

P E R S P E C T I V E

Childhood Origins Of Adult Health: A Basis For Life-Course Health Policy

A plea for policy attention to the way child health problems affect a person's entire lifespan.

by **Christopher B. Forrest and Anne W. Riley**

ABSTRACT: Many common chronic and mental disorders have modifiable precursors that arise during childhood. The life-course model of how health is produced provides a scientific basis for understanding the continuity between child and adult health. Life-course health policy seeks to promote the well-being of the young, both because of its intrinsic value and because doing so will improve the health of the population at all ages. It mandates increased attention to the promotion of biopsychosocial adaptability and other approaches to preventing the precursors to future disorders. Finally, it requires health policies to foster positive long-term outcomes focused on the individual, family, and community.

THE HEALTH OF A NATION is largely a reflection of the past and present health of its children. The increasing life expectancy and decreasing rates of disability among elders can be attributed to the healthier childhoods of successive generations.¹ Lower childhood mortality from infectious diseases, improved obstetric and neonatal care, better nutrition, and fewer adverse environmental exposures have had sizable impacts on children's quality of life. Policies regarding immunizations, prenatal care, subsidized food programs for the poor, and laws regarding water quality have contributed to that fact that infectious diseases, malnutrition, and contaminated drinking water are not substantive threats to U.S. child or adult health. At the same time, the burden of chronic and mental disorders among older Americans has increased dramatically. A growing body of scientific evidence supports

the claim that many of these disorders have their roots in childhood.

The life-course model of health provides a framework for understanding how children's health and environmental exposures are connected to the development of disorders, disability, and death among adults.² It suggests that health is produced across the life span but that childhood is a critical period.³ Unique environmental interactions occur at each stage of human development, some of which can have profound effects on future health.

Life-course health policy seeks to promote the well-being of the young, both because of its intrinsic value and because doing so will improve the health of the population as people age into adulthood. It mandates increased attention to the promotion of biopsychosocial adaptability and other approaches to preventing the precursors to future chronic physical and mental disorders. The life-course perspec-

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tive requires health policies to foster positive long-term outcomes focused at the individual, family, and community levels. Policymakers must recognize that programs implemented today may not have their beneficial effects for years or even decades to come.

The life-course perspective on child health is consistent with several trends in preventive care for adults. J. Michael McGinnis and William Foege have focused attention on the importance of behavior and exposure, such as physical inactivity, diet, and smoking, to population health.⁴ Recent expansions in Medicare benefits have included the addition of clinical preventive services. Many payers and employers have invested heavily in chronic care improvement and wellness programs designed to allow patient self-management and reduce the impact of chronic illness on health and functioning. Some of the most dramatic advances in pharmacology have been in the area of chronic disease prevention, such as lipid-lowering drugs (statins) and the reduction of cardiovascular disease. Such advances demonstrate the growing emphasis on prevention among adults, which also creates a fertile context for the adoption of the long-term prevention perspective of life-course health policy.

In this paper we provide an overview of the science underpinning the life-course model and explain why life-course health policy has not been more widely adopted. We use the examples of childhood obesity (a risk factor) and the importance of the family (a resiliency factor) to show how health policy should be crafted to account for the developmental context of risk exposure, to promote the resilience of the individual, and to prevent disorders and their consequences.

Childhood Precursors Of Adult Disorders

The links between child and adult health status are logical, and most people likely accept them without question. Scientists have begun to empirically describe the actual biological and behavioral mechanisms explaining the ways in which this continuity is maintained. Precursors to chronic diseases and

mental disorders can be organized into four types: (1) childhood environmental exposures; (2) health-related behavior; (3) risk states; and (4) fully developed disorders. Each holds implications for health policy to prevent its occurrence (primary prevention), detect it early (secondary prevention), or moderate its impact on health and functioning once it is present (tertiary prevention) (Exhibit 1). We briefly discuss each type of precursor to provide insight into the scientific evidence supporting life-course health policy.

■ Childhood environmental exposures.

Adverse or favorable environmental stimuli experienced in childhood have profound effects on adult health. Environmental exposures at critical periods of development can change body structures in ways that alter the risk of future disease. Children are especially vulnerable to such exposures during the fetal, infant, and early childhood phases, when development occurs rapidly. David Barker has demonstrated the link between fetal growth retardation, low birthweight, and adult coronary disease.⁵ Other studies have shown that accumulated childhood exposures to different types of abuse or household dysfunction directly increase the risk of psychiatric disorder and several chronic diseases that emerge in adults.⁶ Sexual abuse of children greatly increases their risk of major depressive disorder, anxiety, and substance abuse as adults. Abuse appears to alter the structures and functions of a child's brain and the body's reactivity to stress.⁷ Unstable, especially rejecting parent-child relationships produce biological changes that interact with future environmental stimuli to produce adult disease.

■ Health-related behavior. Smoking, poor dietary habits, sedentary activity, risky sexual activity, and substance abuse are responsible for nearly half of all deaths in adulthood.⁸ These types of risky behavior emerge and are molded during childhood and adolescence; repeated, harmful exposures have cumulative effects on health status. Recognition of the lethality of smoking and the growing awareness that most people started smoking in adolescence has resulted in policies de-

EXHIBIT 1 Types Of Childhood Precursors Of Adult Health And Their Policy Implications

Type of childhood precursor	Examples	Prevention model(s)	Policy implications
Childhood environmental exposures	Prevent child abuse and harsh discipline, lead exposure, poverty, maternal malnutrition, maternal and paternal depression Ensure supportive/consistent parenting, breastfeeding	Primary and secondary prevention	Targeted investments for fetal, infant, and early-childhood phases of life to remove harmful stimuli and promote positive ones
Health-related behavior	Prevent smoking, risky sexual activity, attention problems, disruptive behavior Ensure daily physical activity, healthy nutritional intake	Primary and secondary prevention	Prevent establishment of risky behavior in middle childhood and early adolescence; identify and eliminate behavior that has already developed
Development of health and risk states	Early identification and treatment of high blood pressure, overweight/obesity, high cholesterol, glucose intolerance, and health problems associated with low subjective well-being	Secondary prevention	Early detection and treatment when present; primary prevention of adverse childhood exposures and risky behavior will affect development of these risk states
Chronic disease and mental disorder	High disease burden, diabetes, depression, attention deficit hyperactivity disorder	Secondary and tertiary prevention	Improve access to health services for identification and treatment to promote successful adaptation and functioning

SOURCE: Authors' analysis.

signed to curb smoking advertisements aimed at adolescents and to raise cigarette taxes, which are an effective population-based strategy for reducing rates of new youth smokers.⁹ Social, environmental, education, and workplace policies are needed to address other childhood precursors of risky behavior.

■ **Risk states.** Glucose intolerance, hypertension, and atherosclerosis, harbingers of adult diabetes and cardiovascular disease, are clinically evident among youth. Children with high levels of cardiovascular risk factors tend to have high levels as adults, and vice versa for those with low levels, a phenomenon known

as “tracking.”¹⁰ Tracking of cardiovascular risk states and evidence of early stages of atherosclerotic disease in childhood provide support for preventive interventions in children that are targeted at reducing risk of cardiovascular disease. Differences by racial groups in cardiovascular risk states are already evident among children.¹¹ Thus, resources devoted to modifying these states early in life can help reduce health disparities for the entire population. Community-based interventions that (1) educate the public on cardiovascular risk and its relationship to behavior, (2) involve mass screenings for risk factors, and (3) enact poli-

cies and programs designed to change the local environment in ways that encourage healthful behavior have been shown to modify precursors to cardiovascular disease at young ages.¹²

■ **Fully developed disorders.** Childhood chronic diseases that persist into adulthood (for example, Type 1 diabetes, inflammatory bowel disease, and cystic fibrosis) are uncommon, affecting fewer than 5 percent of children.¹³ Serious emotional and behavioral disorders are more common, affecting at least 11 percent of youth by adolescence, and are also likely to persist into adult life.¹⁴ It is remarkable that one out of three disability days experienced by the U.S. population are a result of conditions that arise in childhood.¹⁵ The overall morbidity burden, irrespective of specific diseases, experienced in childhood appears to affect adult health.¹⁶ The policy response for this category of childhood precursors of adult disease has traditionally been, and in part must continue to be, ensuring adequate financing and availability of high-quality medical and behavioral health services. However, many emotional and behavioral disorders of youth can be prevented or at least delayed, given more positive family, educational, and community environments; this evokes the need for one of the policy strategies discussed for other types of precursors.

Obstacles To Life-Course Health Policy

The U.S. health care system is perfectly designed to produce medical care. This emphasis on the organization, financing, and delivery of services steers attention away from children, whose low disease burden places few demands on health care services designed to moderate the effects of major acute, chronic, and degenerative disorders. Children account for just 11 percent of national health care spending, although they make up 26 percent of the population.¹⁷ Moreover, only 5 percent of national health spending is for prevention programs that hold the potential for improving the health of child populations.¹⁸ Although these low investments reflect an emphasis on personal medical services, they seem illogical

given the benefits of good health in childhood. The provision of high-quality medical care is important, but for the vast majority of children, environmental, school, workplace, and social policies are likely to have a greater impact on current and future well-being.

The biomedical model of health, which colors so much of our thinking, is responsible for the misconception that “children are healthy.” Low disease and disability rates create a picture of relative healthiness. However, developmentally appropriate measures of child health reveal that as many as half of children are exposed to unhealthy environments and experience aspects of poor health that have the potential to evolve into full pathology over the life course.¹⁹ Poor health during childhood can result from acute or chronic physical illness but is more likely to reflect physical and emotional symptoms, behavior, subjective well-being, and other health perceptions. Children’s health needs are just as prevalent as those of many adults, although markedly different.

Another obstacle is the financing of U.S. health care, which reinforces a medical care production model. It is not designed to pay for services that are likely to have large effects on the health of children. There are no billable procedure codes for teaching positive parenting to parents of toddlers, although this is a time when positive or negative cycles of monitoring, giving instructions, providing consequences for behavior, and discipline begin to develop in families. Child health care practitioners cannot bill for their work with communities to promote healthier home and school environments. (If the fee-for-service payment system were modified to create billable procedures for family counseling and community advocacy, much more of this type of activity would almost certainly occur.)

Lastly, many interventions needed to improve child health and prevent the childhood precursors of adult disorders are complex and cannot be delivered in the exam room. For example, a health problem such as childhood obesity requires programs that influence the home environment (nutritional intake and TV watching), communities (safe places to play),

and schools (promoting physical activity and healthful eating). Leadership for life-course health policy is likely to come from the public health sector, which conventionally has been concerned with the healthiness of environments. However, the public health infrastructure is inadequate to address all child health needs.²⁰ In this area, new investments in public health, modifications to health care financing, and creative local solutions to children's health needs are called for.

Life-Course Policy Example: Childhood Obesity

Fully 15 percent of youth are overweight by the time they reach adulthood, a rate that has increased by 50 percent since 1990 and is associated with the increasing blood pressure of U.S. children.²¹ Overweight in adolescence increases risk in adulthood of morbidity and mortality from coronary heart disease, colorectal cancer, and arthritis.²² No simple policy responses can reduce the frequency of childhood obesity. Population-based strategies are needed to simultaneously address the proximal and distal determinants of being overweight, such as physical inactivity, energy-dense nutritional intake, sedentary child entertainment activities, lack of safe play environments, and direct-to-child advertising of food products.

Essentially, childhood obesity results from an imbalance in energy intake and energy expenditure. The logical policy and programmatic responses are to reduce caloric intake while increasing activity. This is a health problem with no shortage of recommendations, which have been issued by the World Health Organization, the U.S. Surgeon General, the U.S. Centers for Disease Control and Prevention (CDC), health professionals, and advocacy groups (Exhibit 2).²³ However, many of these recommendations are programmatic goals. What is lacking are methodologies for formulating and enacting multilevel policies and implementing the prevention programs needed to achieve these results.

■ **School-based childhood obesity prevention programs.** Intensive school-based in-

terventions have had success in altering the determinants of overweight but only modest success in reducing weight. The CATCH study, conducted in fifty-six schools, included an intervention composed of health education, increased physical education, school nutrition modifications, and family education.²⁴ It increased activity level and decreased fat content in school lunches but had no effect on weight. Another intervention, Planet Health, conducted in ten schools, used educational strategies for reducing television viewing and high fat intake and increasing physical activity and consumption of fruits and vegetables.²⁵ Obesity declined in girls but not boys after two years. Both of these interventions addressed multiple determinants of obesity, yet their effects on weight were modest. These findings demonstrate the difficulty of addressing childhood obesity and the possibility that efforts may need to begin even before children enter elementary school.

■ **Future childhood obesity policy.** Obesity provides a good example of how child health policy must be crafted at multiple levels. Within the private sector, annual health plan enrollment creates large disincentives for plans to mount childhood obesity prevention programs. Longer mandatory enrollment in health plans would provide new incentives for plans and purchasers to focus on children's health needs, particularly the precursors to future disorders. Reducing childhood obesity could limit the costs associated with chronic disorders, such as asthma, Type 2 diabetes, and musculoskeletal problems that result from being overweight. The return-on-investment equation shifts in favor of prevention as the interval of health plan accountability increases.

Local communities must be mobilized to begin taking the logical steps of making their environments more conducive to activity and educating teachers, parents, restaurant owners, and other stakeholders about the risks, causes, and prevention of obesity. One way to stimulate community innovation is to provide financial incentives for solutions to the rising rates of sedentary activity and excessive caloric intake. These incentives could be struc-

EXHIBIT 2

Summary Of Childhood Obesity Policy Recommendations

Childhood precursor	Target environment	Specific recommendations
Nutritional intake	Home	Encourage breastfeeding; cook healthy meals with children
	School	Limit access to unhealthful snacks and drinks in school vending machines; make school cafeterias nutritional learning centers
	Community	Regulate direct-to-child advertising of energy-dense foods and fast-food restaurants; reduce marketing and provision of "super-size" portions
Physical activity	Home	Limit television watching (especially during meals), video game playing, and computer usage; increase parental activity levels and make time for family fitness
	School	Daily gym class; daily recess that promotes active games; increase student participation in physically active after-school activities
	Community	Build regional parks with large open spaces and tracks for biking and running; increase the number of bike paths and trails; create "activity-friendly" communities

SOURCES: I. Aboderin et al., *Life Course Perspectives on Coronary Heart Disease, Stroke, and Diabetes: Key Issues and Implications for Policy and Research* (Geneva: World Health Organization, 2001); DHHS, *Physical Activity and Health: A Report of the Surgeon General*, 1996, www.cdc.gov/nccdphp/sgr/pdf/sgrfull.pdf (11 May 2004); K.D. Brownell and K.B. Horgen, *Food Fight: The Inside Story of the Food Industry, America's Obesity Crisis, and What We Can Do about It* (New York: Contemporary Books, McGraw-Hill Companies, 2004); and American Obesity Association, www.obesity.org.

tured in a number of ways (such as competitive grants or higher matching-fund rates for communities that meet specific goals) and provided by state or federal governments or the private sector.

In 2003 Arkansas became the first state to pass legislation (Act 1220 of 2003, House Bill 1583) creating a statewide program to prevent childhood obesity. The bill establishes a child health advisory committee that will recommend policies to the state boards of education and health with the goal of improving child nutrition and promote activity. It prohibits vending machines in elementary schools, requires annual body mass index (BMI) evaluations, and requires schools to report on funding received from food and beverage contracts. Other states are closely monitoring and may emulate the Arkansas experiment.

■ **Available resources.** Several federal

agencies including Education, Agriculture, Commerce, Labor, and HHS play a role in shaping child health policy, but no interagency effort has emerged regarding obesity. More generally, there is no coordinated child health policy directed at the total population of children. Existing programs address the needs of children already experiencing distress or disorder. Without an overarching entity to coordinate national efforts to improve and promote child health in the population, such integration is likely to emerge only after problems become critical. We believe that a legislatively mandated commission should be formed to review existing child health policy, suggest strategies for coordinating these activities (which could be located in an existing office or perhaps in a new entity), and make recommendations for future strategies to coordinate public health efforts to improve the health of

all children, not just those living in obviously distressed families.

Life-Course Policy Example: The Importance Of Family

Our argument so far has focused on risk states and behavior that threaten future health status. However, people are not passive receptacles for environmental stimuli. A rich set of biopsychosocial adaptive mechanisms is used to circumvent negative stressors, seek out positive stimuli, and adapt to stressors that cannot be avoided. A person's adaptability depends on biological processes, behavioral responses, and environmental buffers.

Perhaps the most powerful social resiliency factor for children is the quality of family life. Positive involvement of parents and other family members in children's lives buffers them from excessive demands, provides models and resources for coping with demands, and helps them to effectively meet developmentally appropriate challenges. Effective parenting depends not only on a loving commitment to the child but also on the timely use of techniques that help children develop a sense of security, self-worth, predictability, and personal control; learn to calm themselves; and cope with demands actively and creatively. Health policy clearly could address the general lack of models for behaviorally based parenting education.

Parental mental illness is a specific environmental influence on children that requires the implementation of health and health care policy. Children of mothers with depression are one of the highest-risk groups for the development of serious psychiatric disorders, academic failure, lower social competence, and higher utilization of health services.²⁶ Maternal depression occurs in 11 percent of mothers in all racial/ethnic groups.²⁷ A depressed parent is miserable and hopeless, wants to be alone, and lacks the energy and motivation to meet the routine demands of household work and parenting. Moreover, depression is commonly associated with home environments that pose a risk to child development, including marital discord, family conflict, inadequate financial resources, low social support, and

poor parenting. Some or all of these concomitants of depression can be ameliorated with intensive interventions.²⁸

To address maternal depression, the first policy priority is a medical response: identify all depressed mothers and engage them in high-quality treatment. Only a quarter of all depressed adults receive adequate levels of appropriate treatment.²⁹ A particularly important medical policy focus relates to obstetrical care. Guidelines from the American College of Obstetricians and Gynecologists are quite general about the need to identify and treat depression in pregnant women, despite the overwhelming evidence of its pernicious effects on the fetus and newborn and on the effectiveness of treatment.³⁰ Although cautious obstetricians may not be convinced of the safety of antidepressants in pregnancy, cognitive-behavioral and interpersonal psychotherapy are equally effective but rarely made available.³¹ Obstetricians' responsibility to ensure effective treatment for depression is no less compelling than the responsibility to treat conventional medical disorders. Finally, the lack of true parity in insurance coverage for mental health services is an important policy issue. Universal access to health and mental health care may seem impossible to achieve, but it must resurface if the health of future generations is to be adequately supported.

■ **Healthy families and positive parenting.** Unlike childhood obesity, few policy strategies for addressing the needs of the average family have been put forth. Few would dispute the notion that parents have the responsibility to provide well for their children. However, exactly what that means is not obvious to policymakers or to parents themselves. The policy relevance of findings such as those from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECC) seem to have been lost. In this large and long-term study, the strongest predictor of children's cognitive and social competence was the quality of maternal caregiving.³²

Another example is provided by the sixteen-to-twenty-year outcomes of a random-

ized trial of the Parent-Child Home Program. This home-based intervention was designed to promote warm and positive verbal interactions between low-income mothers and toddlers. It demonstrated a large and important advantage for those who were randomly assigned to the program in rates of high school completion, a major determinant of health status differences among adults.³³

■ **Available resources.** There are almost no universal policies to help parents provide a nurturing environment for their children. State or local jurisdictions require parents to attend parenting classes only when they have been charged with child abuse or neglect or if their child has a serious disruptive behavioral problem. This is consistent with a biomedical treatment paradigm and occurs much too late for most of the children involved.

Most families meet a child's primary needs for food and shelter. For families that are at risk of not providing such basics, there are such programs as the Women, Infants, and Children (WIC) program administered by the U.S. Department of Agriculture and Temporary Assistance for Needy Families (TANF) located in HHS. The Administration for Children and Families (ACF) manages a variety of programs that provide funds and services for children in distressed families. However, the policy agenda contains no coordinated effort to promote the well-being of families that are not in obvious trouble. Given a broader mandate, ACF could serve this role. The challenges of parenting have increased because it is carried out in a much more insular manner by the nuclear family and because the world children live in today is much more complex and risky than it was for their parents. Developing the skills of positive parenting is not something that comes naturally to many parents.

Multiple positive parenting programs exist to teach the basics of listening to children, setting developmentally appropriate expectations for behavior, giving age-appropriate instructions, providing discipline such as time-out or loss of privileges that teaches children to calm themselves, and the cost of misbe-

having without hurting them or teaching aggression. Enrolling only the most troubled children in these programs is not consistent with life-course health policy, which argues for a focus on the family for all children. There may be no more effective way to promote child health than to promote positive parenting.

As with the community mobilization discussed for childhood obesity, similar types of local responses will be needed to improve parenting and increase support of families. Effective parenting practices education is available in some high schools but is almost never a requirement. Just as parents attend birthing class, so too should they consider participating in positive parenting classes. Child health practitioners can also teach this content in group and individual well-child visits. However, this will not happen to any large degree until payment systems are modified to adequately reimburse health professionals for providing health education to families.³⁴

Conclusions

Childhood is an incubation period for many disorders that affect the health of the whole population. The life-course model applies a prism to health policy that separates our attention into critical phases and contexts of children's lives. Each period of a person's life is characterized by a new set of developmental challenges; each makes unique contributions to future health; and each requires developmentally appropriate policies to address the special health needs and determinants of child health. The life-course perspective clearly illustrates that there can be no monolithic child health policy.

Life-course health policy is essentially prevention policy with the longest time horizon possible: from conception to death. It fits within the context of our health care system's increasing emphasis on prevention of chronic mental and physical disorders.

Policymakers will find no strong empirical evidence base in support of the effectiveness of investing in children as a way to improve the health of the entire population. This type of science is incredibly difficult to perform, be-

cause of the long intervals needed to detect program impact and the many determinants of health during the life course. There are a few examples of existing studies, but more research is needed to begin building the scientific basis for life-course health policy.

Perhaps the most powerful policy implication of life-course health policy is that it provides strong support for taking an expanded view of child health production. It focuses our attention on the healthiness of the environments to which children are exposed. Moreover, a growing amount of science is providing plausible explanations for the linkages between child and adult health. No one program or set of policies can affect all of the childhood precursors of adult health. Although existing health care resources are unlikely to be steered away from medical care services to interventions aimed at children, we must create health systems that support families more effectively. As Lee Schorr has cautioned, "Our society is in jeopardy because not enough of our arrangements for providing those supports [to families] are in place and working."³⁵

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