stress reduction into the care model.
- Recognize that family adherence to recommended therapies depends on family wellness and resilience.
- Partner with other providers to promote family wellness (primary care, child care, preschools, schools, social services).

Following discussions with parents, providers, and multiple other stakeholders, Boat highlighted a recent program and publication, *A Roadmap to Emotional Health for Children and Families With Chronic Pediatric Conditions*, which is sponsored by the American Board of Pediatrics (Pickles et al., 2020). In addition to being informed through discussions, this program has also conducted literature reviews to collect all available evidence and has found several key themes. He explained that all health professionals should support the promotion of emotional health, beginning from the time of diagnosis of a disease, even if that person is not a trained mental health professional. Additionally, providers must realize that families may be reluctant to share vulnerabilities and may even underreport the extent of their stress in order to look strong for their children. The road map makes available several types of resources, including scripts for conversation openers, videos, tools, and ideas for changes to improve mental health (there are also currently other resources in development as well as chronic care pilot

programs in different settings). Boat shared that this and other programs have made considerable progress but feels that much work remains to be done as far as adequately understanding and meeting family needs when faced with serious chronic disease. He stressed the urgent need to learn and test interventions designed to better support emotional health and resilience for families of children with chronic illness.

CHALLENGING THE FIELD TO EMBRACE TRANSFORMATIONAL CHANGE

Moving to health care model 3.0 will require us to completely disrupt the current system, Leslie said. The opportunities to work more closely with other sectors—public service, families, businesses—are good, especially in our current environment. The COVID-19 pandemic has already created a massive disruption in nearly all health and mental health care operations and has particularly created room for changes in how we provide care and how we think about children's emotional health and resilience. She cited increased use of telemedicine (via phone or video) as one such example and the public discussion about the impact of isolation on children's development as a second. While the negative impacts of the pandemic are of course numerous, Leslie said, "I'm already seeing a change in the dialogue about how we can better focus on children's mental, emotional, and behavioral health and resiliency." This is not a time to be silent on children's needs, she continued, saying that this pandemic has presented an opportunity to recognize the importance of parents, teachers, and caregivers in children's lives; understand how social distancing can affect mental health; and illuminate the failures of and disparities inherent in health care financing and delivery on a central stage.

Halfon continued the discussion by asking their thoughts on who is involved in this, and when and where these kinds of transformative interventions could take place (at home or in schools). Leslie replied that the best approach would involve using established best practices, accounting for the local context and characteristics of a community to drive change. The settings may be different, she said, but you can look at models of what has already been done in similar scenarios. New York, for example, is hiring peer navigators as part of its mental health programs, while other states are employing community health workers. Success will come from taking creative measures to understand the needs of children and families and the types of programs available to meet those needs. Financing will be important too. Boat brought a different perspective regarding who is involved, saying that pediatricians must be better trained and supported in their practices regarding behavioral and mental health. If they do not feel qualified to be directly involved, then they can make referrals within the

pediatric practice. At the very least, trainees should experience situations where they have to learn about the intersections of physical and emotional health. Without buy-in from physicians, he said, success will be difficult to achieve.

Halfon commented that current epidemics affecting children and youth, including obesity, neurodevelopmental disorders like ADHD and ASD, mental health conditions, and various forms of addiction to drugs, alcohol, vaping, and gaming, all have a life course component. In other words, they all have definable developmental origins, often connected to adversity, adaptive and maladaptive coping mechanisms, and an early start in life. From a life course health development standpoint, they represent a failure of the developmental ecosystem in which children are being forced to grow up and live. While some of the needed changes will come from innovations and improvements in health, mental health, and social service systems, other changes are needed to address root causes (inequality, structural racism, persistent cross-generational disadvantage and adversity) that are deeply embedded in the U.S. ecosystem of child development. The COVID-19 pandemic has laid bare just how many cracks are in both the service systems and the deeper ecosystem, Halfon noted. Once we enter the recovery phase, there will be an opportunity to really talk about the kind of infrastructure needed to rebuild in a smarter way. It will not only require more research and interventions, he said, but also a different way of innovating and improving the utilization of learning networks to leverage large communities of people to share lessons and move beyond the incremental changes we've been making in order to transform the system with bold strokes. One example of a learning network is the ImproveCareNow network that has been moved forward by Peter Margolis and his colleagues at the James M. Anderson Center for Health Systems Excellence at Cincinnati Children's Hospital, Halfon offered. ImproveCareNow has demonstrated how a learning health system can be created using learning networks to create a large community of people committed to testing, improving, and learning together in order to make bold transformative improvements in outcomes.¹ These are huge problems with deep interconnected roots, and we need to do a better job of learning faster and developing solutions that are more transformative.

Potential Future Research to Promote Mental, Emotional, and Behavioral Health for Children

Throughout the six-part webinar series, numerous speakers and discussants presented their work across a diverse array of fields relating to mental, emotional, and behavioral health. Many highlighted the changing

¹For more information on ImproveCareNow, see <https://www.improvecarenow.org>.

epidemiology in this area over the last few decades and the wealth of data that had been collected to paint the picture demonstrating the needs and context nationally. In addition to suggesting new methods of care delivery and policy approaches for improving outcomes for children, though, several speakers highlighted areas where future research is needed to truly address the problems at hand and better understand the nuances of these multifaceted and complex issues. This chapter highlights those suggestions.

Kimberly Hoagwood, Cathy and Stephen Graham Professor of Child and Adolescent Psychiatry at New York University's School of Medicine, emphasized that, in terms of children's mental health research, there has been a 42 percent decrease in funding from the National Institute of Mental Health (NIMH) since 2005. Overall investment in children's services research is only around 2 percent of the NIMH budget, she said. This is also mirrored by state budgets, which similarly underfund research for children's services.

More specifically, a few speakers touched on the need for research and improved understanding that could promote children's mental and emotional health and better outcomes overall. Stephen Buka, professor of epidemiology at the Brown School of Public Health, pointed out the lack of long-term, longitudinal cohort data for children with mental disorders and disabilities, saying that new studies of this sort could allow for tracking development with interventions similar to the approach used by the GenV study in Melbourne described in Chapter 2. He also highlighted that there is no dedicated surveillance system for mental health in children. This results in patchwork, ad hoc systems that make it difficult to ascertain the true burden of these diseases and the nature of the changing epidemiology. During his presentation, Buka noted that internalizing and externalizing symptoms may be changing in recent cohorts of young people, but it is difficult to tell. Available evidence suggests that the burden of internalizing symptoms is most clearly increasing in adolescent girls in particular, but it is unclear as to whether the same thing is happening in boys as well. It is essential, Buka said, for further research to regularly monitor trajectories of mental health symptoms to help us understand how different factors may influence these conditions.

During the presentation of Pilyoung Kim, director of the Family and Child Neuroscience Lab at the University of Denver, some participants asked about findings in the literature based on varying demographics and the different socioeconomic settings in which children live. Kim pointed out the lack of knowledge in the neuroimaging space and the need for greater diversity in those studies to understand cultural differences in interventions. There is also likely a lot that could be learned about geographical differences such as rural versus urban environments and how those children respond to both identified risk and protective factors.

Policy is an area that has often been neglected in this space to the detriment of us all, Hoagwood stated, but it is not feasible for the government and for hospitals to take on the entire burden, making research a necessary element to bridge the gap. She highlighted the lack of comparative policy impact studies in the United States, especially in comparison to other countries, which in the future could help us decide which policy options would have a better impact and outcome on the intended audience.

There were multiple examples of best practices and novel applications presented throughout the entire series. Taking those examples, applying them to local context, and continuing to push forward to learn more about some of the areas highlighted in this chapter can help the field continue to advance in achieving the goals of improving mental, emotional, and behavioral health for children and families.

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A

Schedule of Webinars

September 16, 2019: *Challenging Trends of Mental Health Disorders in Children and Youth*

- Neal Halfon (Director, UCLA Center for Healthier Children, Families, and Communities)
- Kimberly E. Hoagwood (Cathy and Stephen Graham Professor of Child and Adolescent Psychiatry, School of Medicine, New York University)

October 25, 2019: *Changing Epidemiology of Children's Mental Health*

- Stephen Buka (Founding Chair, Epidemiology, Brown University School of Public Health)

November 21, 2019: *Developmental Origins of Children's Mental Health Disorders: Scientific Advances*

- Pilyoung Kim (Director, Family and Child Neuroscience Lab, University of Denver)

February 13, 2020: *Generating a Comprehensive Policy Response to Children's Changing Mental Health Needs*

- Benjamin Miller (Chief Strategy Officer, Well-Being Trust)
- Alex Briscoe (Principal, California Children's Trust)
- Nathaniel Counts (Associate Vice President of Policy, Mental Health America)

April 16, 2020: *Primary Care Approach to Prevention*

- Laurel Leslie (Vice President, Research, American Board of Pediatrics)
- Thomas Boat (Director, CFWELL, Cincinnati Children's Hospital Medical Center)

May 20, 2020: *Reframing Dysfunction and Disease as an Adaptive Response to Experiences and Exposures*

- Erin Dunn (Assistant Professor, Psychiatric and Neurodevelopmental Genetics Unit, Massachusetts General Hospital)

B

Biographical Sketches of Workshop Presenters and Planning Committee Members

William Beardslee (*Planning Committee Member*) directs the Baer Prevention Initiatives at Boston Children's Hospital. He also serves as a senior research scientist at the Judge Baker Children's Center and as the distinguished Gardner-Monks Professor of Child Psychiatry at Harvard Medical School. His research interest centers on the development of children at risk due to parental adversities such as mental illness or poverty. His work is focused on the ways in which self-awareness and shared understanding help individuals and families cope with adversity. He currently directs the Boston site of a multisite study on the prevention of depression in adolescents using a cognitive-behavioral model. He has an M.D. from Case Western University and an honorary Sc.D. degree from Emory University.

Thomas Boat (*Planning Committee Member and Workshop Presenter*) is the dean emeritus of the College of Medicine at the University of Cincinnati and a professor of pediatrics in the Division of Pulmonary Medicine at the Cincinnati Children's Hospital Medical Center. He was formerly the director of the Cincinnati Children's Hospital Research Foundation and chair of the Department of Pediatrics at the University of North Carolina in Chapel Hill. More recently, he has worked at the local and national level to improve child health research efforts, subspecialty training, and clinical care. He has a special interest in issues posed by children's mental health for pediatric care, research, and training, and he is working in Cincinnati and nationally to promote children's behavioral health. He is a member of the National Academy of Medicine. He has also served as chair of the American Board of Pediatrics and as president of both the Society for Pediatric

Research and the American Pediatric Society. He has an M.D. in pediatric pulmonology from the University of Iowa.

Alex Briscoe (*Workshop Presenter*) was appointed director of the Alameda County Health Care Services Agency in 2009, where he led one of the state's largest public health systems, overseeing health and hospital systems, public health, behavioral health, and environmental health departments with an annual budget of \$700 million and 6,200 full-time contract and civil service staff. Before joining the county, he was the director of the Chappell Hayes Health Center at McClymonds High School in West Oakland, a satellite outpatient center of Children's Hospital and Research Center. He has designed and administered a number of mental health and physical health programs and services in child serving systems, including home visiting programs, programs for medically fragile children, and clinical and development programs in child welfare, juvenile justice, and early childhood settings. Briscoe is a mental health practitioner specializing in adolescent services and youth development. He has specialized in Medicaid policy and administration, emergency medical services, youth voice and crisis counseling, and safety net design and administration.

Stephen Buka (*Workshop Presenter*) is a professor and was the founding chair of the Department of Epidemiology at the Brown University School of Public Health. Buka is an epidemiologist whose work centers on the causes and prevention of neuropsychiatric disorders. He has conducted extensive research in neuropsychology and psychiatric epidemiology and has directed several major longitudinal studies examining the impact of birth complications, environmental hazards, and socioeconomic conditions on behavioral and intellectual development. He launched and is directing the New England Family Study, which is a prospective, three-generation study of over 5,000 participants from the Boston and Providence sites of the National Collaborative Perinatal Project, which combines a family design, discordant sibling sets, molecular genetics and biological assays, psychiatric, neuropsychological, and functional imaging assessments.

Nathaniel Counts (*Workshop Presenter*) is the senior policy director at Mental Health America, where he works on innovative federal and state policy solutions for problems in behavioral health. In particular, he focuses on issues in incentive alignment and sustainable financing in behavioral health care, as well as issues in population health. Counts serves on the boards of directors for the One Circle Foundation, CHADD (Children and Adults with ADD), and the Flawless Foundation. He received his J.D. cum laude from Harvard Law School, where he was a Petrie-Flom Center for Health Law policy student fellow, and his B.A. in biology from Johns

Hopkins University. His most recent publication was “Promoting Mental Health and Well-Being in Public Health Law and Practice” in the *Journal of Law, Medicine & Ethics*.

Erin Dunn (*Workshop Presenter*) is a social and psychiatric epidemiologist with expertise in genetics and epigenetics. Her research laboratory uses interdisciplinary approaches to better understand the social and biological factors that influence first onsets of depression among women, children, and adolescents (www.thedunnlab.com). Dunn is currently an assistant professor at the Massachusetts General Hospital (MGH) and Harvard Medical School and is affiliated with the Broad Institute of Harvard and MIT, the Center on the Developing Child at Harvard, and the Henry and Allison McCance Center for Brain Health at MGH. She is the director of research for the Brain Health Initiative, a study based in Florida that aims to revolutionize what we know about (and how we prevent and treat) brain health conditions across the life course (www.brainhealthinitiative.org). She has led several genetic studies that were the first of their kind, and this work was recognized by the Anxiety and Depression Association of America through the Donald F. Klein Early Career Investigator Award and the Brain & Behavior Research Foundation through the Gerald R. Klerman Award, Honorable Mention. She is a 2017 recipient of a National Institute of Mental Health-funded Biobehavioral Research Award for Innovative New Scientists (BRAINS). In 2018, she was awarded a Rising Star award from One Mind.

Neal Halfon (*Workshop Presenter*) is the founding director of the UCLA Center for Healthier Children, Families, and Communities, and also directs the Child and Family Health Leadership and Training Program at the UCLA Fielding School of Public Health. Halfon is professor of pediatrics in the David Geffen School of Medicine at UCLA; health policy and management at the UCLA Fielding School of Public Health; and public policy at the UCLA Luskin School of Public Affairs. For more than two decades, Halfon has been instrumental in advancing research, policy, and systems innovations focused on the healthy development of children at local, national, and international levels. The Center for Healthier Children, Families, and Communities has created a new interdisciplinary platform at UCLA to pursue transdisciplinary research, provided a mechanism to launch significant community-based research, and has spearheaded service and training initiatives.

Kimberly Hoagwood (*Workshop Presenter*) is the vice chair for research in the Department of Child and Adolescent Psychiatry at the New York University (NYU) School of Medicine. Her research portfolio focuses on

four areas: child, adolescent and family outcomes; parent engagement and activation; implementation science in policy contexts; and quality measurement. She also works with the Division of Child, Adolescent, and Family Services at the New York State Office of Mental Health as a research scientist. Hoagwood received her Ph.D. in school psychology from the University of Maryland, College Park. Prior to joining the faculty at NYU, Hoagwood was a professor of clinical psychology in psychiatry at Columbia University. Before that, she was the associate director for child and adolescent mental health research in the Office of the Director at the National Institute of Mental Health, where she also directed the child and adolescent services research program. She is the co-director with Mary McKay of the Community Technical Assistance Center, which serves all of the child service agencies in New York State. She is the principal investigator on several other major grants and subcontracts, all focused on improving the quality of services and outcomes for children and families.

Pilyoung Kim (*Workshop Presenter*) is an assistant professor in the department of psychology and the director of the Family and Child Neuroscience Laboratory at the University of Denver. She received a Ph.D. in developmental psychology from Cornell University and received postdoctoral training in developmental-affective social neuroscience at the National Institute of Mental Health. Her NIH-funded longitudinal research program focuses on investigating how poverty influences brains of two generations (new mothers and their infants). She and her team investigate the roles of prenatal and postnatal exposure to poverty and stress in (1) neural adaptation to parenthood in new mothers and (2) brain development in infants and young children. Her primary research method is pediatric neuroimaging using a functional magnetic resonance imaging, which enables strong research investigation into environmental effects on human brain development. She has over 50 publications and was awarded the Victoria S. Levin Award for Early Career Success in Young Children's Mental Health from the Society for Research in Child Development.

Laurel Leslie (*Planning Committee Member, Workshop Presenter*) is an associate professor at the Tufts University School of Medicine with a primary appointment in the Department of Medicine and a secondary appointment in pediatrics. She is an active faculty member in the Sackler School of Graduate Biomedical Sciences. She is also the associate director of community engagement at Tufts Clinical and Translational Science Institute. Leslie received her B.A. from Harvard University and her M.D. from the University of North Carolina at Chapel Hill. She completed her residency training in primary care pediatrics and fellowship training in developmental-behavioral pediatrics at the University of California, San Francisco, where she also

served as the chief medical resident. Subsequently, she served as a research scientist with the Child and Adolescent Services Research Center at Rady Children's Hospital and Health Center in San Diego. Leslie received an M.P.H. in epidemiology and biostatistics at San Diego State University. Leslie joined the Institute for Clinical Research and Health Policy Studies at Tufts Medical Center in the fall of 2006. Leslie's areas of inquiry include the impact of guidelines and policy initiatives on youth service use and outcomes and collaborative models of care across sectors that incorporate the child and family as active participants in care. Leslie also maintains an active interest in defining the future of pediatric practice and education, participating in the Task Force on the Future of Pediatric Education II, the Pediatric Leadership Alliance, and the American Board of Pediatrics' current Residency Review and Redesign Project.

Benjamin F. Miller (*Workshop Presenter*) is the chief strategy officer for Well Being Trust, a national foundation committed to advancing the mental, social, and spiritual health of the nation. He helps oversee the foundation's portfolio ensuring alignment across grantees, overall strategy and direction, and connection of the work to advance policy. Prior to joining Well Being Trust, Miller spent 8 years as an associate professor in the Department of Family Medicine at the University of Colorado's School of Medicine, where he was the founding director of the Eugene S. Farley, Jr. Health Policy Center. He remains a senior advisor to the Farley Center. Miller is currently an adjunct professor in the Department of Psychiatry and Behavioral Sciences at the Stanford School of Medicine. He received his Ph.D. in clinical psychology from Spalding University in Louisville, Kentucky. He completed his predoctoral internship at the University of Colorado's Health Sciences Center, where he trained in primary care psychology. In addition, Miller worked as a postdoctoral fellow in primary care psychology at the University of Massachusetts Medical School in the Department of Family Medicine and Community Health.

