The Health Development Organization: An Organizational Approach to Achieving Child Health Development

NEAL HALFON, MOIRA INKELAS,
and MILES HOCHSTEIN

University of California; RAND

OVER THE PAST DECADE, LIFE COURSE STUDIES IN the epidemiology of chronic disease, successful aging, and psychological and social development have highlighted the importance of early developmental processes on the later development of a range of chronic diseases (Kuh and Ben-Shlomo 1997). These studies range in focus from the fetal origins of cardiovascular disease (Barker 1998a; Kuh and Davey-Smith 1997; Leon 1998) to early life programming of the hypothalamic pituitary axis (Seckl 1998), and to the role of adverse childhood events (Felitti, Anda, Nordenberg, et al. 1998). They suggest that the developmental process in childhood offers a significant but time-limited opportunity for health promotion and disease prevention. While health care is important at all stages of the life course, there are unique opportunities to shape health status and function in adulthood by intervening during childhood. However, such opportunities can only be exploited if the services that develop children's health in communities are organized to be more developmentally appropriate and more longitudinally focused than they are today.

Recent innovations in health care delivery have created opportunities to redesign health systems to meet these challenges. In this paper, we describe an organizational strategy for the delivery of children's health

services: the “health development organization” (HDO). The HDO is designed to promote the long-term development of the health of a community’s children, and reflects our emerging understanding of how health develops and how it can be influenced during childhood. To accomplish this, the HDO combines the health maintenance functions of the HMO with health promotion services geared toward optimizing future health status. In this paper, we outline how health service delivery systems can begin to reflect the developmental health needs of children.

Developing Health

The central objective of the HDO is the active development of children’s health over an extended time frame. Human beings have enormous potential for what they can become and accomplish in a lifetime (Schultz and Heckhausen 1996). Because of the ongoing physiologic and social development in childhood and the sensitivity of this development to early experiences, health status in effect “develops” during childhood, reaching a level that can be measured in terms of functional status and years of healthy life. The dynamics and mutability of the developmental process during childhood are unmatched during other periods in the life course.

Before outlining the organizational features of an HDO and the strategies necessary for its implementation, we review some basic principles concerning the production of health and the role of development. The discussion covers a large conceptual territory, reviewing briefly a broad literature on health determinants and development, introducing the “life course health development” model, and highlighting several fundamental principles of health care delivery that follow from this model. We then analyze briefly the weaknesses of current health delivery systems for children. Building on the principles of health development and their implications for children, we set forth the principles, design specifications and potential implementation strategies of the HDO.

A Population-Based Approach to Children’s Health Systems

Children’s health and their development throughout childhood provide the foundation on which adult health and achievement are built (Hertzman and Wiens 1996; Kuh and Ben Shlomo 1997). From a

population-based perspective, a system of focused services should emphasize the optimization of developmental potential from the beginning of life.

Investment in children's health begins with the concept of health capital and its "production" or formation. Health capital represents the stock of health of an individual or population, which depreciates over time but can be increased by investment (Grossman 1972; Grossman 1999). Health capital in the classic Grossman model affects not only an individual's productivity in market and nonmarket activities but also the time the individual can spend on those activities (Grossman 1999). Health capital is produced through inputs from multiple institutions; the family, the school, and the physician's office all contribute during childhood. The production of population health (Kindig 1997), or the accumulation of health capital by a population, goes beyond treating disease to involve anticipating and systematically addressing health determinants before the manifestation of disease. The production of health requires a shift in perspective to recognize that just as disease has causes, origins, and critical pathways, so too does health, which can be actively developed in individuals and populations. This perspective is embodied in the health promotion literature, in community and individual wellness programs, and in the growing literature on life-span determinants of the aging process (Baltes, Lindenberger, and Staudinger 1998; Levenworth 1995; Pelletier 1996). It is also implicit in the health management pathways that some managed care organizations have introduced as they move away from episodically focused delivery and payment modalities (Peterson and Kane 1997; Todd and Nash 1997).

Understanding of how individuals, families, and communities facilitate the production of health has expanded over the past twenty years, with the development of *multiple health determinant* models. These models attempt to explain how environmental, social, economic, psychological, and biological factors interact to produce health and developmental outcomes (Canadian Government 1974; Engle 1977; Evans and Stoddart 1990). The "field model" of health proposed by Evans and Stoddart (figure 1), which refined earlier multiple determinant models, was driven by empirical research in social epidemiology (Berkman and Syme 1979; Marmot, Rose, Shipley, et al. 1978), and other research that demonstrated social and environmental influences on various physiological processes. This model has been recently applied to measuring population health and stimulating health interventions in communities

FIG. 1. The multiple determinants of health model. “Multiple determinants” models of health production illustrate the different kinds of factors (e.g., social, physical, genetic) that determine health, and the pathways through which these factors create health. Multiple determinants models have played an important public policy role, broadening the range of issues that are understood to be health issues and illustrating the relationships between environmental, social, and economic factors. Adapted from Evans, Barer, and Marmor, eds. (1994).

(Chrvala and Bulger 1999; Halfon, Ebener, Sastry, et al. 1997; Institute of Medicine 1997), and to outlining a dramatic reengineering of the U.S. health system (Kindig 1997).

Similar dynamic multiple interacting determinant models have been presented in the human development literature (Baltes et al. 1998; Bronfenbrenner 1979; Gottlieb 1996; Sameroff and Fiese 1990), and in other conceptual and applied models of population health (Halfon and Newacheck 1999; Hertzman 1994; Schor and Menaghan 1995). These models emphasize the role of community, family, and individual contexts and relationships in modifying health risks and thereby shaping health outcomes (Boyce, Frank, Jensen, et al. 1998). Key implications of these models are that the characteristics of individual, family, and social contexts are important, that these characteristics can be modified, and that policies or strategies that affect these contexts can in fact promote health (Boyce et al. 1998; Schor and Menaghan 1995), thereby effectively “producing” health.

Health Development in Childhood

The health development organization represents the conceptual meeting point of two domains: the empirical literature outlining the process of health production and the literature describing the specific health needs and developmental characteristics of children. While population-based public health principles and the concepts of health promotion and risk reduction are relevant to adults as well as children, the unique vulnerabilities of children call for systematic attention to their developmental and health risks. This section examines the development of health in children to provide a basis for determining the most effective organizational framework for promoting it.

The “Development” of Health

The scaffolding for human health and development is built and set during childhood (Bateson 1996). An impressive portfolio of studies links childhood experiences with adult health and social outcomes (Barker 1998a; 1998b; Garbarino 1990; Hertzman 1994; Hertzman and Wiens 1996; Kuh and Ben-Shlomo 1997; Nitttrouer 1996; Power and Hertzman 1997). A range of different physiological, social, and environmental risk factors have been found to have both individual and cumulative effects on children’s physiological and psychological development (Hertzman 1994; Meisels and Shonkoff 1990; Sameroff and Fiese 1990). Moreover, intrauterine and early childhood experiences and development have been linked to patterns in adult disease, disability, and mortality through a process of programming that occurs early in life (Barker, Gluckman, Godfrey, et al. 1993; Barker 1998a; 1998b; Leon 1998; Lucas 1998). These studies demonstrate that there is a substantial and cumulative impact of early exposure, experiences, and social conditions on health status throughout the life course. They also show that there are critical or sensitive developmental periods (prenatal and during childhood) when particular experiences and insults can influence long-term health outcomes (Barker et al. 1993; Barker 1998a; 1998b; Evans and Stoddart 1994; Hertzman 1994; Matthews 2000).

Evidence is also accumulating about how malnutrition, stress, and exposure to tobacco and alcohol can modulate placental hormonal function, alter fetal hormonal response patterns, and influence fetal tissue

programming, including hypothalamic pituitary activity and insulin-glucose homeostasis (Seckl 1998). Specific examples of such exposures and their impact include prenatal/postnatal exposures to inhaled allergens with onset and severity of childhood asthma and adult onset of chronic obstructive pulmonary disease (Holt and Sly 1997; Weiss 1995), nutritional status in infancy and childhood with adult onset of cardiovascular disease and diabetes mellitus (Barker et al. 1993), and traumas affecting early childhood attachment relationships with development of psychopathology later in life (Schoore 1994; Sroufe 1997). These examples illustrate why childhood presents a unique opportunity for influencing the trajectory of health development across the life course (Halfon and Hochstein, in progress).

“Health development” is defined as the lifelong process of developmental integration, adaptation, and optimization by which genetic, physiologic, social, and environmental processes or systems interact to produce functional capacities and health states (Halfon and Hochstein, in progress). Health development involves complex interactions between genetic endowment and environmental factors that influence the phenotypic expression of physiologic, psychological, and behavioral characteristics (Lerner 1998; Rutter, Dunn, Plomin, et al. 1997; Sameroff and Chandler 1975). Although the relative influence of nature and nurture on health, disease, and behavioral states continues to be debated, there is an explosion of research documenting the nature of gene environment interactions and associations (Eisenberg 1999; Rutter et al. 1997). An extensive body of literature documents cross-generational and other social environmental effects on the development of organ systems, functional capacities, behaviors, and overall health status (Eisenberg 1999).

The active development of health involves an understanding of the role that these various contexts have on health development and of the environmental and material inputs required to maximize the developmental potential of each individual. How health develops under ordinary circumstances, and how it can be actively developed and promoted over the life course, is captured in the “life course health development” (LCHD) model, which illustrates how interactions between health determinants affect health outcomes across the life course. This approach has been elaborated in greater detail elsewhere (Halfon and Hochstein, in progress), but can be summarized by the four key concepts of multiple determination, cumulative and programmed effects during critical and sensitive periods, and life course variation, which are further elaborated below.

- *Principle 1: Multiple Determinants.* Health is not static; rather it is continuously shaped by multiple determinants and their dynamic interaction. The relationship of these determinants to health and developmental outcomes can be specified, thus illustrating the potential of health care interventions. The field model suggests that genetic, physical, and social environment influence behavioral responses, while availability and access to health and social services influence health and well-being (Evans and Stoddart 1990) (see figure 1).
- *Principle 2: Multiple Processes of Development.* The health development trajectory comprises competing multiple processes of growth, decline, and compensation, so that the overall capacity of an adult is maintained in relative stasis, even as earlier capacities decline (Baltes 1997). Multiple physiologic systems react to the psychosocial environment through a dynamic, adaptive process called allostasis (McEwen 1998). In early life, processes of development and growth outnumber processes of degeneration, loss, and decline. In middle life, there is a balance between growth and decline. In later life, even as compensatory strategies proliferate, the overall trajectory is typically one of decline (Baltes 1997).
- *Principle 3: Cumulative and Programmed Determinants of Health Development.* The developing organism interacts and is changed by external contexts through two basic mechanisms. One mechanism is cumulative and reflects the additive and multiplicative effects of risk and protective factors over time. The other is generally more period-specific and reflects the influence of factors during specific time periods when physiological and functional systems are being programmed (Power and Hertzman 1997). Programmed processes of long-term adaptation are the result of gene-environment interactions, where environmental factors influence and help set the operating parameters of the genetic code during critical and sensitive developmental periods (Gottlieb 1996; Sylva 1997; Wadsworth 1999). These programming processes occur early in life, and can have a defining role in determining functional trajectories at the enzymatic, organ system, and individual level (Lucas 1991; 1998).
- *Principle 4: Life-course Variation and Developmental Sensitivity to Social Context.* The factors that influence health development differ in effect and relative magnitudes across the life course. This suggests that certain types of determinants have special relevance for specific

FIG. 2. Influence of health status across the life course. Across the life course, the health status of individuals is a function of endogenous factors (genetic, physiological, psychological), family influences, and a range of influences from the immediate community (school and workplace), and the larger community (neighborhood, city, and nation). The relative influence of these factors changes as a function of age. Adapted from Nordio (1978).

stages of life. Family factors appear to be the predominant influence in young children, for example, with educational, institutional, and peer influences and individual behaviors playing greater roles as individuals get older (figure 2). Figure 2, adapted from Nordio (1978), depicts one way of conceptualizing the relative importance of different social environments on health development across the life course.

The Health Development Trajectory

The health development trajectory illustrated in figure 3 represents the growing functional capacity of the child across time and its association with adult health status. The concept of a developmental trajectory illustrates how childhood experiences are translated into optimal (or suboptimal) adult health status and health outcomes. The slope of this trajectory is shaped by the individuals' genetic endowment and, in turn, is modified by a range of environmental factors that determine the ultimate level of adult functional status. A critical implication of the underlying health

FIG. 3. How risk reduction and health promotion strategies influence health development. This figure illustrates how risk reduction strategies can mitigate the influence of risk factors on the developmental trajectory, and how health promotion strategies can simultaneously support and optimize the developmental trajectory. In the absence of effective risk reduction and health promotion, the developmental trajectory will be suboptimal (dotted curve).

development trajectory is the “nonequivalence of time” across the life course: developmentally significant milestones are attained at a more rapid rate in childhood, particularly in early childhood, than later. This nonequivalence is reflected in the initial slope of the developmental trajectory. Child development studies reveal that body systems change rapidly and profoundly, compounded over relatively short time frames, during infancy and early childhood (Rutter 1990). The developmental plateau of adulthood, however, is not a plateau at all (Baltes and Graf 1996; Baltes 1997; Baltes et al. 1998). Instead, competing processes of development and degeneration, together with social and biological compensation strategies, create relative stasis in adulthood. This relative stasis, comprised of simultaneous gains and losses, stands in sharp contrast to the burst of development that characterizes the childhood years.

Initial health endowment, risk factors, health promotion, and risk reduction interventions combine to produce adult health, adult disease risks and the timing and rate of health deterioration (see figure 3). *Risk*

factors, such as low birth weight, lead exposure in early childhood, poor parenting, and exposure to neighborhood violence can be characterized as potential sources of downward pressure on the developmental trajectory (Baydar, Brooks-Gunn, and Furstenberg 1993; Sameroff, Seifer, Baldwin, et al. 1993). *Risk reduction* activities help to minimize the effect of present risk factors on the health development trajectory. Examples of risk reduction activities include: (1) home visiting and other intensive prenatal interventions to reduce the likelihood of prematurity and other adverse birth outcomes; (2) timely immunizations to prevent infectious disease in young children; (3) lead screening to detect and remove harmful environmental exposures; and (4) community resources to support families at risk for family neglect or violence.

Health promotion constitutes the active development of *protective factors* (e.g., family social support) and social relationships (e.g., parental attachment) that build a base for social development (Rutter 1990). Health promotion also refers to services provided to children and families that create an upward pressure on the developmental trajectory by ensuring the presence and effects of protective factors and reducing risk factors. Examples of protective factors for promoting health include appropriate nutrition to promote optimal physical development, early literacy and language development supports to promote optimal cognitive development and educational attainment, and nurturing parenting styles and skills to promote optimal social-emotional development and early literacy (Cunningham and Stanovich 1997; Lucas 1998; Rutter et al. 1997; Whitehurst and Lonigan 1998).

As figure 3 illustrates, each trajectory is associated with significantly different functional expectancies. In general, minimizing risk factors while optimizing protective factors through strategic health promotion interventions can raise the trajectory and promote positive long-term health outcomes. This implies that children whose risk and protective-factor profiles place them on different trajectories would require different levels and types of care to achieve comparable health status.

The Unique Characteristics of Children and of Children's Health Development

Although the LCHD model's health development trajectory is a useful framework, to understand why childhood presents such a unique opportunity requires careful consideration of how children's health needs

and risks differ from those of adults. Characteristics that define the kinds of services children need to grow into healthy adults include (1) their developmental vulnerability, (2) their dependency relationships with caregivers and with health care delivery systems, and (3) their differential patterns of morbidity (Forrest, Simpson, and Clancy 1997; Halfon, Inkelas, Wood, et al. 1996; Jameson and Wehr 1993). Each of these differences has direct implications for structuring, organizing, and delivering health services for children.

Developmental Vulnerability. Developmental vulnerability refers to the sensitivity of a child's development and long-term health status to illness, injury, or untoward family social circumstances that results from the rapid, cumulative, and interactive physical and emotional changes that characterize childhood (Gottlieb 1996; Sameroff and Fiese 1990). Functional developmental models have been constructed or considered for the development of lung function (Stratchen 1997; Weiss 1995), for the endocrine system (Lamberts, van den Beld, and van der Lely 1997), for the immune system (Coe 1999) and for cognitive and neurological development (Gottlieb, Wahlsten, and Lickliter 1998; Magnusson and Stattin 1998). These models, coupled with the findings from intervention studies, suggest that protective environmental factors, experiences, and interventions (e.g., provision of appropriate health services) can drive the developmental trajectory to a higher slope and raise the level of adult functioning (Campbell and Ramey 1995; Garbarino 1990; Karoly, Greenwood, Everingham, et al. 1997; Ramey, Bryant, Wasik, et al. 1992; Schor 1995; Schor and Menaghan 1995; Werner 1990).

Dependency. The dependency of children upon parents, other caregivers, and a range of neighborhood conditions and social institutions is a biological, psychological, and social phenomenon (Bronfenbrenner 1979; Brooks-Gunn, Duncan, and Aber 1997; Garbarino 1990; Sampson, Raudenbush, and Earls 1997). The role, interaction, and relative influence of these different "contexts" have become a defining focus for research in the development of children's physical, cognitive, and emotional attainments (Cicchetti and Aber 1998; Steinberg and Avenevoli 2000). Children depend on their parents and other caregivers to recognize and respond to their health needs, to organize their health care, to authorize treatment, and to comply with recommended treatment regimens (Boyce et al. 1998). Interventions to develop child health must therefore take into account the full range of family and community relationships upon which children depend (Schor 1994).

Differential Morbidity and Patterns of Disease. Many of the health problems of children differ from those of adults in etiology and prevalence. The declining prevalence of nutritional and infectious diseases in the United States and the changing pattern of childhood risk has heightened our awareness of other causes of morbidity and mortality and of their epidemiological significance (Halfon et al. 1996; Starfield 1992a). The “new morbidities” include child abuse, substance abuse, and the behavioral and developmental disorders that often result from family dysfunction, neighborhood violence, and exposure to substance abuse (Haggerty, Roghmann, and Pless 1975). These morbidities originate in complex family and socioeconomic conditions and have multiple determinants and complex critical pathways rather than an exclusively biological or single-factor etiology (Haggerty, Roghmann, and Pless 1975; Palfrey 1994; Starfield 1992a). The epidemiology of these morbidities involves specific risk factors, the effects of which are determined by age of first exposure, duration and intensity of exposure, and relative impact of family focused interventions (Costello and Angold 1995; Sameroff and Fiese 1990).

Implications for Health System Design

The implications of health development and unique child health needs for disease prevention, health promotion, and health system design are profound and direct (see table 1). To be successful, health promotion and disease prevention strategies for children must address child-specific risks to health development, with attention to both short- and long-term implications. Following this logic, the design of a system or organization that promotes health development (such as an HDO) should reflect the need for timely intervention and draw from multiple disciplines to assess and respond to a range of different risks. This means designing a continuum of services that addresses the multiple determinants of health, from prevention through treatment (Aday 1993). A longitudinal perspective that views developmental potential across the life course is also essential. (Of course, continuums of care and a longitudinal perspective are desirable for adult and elderly populations as well as for children. However, the slope of the health developmental trajectory in childhood, and the limited window of time it allows for intervention, suggests that children can particularly benefit from this approach. As the value of care continuums and longitudinally oriented care is demonstrated for

children, it may well prove valuable to extend these approaches across the life course.) Finally, funding and financing for the organizations must support a longitudinal focus, particularly by providing financial incentives to encourage the promotion of health and maximize health development.

Create Continuums of Care. The first implication of the developmental trajectory is that children need “integrated continuums of care.” This is the case because health development itself is a continuous process that is affected by multiple determinants. Continuums of care are created when functional relationships exist between specific service providers. In contrast, fragmented systems can produce barriers in access and timeliness. Examples of health care services that are organized into continuums of care include systems of primary care (Starfield 1992b; 1998) and population-based approaches to specific health risks and diseases such as low birth weight and HIV (Aday 1993). For many children, continuous monitoring of the child’s health risks through episodic screening and surveillance in pediatrics comprises much of the necessary continuum. Appropriately constructed continuums of care can provide continuity across delivery sectors (health, social services, and schools) and between providers. The organization of services into continuums of care minimizes barriers to care for families and supports a greater focus on health investment and attaining long-term health objectives.

Encourage a Developmentally Focused Longitudinal Perspective. The second implication of the developmental trajectory is that risk reduction and health promotion should be timed, targeted, and sustained based on a child’s health development needs. To achieve this, delivery systems must focus not only on current health status but also on the potential benefit to functional capacity in the future. Such an approach reflects a longitudinal perspective (i.e., a perspective that considers not only present health status, but health status over an extended time frame). Specific interventions would be guided not only by short-term functional outcomes, but also by the effect on functional levels that can be achieved throughout childhood and into the adult years (Hochstein, Halfon, and Inkelas 1998).

Optimize Investment in Children’s Health. A third implication of the developmental trajectory emphasizes that expenditure on health and health-related services has not only a consumption component but also an investment component (Grossman 1999; Mushkin 1962). The investment component is associated with the social and economic returns that

TABLE 1
Children's Health Characteristics and Implications for Service Provision

Children's health characteristics	Characteristics of risk	Service implications	Types of integration needed	Purpose and consequences of integration
Childhood developmental vulnerability	<ul style="list-style-type: none"> • Early experiences, exposures, and stressors have lifelong effects on health. • Developmental changes create unique health problems. 	<ul style="list-style-type: none"> • Ongoing developmental assessments • Continuity of care and provider • Prevention-oriented care • Long-term perspective in medical necessity determinations 	<ul style="list-style-type: none"> • Longitudinal perspective 	<ul style="list-style-type: none"> • Long-term orientation of service provision • Continuity over time
Dependency in childhood	<ul style="list-style-type: none"> • Children rely on parents to identify need • Child's health needs are considered in family context 	<ul style="list-style-type: none"> • Treatment of child should occur in family and community context • Proactive assessment 	<ul style="list-style-type: none"> • Horizontal and longitudinal integration 	<ul style="list-style-type: none"> • Effective involvement of families in child health care • Ongoing relationships between providers and families over time

Differential
childhood morbidity
and disease patterns

- Children are subject to multiple pathways to disease
 - Psychosocial issues and physiological health issues are closely related
 - Family factors are important
 - Allocation of services based on risk assessment (child, family, community levels)
 - Coordination of cross-sector services (medical, health related, community based)
 - Vertical integration of service levels (primary, secondary, tertiary, rehabilitative care)
 - Horizontal integration of health and health-related services
 - Efficient allocation of resources by need
 - Effective use of primary vs. tertiary services
 - Effective use of interdisciplinary approach
 - Productive relationships between organizations providing health services
-

flow from the production of health capital generated by spending on services that enhance and promote health. The developmental trajectory has temporal characteristics that resemble those associated with financial investments. This model suggests how the development of health in the individual varies as a function of inputs, and can be understood as an investment with economic value. Returns on early life investment in health development can be substantial not only because of the benefit that accrues over the life course but also because early investment actually alters the trajectory and thus health potential in adulthood (Heckmann 1999).

Structural Barriers to Meeting Children's Health Needs

While much of pediatric care has always emphasized prevention, recognized the importance of childhood experiences on health and development, and valued a longitudinal orientation to the developmental needs of children, these important perspectives have not been fully realized as fundamental organizing principles for children's health services delivery. For example, anticipatory guidance and developmental screenings have been hallmarks of preventive care for all children, yet many children do not receive these services, which are not always fully financed or appreciated as being essential or medically necessary (Jameson and Wehr 1993). The HDO directly addresses problems associated with (1) the narrow traditions of the medical model that have given rise to narrowly focused managed care organizations; (2) the failure of a privatized, market-oriented health system to promote optimal health development strategies, and the tendency to emphasize short-term financial returns instead; and (3) the tendency in child health policy to adopt incremental, problem-specific child health programs that target subpopulations and specific needs of children.

Limitations of the "Biomedical Model"

The "biomedical model" has conceptualized disease and shaped the organization of health services for most of this century. It emphasizes the treatment of biologically based disease in individuals (Engle 1977). The biomedical model has achieved significant improvements in morbidity and mortality in children through breakthroughs in immunization and infectious disease treatments, advances in medical neonatal technologies,

and treatment for complex pediatric medical conditions (Hoeklema and Pless 1988). However, it focuses on a limited part of the health risk and treatment continuum for children (Halfon and Berkowitz 1993). As research findings accumulate on the multiplicity of health determinants, the limitations of organizing care for children solely around physiological processes, excluding social, psychological, and behavioral dimensions, have become clearer (Schor 1995; Schor and Menaghan 1995). The children's health services delivery system is still in many respects organized around disease-focused models (Halfon et al. 1996). As a consequence, the necessary providers, services, and continuums required for children's optimal health development are often not included or appropriately valued (Boyce et al. 1998; Green and Kessel 1993). The Bright Futures effort by the federal Maternal and Child Health Bureau is an example of a sustained policy initiative designed to expand the focus of child health delivery (Green and Palfrey 2000). The HDO extends this approach by systematically addressing the contextual factors that influence children's health development.

Health Care Market Preferences for Short-term Returns

Private health care markets often fail to produce and allocate health services optimally from a social benefit perspective (Rice 1997). As mentioned above, the health care market does not currently account for the investment component of children's health expenditures. A related fundamental market failure that is exacerbated in children's health care stems from the difference between the time horizons of financial reimbursement to providers (e.g., monthly capitation, limited duration of enrollment in a health plan) and the time horizons over which developmental outcomes are promoted and measured.

Emphasizing the investment opportunity of childhood presents significant challenges in the current market environment, in which health plans are reimbursed for the services that they provide and not for the long-term health outcomes that they produce. For example, managed care organizations are typically at financial risk for health service costs only for the duration of an individual's enrollment, which often means the current year (and in Medicaid, sometimes only for the current month). Provider organizations are thus *temporally* separated from the "returns" on their investments, such as the potentially lower health care costs

associated with better health status. Furthermore, they are also *sectorally* separated from potential returns from their health care investments in children because the returns to prevention activities may accrue to completely different sectors, such as education or juvenile justice systems. For example, developmental assessment services provided by a managed care organization to a child at age two to detect speech and language difficulties, which can cause behavioral problems and failure in school, might not reduce the provider organization's costs at any time during the child's enrollment in the health plan. However, these services may yield significant immediate and long-term benefits to schools and to mental health systems. Whether such sector shifts occur within the private sector or across private and public sectors, the result is that health promotion and risk reduction services are costly for the provider, and may not provide cost savings or explicit financial rewards that would inherently encourage a health organization to continue to provide the services.

Consequences of Incremental Public Child Health Program Development

There is a rich history in the United States of public policies directed toward filling the service gaps in health care for children. These policies have supported public investment in children through the provision of services that the private health care market might not be expected to provide (Kahn and Kamerman 1992; Kamerman and Kahn 1995; Schlesinger and Eisenberg 1990). The presence of gaps in services and coverage has been the impetus for a range of different supplementary health and health-related services for children, outside of the medical care system (Schlesinger and Eisenberg 1990). These public "wraparound" programs have enabled families to obtain basic personal medical services, specialty care for complex health conditions, and developmental and other services.

An important explanation for the way the child health system has evolved is that children's health programs frequently have been viewed by policymakers as "second chance" programs, and have been developed largely from a welfare tradition (Katz 1986). These programs were designed to reach the "exceptional" child whose family could not meet all of the child's needs (Halfon et al. 1996; Schlesinger and Eisenberg 1990). This policymaking tradition has resulted in the creation of multiple categorical programs outside of the mainstream medical care system.

These programs have had similar health objectives for children, and yet have proved difficult to coordinate because of separate and often competing administrative requirements (Kahn and Kamerman 1992; Select Panel for the Promotion of Child Health 1981).

This categorical approach, in which funding sources are separated in vertical “stovepipes,” profoundly inhibits the integration of services for children and the creation of longitudinally focused continuums. It means that multiple public programs provide services independently and have no mandate or administrative incentives to coordinate their services with other programs or, in some cases, with the largely private medical care system. Instead, organized health systems, school systems, and developmental service systems (among others that serve children) are administratively distinct, even though frequently these divisions are imposed more by financing streams and tradition than by function.

Unfortunately, accountability for child health outcomes becomes difficult to ascertain in this environment, where multiple autonomous programs and systems are divided among private and public institutions (DuPlessis, Inkelas, and Halfon 1998). The result is *sectoral* separation between the inputs to each program and their health development outputs from each program. Institutions tend to become focused on components of the process of producing health development outcomes, rather than on the outcomes themselves. Coordinated approaches to health development would be far better suited toward an emphasis on coordinating and deploying available resources to produce specific health outcomes. Yet, too often, no organization or planning body takes a comprehensive view of the full range of health needs and available resources. The pervasive pattern of structural accountability and policy fragmentation in the United States suggests the need for organizational solutions that can break through “stovepiped” categorical perspectives and reduce the inefficiencies that such categorically funded systems too often perpetuate.

What Is a Health Development Organization?

A health development organization is an integrated network of health services for children. Its design is guided by children’s health development needs, and its objective is to promote health development by creating

continuums of care and encouraging a life course perspective and a longitudinal focus in the provision of all services. In contrast to health maintenance organizations, which are designed to maintain the health of an adult population, the HDO is designed to actively develop the health of children. To accomplish this goal, the HDO would organize risk reduction and health promotion services that can optimize children's developmental trajectories by minimizing the downward pressures created by biological, social, and environmental risks and maximizing the protective factors that support development.

Organizational Integration and Integrated Child Development

The HDO relies on integration of services to achieve many of its goals for children, for several reasons. First, the current child health delivery system is fragmented, disorganized, and plagued with significant structural barriers. These barriers undermine the creation of economically efficient and clinically appropriate continuums of care. Breaking down those barriers will open ways to achieve new allocative efficiencies in health care. A second, more fundamental reason to emphasize integration is to maximize the responsiveness of the health delivery system to the basic process of health development. At the core of health development are the processes of biological and functional differentiation and integration that produce functional body systems and behavioral responses. These processes have biological, social, and environmental components that interact to create functionally integrated biopsychologic systems (Gottlieb 1992).

A health delivery system designed to maximize health development must be responsive to these basic processes by coordinating the clinical domains that influence them. As an example, consider the case of a family managing a child's complex chronic illness, say, asthma. It is increasingly recognized that the onset, severity, and duration of asthma in childhood is the result of gene-environment interactions in a complex developmental context (Martinez and Holt 1999; Halfon and Newacheck 1999). It is also well understood that the workload and stresses associated with management of this condition can affect the functional status and overall stress and conflict levels in the family, with important implications for a child's health outcome (Perrin, Shayne, and Bloom 1993). If medical and

psychosocial services are organizationally separated, the capacity of the health system to respond appropriately to a family's psychosocial issues is likely to be suboptimal, interfering with the family's ability to manage the child's illness successfully. In contrast, a more integrated approach, offering multiple types of services, would be potentially more responsive to the interrelated developmental health needs of the child and family (Halfon and Newacheck 1999).

Like that of clinical integration, the value of service integration for vulnerable populations, for disease and health management strategies, and for service networks in general has been explicitly recognized in the health services literature (Aday 1993; Kindig 1997; Leutz 1999; Leutz, Greenberg, Abrahams, et al. 1985; Shortell, Gillies, and Anderson 1994). Each proposed model of integration in the health services literature has taken a different focus, based on its particular disciplinary perspective or population focus. The principles of organizational integration described by Shortell et al. (Conrad and Shortell 1997; Shortell, Gillies, Anderson, et al. 1993; Shortell, Gillies, and Anderson 1994) come from a perspective within the traditional medical system and focus on the relationships between hospitals, physician groups, and other providers of medical/pharmacy/laboratory services. The framework of system integration described by Moscovice et al. (Moscovice, Wellever, Christianson, et al. 1997) focuses on the unique institutions and organizational relationships required for a rural medical care network. The Community Care Network takes a broad public health perspective that focuses on the role of hospitals and physicians in improving population health (American Hospital Association 1995; Catholic Hospital Association 1993; Kindig 1997). The Caring Communities model involves local communities, schools, parents, business leaders, and health care providers in creating a more integrated set of community services (Trillium Foundation 1999).

An important practical experiment in service integration is the SHMO, or social health maintenance organization. The SHMO was implemented in several demonstration projects across the United States to integrate medical care with ancillary social services to address the dependency needs of the frail elderly (Kane, Kane, Finch, et al. 1997; Leutz et al. 1985; Manton, Newcomer, Vertrees, et al. 1994; Newacheck, Hughes, Halfon, et al. 1997; Newcomer, Harrington, and Friedlob 1990). The national Chronic Illness Consortium, which focuses on delivering community-

based integrated service to the frail elderly, is an amalgam of the SHMO and Community Care Network models. However, the unique issues of child health development suggest a different perspective on organizational integration. While the integration strategies of HDOs build on previous models of integrated health delivery systems, several strategies are specially tailored for them. They address the differences in target population, the greater number of institutions to be integrated, and, most important, the stated goal of the HDO to develop individual and population health over a multiyear time frame.

Vertical, Horizontal, and Longitudinal Integration

To optimize health development, the HDO integrates services in three dimensions: vertical, horizontal, and longitudinal. Vertical service integration in health systems refers to formal linkages between providers whose services are inputs to, or outputs of, the services produced by others (Conrad and Shortell 1997). The vertical dimension in health systems refers to hierarchy of service type and intensity, ranging from prevention and primary care (e.g., office-based services) to more intensive or acute tertiary care, to habilitative or long-term care. Depending on their level and type of need, patients rely upon services at different points along the vertical dimension of health production from preventive and primary care (Conrad and Shortell 1997; Kindig 1997).

In health and social services, the definition of horizontal integration differs from that used in standard economic theory, and also from that used by Shortell et al. (1993) to describe linkages between “like” health providers or institutions, such as between pharmacies, between hospitals, or between physician groups. Horizontal integration is used to describe the formal linkage between independent sectors that provide health, education, and related social services to children. While the sectors are independent, the services promote health development interdependently. For a child who has been abused or neglected, this might mean clinical integration and care coordinated across the health, child welfare, and education sectors. This expanded definition of horizontal service integration captures the breadth of services required to optimize health and developmental outcomes for children.

Finally, a particularly significant dimension of child health development is the longitudinal integration of services over time. The longitudinal perspective is a familiar concept in pediatrics, for which anticipatory guidance is a defining activity. The pediatric provider's role in anticipating child risk and family needs and promoting healthy behaviors supplies a kind of longitudinal integration to families. Longitudinal integration refers to an explicit recognition that services provided at one time in one institution context (e.g., preschool) are related to services that may be needed at a later time by the same child in another institution (e.g., high school). Longitudinal integration is a set of organizational principles that integrates services to minimize health risk and optimizes health development trajectories. It includes structuring services to optimize health development. For example, the provision of prenatal care and postnatal well-child care is reconfigured into a set of continuous developmental risk assessment services to identify potential risk. Health systems that assure continuity of service and are sensitive to developmental and social transitions faced by children likewise exhibit longitudinal integration.

Table 2 summarizes the implications that the three kinds of integration described above have for *clinical integration* (coordinating clinical services for an individual across providers, organizations, or temporal periods), for *organizational integration* (forming administrative linkages across providers, networks, or temporal periods), and for *financial integration* (sharing financial risk across providers, networks, or temporal periods) (Moscovice et al. 1997; Shortell, Gillies, and Anderson 1994).

In summary, the HDO is a vertically, horizontally, and longitudinally integrated health service delivery system for children. It coordinates services to stimulate risk reduction and health promotion and to optimize the long-term health development trajectory of all of its enrolled children. Whether it actually functions as a tightly integrated organization, a set of more loosely joined systems, or a set of more informal networks is a question for future research and community innovation. Regardless of the form in which they are created, HDOs provide one possible answer to the question of how a community-based organization or system could increase health development for children and thereby improve the health status of children and adults.

TABLE 2
Examples of Integration across Vertical, Horizontal, and Longitudinal Dimensions

	Vertical Integration	Horizontal Integration	Longitudinal Integration
Clinical	<p>Vertical Clinical Integration</p> <p>Definition: Provider-initiated coordination of patient services across physicians and levels of care intensity</p> <p><i>Example: Routine use of provider-level mechanisms to refer and provide services to children across service intensity levels (primary, secondary, tertiary, long-term care)</i></p>	<p>Horizontal Clinical Integration</p> <p>Definition: Care coordination by the child's provider in multiple service sectors</p> <p><i>Example: Integrated assessment and health management of pathways between health providers and child welfare agencies for children in foster care</i></p>	<p>Longitudinal Clinical Integration</p> <p>Definition: Provision of services that takes into account patient experience, future needs, and developmental potential and that enhances continuity of care and long-term development</p> <p><i>Example: Developmental and risk assessment linked to appropriate interventions and anticipatory guidance</i></p>
Organizational	<p>Vertical Organizational Integration</p> <p>Definition: Close organizational relationships in administration and management between different levels of care in the health production process</p> <p><i>Example: Contractual relationships and agreements between providers at different levels of service intensity, e.g., a hospital develops a primary care network</i></p>	<p>Horizontal Organizational Integration</p> <p>Definition: Close relationships between agencies, departments, and operating units in separate health-related sectors</p> <p><i>Example: Contractual relationships and agreements across sectors, e.g., between social welfare, education, and health sectors, to promote common developmental goals</i></p>	<p>Longitudinal Organizational Integration</p> <p>Definition: Organizational planning and design that facilitate children's transitions between organizations and sectors over time</p> <p><i>Example: Establishment of a school-readiness screening and intervention program to link health development outcomes with school readiness and achievement</i></p>

Financial	<p>Vertical Financial Integration</p> <p>Definition: Joint ownership, strong economic ties, or risk-transfer mechanisms between different levels of the health production system</p> <p><i>Example: Pooled financial risk and ownership across consolidated networks</i></p>	<p>Horizontal Financial Integration</p> <p>Definition: Joint ownership, strong economic ties, or risk-transfer mechanisms that exist between agencies, departments, and operating units in different health-related sectors involved in promoting the well-being and health of children</p> <p><i>Example: Contractual financial risk-transfer arrangements between sectors, establishment of common risk pools, or shared ownership of specific service delivery platforms</i></p>	<p>Longitudinal Financial Integration</p> <p>Definition: Financing mechanisms that encourage and promote long-term health development</p> <p><i>Example: Financial incentives to encourage organizations to make long-term investments in population health</i></p>
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Getting from Here to There: First Steps, Who Must Act, and What Needs to Be Done

The question of how to advance a policy agenda focused on integrating services for children is more complex than any one article or book could fully explore. The following proposals suggest how some of the feasibility and policy issues associated with the creation of HDOs could be addressed. First, we propose developing tools and technical systems that will help build the underlying structure of HDOs. These tools are critical first steps toward transforming the broad policy analysis we offer above into recognizable progress in the organization of health systems for children. Second, we discuss the actions that the government and private philanthropic organizations can take to foster the creation of HDOs. Third, we suggest several public policy strategies that communities, philanthropic organizations, existing provider organizations, or governments can pursue, including regulatory strategies, tax-based strategies, and decategorization strategies.

Using Tools to Support System Development: First Steps

In this section, we describe some critical first steps to move existing health care organizations in the direction of HDO functionality. The areas of particular importance to this goal are: the development of financial risk adjustment tools and methodologies, the development of health risk assessment tools, and the development of techniques to monitor performance and evaluate quality of care. Developing financial risk tools enables payers and policymakers to adjust the stream of payments to reflect actual risk levels. Health risk assessment tools enable provider organizations to target the delivery of care based on the needs of patients and of their insured population as a whole. Finally, performance and quality monitoring enables payers and policymakers to evaluate the efficacy of critical features of a system's organization. Each of these tools helps to structure the relationship between three components of a functioning health system: purchasers, providers, and patients. Examples of barriers to integration and corrective steps in organization, financing, and performance are provided in table 3.

Financial Risk Tools and Systems. Basic alignment of risks and payments is the key to providing appropriate financial incentives to the HDO (or any health care organization serving children). Currently, prepayment places health plans (and increasingly individual physicians) at financial risk for a range of services. Both purchasers and provider organizations need better information concerning the relationship between a patient's risk status (health conditions, family risk factors, and social risk factors), and the provider's likely expenditures. If purchasers do not account for the health risks that predict provider costs, then providers and health plans inevitably will face financial disincentives to care for children with higher risks. Under such circumstances, provider organizations cannot be expected to provide an appropriate level of care to optimize health development. Not only is a risk-adjusted payment scheme important to ensure an appropriate mix of services, but the long-term sustainability of an HDO in a competitive market depends upon it. Without it, the HDO, like any existing provider organization or insurer, will be vulnerable to adverse patient selection and to inadequate funding to comprehensively develop the health of the children it serves.

Health Development Risk Assessment Tools. The developmental trajectory illustrates how the multidimensional constructs of health and health risk are determined by genetic, behavioral, family, social, and environmental influences. Thus, health development risk assessments will be essential management tools for an HDO. Information gathered from health development risk assessments can provide the basis for designing integrative prevention and health promotion strategies. Health development risk assessment improves the capacity of providers to mobilize a continuum of care appropriate to the intensity of needs of an individual child. From a clinical viewpoint, a comprehensive health development risk assessment can promote the recognition of, and response to, a child's health risks and the potential protective factors. In a fully functioning HDO, developmentally appropriate risk assessment instruments would evolve to the point where they can capture the relevant risks and capacities of children and their families, and would be used to direct families to the appropriate level of care.

Beyond their significant potential value in the design of systems and care continuums, health development risk assessment tools also provide a vital feedback loop between interventions and outcomes. Risk assessment has the potential to track the risk of an individual or an enrolled

TABLE 3
Technical Steps to Improve Integration

Types of integration	Examples of barriers to prevention and to coordinated risk reduction			
	Organization	Financing	Performance	Corrective steps
Vertical	<ul style="list-style-type: none"> • Incremental development of child health programs • Lack of continuum of care • Lack of focus on prevention 	<ul style="list-style-type: none"> • Gaps in coverage for full primary and developmental care 	<ul style="list-style-type: none"> • Accountability of institutions for services rather than for outcomes 	<ul style="list-style-type: none"> • Implement comprehensive child risk assessment • Formal relationships within hierarchy • Implement outcome measures in evaluating care
Horizontal	<ul style="list-style-type: none"> • Disciplinary and sectoral divisions • Incremental policy and program development • Political will (safety net vs. system approach) 	<ul style="list-style-type: none"> • Multiple, categorical financing streams 	<ul style="list-style-type: none"> • Empirical basis for effectiveness of coordination • Few quality measures assessing access/use of cross-sector services 	<ul style="list-style-type: none"> • Decategorize public funds • Implement outcome measures in evaluating public agency performance and health care quality

Longitudinal

- Turnover in provider and use of multiple providers
 - Turnover in source and type of coverage
 - Benefits accrue over life course
 - Discounting of health benefits realised in future
 - Remaining risks may “wash out” effects if prevention and risk reduction are only short term
 - Few outcome measures available to link health plan inputs with long-term results for children
 - Empirically demonstrate process-outcome links
 - Develop strategies to reward long-term investment
 - Support public interventions to sustain private-sector inputs
-

population in relation to health care inputs and health outcomes. Thus at the organizational level, health risk assessment tools enable the structure and operation of an HDO to evolve in response to the process of care and its effects on patient risk status. Greater use of health development risk assessment can help close the empirical gap that now exists in quantifying how child and family health risks and capacities interact with health care inputs over time to produce short- and long-term health outcomes. To apply health assessment tools to this task, further research and development will be needed (Szilagyi and Schor 1998).

Performance Monitoring and Quality of Care. To create better functioning integrated health systems for children, better performance monitoring and quality of care measurement tools are needed. These tools would enable purchasers and consumers to understand how well an HDO is "producing health." To the extent that performance measurement and quality monitoring can empirically demonstrate measurable improvements in health outcomes, it will be easier for consumers and purchasers to justify the kinds of health purchasing decisions required to support a multidimensionally integrated health system like the HDO.

Creating tools that can monitor performance and evaluate the quality of care allows organizations to move toward multidimensional integration and better health outcomes for their enrolled populations (DuPlessis, Inkelas, and Halfon 1998). As multidimensional performance measurement develops, organizations such as the National Committee for Quality Assurance (NCQA) and the Foundation for Accountability (FACCT) might incorporate relevant performance measures that consumers and purchasers could use to understand the extent to which a health plan is oriented toward health development.

Unfortunately, other issues in performance measurement suggest just how great the challenges are. In spite of the conceptual and practical importance of performance measurement for HDOs, the development of performance measurement techniques for child health services is still in its early stages. At present, neither the evidence base demonstrating effectiveness of health development services nor the political forces driving quality measurement have created the impetus to include many measures related to children's health development into NCQA Health Plan Employer Data and Information Set (HEDIS) or other quality-monitoring programs (McGlynn and Halfon 1998). Beyond the political issues, finding the appropriate quality measures for children is further complicated by the nature of their developmental trajectory (McGlynn

and Halfon 1998). For example, in simple terms, children's expected growth and development have a tendency to camouflage and obscure the effects of inadequate health care on their developmental trajectory. While relatively small changes in the developmental trajectory are believed to have significant effects on developmental outcomes, detecting those small changes requires more sensitive techniques than are widely available at present. Since the overall functional capacity of most children will continue to improve even if they receive poor quality health care, it is easy to confuse marginal improvements in functional status with the optimal range of function that a child is capable of achieving. As a result, the health impact of service deficits is hard to detect without careful, continuous assessment across developmental periods.

It should be clear that the technical challenges are significant, and that the difficulties should not be understated. Nonetheless, an intensive focus on relevant measures of institutional effectiveness (e.g., objectively evaluated developmental outcomes, measures of parent and family satisfaction, global measures of improved health status of children in the community) and on measures that reflect the broad scope of services and special functions that the HDO aims to provide for children can facilitate HDO development. Getting performance measures right, or even partly right, will help policymakers and purchasers define the outcomes that matter most for HDOs. When combined with the financial risk adjustment tools discussed above, those tools can provide managed care organizations with direct incentives to expand the provision of the services that matter most for childhood health development outcomes.

Finally, there are significant organizational challenges in measuring the performance of service systems for children. The multiple fragmented layers of services and programs for children in the current system create significant difficulties in assessing quality and performance (DuPlessis, Inkelas, and Halfon 1998; Grason and Guyer 1995a; 1995b). Performance measures and quality measurement tools must be used in concert with processes of integration. Experience suggests that defining what is to be measured and how it is to be measured can serve as a catalyst for change (Fielding, Sutherland, and Halfon 1999).

The HDO will not be sustainable, politically or commercially, if it cannot demonstrate better and more efficient health outcomes than current managed care organizations, relative to the health risks faced by its enrolled population. Performance measurement tools are essential for

demonstrating that kind of success. The challenges for the HDO approach are to understand the financial risks posed by varying health risk levels in a population of children, to evaluate health risk accurately, to link that risk to clinical and organizational responses, and to measure quality and performance at the provider, plan, and system levels. Concerted public and private efforts to build the tools for these “basic” health system needs and functions can move communities in the direction of the HDO.

Government, Industry, and Philanthropic Roles: Who Must Act

Translation of the HDO concept into an innovative service delivery system can be facilitated by federal, state, and local government actions, managed care and insurance industry innovations, and private philanthropy initiatives. These strategies would generate awareness of how health systems can promote children’s development, test the feasibility and sustainability of new models, and ensure that they evolve in a manner compatible with existing systems.

Federal Government. The federal government can play a central role in education and conceptual development by convening appropriate groups of individuals and policymakers, by supporting research and development of the HDO approach, and by disseminating the findings of this process. Moreover, it can utilize the principles of health development itself when developing standards, guidelines, incentives, and new program initiatives. The Department of Health and Human Services, which oversees both health and child development and child welfare programs, is in an ideal position to take the lead in integrating health and developmental strategies and services focused on child health development.

Examples abound: the Health Resources and Services Administration (HRSA) and its Maternal and Child Health Bureau (MCHB) could facilitate state and local community innovation by sponsoring pilot initiatives to coordinate and integrate services across sectors, decategorize current funding streams, and carry out other service integration strategies. Several of these strategies have received general support by HRSA and MCHB under other programmatic initiatives, but they have not been focused into a strategy for health system change. The Agency for Healthcare Research and Quality (AHRQ) could facilitate the development of HDOs through targeted initiatives to develop child focused

risk assessment and community-based quality monitoring and improvement measures and processes (DuPlessis, Inkelas, and Halfon 1998). In addition, HRSA and AHRQ could facilitate the development of better measures of community benefit, and of system integration and organization, which would link organizational change to long-term health development within a community. The Health Care Financing Administration (HCFA) could replicate its prior role in development of the Social HMO Initiative. HCFA could also sponsor pilot projects and, over the long run, support the development of financial incentives to stimulate cross-sector and longitudinal service and fiscal integration. An initial pilot might use HDO principles to reconceptualize the role that Medicaid and the State Child Health Insurance Program (SCHIP) could play as funding sources for integrated child delivery systems, and not simply as payers for “traditional” managed care products. MCHB involvement in the development of pilot projects could help ensure that HDO functions can be adapted for communities with different resources so that delivery system inequities are reduced, and not exacerbated, by HDO implementation.

State Government. States have increasingly become the crucibles of child health policy innovation and change. Because most children’s health and welfare programs have grown out of a state-based welfare tradition, and because each state operates a unique Medicaid program, states have always been a major focus of innovation in children’s health policy. With the passage of SCHIP, many states are reexamining the organization and funding of health services for low-income children (Halfon, Inkelas, and Newacheck 1999). In addition, many states have launched major initiatives focused on early child development. These include Vermont’s Success by Six, North Carolina’s Early Start, and California’s recently passed Children and Families First Act, which established county-level commissions on early childhood and provided localities with more than \$750 million in new funding focused on children up to five years of age.

State-focused policy organizations (e.g., National Academy of State Health Policy, National Governors Association) and professional organizations with strong state-focused activities (e.g., Association of Maternal and Child Health Programs, American Academy of Pediatrics’ Zero to Three) could take leadership roles in conceptualizing how to implement greater horizontal and longitudinal integration of services for children. These groups can work with state health, child development, and educational decision makers and focus on current barriers to HDO principles as

well as on strategies to innovate. Key policy issues include cross-sectoral financing mechanisms, innovation in Medicaid and SCHIP contracting and quality measurement, and better monitoring of health developmental indicators. States are also in a strategic position to sponsor pilot HDO projects in selected communities.

Local Government and Communities. Much of the innovation needed to create HDOs will need to take place within local communities. In states with county-based government, counties can forge new collaborative partnerships and stimulate strategic alliances between education, child development, and health sectors. Through the Healthy People 2010 process and other Maternal and Child Health reporting and surveillance activities, counties can focus the attention of local policymakers and leaders on indicators of improved health development of children. County governments also have a role in the process of decategorizing the existing categorical funding sources. County government can facilitate the development of master or omnibus contracts between public agencies and newly developing community-based delivery systems that utilize schools, family resource centers, and community clinics as integrated delivery platforms.

Many of the building blocks necessary to establish systems of care consistent with HDO principles are either planned or in place in many communities. Some communities have made great strides at integrating public sector programs. For example, in Monroe County, New York, the health department has negotiated with state and federal governments to decategorize several state and federal funding streams, and is creating an integrated approach to the delivery of early childhood health and development services (Newacheck, Halfon, Brindis, et al. 1998). In Hartford, Connecticut, the ChildServe program links all pediatric providers in the Hartford area with a care coordinator and case management system designed to improve coordination and access to developmental services. (ChildServ 1999). The conceptual and empirical literature on systems of care for children presents a range of other examples for providing comprehensive care, for integrating several different types of services, and for linking community and institutional providers of care (Melaville and Blank 1991; Racine, Stein, Belamarich, et al. 1998; Rosenblatt and Attkisson 1992a; 1992b; Schlenger, Etheridge, Hansen, et al. 1992). Some communities have begun the process of integrating primary and tertiary care by creating networks using children's hospitals as the medical hub and linking with primary care providers, primary care centers,

school-based clinics, and other service providers (Hacker 1996; Kaplan, Brindis, Phibbs, et al. 1999).

For HDOs to emerge and succeed, ways of adapting HDO principles to the needs, policies and organization of all of the relevant service sectors will be required. Previous theoretical work on the preconditions for system integration by several analysts of hospital-physician network formations (Griffith 1997; Pointer, Alexander, and Zuckerman 1997; Shortell, et al. 1993) suggests some strategies. Achieving public agency commitment is quite a complex undertaking given the many incentives and competing objectives that public agencies themselves hold. It will be particularly important that community agencies and state and county bureaucracies that are already shouldering a heavy burden by caring for many children see an advantage for themselves in moving toward the creation of longitudinally focused, integrated health development systems.

The state-wide programs initiated in North Carolina and, more recently, in California with the Children and Families First Act, hold great promise. New county-level commissions, with significant flexible funds have been established in California to build integrated systems of care for children up to age five (Halfon, Gonzalez, and Hochstein 1999). These early child "health development" commissions function partly as local venture capital firms, partly as outcome trusts, and partly as community development councils. If they can facilitate more integration across sectors and create long-term investment strategies for schools, health care providers, and other community-based organizations, they may represent the type of new political entity that counties need to redesign existing systems for children.

The Private Sector. The managed care and health insurance industries as a whole may also see an opportunity in better-integrated children's services. Faced with a flood of new knowledge on how genes influence human development, the insurance industry increasingly will be challenged to rethink the notion of risk in a new developmental context. For example, if a two-year-old child's genetic profile and fetal growth history signals a high probability of heart disease at age 50, should that two-year-old be tracked into an intensive heart-disease-prevention and health promotion pathway so as to minimize the component of the individual's risk equation that is determined by environmental and behavioral influences? What are the health care financing and insurance implications, or the business implications, of this knowledge?

Exclusions for “preexisting conditions” have been commonplace and viewed as a mechanism for avoiding adverse selection. Within a decade, many or even most human health conditions will have a known pre-existing (i.e., genetic) component. As the genomics revolution reduces uncertainty in the expected total medical cost profile of an individual across the life course, and as health development is more specifiable, the core function of health insurance as a risk-spreading mechanism for catastrophic health events may become less important. Instead, a growing proportion of health spending and medical costs may be preventive in nature, resembling investments in the individual’s health capital. In this environment, the insurance industry will be challenged to reexamine traditional roles. The health insurance industry may find it advantageous to create new product lines that are responsive to the growing knowledge of functional risk profiles and to the growing capacity of medical interventions to transform long-term risk equations.

The managed care industry could come to view the HDO as a product line that allows it to develop longer-term relationships with its insured population base, to achieve lower rates of enrollee turnover, and to extend its risk horizons (Robinson 1999). Horizontal integration with other service systems may also be attractive to managed care organizations since these relationships could potentially “off-load” certain case management and coordination functions to child welfare, school, or other systems involved in children’s lives. In some markets, the HDO might be one health insurance option for companies and families. In others, an HDO could be a special product line focused on children with special health care needs, children in foster care, or other vulnerable groups. While HDO principles of care continuums and long-term investment are desirable for all children, a market reality is that the highly organized HDO network (as one health care product among many) might be preferred by some families and consumers more than others. Whether there is adequate demand for an HDO product, and whether it can be extended to those children who would most benefit from it, may depend on how well families understand its potential, as well as on how well other parties (e.g., public child health insurance programs) recognize its value and support its adaptation. Development of an HDO product line might also allow an MCO to be more accountable to the communities it serves, and better able to meet its mandate to provide “community benefit” (Schlesinger, Gray, and Perreira 1998).

Philanthropy and Community Benefit. Lastly, private philanthropy has a potentially large role to play in many of the same ways that have been suggested for each level of government. Private philanthropy could convene decision makers from relevant sectors to explore the potential development of HDOs. Local conversion foundations could help local communities devise *health development trusts* through innovative, strategic grant making. Such grant making would resemble the activity of a venture capital firm more than the typical foundation-funded demonstration projects.

While only certain components of a health development organization may be developed in the short term, a more favorable environment could emerge as innovative purchasing models mature and strategic investments are made. For example, Kindig (1997) has suggested that a “health outcomes trust” be created as a financial integrating mechanism for promoting population health. Functioning much like a public utility, an outcomes trust could be structured like the health insurance purchasing cooperatives (HIPCs) in states such as California and Florida. Such outcomes trusts might serve as a quasi public-private body that can integrate funds and thereby support greater functional and clinical integration between agencies, providers, and even sectors.

Strategies for Building HDOs: What Needs to Be Done

Several types of public policies could move health systems in the direction represented by the HDO framework. First, regulatory strategies could be used to encourage provider organizations to adopt a developmental focus. Second, tax-based strategies could be used to generate targeted funds and to support an expanded and more integrated public system of care. Third, decategorization strategies could redirect and reorganize existing funding streams to achieve more integrated systems of care.

Regulatory Approaches. A regulatory approach might establish requirements for managed care organizations to ensure that they provide specific health development services. In this way, a better balance could be encouraged between services that represent current consumption and services that represent longer-term health investments. For example, Medicaid contracts might require that managed care organizations provide parenting education and support services, and other services that

support long-term health development. Medicaid contracts could also specify the formal working arrangements between the managed care organization, school systems, and social services agencies in order to support a broader, more horizontally integrated approach to health development. Alternatively, rather than setting a specific process of care standard, a regulatory strategy might allow more flexibility to a managed care organization by establishing penalties for specific types of undesirable outcomes, but refraining from regulating the design of the health plan infrastructure.

Tax-Based Approaches. A public investment approach would most likely emphasize public tax expenditures or provide tax credits for specific services that represent health capital investments. The public tax expenditure approach to health investment has a long history in children's health care (Hutchins 1997). This is exemplified by Title V, state mandates for regionalized services for children with developmental delay, and the federal Individuals with Disabilities Education Act (IDEA) legislation. These publicly funded wraparound services not only underwrite a more expansive set of clinical services but provide case management linkages between systems. Broader scope and availability of these wraparound services could supplement what managed care organizations provide. Alternatively, tax credits could be awarded when managed care organizations demonstrate the provision of broader and more integrated service packages. In addition, tax credits might be awarded to hospitals that establish comprehensive family resource centers to promote the development of young children and families. Each of these approaches has potential merits as well as feasibility constraints (Halfon and Inkelas, in progress). Consequently, these approaches would all require further exploration and development before their viability as financing strategies for HDOs could be determined.

Decategorization Strategies. An added challenge facing public sector investment in the health capital of children stems from the long history of categorical funding, distributed in fragmented and unintegrated systems of care. Horizontal integration requires the flexible distribution of resources across services or programs focused on young children, such as primary care, early childhood developmental services, WIC screening, and child care services. Decategorization strategies in the public sector can permit more flexible funding arrangements that allow integrated continuums of care to develop. For example, as part of the Robert Wood Johnson Child Health Initiative, Monroe County combined eight

different state and federal funding streams into a decategorized pool to permit the redesign and integration of early childhood services. This and other emerging examples hold promise for creating mechanisms that allow greater financial flexibility to stimulate horizontal integration (Newacheck et al. 1997).

Conclusions

A recent report commissioned by the Robert Wood Johnson Foundation, titled *Health and Health Care 2010*, highlights the major projected morbidities in the year 2020 (Institute for the Future 2000). These will include cardiovascular disease, mental health disorders (including major depressive disorders), and substance abuse (including alcohol, tobacco, and illegal drugs). Each of these causes of significant morbidity has clear developmental origins and determinants and responds to long-term prevention strategies. If smoking initiation can be substantially reduced during adolescence, the disease and disability from long-term tobacco exposure could be dramatically reduced. If the biopsychosocial origins of mental health disorders can be better understood and addressed, beginning in childhood, the economic and human burden of mental health disorders could be diminished. Children born today will move down the road toward these outcomes or away from them, depending on the capacity of our health systems to promote their health development. It is none too early to begin to organize and build the systems of care that can alter the health destinies projected for them, and for other Americans, in the year 2020.

In the United States today, the operational principles behind health care delivery are moving beyond old approaches emphasizing episodic care to increasing support for integrated systems, and notions of disease management are now being further reconceptualized as health management (Kindig 1997; Todd and Nash 1997). These undercurrents of change contain hidden opportunities to refashion the organization of health care for children. Support for significant delivery reforms will only be strengthened by the growing number of studies documenting the childhood origins of adult disease. States are beginning to take steps toward regulating the managed care industry to preserve physician-patient relationships, to empower patients as consumers, and to permit physicians more flexibility in the types of business relationships they

develop. At the same time, new health care delivery products are emerging that target specific populations or consumers with special preferences (Robinson 1999). Communities, policymakers, and managed care organizations are also considering how "community benefit" will be redefined for this new era of health care delivery (Schlesinger, Gray, and Perreira 1998). Many communities are initiating community health improvement efforts that could stimulate improved collaboration and coordination among public and possible private providers and payers (Institute of Medicine 1997).

Creating a health development organization requires a rethinking of how health, social service, and even education systems in communities interact and could be better integrated. This is a big project. Yet the strategies involving government, business, and philanthropy outlined above suggest how initial steps that build on existing trends can begin the process of change. The research and development of the technical tools described above constitutes a concrete and practical agenda for building the underlying infrastructure to support HDO development. The responsiveness of private and public sector institutions to HDO concepts will depend upon the extent and pace of progress in the development of tools, including financial risk adjustment, health risk assessment, and performance and quality measurement. Without financial allocation mechanisms and the capacity to evaluate developmental health risks, efforts to create HDOs will be impeded. Without performance and quality of care measures that can demonstrate the success of HDO risk reduction efforts, purchasers and consumers will be unable to evaluate how well HDOs are accomplishing their primary responsibility: developing the health and human capacities of their enrolled populations.

Because the HDO is an organizational concept rather than a prescriptive structural model, it is intended as a conceptual starting point for local innovation and testing. The creation of HDOs will be an incremental process, growing out of contemporary public and private organizations and the ongoing development of tools and performance measures. While the reality of HDOs must grow in response to the pace of tool development as well as the readiness of communities, businesses, and philanthropies to move toward more effective, integrated, and comprehensive development of children's health, the vision of the HDO offered here defines a worthy goal. In the best-case scenario, the vision of a fully integrated HDO may help to motivate a new kind of organizational

synergy among the organizations and services that now work with different aspects of children's lives. As the developmental trajectories between birth and old age are defined with greater precision through advances in genetics and biomedical research, the HDO provides an optimistic vision of how health systems can organize themselves to build both upon the science of human development and upon the growing recognition and willingness on the part of communities and governments to take their future in their own hands and, beginning with children, work to maximize health development across the life course.

References

- Aday, L.A. 1993. *At Risk in America: The Health and Health Care Needs of Vulnerable Populations in the United States*. San Francisco: Jossey-Bass.
- American Hospital Association. 1995. 25 Partnerships Named to Receive Grants in Community Network Competition. News release, August 22. Washington, D.C.
- Baltes, P.B. 1997. On the Incomplete Architecture of Human Ontogeny. *American Psychologist* 52:366–80.
- Baltes, P.B., and P. Graf. 1996. Psychological Aspects of Aging: Facts and Frontiers. In *The Lifespan Development of Individuals: Behavioral, Neurobiological, and Psychological Perspectives*, ed. D. Magnusson, 427–60. New York: Cambridge University Press.
- Baltes, P.B., U. Lindenberger, and U. Staudinger. 1998. Life-Span Theory in Developmental Psychology. In *Handbook of Child Psychology*, 5th ed., eds. W. Damon and R. Lerner, Vol. 1, 1029–144. New York: Wiley.
- Barker, D.J.P. 1998a. In Utero Programming of Chronic Disease. *Clinical Science* 95:115–28.
- Barker, D.J.P. 1998b. *Mothers, Babies and Health in Later Life*. Edinburgh: Churchill, Livingstone.
- Barker, D.J.P., P.D. Gluckman, K.M. Godfrey, J.E. Harding, J.A. Owens, and J.S. Robinson. 1993. Fetal Nutrition and Cardiovascular Disease in Adult Life. *Lancet* 341:938–941.
- Bateson, P. 1996. Design for a Life. In *The Lifespan Development of Individuals: Behavioral, Neurobiological, and Psychological Perspectives*, ed. D. Magnusson, 1–20. New York: Cambridge University Press.
- Baydar N., J. Brooks-Gunn, and F.F. Furstenberg. 1993. Early Warning Signs of Functional Illiteracy: Predictors in Childhood and Adolescence. *Child Development* 64(3):815–29.

- Berkman, L.F. and L. Syme. 1979. Social Networks, Host Resistance and Mortality: A Nine-Year Follow-Up Study of Alameda County Residence. *American Journal of Epidemiology* 109(2):186–204.
- Boyce, W.T., E. Frank, P.S. Jensen, R.C. Kessler, C.A. Nelson, and L. Steinberg. 1998. Social Context in Developmental Psychopathology: Recommendations for Future Research from the MacArthur Network on Psychopathology and Development. *Development and Psychopathology* 10:143–64.
- Bronfenbrenner, U. 1979. *The Ecology of Human Development*. Cambridge: Harvard University Press.
- Brooks-Gunn, J., G.J. Duncan, and J.L. Aber. 1997. *Neighborhood Poverty: Context and Consequences for Children*. New York: Russell Sage Foundation.
- Campbell, F.A., and C.T. Ramey. 1995. Cognitive and School Outcomes for High-Risk African American Students at Middle Adolescence: Positive Effects of Early Intervention. *American Education Research Journal* 32(4):743–72.
- Canadian Government. 1974. *A New Perspective of Health of Canadians. (Lalonde Report.)* Ottawa: Department of National Health and Welfare.
- Catholic Hospital Association (CHA). 1993. *A Workbook on Community Accountability in Integrated Delivery*. St. Louis: CHA.
- ChildServ. 1999. *The Early Detection of Developmental Problems in Childhood*. Hartford, Conn.: Center for Children's Health and Development.
- Chrvala, C.A., and R.J. Bulger. 1999. *Leading Health Indicators for Healthy People 2010: Final Report*. Washington, D.C.: Institute of Medicine, National Academy of Sciences.
- Cicchetti, D., and J.L. Aber. 1998. Contextualism and Developmental Psychopathology. *Development and Psychopathology* 10(2):137–41.
- Coe, C.L. 1999. Psychosocial Factors and Psychoneuroimmunology within a Lifespan Perspective. In *Developmental Health and the Wealth of Nations*, eds. D.P. Keating and C. Hertzman, 201–19. New York: Guilford Press.
- Conrad, D.A., and S.M. Shortell. 1997. Integrated Health Systems: Promise and Performance. In *Integrated Delivery Systems: Creation, Management and Governance*, 3–44. Chicago: Health Administration Press.
- Costello, E.J., and A. Angold. 1995. A Brief History of Child Psychiatric Epidemiology in Developmental Epidemiology. In *Developmental Psychopathology*, Vol. 1, *Theory and Methods*, eds. D. Cicchetti and D.J. Cohen, 23–56. New York: Wiley.
- Cunningham, A.E., and K.E. Stanovich. 1997. Early Reading

- Acquisition and Its Relation to Reading Experience and Ability 10 Years Later. *Developmental Psychology* 33(6):934–45.
- DuPlessis, H.M., M. Inkelas, and N. Halfon. 1998. Assessing the Performance of Community Systems for Children. *Health Services Research* 33(4; Part 2):1111–42.
- Eisenberg, L. 1999. Experience, Brain, and Behavior: The Importance of a Head Start. *Pediatrics* 103:1031–35.
- Engle, G. 1977. The Need for a New Medical Model: A Challenge for Biomedicine. *Science* 197(4286):129–96.
- Evans, R.G., M.L. Barer, and T.R. Marmor, eds. 1994. *Why Are Some People Healthy and Others Not?* New York: Walter de Gruyter.
- Evans, R.G., and G.L. Stoddart. 1990. Producing Health, Consuming Health Care. *Social Science and Medicine* 31(12):1347–63.
- Evans, R.G., and G.L. Stoddart. 1994. Producing Health, Consuming Health Care. In *Why Are Some People Healthy and Others Not?*, eds. R.G. Evans, M.L. Barer, and T.R. Marmor, 27–64. New York: Walter de Gruyter.
- Felitti, V.J., R.F. Anda, D. Nordenberg, et al. 1998. Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine* 14:245–58.
- Fielding, J.E., C. Sutherland, and N. Halfon. 1999. Community Report Cards: Results of a National Survey. *American Journal of Preventive Medicine* 17:79–86.
- Forrest, C.B., L. Simpson, and C. Clancy. 1997. Child Health Services Research: Challenges and Opportunities. *Journal of the American Medical Association* 277(22):1787–93.
- Garbarino, J. 1990. The Human Ecology of Early Risk. In *Handbook of Early Childhood Intervention*, eds. S.J. Meisels and J.P. Shonkoff, 78–96. New York: Cambridge University Press.
- Gottlieb, G. 1992. *Individual Development and Evolution: The Genesis of Novel Behavior*. New York: Oxford University Press.
- Gottlieb, G. 1996. Commentary: A Systems View of Psychobiological Development. In *The Lifespan Development of Individuals: Behavioral, Neurobiological, and Psychosocial Perspectives*, ed. D. Magnusson, 76–103. New York: Cambridge University Press.
- Gottlieb, G., D. Wahlsten, and R. Lickliter. 1998. The Significance of Biology for Human Development: A Developmental Psychobiological Systems View. In *Handbook of Child Psychology*, 5th ed., eds. W. Damon and R. Learner, Vol. 1, 233–74. New York: Wiley.
- Grason, H.A., and B. Guyer. 1995a. *MCH Quality Systems Functions Framework*. Arlington, Va.: Association of Maternal and Child Health Programs.

- Grason, H.A., and B. Guyer. 1995b. *Assessing and Developing Primary Care for Children: Reforms in Health Systems*. Arlington, Va.: National Center for Education in Maternal and Child Health.
- Green, M., and S.S. Kessel. 1993. Diagnosing and Treating Health: Bright Futures. *Pediatrics* 91(5):998–1000.
- Green, M., and J.S. Palfrey. 2000. *Bright Futures: Guidelines for Health Supervision in Infants, Children, and Adolescents*, 2nd ed. Arlington, Va.: National Center for Education in Maternal and Child Health.
- Griffith, J.R. 1997. Managing the Transition to Integrated Health Care Organizations. In *Integrated Delivery Systems: Creation, Management, and Governance*, 91–132. Chicago: Health Administration Press.
- Grossman, M. 1972. On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy* 80(2):123–255.
- Grossman, M. 1999. The Human Capital Model of the Demand for Health. Working Paper no. W7078. Cambridge, Mass.: National Bureau of Economic Research.
- Hacker, K. 1996. Integrating School-Based Health Centers into Managed Care in Massachusetts. *Journal of School Health* 66:317–21.
- Haggerty, R.J., K.J. Roghmann, and I.B. Pless. 1975. *Child Health and the Community*. New York: Wiley.
- Halfon, N., and G. Berkowitz. 1993. Health Care Entitlement for Children: Providing Health Services As If Children Really Mattered. In *Visions of Entitlement: The Care and Education of America's Children*, eds. M.A. Jensen and S.G. Goffin, 175–212. Albany, N.Y.: State University of New York Press.
- Halfon, N., P. Ebener, N. Sastry, et al. 1997. *California Health Report*. Santa Monica, Calif.: RAND. DRU-1592-TCWF.
- Halfon, N., R. Gonzalez, and M. Hochstein. 1999. *Building Bridges for California's Young Children: A 12-Point Agenda to Enhance Proposition 10*. Los Angeles: UCLA Center for Healthier Children, Families and Communities, California Policy Research Center.
- Halfon, N., and M. Hochstein. In progress. Life Course Health Development: An Integrated Framework for Measuring Health and Financing Health Intervention.
- Halfon, N., and M. Inkelas. In progress. Motivating Investment in "Health Development" in Children's Health Care.
- Halfon, N., M. Inkelas, and P. Newacheck. 1999. Enrollment in State Child Health Insurance Program: Strategies for Evaluation and Continuation Quality Improvement. *Milbank Quarterly* 77(2):181–204.
- Halfon, N., M. Inkelas, D.L. Wood, and M.A. Schuster. 1996. Refinancing and Restructuring the U.S. Child Health System. In *Changing the U.S. Health Care System: Key Issues in Health Services, Policy, and*

- Management*, eds. R.M. Andersen, T.H. Rice, and G.F. Kominski, 227–54. San Francisco: Jossey-Bass.
- Halfon, N., and P.W. Newacheck. 1999. Characterizing the Social Impact of Asthma in Childhood. In *Socioeconomic Impact of Asthma*, eds. K. Weiss, A.S. Buist, and S.D. Sullivan, 23–53. New York: Marcel Dekker, Inc.
- Heckmann, J.J. 1999. Policies to Foster Human Capital. Working Paper no. 7288. Cambridge, Mass.: National Bureau of Economic Research.
- Hertzman, C. 1994. The Lifelong Impact of Childhood Experiences: A Population Health Perspective. *Daedalus* 123(4):167–80.
- Hertzman, C., and M. Wiens. 1996. Child Development and Long-Term Outcomes: A Population Health Perspective and Summary of Successful Interventions. *Social Science and Medicine* 43(7):1083–95.
- Hochstein, M., N. Halfon, and M. Inkelas. 1998. Creating Systems of Developmental Health for Children. *Journal of the New York Academy of Sciences* 75(4):751–71.
- Hoekleman, R.A., and I.B. Pless. 1988. Decline in Mortality among Young Americans during the 20th Century: Prospects for Reaching National Mortality Reduction Goals for 1990. *Pediatrics* 82(4):582–95.
- Holt, P.G., and P.D. Sly. 1997. Allergic Respiratory Disease: Strategic Targets for Primary Prevention during Childhood. *Thorax* 52:1–4.
- Hutchins, V.L. 1997. A History of Child Health and Pediatrics in the United States. In *Health Care for Children: What's Right, What's Wrong, What's Next?*, ed. R.K. Stein. New York: United Hospital Fund.
- Institute for the Future. 2000. *Health and Health Care 2010: The Forecast, The Challenge*. San Francisco: Jossey-Bass.
- Institute of Medicine. 1997. *Improving Health in the Community: A Role for Performance Monitoring*, eds. J.S. Durch, L.A. Bailey, and M.A. Stoto. Washington, D.C.: National Academy Press.
- Jameson, E.J., and E. Wehr. 1993. Drafting National Health Care Reform Legislation to Protect the Health Interests of Children. *Stanford Law and Policy Review* 5:152–76.
- Kahn, A.J., and S.B. Kamerman. 1992. *Integrating Services Integration: An Overview of Initiatives, Issues, and Possibilities*. New York: National Center for Children in Poverty, Columbia University School of Public Health.
- Kamerman, S.B., and A.J. Kahn. 1995. *Starting Right*. New York: Oxford University Press.
- Kane, R.L., R.A. Kane, M. Finch, et al. 1997. S/HMOs, the Second Generation: Building on the Experience of the First Social Health

- Maintenance Organization Demonstrations. *Journal of the American Geriatrics Society* 45(1):101–7.
- Kaplan, D.W., C.D. Brindis, S.L. Phibbs, P. Melinkovich, K. Naylor, and K. Ahlstrand. 1999. A Comparison Study of an Elementary School–Based Health Center. *Archives of Pediatrics and Adolescent Medicine* 153:235–43.
- Karoly, L.A., P.W. Greenwood, S.S. Everingham, et al. 1997. *Investing in Our Children*. Santa Monica, Calif.: RAND.
- Katz, M. 1986. *In the Shadow of the Poor House*. New York: Basic.
- Kindig, D.A. 1997. *Purchasing Population Health: Paying for results*. Ann Arbor: University of Michigan Press.
- Kuh, D., and Y. Ben-Shlomo. 1997. *A Life Course Approach to Chronic Disease Epidemiology*. New York: Oxford University Press.
- Kuh, D., and G. Davey-Smith. 1997. The Life Course and Adult Chronic Disease: A Historical Perspective with Particular Reference to Coronary Heart Disease. In *A Life Course Approach to Chronic Disease Epidemiology*, eds. D. Kuh and Y. Ben-Shlomo. New York: Oxford University Press.
- Lamberts, S.W.J., A.W. van den Beld, and A. van der Lely. 1997. The Endocrinology of Aging. *Science* 278:419–24.
- Leon, D.A. 1998. Fetal Growth and Adult Disease. *European Journal of Clinical Nutrition* 52:S72–S82.
- Lerner, R.M. 1998. Theories of Human Development: Contemporary Perspectives. In *Handbook of Child Psychology*, eds. W. Damon and R.M. Lerner, 1–24. New York: Wiley.
- Leutz, W.N. 1999. Five Laws of Integrating Medical and Social Services: Lessons from the United States and United Kingdom. *Milbank Quarterly* 77(1):77–110.
- Leutz, W., J. Greenberg, R. Abrahams, J. Prottas, L. Diamond, and L. Gruenberg. 1985. *Changing Health Care for an Aging Society: Planning for the Social Health Maintenance Organization*. Lexington, Mass.: Lexington Health.
- Levenworth, G. 1995. Preventive Medicine: Strategies for Quality Care and Lower Costs. *Business and Health* 13(3):supp. A.
- Lucas, A. 1991. Programming by Early Nutrition in Man. In *Ciba Foundation Symposium: The Childhood Environment and Adult Disease*, eds. G.R. Beck and J. Whelan, 56–76. New York: Wiley.
- Lucas, A. 1998. Programming by Early Nutrition: An Experimental Approach. *Journal of Nutrition* 128:401S–406S.
- Magnusson, D., and H. Stattin. 1998. Person-Context Interaction Theories. In *Handbook of Child Psychology*, 5th ed., eds. W. Damon and R. Lerner, Vol. 1, 685–760. New York: Wiley.

- Manton, K.G., R. Newcomer, J.C. Vertrees, G.R. Lowrimore, and C. Harrington. 1994. A Method for Adjusting Capitation Payment to Managed Care Plans Using Multivariate Patterns of Health and Functioning: The Experience of Social Health Maintenance Organizations. *Medical Care* 32(3): 277–97.
- Marmot, M.G., G. Rose, M.H. Shipley, and P.J.S. Hamilton. 1978. Employment Grade and Coronary Heart Disease in British Civil Servants. *Journal of Epidemiology and Community Health* 32:244–49.
- Martinez, F.D., and Holt P.G. 1999. Role of Microbial Burden in Aetiology of Allergy and Asthma. *Lancet* 354:12–15.
- Matthews, S.G. 2000. Antenatal Glucocorticoids and Programming of the Developing CNS. *Pediatric Research* 47:291–300.
- McEwen, B.S. 1998. Stress, Adaptation, and Disease: Allostasis and Allostatic Load. *Annals of the New York Academy of Sciences* 840:33–44.
- McGlynn, E.A., and N. Halfon. 1998. Overview of Issues in Improving Quality of Care for Children. *Health Services Research* 33(4; Part 2):977–1000.
- Meisels, S.J., and J.P. Shonkoff. 1990. *Handbook of Early Childhood Intervention*. New York: Cambridge University Press.
- Melaville, A.I., and M.J. Blank. 1991. *What It Takes: Structuring Interagency Partnerships to Connect Children and Families with Comprehensive Services*. Washington D.C.: Education and Human Services Consortium.
- Moscovice, I., A. Wellever, J. Christianson, M. Casey, B. Yawn, and D. Hartley. 1997. Understanding Integrated Rural Health Networks. *Milbank Quarterly* 75(4):563–88.
- Mushkin, S.J. 1962. Health as an Investment. *Journal of Political Economy* 70(2):129–57.
- Newacheck, P.W., N. Halfon, C. Brindis, and D. Hughes. 1998. Evaluating Community Efforts to Decategorize and Integrate Financing of Children's Health Services. *Milbank Quarterly* 76(2):157–73.
- Newacheck, P.W., D.C. Hughes, N. Halfon, and C. Brindis. 1997. Social HMOs and Other Capitated Arrangements for Children with Special Health Care Needs. *Maternal and Child Health Journal* 1(2):111–19.
- Newcomer, R., C. Harrington, and A. Friedlob. 1990. Social Health Maintenance Organizations: Assessing Their Initial Experience. *Health Services Research* 25(3):425–54.
- Nittrouer, S. 1996. The Relation between Speech Perception and Phonemic Awareness: Evidence from Low-SES Children and Children with Chronic OM. *Journal of Speech and Hearing Research* 39(5):1059–70.

- Nordio, S. 1978. Needs in Child and Maternal Care: Rational Utilization and Social-Medical Resources. *Rivista Italiana di Pediatria* 4:3–20.
- Palfrey, J. 1994. *Community Child Health: An Action Plan for Today*. Westport, Conn.: Praeger.
- Pelletier, K. 1996. A Review and Analysis of the Health and Cost-Effective Outcome Studies of Comprehensive Health Promotion and Disease Prevention Programs at the Worksite: 1993–1995 Update. *American Journal of Health Promotion* 10(5):380–88.
- Perrin, J.M., M.W. Shayne, and S.R. Bloom. 1993. *Home and Community Care for Chronically Ill Children*. New York: Oxford University Press.
- Peterson, K.W., and D.P. Kane. 1997. Beyond Disease Management: Population-Based Health Management. In *Disease Management: A Systems Approach to Improving Patient Outcomes*, eds. W.E. Todd and D. Nash, 305–45. Chicago: American Hospital Publishing.
- Pointer, D.D., J.A. Alexander, and H.S. Zuckerman. 1997. Loosening the Gordian Knot of Governance in Integrated Health Care Delivery Systems. In *Integrated Delivery Systems: Creation, Management, and Governance*, 221–54. Chicago: Health Administration Press.
- Power, C., and C. Hertzman. 1997. Social and Biological Pathways Linking Early Life and Adult Disease. *British Medical Bulletin* 53(1):210–21.
- Racine, A.D., R.K. Stein, P.F. Belamarich, et al. 1998. Upstairs Downstairs: Vertical Integration of a Pediatric Service. *Pediatrics* 102:91–97.
- Ramey, C.T., D.M. Bryant, B.G. Wasik, J.J. Sparling, K.H. Fendt, and L.M. LaVange. 1992. Infant Health and Development Program for Low Birth Weight, Premature Infants: Program Elements, Family Participation, and Child Intelligence. *Pediatrics* 3:454–65.
- Rice, T. 1997. Can Markets Give Us the Health System We Want? *Journal of Health Politics, Policy and Law* 22(2):383–426.
- Robinson, J.C. 1999. The Future of Managed Care Organizations. *Health Affairs* 18(2):7–24.
- Rosenblatt, A., and C.C. Attkisson. 1992a. Integrating Systems of Care in California for Youth with Severe Emotional Disturbance. Part I: A Descriptive Overview of the California AB377 Evaluation Project. *Journal of Child and Family Studies* 1(1):93–113.
- Rosenblatt, A., and C.C. Attkisson. 1992b. Integrating Systems of Care in California for Youth with Severe Emotional Disturbance. Part II: Initial Group Home Expenditure and Utilization Findings from the California AB377 Evaluation Project. *Journal of Child and Family Studies* 1(3):263–86.
- Rutter, M. 1990. Psychosocial Resilience and Protective Factors. In *Risk and Protective Factors in the Development of Psychopathology*, eds. J. Rolf,

- A.S. Masten, D. Cicchetti, K.H. Nuechterlein, and S. Weintraub, 181–214. New York: Cambridge University Press.
- Rutter, M., J. Dunn, and R. Plomin, et al. 1997. Integrating Nature and Nurture: Implications of Person-Environment Correlations and Interactions for Development Psychopathology. *Development and Psychopathology* 9:355–64.
- Sameroff, A.J., and M.J. Chandler. 1975. Reproductive Risk and the Continuum of Caretaking Casualty. In *Review of Child Development Research*, ed. F.D. Horowitz, vol. 4, 187–244. Chicago: University of Chicago Press.
- Sameroff, A.J., and B.H. Fiese. 1990. Transactional Regulation and Early Intervention. In *Handbook of Early Childhood Interventions*, eds. S. Meisels and J. Shonkoff, 97–116. New York: Cambridge University Press.
- Sameroff, A.J., R. Seifer, A. Baldwin, and C. Baldwin. 1993. Stability of Intelligence from Preschool to Adolescence: The Influence of Social and Family Risk Factors. *Child Development* 64:80–97.
- Sampson, R.J., S.W. Raudenbush, and F. Earls. 1997. Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy. *Science* 277:918–24.
- Schlenger, W.E., R.M. Etheridge, D.J. Hansen, D.W. Fairbank, and J. Onken. 1992. Evaluation of State Efforts to Improve Systems of Care for Children and Adolescents with Severe Emotional Disturbances: The CASSP Initial Cohort Study. *Journal of Mental Health Administration* 19:131–42.
- Schlesinger, M., and L. Eisenberg. 1990. Little People in a Big Policy World: Lasting Questions and New Directions in Health Policy for Children. In *Children in a Changing Health System: Assessments and Proposals for Reform*, eds. M. Schlesinger and L. Eisenberg., 325–60. Baltimore: Johns Hopkins University Press.
- Schlesinger, M., B.H. Gray, and K.M. Perreira. 1998. A Broader Vision for Managed Care, Part 1: Measuring the Benefit to Communities. *Health Affairs* 17:152–68.
- Schor, E.L. 1995. Developing Communality: Family-Centered Programs to Improve Children's Health and Well-Being. *Bulletin of the New York Academy of Medicine* 72(2):413–42.
- Schor, E.L., and E.G. Menaghan. 1995. Family Pathways to Child Health. In *Society and Health*, eds. B. Amick, S. Levine, A. Tarlov and D. Walsh, 18–45. New York: Oxford University Press.
- Schore, A.N. 1994. *Affect Regulation and the Origin of the Self: The Neurobiology of Emotional Development*. Hillsdale, N.J.: Lawrence Erlbaum.
- Schultz, R., and J. Heckhausen. 1996. A Life-Span Model of Successful Aging. *American Psychologist* 51:702–14.

- Seckl, J.R. 1998. Physiologic Programming of the Fetus. *Emerging Concepts in Perinatal Endocrinology* 25(4):939–62.
- Select Panel for the Promotion of Child Health. 1981. *Better Health for our Children: A National Strategy*. Washington, D.C.: U.S. Department of Health and Human Services.
- Shortell S.M., R.R. Gillies, and D.A. Anderson. 1994. The New World of Managed Care: Creating Organized Delivery Systems. *Health Affairs* 13(5):46–64.
- Shortell S.M., R.R. Gillies, D.A. Anderson, J.B. Mitchell, and K.L. Morgan. 1993. Creating Organized Delivery Systems: The Barriers and Facilitators. *Hospital and Health Services Administration* 38(4):447–66.
- Sroufe L.A. 1997. Psychopathology as an Outcome of Development. *Development and Psychopathology* 9(2):251–68.
- Starfield, B. 1992a. Child and Adolescent Health Measures. *Future of Children* 2(2):25–39.
- Starfield, B. 1992b. *Primary Care: Concept, Evaluation, and Policy*. New York: Oxford University Press.
- Starfield, B. 1998. *Primary Care: Balancing Health Needs, Services, and Technology*. New York: Oxford University Press.
- Steinberg, L., and S. Avenevoli. 2000. The Role of Context in the Development of Psychopathology: A Conceptual Framework and Some Speculative Propositions. *Child Development* 71(1):66–74.
- Stratchen, D.P. 1997. Respiratory and Allergic Diseases. In *A Life Course Approach to Chronic Disease Epidemiology*, eds. D. Kuh and Y. Ben-Sholomo, 101–20. New York: Oxford University Press.
- Sylvia, K. 1997. Critical Periods in Childhood Learning. *British Medical Bulletin* 53(1):185–97.
- Szilagyi, P.G., and E.L. Schor. 1998. The Health of Children. *Health Services Research* 33(4; Part 2):1001–39.
- Todd, W.E., and D. Nash. 1997. *Disease Management: A Systems Approach to Improving Patient Outcomes*. Chicago: American Hospital Publishing.
- Trillium Foundation. 1999. URL: www.trilliumfoundation.org/english/cca/building_caring_communities/what_are_cc.html. Accessed June 22, 2000.
- Wadsworth, M. 1999. Early Life. In *Social Determinants of Health*, eds. M. Marmot and R.G. Wilkinson, 44–63. New York: Oxford University Press.
- Weiss, S.T. 1995. Early Life Predictors of Adult Chronic Obstructive Long Disease. *European Respiratory Review* 5(31):303–9.
- Werner, E.E. 1990. Protective Factors and Individual Resilience. In *Handbook of Early Childhood Intervention*, eds. S. Meisels and J. Shonkoff, 97–116. New York: Cambridge University Press.

Whitehurst, G.J., and C.J. Lonigan. 1998. Child Development and Emergent Literacy. *Child Development* 69(3):848–72.

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Address correspondence to: Neal Halfon, MD, MPH, UCLA Center for Children, Families, and Communities, School of Public Health, University of California, 61-254 CHS, Box 951772, Los Angeles, CA 90095-1772 (e-mail: nhalfon@ucla.edu).