# CHAPTER 15

# Translating Contemporary Developmental and Health Science

*Designing an Early Childhood Program for Young Children and Their Families Living in Poverty*

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Almost every culture has a proverb, saying, or *dichos* (as noted by Cabrera, Chapter 11, this volume) about the value of early childhood experience for later development and life outcomes: *It is easier to straighten a tree during its nursery stage* [Ethiopian]; *Good work should begin as early as possible* [Indian]; *An ounce of prevention is worth a pound of cure* [American]; *Learning when young is like carving in stone* [Egyptian] (Odom & Kaul, 2003). This nearly universal belief is now substantiated by the science of brain development in early childhood that is documenting the toxic effects of risks associated with an economically impoverished environment and the benefits of environments that provide nurturance and care (Shonkoff & Phillips, 2000). Knowledge about the features of early child care and education (ECCE) programs that generate these benefits are informed by an active developmental and health science that has accrued over the past 40–50 years, since the classic and pioneering early education programs of the 1960s and 1970s. The purpose of this book has been to highlight the implications from the current scientific literature for designing a model of early care, intervention, and education that would positively affect life outcomes for the infants, toddlers, and their families experiencing the highest

risks. In this chapter, we draw on the science reported by chapter authors, as well as other sources, to describe the implications of developmental and health science for infant/toddler/family care and intervention. We propose a model that is cross-disciplinary, center and home based, and could be individualized for infants/toddlers and families in poverty.

## A Rationale for Focusing Early on Children and Families at Highest Risk Due to Poverty

As well stated by several authors of chapters in this book, during the prenatal, infancy, and toddler periods, formative features of health and development occur that have lifelong effects. Early brain development, beginning prenatally and advancing through the first 3 years of life (and beyond), is affected by maternal nutrition and health (Whitaker & Gooze, Chapter 9, this volume; Zuckerman, Chapter 10, this volume), the early social, linguistic, and physical environment (Bauer, Chapter 3, this volume), and the potentially toxic effect of stress (Shonkoff & Bales, 2011). Significant health events occur during that period, such as critical immunizations, nutrition and nutritional practices, and injury prevention (Zuckerman, Chapter 10, this volume; Whitaker & Gooze, Chapter 9, this volume). In addition, during the infant and toddler years, secure attachment to primary caregivers is formed (Berlin, Chapter 8, this volume), early cognitive skills and self-regulatory skills are established (Bauer, Chapter 3, this volume; Blair, Berry, & Friedman, Chapter 6, this volume; Columbo, Kannass, Walker, & Brez, Chapter 2, this volume), and language emerges (Hirsh-Pasik & Golinkoff, Chapter 4, this volume). Although subsequent life events will affect all of these features of development, the life events occurring between conception and the age of 3 have major effects on the course of development during later childhood, adolescence, and into adulthood (Aber, Chapter 1, this volume). All of the features of health, development, and learning, just noted, are affected by risks associated with poverty.

### Infants, Toddlers, and Families at Highest Risk

Early care and intervention programs for very young children already exist, with the most scaled-up program being Early Head Start (EHS). Love et al. (Chapter 13, this volume) concluded that EHS has positive effects for many young children and families, especially when the programs are implemented well enough to meet quality standards set by the agency (Love et al., 2005). However, they also noted that infants and families at highest risk did not benefit significantly, as compared to the control group, which has two implications. First, a different and potentially more intensive model of early care, education, and intervention may be necessary for the

most severely stressed children and families. Second, this raises a question concerning the identification of risk and the conceptualization of risk that is most likely to be useful for identifying potential nonresponders to typical early care and intervention programs.

Current theoretical perspectives elucidate the mechanisms by which risk factors play a role in human development and help to address these two issues (i.e., the possible need for different models for differentially stressed families and the identification and conceptualization of risk). Jones Harden, Monahan, and Yoches (Chapter 12, this volume) describe several types of risk models. Risk indicators include both biological and environmental variables associated with poor outcomes, such as lack of prenatal care, low birthweight, maternal education, teenage parenting, and poor quality of child care environment. An additive risk model suggests that risk variables have unique effects (Ackerman, Izard, Schoff, Youngstrom, & Kogos, 1999), while a cumulative risk model suggests that as the number of risks (regardless of their nature) increases the general risk to development increases (Rutter, 1979). Scientists have also proposed a transactional risk model (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007; Sameroff & Chandler, 1975). In this view, children with certain biological risk conditions (e.g., low birthweight) may respond differently than the general population of infants to the accumulation of risks.

The psychobiological systems view of development (Gottlieb, Wahlsten, & Lickliter, 2006) describes the mechanisms by which children with differing risk factors may respond differentially to early learning environments. This theoretical perspective holds that development is characterized by probabilistic epigenesis, the emergence of new structures and functions in the developing child due to dynamic interactions between and within genetic, neurological, behavioral, and environmental activity, which in turn results in increased complexity and organization over time. Thus, poverty influences development via these dynamic interactions among environmental risk factors and the individual behavioral, neurological, and genetic levels of the unique developing child. Due to the increased complexity that is resulting over time, this perspective also elucidates why beginning earlier in the lifespan is more effective than at later stages.

An ecological risk perspective, based on Bronfenbrenner's (Bronfenbrenner & Morris, 1998) ecological systems model and extended by Conger and Donnellan (2007) to a "family stress" model, suggests development occurs in the context of dynamic interactions among multiple, interdependent environmental levels, with more distal environmental levels (e.g., factors associated with poverty) influencing the more immediate environments of the developing child (e.g., family and care/educational settings) via their influence on proximal processes. Development occurs via these proximal processes, increasingly complex reciprocal interactions between the developing child and people and objects in his or her immediate environment. To

effectively promote development, this "interaction must occur on a fairly regular basis over extended periods of time" (p. 797). Further, risks residing within "microsystems" (e.g., family, child care setting) may potentially be moderated by "protective" influences at a "mesosystem" level (e.g., a high-quality child care program might moderate the influence of a high-stress family and/or home environment).

Some empirical research supports this theoretical proposition of potential moderating effects of protective environmental influences. In their study with the NICHD Early Child Care Research Network, Watamura, Phillips, Morrissey, McCartney, and Bub (2011) highlighted the deleterious effect for children in high-stress homes/poor-quality child care settings and the compensatory effects that could occur through high-quality child care. Some researchers find that children and/or families experiencing relatively greater risks may respond more strongly to treatment than children and families whose risks are less (Burchinal, Roberts, Zeisel, Hennon, & Hooper, 2006; see Pungello & Gardner-Neblett, in press). However, not all studies find this moderation effect (see Pungello & Gardner-Neblett, in press). For example, Love et al. (Chapter 13, this volume) found that the highest-risk families did not benefit from participation in EHS. The implication from these contrasting findings is that in designing an effective program for infants/toddlers/families in poverty, determining those who are not currently responding to standard, well-implemented early care and development programs is critical in order to provide an intervention that is intensive and well designed enough to work for them. To accomplish such a purpose, the current risk models need to be "translated" into operationalized procedures that can accurately predict high-risk infants/toddlers/families who are likely to be nonresponders to standard care already provided and procedures that will provide early intervention that will be most effective for them.

### Center- and Home-Based Model

Although in their evaluation of EHS programs Love et al. (Chapter 13, this volume) could not make conclusive statements about the model of early child care that would be most effective, there is good reason to believe that a center-based model that has a significant home and family component may be very applicable for the highest-risk children and families. Several authors in this volume have noted that programs for this population should be "two-generational" in that they should provide health and developmental services for children and family members (primarily mothers and fathers). High-quality center-based care for infants and toddlers, as Watamura et al. (2011) noted, may benefit those children who are in highly stressed family situations. For some families, removing child care responsibility for part of the day may provide opportunities for the caregiver to

look for work if needed or participate in social services if needed (e.g., job training, mental health services). In addition, a center-based program that is cross-disciplinary could be located where health care and social services may be accessed or provided.

A two-generational program would also include a significant home/family component. Such a comprehensive program would ideally begin prenatally with health care and social services for the mother and involve other family members. After the child is born, program staff would create a system for sharing information about programming at the center, plan a nutritional system that supports breast feeding and other appropriate nutrition, provide early parenting education (if needed), and involve the family members, as feasible in programs that occur at the center. The center–family linkage is a critical one. The acknowledged challenge will be to foster parental access and use of the program, because for the highest-risk parents an issue exists with child attendance (i.e., which could be addressed by providing programs in proximity to the home or transportation) and parent's utilization of services (Jones Harden et al., Chapter 12, this volume).

## Drawing Implications from Developmental Health Sciences

The studies that documented the effects of the Perry Preschool Project (Schweinhart, Berrueta-Clement, Barnett, Epstein, & Weikart, 1985), the Abecedarian Project (Ramey & Campbell, 1984), and the Chicago Child Parent Centers (Reynolds, Temple, Ou, Arteaga, & White, 2011)—the pioneering early childhood education programs—are approaching middle age. These early experiments, designed for a different generation of children and parents, demonstrated that early learning environments can have significant long-term effects for children. Since that time, a great deal of basic research in health and developmental science has taken place. Work is now needed that applies these current findings to programs that serve families facing the adversity and stress of poverty. The chapters in this book highlighted the science that has unfolded in the decades after the pioneering programs were implemented. In this section, we discuss implications from the health and developmental science that would extend the important and foundational work conducted by the pioneering program developers.

### Health and Nutrition

Following a cumulative risk model, Zuckerman (Chapter 10, this volume) proposes that individual risks related to poverty link together into a "chain" in which each risk "modifies and potentiates the other" (p. 241). As the persistence and number of risk factors mount, they establish an

"allocastic load" that builds through repeated responses to stressors. This is the mechanism by which poverty "gets under the skin" of infants and toddlers, through the production of cortisol and debilitating sequalea of other physiological reponses to stress (Blair et al., Chapter 6, this volume). For the child, this load begins to accumulate as early as conception, with the mother's health having immediate impact during pregnancy. A two-generational feature of a comprehensive intervention model affecting the highest-risk children would address the mother's (and other caregivers') physical and mental health as the focus of the model as well as the child's health. Health-related features of such a model would include prenatal medical visits and care, well-baby checks, and immunizations at appropriate times. Zuckerman (Chapter 10, this volume) notes that health-related behaviors have lifelong effects beginning in childhood. Efforts to incorporate health care and early childhood developmental programming are the Healthy Steps program (Zuckerman, Parker, Kaplan-Sanoff, Augustyn, & Barth, 2004) that combines home visiting as follow-up to pediatric visits and the Medical–Legal Partnership (*www.medical-legalpartnership. org*) program that assists families in civil matters related to poverty (e.g., housing, accessing financial support). Certainly, models for incorporating medical and health care into a comprehensive prevention/early intervention program exist (Mendelsohn et al., in press), but they are not widespread.

A key feature of early health care is the role of nutrition and physical activity. For children and families living in poverty, there is the paradoxical concern about both undernutrition and obesity. Supplemental nutrition programs, like Women, Infants and Children (WIC), are universal in communities, but issues related to food insecurity continue to exist for many children and families in the United States (Fiese, Gundersen, Koester, & Washington, 2011). Providing adequate nutrition is a key feature of center-based programs, and assisting families in accessing adequate nutritional resources is a needed complement.

In parallel, early child care and intervention programs can play a major role in establishing healthy nutritional habits for children and their families and preventing obesity. Whitaker and Gooze (Chapter 9, this volume) note that obese children become obese adults, and they propose valuable principles for early child care and intervention programs. These include responsive feeding in which adults control proportion and children indicate how much food they want, small utensils, practices that promote breast feeding, and parent education about healthy food. They note that child care providers may need training to recognize signals of hunger and satiation in infants and very young children, and that child care workers should model moderation and healthy food choices.

In combination with nutritional routines, early child care programs should foster physical activity and motor development (McWilliams et al.,

2009). Intentionally organizing space that requires physical activity, placing infants in prone positions and allowing exploration, planning activities involving physical activity, and incorporating daily routines that foster physical activity should be an essential feature of early child care programs. Whitaker and Gooze (Chapter 9, this volume) note the relationship between short sleep duration and obesity, and offer valuable recommendations for sleep routines both in child care centers and at home.

### Child Care Program Features

Developmental science has much to offer in designing an early child care treatment and intervention program for infants and toddlers living in poverty. Both basic and applied science has articulated features of early development that inform practice and assist in monitoring children's progress. One of the principles of child development is that the abilities we sometimes think of as relatively distinct in later childhood (e.g., cognition, language, social competence) are closely integrated in the infant/toddler years. Their differentiation is a characteristic of development across childhood. Yet, basic developmental science, by necessity, focuses on early developmental strands such as cognition (e.g., attention, memory), language (e.g., vocabulary development, syntax), social relationships and abilities (e.g., attachment, temperament), and self-regulation (being one ability that crosses strands).

### Early Cognitive Skills

In the last 40 years, much has been learned about attention, memory, and self-regulation. Attention, in particular, is a key ability that early on affects the development of other cognitive processes. Infants and toddlers must be able to focus attention as well as shift attention in order for them to benefit from a rich learning environment. Columbo et al. (Chapter 2, this volume) note a developmental shift in attention abilities that occurs during early infancy, with infants younger than 6 months more often becoming fixated on objects with more volition in attentional shift emerging later in the first year. Young infants' attention is drawn to adults when adult speech is high pitch, slow rate, and accompanied with gestures (i.e., motherese). Later in the first year, a more productive strategy for fostering attention may be for the adult to "follow" the attentional lead of the child. Contingent adult attention (i.e., an adult action that routinely follows a child action) and response-contingent toys and games (i.e., noted as stimulus synchrony) may also be attention-facilitative strategies. Joint attention (in which the child shows interest by shifting his/her attention from an object to an adult) is a key component of vocabulary learning. A key skill that child care providers

need is recognition of children's states of arousal in order to determine when is the best time to engage the child in a task that encourages attention and when the child is overstimulated.

Early memory development also is a cognitive capacity that develops across the early years and is related to attention (i.e., emerging memory abilities may allow the child to overcome object fixation during the first year). Bauer (Chapter 3, this volume) notes that early memory skills may be enhanced by use of multistep imitation, as may occur in caregiver–infant games. She also highlights the importance of consolidation on early memory development in that young children will have better retention of information presented if they have a period of time after the presentation to process the information and establish the memory. Consolidation and memory are enhanced through repetition, with the repetition including similar elements with elaborations (i.e., slight difference). This pattern has implications for building a curriculum for children in a "spiral" manner, in which concepts are related and elaborated across time.

### Self-Regulation

In infancy and very early childhood, self-regulation stretches across cognitive and social domains. It has clear linkages to cognition in that early sustained attention in infants predicts later self-regulation. In addition, self-regulation has been proposed as a precursor to later executive function, and the absence or delays in self-regulation is associated with behavior problems in later life. Blair et al. (Chapter 6, this volume) propose that high-quality child care may positively affect self-regulation, which in turn may affect children's reaction to stress. Because of its centrality across domains, a strong argument exists for making self-regulation a central emphasis in early child care and intervention programs. This is bolstered by the fact that these abilities appear to be amenable to change. As Blair et al. note, several interventions have been developed for promoting mothers' support of infants' self-regulations (Landry, Smith, Swank, & Guttentag, 2008; van den Boom, 1994), and this training could well be extended for child care providers in center-based programs.

### Language and Communication

The development of language and communication is one of the hallmark achievements of infancy and early childhood. Children's vocabulary at age 3 predicts language competence (Hart & Risley, 1995) and reading performance in later childhood (Dickinson, Golinkoff, & Hirsh-Pasek, 2010). A variety of factors associated with poverty conspire to produce poor language outcomes for infants and children from poor environments, yet with proper early child care and intervention the trajectory for language development

is malleable (Landry, Smith, & Swank, 2006). The program of research conducted by Hirsh-Pasek and Golinkoff (Chapter 4, this volume) indicates that children learn words that they hear most and events that interest them, benefit from contingent responsiveness of caregivers, and are limited by prohibitors (i.e., negative directives from caregivers). The range of research cited by Hirsh-Pasek and Golinkoff indicates that infants benefit greatly from language-rich, responsive environments in which caregivers engage children in communicative interactions and elaborate the communicative efforts of the child. In fact, Hirsh-Pasek and Golinkoff cite David Dickinson et al.'s advice to "strive for five," meaning five communicative turns during an interaction sequence with children in which the adults elaborate the language concepts with each turn. Although five turns may be a lot for very young children, the strategy of repetition and elaboration is similar to Bauer's (Chapter 3, this volume) recommendation for memory development. Certainly establishing a style of interaction between caregiver and/or parents and their very young children that reflects these features of interaction will enhance language development and eventually the early literacy skills of infants and toddlers. Similarly, early literacy activities may enhance language development as well. The strategies of singing, oral narratives, nursery rhymes, repeated story reading, linkage of vocabulary to pictures in storybooks, and following the child's interests in storybook pictures through elaboration all may take place in center care or home settings.

Because of immigration to the United States, family members in many homes now speak a language other than English, and authors greatly debate the way in which language should be introduced and fostered for very young children in bilingual or non-English-speaking households. The research by Hoff and Place (Chapter 5, this volume) indicates that infants and toddlers living in non-English-speaking homes can indeed learn both the home language and English, although the acquisition of the two languages will be somewhat slower than for children only learning a single language. For these very young bilingual language learners, later developing expressive language may mask the cognitive or receptive language skills of the child, which should be a cue for care providers to guard against underestimating children's ability. Also, an important recommendation by Hoff and Place is that for infants and toddlers enrolled in a center-based setting and whose caregivers in the home have limited English, the home caregiver (e.g., mother, grandmother) should communicate with the infant/toddler in the home language rather than modeling a less-than-fluent form of English.

### Social Abilities: Temperament

Bates (Chapter 7, this volume) describes temperament as an early appearing, stable style of reacting to the environment. Temperament is thought to

be biologically based, featuring an epigenetic overlay in its potential inter-
actions with the environment. Decades of research (e.g., Chess & Thomas,
1984) has revealed reliable temperament styles, and whereas alone a child's
temperament does not determine eventual outcomes, the ways in which
caregivers respond to children's temperament are related to outcomes. For
example, infants with difficult temperament, which Bates has identified as
negative emotionality (e.g., irritable, frustrated, fearful), will respond dif-
ferently to caregivers' responses (e.g., firm parenting, "not-so-nice" par-
enting). If the style of caregiving is consistent across time, it will lead to
different long-term outcomes.

The research by Bates (Chapter 7, this volume) and other temperament
researchers has strong implications for an early child care and interven-
tion program for very high-risk infants and toddlers. First, children with
certain types of risks, such as very low birthweight or prenatal exposure
to cocaine/crack, are more likely to exhibit temperaments that are difficult
for caregivers. Second, and fortunately, caregivers (either parents or child
care providers) can respond to information about temperament by chang-
ing their parenting styles. Third, Bates's research has identified styles of
caregiver responding that are likely to generate positive outcomes for chil-
dren's temperamental styles. Certainly, early assessment of temperament
may help caregivers plan such styles of interactions. His practical advice
that caregivers' responses be predictable, that their general quality be warm
and responsive (with some variations depending on the child's tempera-
ment), and that for children who are temperamentally difficulty taking a
"tag-team" approach (i.e., when there are multiple caregivers available who
can share the responsibility) are all important.

### Social Abilities: Attachment

Somewhat like the development of language, another important achieve-
ment of infancy is establishing a secure attachment with at least one famil-
ial caregiver, who is usually the mother. The importance of attachment for
an early intervention program for very high-risk infants is underscored by
the higher prevalence of insecure attachment for children living in poverty
(Berlin, Chapter 8, this volume), and a great deal of research speaks to
the poor long-term outcomes for children who have insecure attachments
(Thompson, 2008). In addition, although there was once the belief that
participation in infant/toddler child care interfered with the formation of
an attachment relationship between familial caregivers (usually the mother)
and their children, current research indicates that such interference does not
necessarily happen (NICHD Early Child Care Research Network, 1997).
Berlin notes that the literature is beginning to suggest a genetic predisposi-
tion to insecure attachment that may be associated with child temperament
and style of caregiving received (discussed above).

For a comprehensive ECCE program for infants/toddlers from low-income families, supporting the development of a secure attachment between the child and the mother/familial caregiver is important and substantiates the importance of having a family/home component. Berlin (Chapter 8, this volume) notes that Dozier et al. (2009) has developed an effective intervention program that consists of four features: parent nurturance, following the child's lead, nonthreatening caregiving, and "overriding" the parents own history of growing up in a non-nurturing environment (if it exists). Berlin notes that such training might be appropriate for child care center providers as well. In addition, child care providers may ease the strains of attachment by planning with the parent the infant's transition into the center (i.e., in terms of their initial attendance) and also the "drop-off" and "pick-up" transitions that occur daily.

### Curriculum Model

In the traditional sense, an empirically based "curriculum" for infants and toddlers does not exist and would be a key feature of a comprehensive early child care program for children living in poverty. As suggested in the previous sections, such a curriculum would contain activities that foster sustained attention, build memory skills, promote early language development and self-regulation skills, and has opportunities for physical activities. Moving from more adult-directed activities for very young infants to more child-directed activities in which the adults' role is to elaborate, reinforce, and/or apply words to the activities of interest to the child would be important. Language-rich activities focusing on key concepts that are repeated and elaborated would promote language development. Associated early literacy (e.g., book reading) would be one fertile class context for such activities.

### Parent and Family Services

One feature of the family dimension of a comprehensive ECCE program would focus on health care, nutrition, and potentially employment training services that might alleviate some of the economic stress that families experience. However, a second feature of the family component should focus on parental caregiving and the home environment when needed.

Using the NICHD Study of Early Child Care database, McCartney, Dearing, Taylor, and Bub (2007) found that in low-socioeconomic status (SES) households, positive caregiving occurred for 39% of the families, and the developmental outcomes for children living in low-SES homes in which there are non-nurturing environments are bleak. Jones Harden et al. (Chapter 12, this volume) note the potential protective effect of high-quality child care, but also stipulate that such care may not work for the highest-risk families because they may not utilize the service for their children. They

propose that parenting programs need to accompany child care programs for the highest-risk families. The Dozier et al. (2009) early intervention parent education model, noted previously, is one example of a complementary program that could enhance responsive caregiving and secure attachment between child and family. Similarly, the Play and Learning Strategies (PALS) program developed by Landry et al. (2006) could complement the learning experiences very young children receive in a center-based context. These are but two of a growing number of programs designed to teach responsive interactions to caregivers in home settings. Importantly, Jones Harden and Nzinga-Johnson (2006) emphasized that such programs need to be grounded in the cultural context, with interventions applied in laboratory or clinical settings adapted for homes and home culture. The implications drawn by Jones Harden et al. and Cabrara (Chapter 11, this volume) provide a starting point in considering adaptations for African American and Latino families living in poverty, respectively. Cabrara also makes the very important point that caregiving in some homes and cultures extends beyond the mother, with fathers as well as other extended family members making potentially important and unique contributions to caregiving in the home and community.

### Technology

A generational change that affects most aspects of children's (and adults') lives is the development and ubiquity of technology. Given the lag between research and publication, and the speed with which web and smart technology (e.g., iPads and other tablets, smartphones, iTouches) is advancing, the literature may just be beginning to reveal implications for ECCE programs. For example, images on visual displays have attention-evoking quality. Such images can be programmed to be "response contingent" and they can be organized into a pattern of presentations that allows a period of consolidation and subsequent elaborated content. In early child care programs, there are appropriate attempts to limit "screen time" for children (i.e., the showing of television programs or movies as a way of occupying young children's time). Those forms of visual display are different from carefully designed instructional technology that could introduce cognitive and language concepts, for example, on an iPad and with the adult potentially being a facilitator of the learning experience. However, the scientific evaluations of such innovations for infants and toddlers in child care centers are still in the future.

Web technology has been put to great use to assist EHS practitioners in monitoring children's progress and introducing educational plans when development lags. Carta, Greenwood, Baggett, Buzhardt, and Walker (Chapter 14, this volume) describe a web-based system, Making Online

Decisions (MOD) (*www.igdi.ku.edu*), that builds on the authors' previous identification of Individual Growth and Development Indicators (IGDIs) for language development. The language IGDIs system is an efficient assessment of children's early language development. With the MOD, teachers enter the IGDIs language data for children; the system calculates the growth trajectory for children, and the MOD recommends language learning activities when children lag behind in expected growth (Buzhardt et al., 2010). Buzhardt et al. (2011) report positive effects of the MOD for children enrolled in EHS.

The use of web-based technology to coach parents in the use of an intervention at home or teachers in the use of specific teaching approaches in a center-based setting is also evolving. Carta et al. (Chapter 14, this volume) describe the Infant-Net program designed by Baggett et al. (2010). Basing their work on the previously mentioned PALS program (Landry et al., 2006), Baggett and colleagues developed a self-paced set of activities and lessons for promoting infant–caregiver interactions that parents could employ (with some guidance) at home. An important part of that system was a video-sharing feature in which the computer could videotape the parents' interactions with their child at home, and parent and early child care professionals would jointly view and discuss the video at a later time. Using a somewhat similar strategy with young children with autism and their families, Vismara, Young, Stahmer, Griffith, and Rogers (2009) have delivered information about an intervention approach that would be used in the home (e.g., the Early Start Denver Model), observe parent–child interactions through a telemedicine format, and provide feedback to parents immediately after a play session. As the video capacities and utility of the smart technology continues to develop (e.g., better cameras in iPhones and iPads), the applications to early child care will emerge, perhaps at a faster pace than science can determine the impact.

## Child Care Personnel and Professional Development

Recruiting effective teachers and other personnel for very early child care and education programs for at-risk infants and toddlers and their families is a continuing challenge. Berlin (Chapter 8, this volume) proposed that for practitioners to promote attachment for mothers and infants, they (child care providers) should feel comfortable with or confront their own attachment relationship. Reflecting on characteristics of the workforce, Bates (Chapter 7, this volume) suggests that potential teacher beliefs about the value of caregiver–infant interactions and the sensitive/responsiveness of potential teachers in those interactions be screened. Like infants, teachers bring with them temperamental styles that may be expressed through their caregiving.

## Summary: Developing and Implementing a Model

Incorporating the implications from the chapters in this book into a vision for an effective early care and education program is a challenge. The adage that "The future looks a lot like the past" will be true in some ways, in that we have known, for example, about the value of attachment, parent–child interactions, temperament, and language development. Developmental and health science, however, is providing important new information about the importance of certain cognitive process (e.g., attention, memory), key features of the social environment for promoting language development, and epigenetic influences suggested by the interaction of temperament and caregiver style. Current science also indicates the importance of a language-rich environment and the effect of learning two (or more) languages at once in early childhood, "second-generation" influences of insecure attachment, the longitudinal consequences of early obesity, and the differences in family structure and caregiving among different linguistic and culture groups.

Following a "Back to the future" approach, the literature suggests that a high-quality center-based model of early care and education can have significantly positive effects on children's development (Watamura et al., 2011) but also that there are critically important features of the home environment (i.e., parent–child interaction and caregiving) that can be addressed effectively through a well-implemented home-based program (Berlin, Zeanah, & Lieberman, 2008; Landry et al., 2008). A structural framework exists, emanating from EHS, for a center- and home-based combination (Love et al., Chapter 13, this volume), although a more significant health feature of such a model might be incorporated. A theoretical framework for such an early care and education program could be based on a Bronfenbrener-like ecological systems model, as can be seen in Figure 15.1. In this figure, the features residing within the child (i.e., cognitive and language abilities, self-regulation and social skills, temperament, gender, race) are the biosystem to which Bronfenbrenner and Morris (1998) refer; this system is represented by the baby icon. The child (biosystem) participates in microsystem environments such as the class–center, home, and the pediatric practice; the literature suggests features of a model important in each. The interactions and communications that exist among the center staff, family, and pediatric care staff represent Bronfenbrenner's mesosystem and should have reciprocal effects on actions within those ecological contexts and on the child. The center, home/family, and pediatric care service are also affected by regulations and other factors operating outside of these immediate ecological contexts but that still exert a primary influence on practice; these represent exosystem factors in Bronfenbrenner's model. All of these ecological systems are affected by more distal (from the child) factors such as the economy, cultural values, and technological innovations that Bronfenbrenner characterized as macrosystem influences.
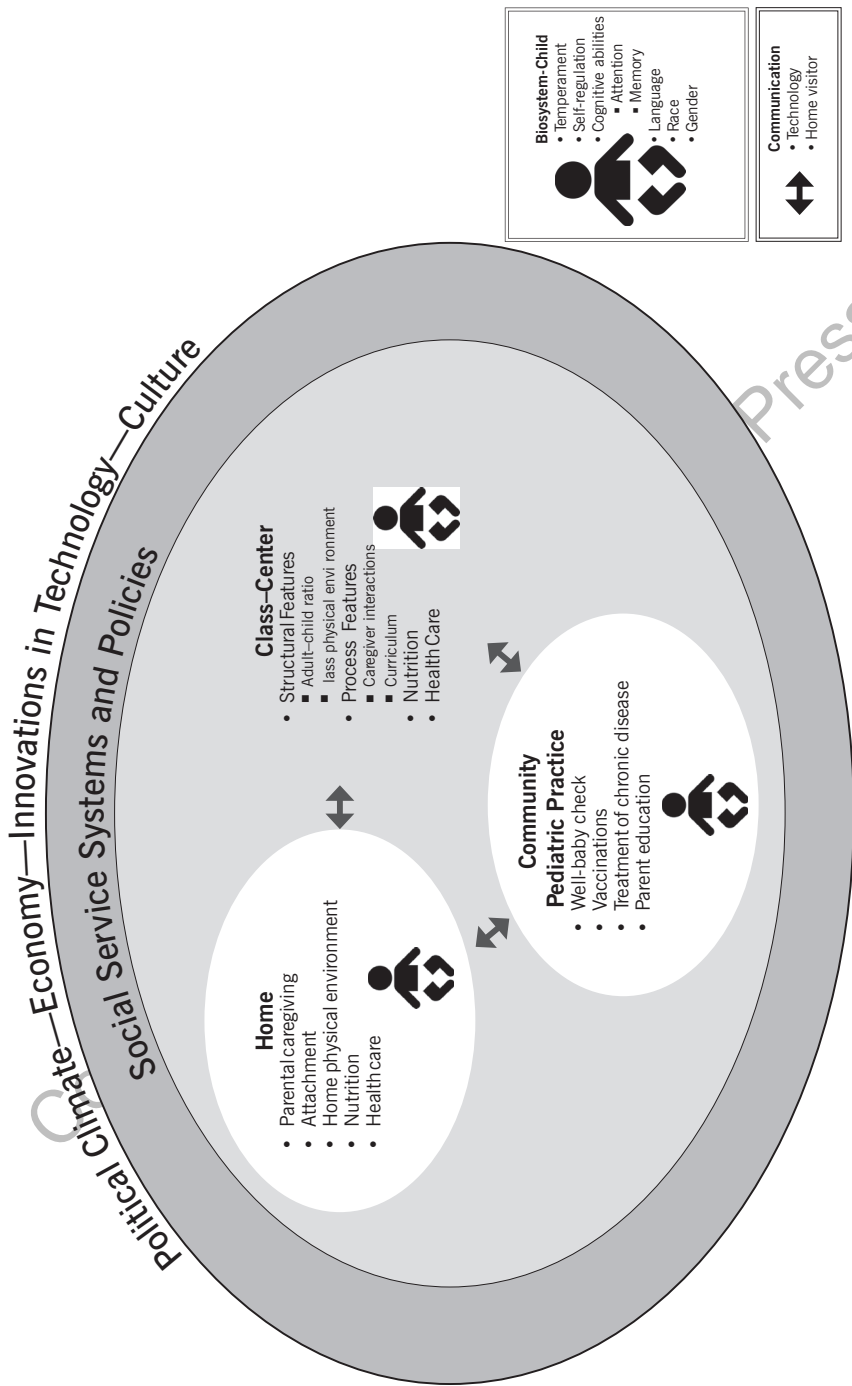
**FIGURE 15.1.** Early intervention conceptual model.

Such a model for early child care and education is ambitious and organizationally very challenging. Such a model, we propose, would offer child care, education, nutrition, health, and family education services in one location close to the families served. A primary issue with families facing the highest risks is their accessing services available (Jones Harden et al., Chapter 12, this volume), and proximity to services may well affect families' active use. Also, in addition to high-quality child care, it would offer intervention in the home focusing on sensitive and responsive caregiving, a safe home environment, nutrition, and mental health services for family members if necessary, and accessing vocational training and jobs if needed. Although such a model would focus on the prenatal to age 3 range, continuity into Head Start or preschool settings is critical (Love et al., Chapter 13, this volume), so proactive transition planning for children in the center, for parents, and for teachers in the next setting would be important.

In conclusion, although not widespread, examples exist of some programs that approximate this model. For example, a key feature of the Educare Centers (*www.educareschools.org*), child care centers serving families living in poverty in a small number of communities in the United States, is the provision of family support services. Family support specialists at each center provide programming within the center to promote and enhance the parent–child relationship. They also encourage parents to become engaged in their children's early education in the center and to make connections to needed services for families and children within the wider community (e.g., mental health services). On a wider community scale is the example of the Harlem Children's Zone (*www.hcz.org*), currently being replicated in other underresourced communities across the United States through the "Promise Neighborhoods" initiative by the federal government (*www2.ed.gov/programs/promiseneighborhoods*). This model operates at the neighborhood level, providing and coordinating a comprehensive system of programs to support children and families, beginning with "The Baby College" (a series of workshops for parents of children ages 0 to 3) and continuing with best-practice programs for children through college (including services in school, in after-school programs, social services, and health and community-building programs). Although larger in scope than the current model being proposed, the concept of coordinating services across early learning and community environments is similar, as is the tenant of beginning as early in the lifespan as possible. These examples provide some of the structural features that could be employed to develop a comprehensive model of early care and education. The science reviewed in this book and the implications from that science provide a basis for filling in the content. Another adage to which most readers who have worked in child care would resonate is that "The devil is in the details." Although this book has not removed the devil completely, the authors have offered implications for future practice that could enhance and elaborate, and dare we say, provide

a more divine vision of early care and education for infants and young children from poor families.

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