A Measured Approach to Child Health

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ABSTRACT

Children's health and its measurement have gained increasing attention in the face of advances in treating disease, and the growing recognition of long-term implications of child health for adult health and the nation's economy. Advances in measurement are aided by new conceptualizations, including a dynamic definition of child health and model of how it evolves. This paper discusses challenges in measurement of child health, the role of large-scale data sets, how to select a measure, 2 promising measurement frontiers, and the role of the Academic Pediatric Association in promoting a measured approach to child health.

KEYWORDS: child health; cultural issues; health; health services research; health status; measure; outcomes

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IT IS APPROPRIATE to take stock of the progress in the measurement of child health on the Academic Pediatric Association's (APA) 50th anniversary, and to be proud of the role of our organization, its members, and all of pediatrics in making the last half century a time of significant achievement. In the early 20th century, children and their health were a relatively low priority,[1] and for much of the century child health was measured primarily by rates of mortality and morbidity. The inception of the APA marked a period of renewed efforts to improve child health on both the individual and population levels, and this required an increasing focus on how to measure it. There is renewed interest in the development of more accurate measures of child health, and this paper examines the current status of work in this area.

The discussion below includes a review of the most comprehensive and forward-looking definition and model of child health and considers the model's use in understanding the evolution of child health. This is followed by a brief discussion of large-scale data sets, the importance of measuring child health, key elements in selecting a child health measure, and why measurement of child health is so challenging. Finally, the discussion features 2 promising new frontiers that are breaking ground in measurement of child health and a discussion of ways in which the APA can help to promote better measurement of child health.

DEFINITION

A committee of the Institute of Medicine and the National Research Council of the National Academies, which I was privileged to co-chair, developed a definition that built on the work of many thoughtful scholars and the new science summarized in the landmark book, *Neurons to Neighborhoods.*[2] In the committee report, *Children's Health, The Nation's Wealth,*[3] *children's health* was defined as "the extent to which individual children or groups of children are able or enabled to (a) develop and realize their potential, (b) satisfy their needs, and (c) develop the capacities that allow them to interact successfully with their biological, physical, and social environments."[3]

This definition builds on and goes beyond the World Health Organization[4] and Ottawa Conference[5] definitions in 4 ways: a) by including a view of health as a positive construct, b) by emphasizing development during childhood and its implications for long-term outcomes, c) by implying an interaction between the child and his or her environment, and d) by acknowledging that multiple influences interact with biology over time.[3]

In addition, the report suggests a need to go beyond traditional measures of diseases and disorders to assess the *functioning* of children in their daily lives and environments and their *positive* capacity to be healthy. Functioning is the best way to assess the final common pathway of the effects of children's conditions and treatments on their daily lives.[6] The report calls the positive capacity to be healthy "health potential," but others have referred to it as "resilience" or "well-being." Although there are many measures that assess deficits and some that assess functioning, health potential represents the largest unexplored measurement frontier in child health and is one that needs to be tackled to fully understand and help foster child health in the future. This has become of even more importance in the face of new emphasis on preventive measures featured in the Patient Protection and Affordable Care Act.[7] In the face of this new priority, it will become increasingly important to be able to measure levels of health beyond the absence of disorders or functional limitations.

THE MODEL

Modern science has unraveled many mysteries of biology and its role in child health, but we are only now on the cusp of understanding the complex ways in which biology is altered by environment over time. Many risk and protective factors have been identified, which the report refers to as "influences," because it is known that in many instances the same thing, such as family, peers, or a substance (eg, iron or iodine), can be either a source of risk or of protection, depending on the circumstances.

Influences were divided into 6 somewhat arbitrary groupings (Figure 1). They include aspects of biology (which encompass biologically incorporated prenatal factors and exposures), behavior, social environment, and physical environment, which all exist in the context of services and policies. Unlike some models, such as Healthy People 2010,[8] in this model the terms, services, and policies are not restricted to health services or health policies. Rather, here they refer to all services and policies that may directly or indirectly affect health outcomes of children. This is because many, if not most, services and policies affect child health, even when that is not their direct intent. For example, the policies that govern the built environment, a component of physical environment, may increase or limit the risks of injury and those that influence mining, traffic, subsidies, or taxes, have both direct and indirect effects on the developing child's health. A similar case can be made for services in the community that directly or indirectly affect a child's life and environment.

The diagram in Figure 1 is a representation at one point in time, but each circle consists of many subdomains that together form even more complex patterns of interactions and may have differing levels of saliency at different times of life. For example it is generally thought that family is a primary social environmental component of infants in a way that is different from its role for adolescents who, although still influenced heavily by their family, may also be more involved with peers and community. All these influences affect child health in a transactional or interactive manner and are mediated or moderated by other influences in complex ways that are only now being understood. The influences overlap, so that the result is not a sum, but a result of their interactions—of how they affect one another and overall health.

However, although child health status is often measured in a cross-sectional way as represented in Figure 1, this representation is only a snapshot at one point in time. In reality, children's health and the effects of multiple influences evolve over time and throughout development as shown on the 2 axes in Figure 2. Health results from the dynamic intersection of these interactions in a model that is best represented by a kaleidoscope. With each turn the patterns change, altering health, incorporating the previous elements, including the child's former health, and affecting health into adulthood. Influences change in relative importance during different stages of development and across time. Thus, the relative size of each circle and the subcomponents within it—that is, their relative salience—are dynamic. The result is not random: as in a kaleidoscope, results are determined by the previous patterns or settings and how much change is produced by the next alteration. So too the specific influences and combination of health influences change and interact over time and throughout development in ways that can be predicted if the prior state is understood. At some stages the turns are rapid, representing substantial developmental change, and at others less so. Each turn incorporates the previous elements and the child's prior health and casts them in a new light, affecting

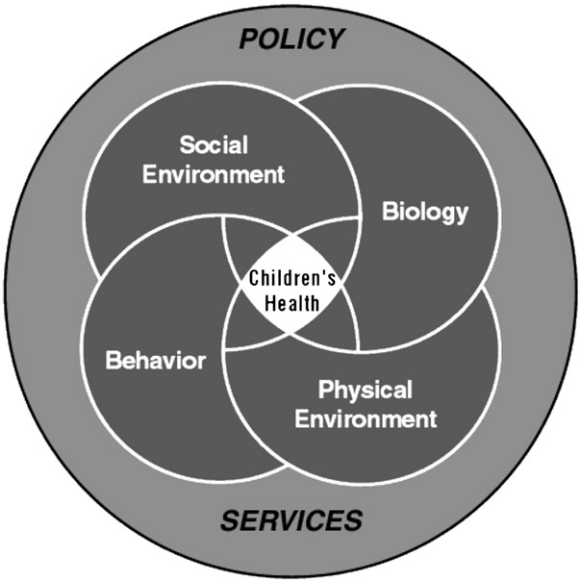

Figure 1. Cross-sectional model of child health and the influences of child health. Source: *Children's Health, The Nation's Wealth: Assessing and Improving Child Health.*[3] *Reprinted with permission from the National Academies Press, Copyright 2004, National Academy of Sciences.*

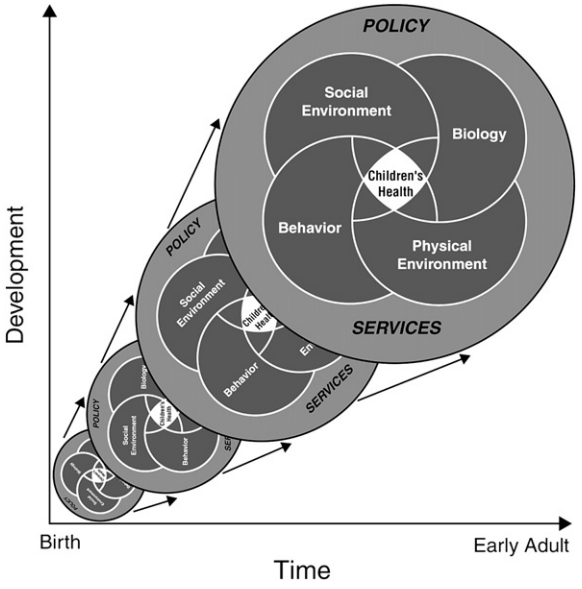

Figure 2. Longitudinal model of child health and influences of child health over time and through development. Source: *Children's Health, The Nation's Wealth: Assessing and Improving Child Health.*[3] *Reprinted with permission from the National Academies Press, Copyright 2004, National Academy of Sciences.*