



REVIEW ARTICLE

Social determinants of health, personalized medicine, and child maltreatment

Wendy G. Lane^{1,2} and Howard Dubowitz²

This review begins with a brief summary of the importance of child maltreatment as a major public health problem, given its prevalence and the substantial human and economic costs involved. The focus then shifts to consideration of personalized medicine and child maltreatment, including genetic and genomics factors, as well as the role of social determinants of health. Research on epigenetics related to child abuse and neglect is presented, followed by that pertaining to a few specific social factors, such as poverty, parental depression and substance use, and domestic (or intimate partner) violence. The review ends with a discussion of interventions to help address social determinants of health with brief descriptions of several model programs, and thoughts concerning the role of personalized medicine in addressing child maltreatment in the foreseeable future.

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IMPACT:

- This paper synthesizes knowledge on social determinants of health and advances in genetics and genomics related to the prevention of child maltreatment.
- It provides examples of model approaches to addressing the prevention of child maltreatment in primary care practices.

THE IMPORTANCE OF CHILD MALTREATMENT (CM)**Prevalence**

CM is a major public health problem in the United States, affecting many lives, and costing individuals, families, and our society dearly. In 2018, 7.8 million children were reported to Child Protective Services (CPS). Of these, 678,000 children (i.e., 9.2 per 1000) were “substantiated” victims of child abuse and neglect.¹ Yet, reported cases capture only the tip of the iceberg. The National Incidence Study (NIS-4), using observations by community professionals, estimated that 1.26 million children (i.e., 17.1 per 1000) were maltreated in 2005–2006, and the more inclusive “Endangerment Standard” involved nearly three million victims (i.e., 40 per 1000).²

Outcomes

The consequences of CM can be devastating—in the short term and long term. In addition to injuries and physical health problems, child and adolescent sequelae include many psychological and behavioral problems.^{3–7} CM has also been linked to an array of adult outcomes such as substance use disorders, HIV/AIDS-related sexual risk behaviors,^{8–14} and being a victim and/or perpetrator of intimate partner violence (IPV).^{15–20} Other problems in adulthood include depression, suicide, criminal behavior, interpersonal problems, and academic and vocational difficulties,^{21–30} as well as multiple physical health problems.^{31–34}

Costs

The financial costs of CM are immense. The costs associated with injuries due to physical abuse far exceed the per-child costs of

non-inflicted injuries of comparable severity.³⁵ Two-thirds of the medical costs of CM are paid through Medicaid.³⁶ Additional costs are incurred by the child welfare, educational, mental health, and judicial systems, with estimated US costs of \$103.8 billion per year.³⁷

Prevention

There is clearly a compelling need for preventing CM. Doing so requires identifying and ameliorating risk factors and strengthening protective factors, thus fostering safe, stable, and nurturing relationships.³⁸ The broad concepts of social determinants of health (SDH) and personalized medicine each contribute to our understanding of risk and protection from maltreatment as well as its long-term sequelae.

PERSONALIZED MEDICINE AND CM

Personalized medicine has been defined in several different ways, and sometimes the term has been considered interchangeable with “individualized medicine” or “precision medicine.” Ginsburg and Willard³⁹ defined it as care informed by individuals’ unique genetic, genomic, and environmental information. The NIH has defined it as an emerging approach to disease treatment and prevention that takes each person’s variability in genes, environment, and lifestyle into account.⁴⁰ Yet, despite the inclusion of environmental factors in the definition, personalized medicine research has primarily focused on genetics and genomics. In one recent systematic review of precision medicine focused research, only 30% of articles included environment and lifestyle in their

¹Department of Epidemiology and Public Health, University of Maryland School of Medicine, Baltimore, MD, USA and ²Department of Pediatrics, University of Maryland School of Medicine, Baltimore, MD, USA

Correspondence: Wendy G. Lane (wlane@som.umaryland.edu)

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definition of precision medicine.⁴¹ Further, only 1.6% of publication titles included terms related to social and environmental determinants or health, health disparities, or health (in)equities, suggesting that even when these issues were included, they were not the primary focus.

In the context of CM, there are roles for both the genetic and genomic aspects of personalized medicine, as well as the environmental factors, or SDH. Ecological–developmental theory posits multiple and interacting contributors to CM, including both risk and protective factors, involving the individual and the surrounding environment. Genetics and genomics may help explain how exposure to CM can lead to long-term adverse health outcomes in some individuals but not others, to identify those who may be at greater risk of long-term health sequelae, and to identify those who may respond to specific interventions. There is also the potential to track individual responses to interventions if changes to the genome can be reversed. Much of this work is still in its early stages and has not yet been applied to ascertainment of individual-level risk nor potential treatment response. Personalized care through the identification and amelioration of SDH currently plays a much larger role in CM, particularly in the context of prevention. This article briefly reviews some potential contributions of genetics and genomics to the understanding and “personalized” approach to CM, but focuses primarily on the social and environmental determinants of health as they relate to the prevention of maltreatment. It is also important to note that gene–environment interactions may play a role in both prevention and outcomes of CM; therefore, interventions to address SDH may well influence outcomes through epigenetic changes.

EPIGENETICS AND CM

Over the past several decades, basic science research has established that CM and other stressors can become “biologically embedded,” in a manner that increases the risk for poor health outcomes through increased vulnerability or decreased resilience.⁴² Potential mechanisms may include neuroendocrine dysfunction, excessive inflammatory response, changes in metabolic function, and decreased immune response. Understanding of epigenetics has begun to clarify the molecular pathways through which these changes in biologic processes may occur and are subsequently incorporated into the genome.

DNA methylation, a tool that cells use to turn genes “off” and “on,” has been the most commonly studied mechanism of epigenetic change regarding the impact of CM.^{43–46} A recent systematic review identified 72 studies over the previous 20 years examining the relationship between CM and DNA methylation.⁴⁷ Only weak associations were identified in the three studies examining CM and overall DNA methylation. However, associations between CM and increased methylation were identified when examining several specific candidate genes, selected based on a priori hypotheses, including *NRC31* (glucocorticoid receptor) and *SLC6A4* (serotonin transporter). Telomere length has also been studied as an epigenetic marker of chronic stress, including CM. While telomere length normally shortens with cell division and aging, accelerated shortening has been identified in children exposed to both interpersonal^{48–51} and community violence.⁵²

Both DNA methylation and telomere shortening have also been associated with chronic physical and mental health problems. For example, Yang et al.⁵³ found that multiple DNA methylation sites identified as modified in maltreated children served as markers for breast, colon, lung, prostate, and ovarian cancer development. A systematic review of DNA methylation in CM by Neves et al.⁴⁶ identified methylation patterns in genes associated with post-traumatic stress disorder (PTSD), major depressive disorder, depression, anxiety, and suicide. Cecil et al.⁴⁷ found that DNA methylation sites are associated with neurodegeneration and

Alzheimer’s disease, intellectual disability, attention deficit hyperactivity disorder, bipolar disorder, major depression, and schizophrenia. While not specific to maltreated individuals, shortened telomere length has been associated with cancer⁵⁴ and cardiovascular disease.⁵⁵ There is therefore some potential to use personalized medicine to predict, among those with a history of CM, which individuals may be at greater risk for long-term health repercussions. However, the extent of the increased risk has not been quantified, and clear implications for clinical practice have not yet emerged.

In addition to the potential for predicting long-term health effects of CM, several studies have shown that epigenetic changes may help predict or track response to treatment. Yehuda et al.⁵⁶ followed 16 combat veterans with post-traumatic stress disorder and measured cytosine methylation in promoter regions of two glucocorticoid-related genes pre- and post psychotherapy. Methylation of one of these promoter genes (*NRC31*) predicted which subjects responded clinically to treatment. In addition, greater expression of a different promoter gene (*FKBP51*) was associated with a positive response. Perroud et al.⁵⁷ found that individuals with borderline personality disorder who responded to intensive dialectical behavioral therapy had decreased methylation of the *BDNF* gene post treatment, while non-responders had increased methylation. Increases in methylation at a serotonin transporter promoter were associated with treatment response in children with anxiety receiving cognitive behavioral therapy.⁵⁸ Shields et al.⁵⁹ in a study specifically focused on CM found that emotional support attenuated the effects of severe physical and sexual abuse on methylation, suggesting that meeting children’s emotional needs may buffer the epigenetic effects of CM. This study is particularly important as it provides preliminary evidence that emotional response and social conditions—that is, SDH—may ameliorate or prevent the long-term health effects of CM.

SOCIAL DETERMINANTS OF HEALTH AND CM

SDH are defined by the World Health Organization (WHO) as “the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life.”⁶⁰ SDH lead to disparities in health outcomes through increased risk for illness, decreased access to health care, and fewer opportunities for health promotion and disease prevention. While the WHO has focused on community- and societal-level issues, such as economic and social policies, and social and cultural norms, others have included individual- and family-level factors that may contribute to poor health.^{61,62}

The National Academies of Sciences⁶³ has stated that SDH should be integral to health professional education and training to better understand the context of a patient’s illness. They are also careful to note that health care professionals should understand a community’s circumstances and needs before identifying and intervening in SDH. The National Academies noted that action should take place within the context of “well thought out partnerships” between medical professionals and others in the community.

This topic is not new to child health professionals. Child health has long been viewed in the context of family and community.⁶⁴ However, the extent to which pediatricians can and should intervene on behalf of individual children and families in the context of the health encounter has evolved over the past decade. There has been mounting interest in the health care system to help address SDH to promote health and wellbeing in general, and also to prevent children from being abused or neglected. This is due, in part, to the now extensive literature on how SDH contributes to adverse health outcomes. This development is also the result of a small number of interventions that have successfully identified and ameliorated some of the adverse effects of SDH for many children and families. In this paper, we focus on preventing CM. Addressing

CM requires an understanding of the risk and protective factors as well as the processes that explain this phenomenon. Ecological–developmental theory posits multiple and interacting contributors, including both risk and protective factors, involving the individual and the surrounding environment. The following section briefly describes some of these SDH germane to CM.

Poverty

In 2018, 11.9 million children in the United States lived in poverty, representing 16% of the child population. While children represented 23% of the population, they accounted for 31% of people in poverty.⁶⁵ Children living in poverty are more likely to have physical, mental health, and developmental conditions compared to children not living in poverty. Examples include higher rates of asthma, dental caries, language delays, poor growth, depression, and conduct disorders.⁶⁶ In general, families living in poverty have a reduced ability to provide for the basic needs of their children, including food, shelter, and health care. Economic and other stressors may increase parental conflict, harsh verbal and physical punishment, and decrease nurturing.^{66,67} Several studies have shown temporal associations between poverty and CM, including increased child welfare involvement following home foreclosure or decreases in welfare payments,^{68,69} as well as reductions in CM when economic circumstances improve.^{70,71}

Neighborhood poverty

Neighborhood poverty has also been directly linked to CM. Families living in high poverty neighborhoods have been found to be at increased risk for CM,⁷² and neighborhood poverty has also been identified as one of the strongest predictors for CM when examining census tract data in Baltimore.⁷³ In addition, even sharing a border with at least one other poor neighborhood increases the risk for CM,⁷⁴ particularly for African-American neighborhoods.⁷⁵

Housing insecurity

Housing insecurity may be defined by a number of factors, including: high housing costs in relation to income, poor housing quality, unstable neighborhoods, overcrowding, homelessness, multiple moves in the past year, and difficulty paying rent.^{76,77} In 2015, 2.9 million US households with children had “worst-case” housing needs, defined as renters with incomes below 50% of the area median income who receive no government housing assistance or, those paying more than one-half of their income for rent, living in severely inadequate conditions, or both.⁷⁸ Housing insecurity has been associated with poor health, poor growth, and developmental delays in children.⁷⁹ Unsafe neighborhoods and inadequate housing can mentally and emotionally strain parents, making it difficult to cope with children’s needs. Multiple studies have examined the impact of housing instability on children, finding higher rates of CM when compared to more stably housed families.^{74,80,81} Children living with caregivers in unsafe housing are also less likely to receive adequate physical care.⁸¹ Housing insecurity is directly associated with neglect and indirectly via maternal stress.⁸²

Energy insecurity

Energy insecurity is closely linked to housing insecurity. Energy insecurity includes threatened or actual utility shut-off or refused delivery of heating fuel, an unheated or uncooled home because of unpaid utility bills, or the use of a cooking stove for heat.⁷⁶ Children’s high skin surface area to mass ratio makes them more vulnerable to extreme heat and cold. A 1996 study identified a possible association between energy insecurity and failure to thrive. The authors reported lower weight for age in children going to an ED within 3 months following the coldest month of

the year than at other times of the year, thought to be related to increased caloric needs during winter months due to cold stress and infections.⁸³

Food insecurity

Food insecurity is also closely associated with poverty and may be linked both directly and indirectly to CM; it may be considered a form of societal neglect in a wealthy country. Severe child hunger has been directly linked to overall poor health in school-age children, even after controlling for low birthweight, housing status, maternal distress, and stressful life events.⁸⁴ Food insecurity contributes to failure to thrive, when families overdilute infant formula, thereby providing inadequate calories for growth.⁸⁵ Food insecurity may also be associated with obesity, potentially mediated through maternal depression.⁸⁶ Food insecurity is also indirectly associated with CM, through several pathways, including parental depression and anxiety, decreased positive parenting behavior, and decreased responsiveness and sensitivity to infant cues and distress.^{86–88} Similarly, children faced with food insecurity are more likely to exhibit behavioral problems and hyperactivity, increasing their risk for maltreatment.^{87–89}

Parental depression

Parental depression is a frequent problem among mothers and fathers of children. An estimated one in ten US children is cared for by a depressed mother in any given year.⁹⁰ Depressed mothers experience more adversities (poverty, separation or divorce, unemployment, financial difficulties) and have worse functioning. A synthesis of research on paternal depression during the perinatal period found prevalence rates of 2.3–8.4%.⁹¹ A large study in the United Kingdom found that by child’s age 12 years, 39% of mothers and 21% of fathers had experienced depression, especially in the first year post partum.⁹² Parents with a history of depression, younger parents, and those from deprived areas were particularly vulnerable to depression.

Several studies have demonstrated the adverse effects of maternal depression on children, including depression, anxiety, and conduct disorder.^{91,93,94} A few studies have also shown consistent associations between postnatal paternal depression and an increased risk of behavioral and emotional problems in children between 3 and 5 years of age.^{95–97} One study suggested that the association between depression in fathers during the postnatal period and subsequent child behavior is explained predominantly by family factors, such as depression in the mother and couple conflict.⁹⁸ In contrast, the link between maternal depression and child outcomes is better explained by other factors, which might include direct effects of depression on mother–infant interaction. There is also a strong link between maternal depression and CM.⁹⁹ For example, one study found that maternal depression was a significant predictor of a report to CPS in the first 4 years of a child’s life.¹⁰⁰ Maternal depression was associated with severe physical abuse, after controlling for sociodemographic factors such as family income, race, and mother’s educational level.⁹⁹ Another study found that mothers with probable comorbid PTSD and depression reported greater parenting stress¹⁰¹ and more psychological aggression toward and physical assaults of their children. A prospective study of behavior associated with neglect found maternal depression to be strongly predictive of preschoolers’ internalizing and externalizing behavior problems.¹⁰² The benefits to children of treating maternal depression have been shown.

Parental substance abuse

The number of children in the United States living with at least one substance-abusing parent is alarming.¹⁰³ Data from the combined 2009–2014 National Surveys on Drug Use and Health found that 8.7 million children or 12.5% of children under age 18 years lived with at least one parent who abused drugs or

alcohol.¹⁰⁴ More than one-third of these children (36%) were under age 6 years.¹⁰⁵

Neger and Prinz¹⁰³ summarized the literature on the harm to children related to parental substance abuse.¹⁰³ Infants exposed to prenatal drugs were found to have a difficult temperament, including irritability, sleep and feeding disturbances, excessive crying, and physical ailments such as gastrointestinal problems, fever, and seizures. Children under the age of 3 years are at risk for insecure and disorganized attachment and poor development, especially regarding speech and language. School-age children are apt to show aggressive behaviors, have fewer friends and experience more peer conflict, and are at risk for hyperactivity and inattention. Adolescents of parents who abuse substances show high rates of psychopathology, such as depression, anxiety, and substance abuse. Another study found that parental substance abuse was associated with children's hospitalization for both somatic and psychiatric conditions.¹⁰⁶ The authors speculated that this may be related to an unsafe environment, long-standing stress, and inadequate responses to the child's needs. There is also the likelihood that substance abuse is associated with ineffective parenting practices, such as coercive parenting styles, less supervision, and harsh punishment.^{107,108}

Not surprisingly, parental substance abuse has been associated with CM, particularly neglect,¹⁰⁹ as well as increased recidivism.¹¹⁰ In one study, over 8000 participants who grew up with one or more alcoholic parents were twice as likely to experience emotional, physical or sexual abuse, or neglect during childhood than those whose parents were not alcoholics.¹¹¹

Intimate partner (or domestic) violence (IPV)

IPV is defined as any physical, psychological, or sexual harm committed by a current or former partner or spouse.¹¹² IPV continues to be a serious problem in the United States and internationally. It is estimated that more than a third of women (36%) and more than a quarter of men (29%) in the United States experience rape, physical violence, and/or stalking by an intimate partner in their lifetime.^{113,114} Approximately 15.5 million children are estimated to live in two-parent households in which IPV occurred in the previous year,¹¹⁵ and ~16% witnessed IPV at least once during their lives.¹¹⁶

Substantial evidence links children's exposure to IPV with many serious consequences, including emotional, behavioral, physical, social, and academic problems.¹¹⁷ Children may become involved in physical altercations, leading directly to injury and to developing violent means of resolving conflict.^{17,118} Bair-Merritt and colleagues examined 22 papers on children's exposure to IPV and physical health consequences. They concluded that such exposure to IPV is related to increased adolescent and adult risk-taking behavior (e.g., substance abuse), but that there is insufficient evidence to draw conclusions regarding overall health status, use of health services, breastfeeding practices, and infant weight gain.¹⁷ Some evidence suggests exposure to IPV may also be associated with physical changes in the brain.¹¹⁹ A meta-analysis reviewed 74 studies that examined children's exposure to IPV and later adjustment problems.¹²⁰ Children exposed to IPV were at risk for externalizing, internalizing, and total adjustment problems, and the relationship strengthened over time. Associations were also stronger when IPV was conceptualized broadly, including psychological and sexual violence. Child sex, sample type, and whether only the male partner's or both partners' violence was measured did not predict the association between children's exposure to IPV and later adjustment problems. Children exposed to IPV may also exhibit impaired emotional and cognitive development with potentially far-reaching implications for children's ability to successfully negotiate school and interpersonal domains and develop into successful adults. A prospective study of 213 adolescents found that exposure to either physical or verbal aggression in adolescence was associated with perpetrating abuse and victimization in

adulthood.¹²¹ However, several authors have cautioned that this link may be weak, with many studies having methodological shortcomings such as the lack of prospective longitudinal designs.¹¹⁷ In addition, many children exposed to IPV appear to be resilient. For example, Kitzmann and colleagues found that 37% of children exposed to IPV had outcomes similar or even better than children who were not exposed to IPV.¹²²

Exposure to IPV is also associated with long-term mental health problems,¹²³ especially when IPV co-occurs with CM,¹²⁴ and they do frequently co-occur. One review found co-occurrence rates between 30 and 60% in most of the 31 studies.¹²⁵ A review of similar studies found a co-occurrence rate of about 40% regarding IPV and child physical abuse.¹²⁶ This research provided the basis for the American Academy of Pediatrics policy urging pediatricians to help address IPV.¹²⁷

INTERVENTIONS TO ADDRESS SDH

Several interventions have been developed for addressing SDH within the pediatric primary care setting. Some common components include identifying risk (and sometimes protective) factors through screening, incorporation of behavioral change strategies such as motivational interviewing, and referrals of families with specific needs to other professionals and/or community agencies for assistance.

There are a number of considerations in selecting one's approach. 1. It is preferable to use an intervention that is evidence-based and that was developed for clinical care. 2. It is ideal that screening tools have solid psychometric properties (e.g., high sensitivity). There is however the potential benefit of identifying a problem some fraction of the time rather than not at all. 3. Time constraints in primary care argue for prioritizing problems that are prevalent and where resources are available. The availability of affordable housing is a huge problem, but pediatricians in general have few options for helping. 4. Many parents are unfamiliar with being asked about SDH; this is tricky territory. Thus, it is valuable to introduce the questions sensitively, to facilitate disclosing potentially embarrassing information. 5. Some approaches identify specific concerns, whereas others focus on risk categorization. It appears that the former is more useful, helping guide interventions tailored to the specific needs of an individual family. 6. It is likely important how and by whom the screen is administered. Interestingly, people appear to be more willing to share socially undesirable information, such as pertaining to substance use, indirectly—on paper or a computer—than face to face. They may also be more willing to disclose problems in the context of a trusting relationship with a primary care professional (PCP) compared to online when enrolling for a governmental assistance program. Practitioners need to weigh these factors in optimizing their approach to SDH screening. The following are exemplary approaches to this task.

THE SAFE ENVIRONMENT FOR EVERY KID (SEEK) MODEL (WWW.SEEKWELLBEING.ORG)

The SEEK model offers a practical, evidence-based approach to help PCPs address targeted psychosocial risk factors for CM in families with children aged 0–5 years. The targeted problems are: parental depression, major stress, substance abuse, IPV, food insecurity and harsh punishment. By helping address these problems, SEEK aims to strengthen families, support parents and parenting, and thereby promote children's health, development and safety, and help prevent child abuse and neglect.

Core components of the SEEK model are: (1) *training PCPs* to help address the targeted risk factors; (2) the *SEEK Parent Questionnaire-R* to screen for the problems at selected well-child visits;^{128–133} (3) the *Reflect–Empathize–Assess–Plan* approach to help PCPs briefly assess and initially help address positive screens;

(4) principles of *Motivational Interviewing*; (5) facilitating referrals to in-house or community resources for identified problems; (6) *SEEK Parent Handouts* for the targeted problems, customized with information on local resources; and (7) ideally, a social worker or behavioral health professional, partnering with PCPs and parents.

Evidence supporting the SEEK model

Two randomized controlled trials have been conducted. The first was in pediatric residency primary care (“continuity”) clinics serving a very low-income urban population.^{134,135} The second was in 18 suburban private pediatric practices serving a mostly middle-income and relatively low-risk population.^{136,137} In both trials, medical professionals significantly improved in their level of comfort, perceived competence, and practice behavior with regard to addressing the targeted problems. Some of these improvements were sustained for up to 18–36 months beyond the initial training. In the first study, SEEK families benefited by having significantly less CM—assessed three ways: by parental report of how they handled conflict with their child, by review of medical records for instances of abuse or neglect, and by CPS reports. In the second study, SEEK mothers reported less harsh physical punishment and psychological aggression, reasonably considered as CM, compared to controls. SEEK did not require additional time on average for medical professionals to address psychosocial problems. In the second study, SEEK cost \$3.59 per child per year and \$305.58 per case of psychological aggression or physical assault averted.¹³⁸

HEALTH LEADS/WE CARE (WELL-CHILDCARE VISIT, EVALUATION, COMMUNITY RESOURCES, ADVOCACY, REFERRAL, EDUCATION)

Health Leads is a non-profit organization that trains undergraduate students to volunteer in urban health clinics helping families meet their social needs. Families seeking pediatric primary care complete a pre-visit screening form, physicians conduct an initial assessment of needs and make referrals to Health Leads staff. The Health Leads volunteer conducts an in-depth assessment, provides resources and phone follow-up to families, and updates the physician.¹³⁹ The program provides a toolkit for practices to create their own screening questionnaire; the program website (<https://healthleadsusa.org>) includes webinars and additional resources.

The WE CARE model was developed out of the Health Leads program.¹⁴⁰ It consists of a 10-item screener, brief provider education, and a Family Resource Book, developed with social work and legal advocacy colleagues. Psychosocial issues covered in the questionnaire include education and employment status, food insecurity, homelessness risk, parental depression, parental smoking, household problem alcohol or drug use, IPV, and childcare needs. Clinic families are asked to complete the screening questionnaire, and pediatric residents make referrals to resources if the parents request assistance. In a randomized, controlled evaluation, parents in the intervention group were more likely to discuss family psychosocial topics, receive referrals for services, and to have contacted a community resource compared to parents in the control group.¹⁴⁰ A subsequent study also found increased use of community resources.¹⁴¹ In addition, participants in the intervention group were more likely to be employed and to have childcare, and less likely to be in a homeless shelter.

MEDICAL–LEGAL PARTNERSHIPS

Medical–Legal Partnerships are programs that place lawyers and legal services within health care settings in order to address SDH through legal action. Legal services are typically provided by civil

legal aid organizations or law schools. Common issues that are addressed include access to health insurance, other public benefits, housing conditions, and educational services and accommodations for children with special health care needs. The program began in 1993 and has since expanded to nearly 300 health care sites, with a National Center for Medical–Legal Partnership at George Washington University. Each health center selects the SDH for which they wish to screen. Some focus solely on legal needs, while some screen for other issues that can be addressed by other staff such as social workers or financial counselors.

There has been some critique of MLP because of the lack of routine screening at MLP sites, and the absence of a formal screening protocol.¹⁴² In order to more systematically assess SDH, MLP collaborated with the National Association of Community Health Centers, and several other agencies to develop PRAPARE (The Protocol for Responding to and Assessing Patients’ Assets, Risks, and Experiences), a formal assessment tool. PRAPARE includes screening questions related to housing, financial stability, stress, employment, and insurance status. Screening questions addressing additional SDH such as IPV and incarceration history are optional. A number of studies have demonstrated the benefits of MLP programs, including improved health of asthma patients due to improved housing and improved access to services, and decreased barriers to care in children with sickle cell anemia.^{143–145}

PROJECT DULCE (DEVELOPMENTAL UNDERSTANDING AND LEGAL COLLABORATION FOR EVERYONE)^{146–148} ([HTTPS://DULCENATIONAL.ORG](https://dulcenational.org))

Project DULCE is a primary care-based intervention focused on infants 0–6 months. Based on a Strengthening Families protective factors approach,¹⁴⁹ the program built upon two interventions, Healthy Steps^{150,151} and Medical–Legal Partnership. Healthy Steps is an evidence-based program, which embeds a professional with child development expertise into pediatric primary care to educate, support, and refer parents for additional services. DULCE Family Specialists have postgraduate training in child development and training from both Healthy Steps and MLP. They meet with families in the clinic and in their homes, screen for child developmental and parental mental health problems, and offer support and referrals to help meet families’ needs.

A randomized trial found better immunization rates and fewer emergency department visits for intervention families compared to controls. Intervention families were also more successful in accessing resources, including food, energy, telephone, and emergency cash assistance.¹⁴⁸

In conclusion, there are many individual, family, community, and societal factors that may contribute to poor health through increased risk for illness, decreased access to health care, and a reduced opportunity for health promotion and disease prevention. The multiple SDH can be overwhelming to address in the primary care setting. However, there are resources available to help identify and address SDH, improve child and family health, and reduce the likelihood of CM.

It has long been apparent that the circumstances of children and families vary greatly. It follows that services and interventions should be personalized; that is, tailored to meet their individual needs. Efforts to prevent CM and to ameliorate its sequelae are best guided by understanding the specific psychosocial risk and protective factors at play. As stated at the outset, this paper is based on evidence reported in the published literature, but we did not conduct a systematic review. Inevitably, different papers use varying methodologies and have strengths and shortcomings. Nevertheless, there is support for the potential role that genomic and genetic information may play in personalizing approaches to helping families. However, much of this research is still preliminary, and clinical applications are limited. There is risk that

Table 1. Social determinants of health programs with web-based resources.

Program	SDH items screened	Additional resources	Resource availability
Health Leads	<p>ESSENTIAL: food insecurity, housing instability, utility needs, financial resource strain, transportation, exposure to violence</p> <p>OPTIONAL: childcare, employment, health behaviors, social isolation and support, behavioral/mental health</p>	<p>Screening Toolkit Social Needs Roadmap and Implementation Tools Specific information for Centers for Medicare and Medicaid Accountable Health Communities (AHC) grantees</p>	<p>https://healthleadsusa.org/</p>
Medical–Legal Partnership	<p>CORE MEASURES: (PRAPARE) Housing status and stability Employment Income/financial stability Stress Insurance status Transportation Social integration and support</p> <p>OPTIONAL MEASURES: Incarceration history Safety Intimate partner violence Refugee status</p>	<p>Toolkit for screening implementation and action, including appendix with resources. Free electronic health record templates for commonly used systems, including Epic, eClinicalWorks, GE Centricity, and NextGen</p>	<p>www.mlpboston.org www.medical-legalpartnership.org http://medical-legalpartnership.org/ PRAPARE Toolkit: http://www.nachc.org/research-and-data/prapare/toolkit/</p>
A Safe Environment for Every Kid (SEEK)	<p>Parental depression Major stress Unhealthy substance use Domestic (or intimate partner) violence Food insecurity Harsh punishment</p> <p>OPTIONAL: There is flexibility to add a few other problems</p>	<p>SEEK training videos SEEK Parent Questionnaire-R SEEK Algorithms and Responses to Barriers SEEK Parent Handouts Materials related to Motivational Interviewing and the Quality Improvement process</p>	<p>www.SEEKwellbeing.org</p>

the focus on high-tech genetic testing may detract from a focus on broad systemic issues, such as poverty, limited access to health care, and a paucity of policies and programs to support families, all of which contribute greatly to CM. Tackling these too remains a much needed priority (Table 1).

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Both authors contributed to the conception, acquisition of data, and interpretation of data; drafting the article; and final approval of this version.

ADDITIONAL INFORMATION

Competing interests: H.D. owns the copyright to the SEEK materials. All revenues received from associated licenses and trainings help sustain the dissemination of the SEEK model.

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