
“Children with Half-Starved Bodies” and the Assessment of Malnutrition in the United States, 1890–1950

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SUMMARY: Malnutrition was one of the most significant children’s health issues of the early twentieth century, but it also engendered considerable controversy. Just how many children were truly malnourished, and how could they be reliably identified? Despite the failures of numerous diagnostic methods—even the definition of malnutrition defied consensus—health authorities remained convinced that malnutrition was a serious and widespread problem. Indeed, the imprecision that surrounded the condition allowed it to be used metaphorically to advance a broad range of professional, social, and public health agendas. By the 1940s, due in part to the lack of reliable diagnostic methods, public health nutrition policy shifted abruptly from one of assessment, based on mass surveillance and individualized care, to one of management, based on a universal program of nutrition education, fortification of foods, and food security that treated all children as in need of nutritional assistance.

KEYWORDS: public health nutrition, malnutrition, children’s health, pediatrics, risk, anthropometry, weight, diagnostics, disease surveillance

In the early years of the twentieth century, pediatricians and school medical inspectors across the United States began reporting high rates of malnourishment among school-aged children. Health departments and private health agencies had devoted considerable resources to “baby saving” campaigns, promoting in particular the importance of breast feeding, the availability of safe milk and infant formula, maternal education, and

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routine pre-, peri-, and postnatal medical care.¹ These efforts produced marked declines in mortality during the first two years of life but did little to improve the health of older children. By 1920, health authorities were nearly unanimous in their belief that malnourishment among school-aged children was a pervasive cause of ill health, stunted growth, and disability. Malnutrition reduced resistance to infectious diseases and slowed or even prevented recovery from them, retarded mental and physical development, and in some cases led to chronic disease or permanent disability; furthermore, malnourished children were unable to meet the demands of work and schooling (both physical and mental), and they exhibited behavioral problems, apathy, and lethargy.

Although physicians largely agreed that malnourishment during childhood was a serious public health problem, they disagreed considerably about the clinical definition, diagnosis, surveillance, and prevalence of malnutrition, a “medical octopus” with a multitude of indeterminate presentations.² Malnutrition was characterized not by the presence of something foreign, as with infectious diseases, but by the absence of something essential, which significantly complicated diagnosis. Much like healthy carriers (who were diseased but not ill), malnourished children (who were ill but not diseased) sparked considerable debate over the nature of illness and the appraisal of health. This essay examines the construction of malnutrition as a critical public health problem, exploring how the malleability of malnourishment as a clinical concept facilitated widespread agreement about its severity despite numerous failed attempts to establish universal diagnostic standards. Ultimately, public health nutrition programs abandoned surveillance and assessment strategies, a central element of infectious disease control, for management initiatives based on a redefinition of malnutrition as a manifestation of risk.

Historians have published widely divergent interpretations of the assessment and perceived extent of malnutrition in the early twentieth century.³ Harvey Levenstein has argued that the unprecedented attention

1. On the history of “baby saving” campaigns, see Molly Ladd-Taylor, *Mother-Work: Women, Child Welfare, and the State, 1890–1930* (Urbana: University of Illinois Press, 1994); Richard A. Meckel, *Save the Babies: American Public Health Reform and the Prevention of Infant Mortality, 1850–1929* (Baltimore: Johns Hopkins University Press, 1990); Jacqueline H. Wolf, *Don’t Kill Your Baby: Public Health and the Decline of Breastfeeding in the Nineteenth and Twentieth Centuries* (Columbus: Ohio State University Press, 2001).

2. John Preston Sutherland, *Malnutrition: The Medical Octopus* (Boston: Meador, 1937). The term “malnutrition” also encompassed a number of clinical designations, such as athrepsia, cachexia, dekomposition, hunger edema or nutritional edema, inanition, kwashiorkor, and marasmus.

3. For the purposes of this article, discussion of the existence of malnutrition refers exclusively to the views of the historical actors. There is a large and growing literature that

paid to malnutrition by both health professionals and the popular press in the 1910s and 1920s came to be seen in the 1930s as overblown, little more than a health fad.⁴ Jeffrey Brosco has characterized the 1920s as a period of “epidemic” malnutrition, an epidemic that was revealed by the widespread use of anthropometric surveillance methods. The epidemic ended not because real prevalence declined but because diagnostic methods changed and mass surveillance programs ended.⁵

Although the fervor of the 1920s was tempered somewhat during the 1930s, malnutrition remained a significant concern for both health professionals and the public, and mass surveillance continued in a variety of forms into the 1940s. What changed was not the cessation of an epidemic but rather the understanding of what most experts agreed was a persistent and ongoing problem. Beginning in the late 1930s, health authorities increasingly deemphasized mass surveillance programs, once a cornerstone of public health nutrition, because no diagnostic methods proved to be consistently reliable. Rather, they redefined malnutrition as a manifestation of risk (as opposed to an illness) and shifted from a policy of assessment, based on surveillance, to a policy of management, a broad-spectrum approach based on nutrition education, fortification of foods, and food security addressed at all children, not solely the malnourished ones. Malnutrition was not epidemic but endemic, and nearly all children, it seemed, could benefit from nutritional improvement.

The debate over the existence of malnourishment, however, was not exclusively medical. Richard Meckel has shown that it had very real political consequences in the early 1930s. With mortality rates continuing to decline even as the Great Depression worsened, the impact of the economy on health remained a controversial topic, and federal and local funding for children’s health programs hinged in part on the extent to which politicians and bureaucrats acknowledged malnourishment as a public health problem.⁶ Major events, particularly the two world wars

retrospectively analyzes nutritional health and the mortality decline, sparked by the work of Thomas McKeown and others, which is beyond the scope of this article. For an overview of that literature, see James Colgrove, “The McKeown Thesis: A Historical Controversy and Its Enduring Influence,” *Amer. J. Pub. Health* 92, no. 5 (2002): 725–29.

4. Harvey Levenstein, *Revolution at the Table: The Transformation of the American Diet* (Oxford: Oxford University Press, 1988), 112ff.

5. Jeffrey P. Brosco, “Weight Charts and Well Child Care: When the Pediatrician Became the Expert in Child Health,” in *Formative Years: Children’s Health in the United States, 1880–2000*, ed. Alexandra Minna Stern and Howard Markel (Ann Arbor: University of Michigan Press, 2004), 91–120.

6. Richard A. Meckel, “Politics, Policy, and the Measuring of Child Health: Child Malnutrition in the Great Depression,” in *Healing the World’s Children: Interdisciplinary Perspectives on Health in the Twentieth Century*, ed. Cynthia Comacchio, Janet Golden, and George Weisz (Montreal: McGill-Queen’s University Press, 2008), 235–52.

and the Depression, brought heightened attention to malnourishment among children and youth, but the condition was meaningful beyond the context of specific sociopolitical crises. Malnutrition was not simply a “medical octopus” but a social, cultural, and political one; it provided a useful metaphor for a wide range of issues and an effective platform for the promotion of numerous health-related agendas.

Pediatricians, Brosco has argued, used malnutrition to consolidate their authority over children’s health and promote well child care.⁷ Home economists, public health nurses, and teachers justified the establishment of school lunch programs and nutrition classes on the grounds that malnutrition caused diminished attendance, behavioral problems, and poor academic performance in addition to ill health.⁸ Social reformers and settlement house workers employed malnutrition to promote nutrition education and food relief programs for the poor; in this context, nutritional health was an issue of social justice. Dietitians developed their professional identity in response to concern about malnourishment, adopting a role in medical care and public health as nutrition experts able to translate scientific research into practical diets and public education campaigns. For health departments and other official health agencies, malnutrition was one of several factors that stimulated the transition from an almost exclusive focus on infectious disease control to a more comprehensive mission that included greatly expanded attention to nutrition as well as chronic diseases, substance abuse, occupational safety, and mental health. Thus, the debate over how to diagnose malnutrition and how to establish its prevalence was not a trivial one; understanding of the nature and extent of malnourishment among children had very real professional, political, and public health consequences.

The “emergence” of malnutrition as a public health problem at the turn of the twentieth century was not caused by a significant increase in prevalence; presumably, malnourishment and starvation had existed to a greater or lesser extent for all of American history. Rather, the sudden increase in the visibility of the condition resulted from the interaction of numerous factors. Large-scale studies of growth and development, along with expanded research on nutrition and the quantification of energetics, provided a theoretical basis for measuring nourishment. Declining infant and total mortality rates, combined with more effective control of

7. Brosco, “Weight Charts and Well Child Care” (n. 5), 109–10.

8. On the history of school lunch programs, see Susan Levine, *School Lunch Politics: The Surprising History of America’s Favorite Welfare Program* (Princeton: Princeton University Press, 2008); Andrew R. Ruis, “Eating to Learn, Learning to Eat: School Meals and Nutrition Policy in the United States, 1900–1946” (Ph.D. diss., University of Wisconsin, Madison, 2011).

common childhood diseases, made subclinical cases of malnutrition more apparent. Compulsory education, which after the turn of the century typically included medical inspection, school nursing, and other health initiatives, brought millions of children under state surveillance, many of them for the first time. Lastly, sociopolitical changes—industrialization and urban growth, increasingly aggressive foreign policies, and the growing influence of eugenic theories—lent conditions like malnutrition metaphorical implications in a world increasingly preoccupied with national strength and international competition.

By the first decade of the twentieth century, pediatricians generally acknowledged that malnutrition was a widespread and pervasive problem. “That improper and unscientific feeding of children from the time of birth to maturity is one of the most fruitful causes, both directly and indirectly, of disease, disability, incapacity for work, both mental and physical, loss of energy, susceptibility to contract and inability to withstand disease,” observed the pediatrician E. Mather Sill in 1910, “everyone who has had wide experience must admit.”⁹ Such views were reinforced by journalists, settlement workers, and social reformers, who chronicled in detail the ills that beset children in rapidly expanding cities and neglected rural areas. This interest in the nutritional health of children, the historian William Reese has argued, arose at precisely the time when fitness became a dominant theme in discussions of American regional superiority and foreign policy.¹⁰ At the end of the nineteenth century, instead of focusing on the annexation of contiguous territory, U.S. military and political leaders shifted their attention to international markets and pursued an aggressive policy of hemispheric dominance. National strength in this new, imperial context became predicated upon the health and fitness of the American people.

Social commentators argued that the major demographic changes already well under way at the end of the nineteenth century threatened this foundation. Declining birth rates among whites, particularly in the upper classes, and steady immigration by “inferior” peoples raised fears of race suicide and national degeneration, fears that persisted well into the twentieth century. Scientists typically considered white Anglo-Saxons to be biologically superior, but declining birth rates put them in danger of being outbred by “lesser” races, including the Irish, Jews, Southern and Eastern Europeans, and blacks. This focused the attention of scientists

9. E. Mather Sill, “Dietary Studies of Undernourished School Children in New York City,” *J. Amer. Med. Assoc.* (November 26, 1910): 1886–91, quotation on 1889.

10. William J. Reese, *Power and the Promise of School Reform: Grassroots Movements during the Progressive Era* (Boston: Routledge & Kegan Paul, 1986), 215–16.

and physicians on the health of middle- and upper-class whites, and in particular on reproduction.¹¹ One reporter observed that increasing the birth rate, a goal of numerous eugenic initiatives, accomplished little if the children born weren't given proper care:

On all sides we hear about race suicide, and we have it drilled into our ears that the nation whose birth rate declines is well started on the road that leads to degeneration. . . . Meanwhile what children there are in the country may die from malnutrition without anybody becoming particularly excited over the fact. . . . It would really seem to an impartial observer from Mars or some other logically minded planet that we ought either to take care of the children when they are here or else drown them as soon as they are born.¹²

Like race suicide, malnutrition was symbolic of general fear about the stability and power of the nation.

Changes in American domestic policy reflected these concerns as well, creating conditions in which malnutrition became more visible and took on new meanings. As opposition to child labor grew, slowly reducing the proportion of children working in the formal economy, states began requiring attendance at school. In 1852, Massachusetts became the first state to pass a compulsory education law, but all states had done so by 1918. Enrollment in high schools increased from 8 percent of children aged fourteen to seventeen in 1900 to over 44 percent in 1930, with a concurrent decline in the percentage of working teenagers.¹³ In the first half of the twentieth century, enrollment in both primary and secondary schools expanded, the average school year lengthened, and per capita investment in education nearly doubled.¹⁴

As the school became a central civic institution, it changed in both structure and mission. Schools, especially in urban areas, assumed responsibilities well beyond teaching the three Rs, providing services such as special classes for the disabled, physical education and playgrounds, lunch

11. See, for example, Daniel J. Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (New York: Knopf, 1985); Edward J. Larson, *Sex, Race, and Science: Eugenics in the Deep South* (Baltimore: Johns Hopkins University Press, 1995); Alexandra Minna Stern, *Eugenic Nation: Faults and Frontiers of Better Breeding in Modern America* (Berkeley: University of California Press, 2005).

12. "How the Plan of Providing Lunch for New York School Children Has Worked," *Washington Post Magazine*, July 3, 1910, 1.

13. Harvey A. Kantor and David B. Tyack, "Introduction," in *Work, Youth, and Schooling: Historical Perspectives on Vocationalism in American Education*, ed. Harvey A. Kantor and David B. Tyack (Stanford: Stanford University Press, 1982), 1–13, data on 7–8.

14. William J. Reese, *America's Public Schools: From the Common School to "No Child Left Behind"* (Baltimore: Johns Hopkins University Press, 2005), 119.

or milk programs, social work, nursing, and medical inspection.¹⁵ Only one American city had regular medical inspection in 1890, but over four hundred did by 1910.¹⁶ This brought millions of children under state surveillance, most of them for the first time.

With the advent of routine medical inspection, physicians and nurses working in the schools documented rampant health problems. Although many, such as poor eyesight, adenitis, and carious teeth, were relatively minor, health inspectors identified them in a shockingly high number of children; according to one report published in 1912, approximately 75 percent of schoolchildren bore at least one physical or mental "defect," and most bore several.¹⁷ Malnutrition was one of the most serious problems, in large part because it was a gateway to more severe, even permanent, health concerns; rhetorically, malnutrition was not a concrete condition, per se, but a state of illness with the potential for countless negative outcomes. Based on nationwide reports, the chief medical inspector of Cincinnati thought it "fair to place the probable number of mal-nourished children in American cities at 10 per cent. of the school population."¹⁸ School medical inspection revealed the pervasiveness of malnutrition and other remediable health problems among children.

A shift in the epidemiological landscape of the United States also made malnutrition more apparent. By 1920, the great plagues of the nineteenth century—cholera, malaria, smallpox, typhoid fever, typhus, and yellow fever—were either gone or reduced to isolated outbreaks, due primarily to concentrated public health efforts. The incidence of diphtheria, one of the deadliest childhood diseases, diminished considerably after antitoxin became widely available in 1896. Between 1890 and 1920, the mortality rate of diphtheria dropped fivefold. Infant mortality rates also declined in the same period, from 111.4 per thousand to 85.8 per thousand.¹⁹ On the

15. Edward A. Krug, *The Shaping of the American High School* (New York: Harper & Row, 1964), 260–62. On Progressive education, see also Ronald D. Cohen and Raymond A. Mohl, *The Paradox of Progressive Education: The Gary Plan and Urban Schooling* (Port Washington, N.Y.: Kennikat Press, 1979); Lawrence A. Cremin, *The Transformation of the School: Progressivism in American Education, 1876–1957* (New York: Knopf, 1961); Reese, *Power and the Promise of School Reform* (n. 10).

16. *What American Cities Are Doing for the Health of School Children Part I: Medical Inspection* (New York: Russell Sage Foundation, Division of Child Hygiene, 1912), 5.

17. Robert W. Hastings, "Medical Inspection of Schools," *Amer. J. Pub. Health* 2, no. 12 (1912): 971–76, data on 973.

18. William H. Peters, "Report of the Committee on Medical Inspection of Schools," *Amer. J. Pub. Health* 6, no. 6 (1916): 589–91, quotation on 590.

19. John S. Billings, *Report on Vital and Social Statistics in the United States at the Eleventh Census: 1890* (Washington, D.C.: U.S. Department of the Interior, Census Office, 1896);

whole, children were surviving at ever greater rates; combined with smaller average family sizes, a result of urban living, children became “emotionally priceless” rather than economically valuable. Malnutrition, which previously may have been masked by more acute afflictions, was more frequently observed, and it challenged the “sacredness” of child life.²⁰

This epidemiological shift also spurred changes in public health priorities. The germ theory of disease and bacteriological research engendered new, effective tools for infectious disease control, but success in reducing the burden of diseases like diphtheria and tuberculosis also revealed the extent to which noncontagious disorders had been ignored. As the nutritionist Ellen Richards observed in 1910,

Since 1882, tuberculosis has decreased forty-nine per cent; typhoid, thirty-nine per cent. Statistics in regard to heart disease and other troubles under personal control, however, show increase—kidney disease, 131 per cent; heart disease, fifty-seven per cent; apoplexy, eighty-four per cent. This means that infectious and contagious diseases, of which the State has taken cognizance and to the suppression of which it has applied known laws of science, have been brought under control. . . . On the other hand, such results of improper personal living as do not come under legal control . . . [have] enormously increased.²¹

Health authorities in the early twentieth century became increasingly convinced that the control of infectious diseases and the reduction of mortality, though critically important, were not sufficient to ensure a healthy population, and malnutrition revealed the weaknesses inherent in traditional public health methods.

When pediatricians and other health professionals began to address malnutrition in the school-aged population, however, a fundamental contradiction emerged: as research into human growth and nutrition increasingly quantified both the process of development and the relationship between food and health, the effective use of such quantitative techniques in diagnostic contexts proved frustratingly elusive. Physicians and nutritionists in the early twentieth century increasingly promoted a

Forrest E. Linder and Robert D. Grove, *Vital Statistics Rates in the United States 1900–1940* (Washington, D.C.: U.S. Government Printing Office, 1947); *Mortality Statistics 1920: Twenty-First Annual Report* (Washington, D.C.: U.S. Department of Commerce, Bureau of the Census, 1922). Aggregate statistics are somewhat misleading, as whites fared far better than blacks and Native Americans, but in nearly all cases, life expectancies were increasing and both total and infant mortality rates were decreasing during the first half of the twentieth century.

20. On the increased social value of children, see Viviana A. Zelizer, *Pricing the Priceless Child: The Changing Social Value of Children* (New York: Basic Books, 1985).

21. Ellen H. Richards, *Euthenics, the Science of Controllable Environment: A Plea for Better Living Conditions as a First Step toward Higher Human Efficiency* (Boston: Whitcomb & Barrows, 1910), 3–4.

utilitarian view of food, placing qualitative cultural and personal tastes second to quantitative nutritional analyses. All foods could be reduced to functional components, and it was the nutritive functions of food that really mattered. As physicians and scientists learned more about the nutritional needs of the body, they also identified ever more health problems that arose from improper or deficient nourishment. Malnutrition, along with specific nutrient deficiencies such as pellagra, rickets, and scurvy, became scalar, theoretically quantifiable diseases as a result of the new understanding that food contained chemical constituents that must be consumed in sufficient amounts to maintain health and growth.

Applying this quantitative approach to diagnosis, however, proved considerably more problematic. Health professionals struggled to generate a precise, clinical definition of malnutrition, as this required—at least implicitly—establishing a normative definition of good health from which the malnourished child deviated. Without a standard definition or diagnostic process, estimates of the incidence and severity of malnutrition were highly variable. Indeed, rates reported by school medical inspectors in the first two decades of the twentieth century ranged from 3 percent to 30 percent. Diagnosing malnourishment based upon physical examination alone, especially in schools and other public health contexts, proved to be exceedingly difficult. Unless the observer had “direct training with reference to nutrition and growth it is very easy to overlook inflammatory processes and other significant defects,” argued William Emerson, a prominent nutritionist and pediatrician, in 1924. “Physicians lacking experience with the problem of malnutrition often fail to grasp the situation.”²²

Physicians made several attempts to normalize the description and identification of malnutrition. The Dunfermline Scale, developed in 1912 by Dr. Alister Mackenzie of the Carnegie Dunfermline Trust in Scotland, was one of the most commonly used diagnostic simplifications. The Dunfermline method used height, weight, eyesight, breathing, muscle tone, mental acuity, and complexion to evaluate nutrition. The scale itself was a reporting tool consisting of four categories: “Excellent,” “Good,” “Requiring Supervision,” and “Requiring Medical Treatment.” Physicians grouped children according to their state of health and development. Although many employed the system to make diagnostic reporting more straightforward, it did not simplify the diagnosis itself, which remained one based mostly on experience and judgment.²³

22. William R. P. Emerson and Frank A. Manny, “The New Weight-Height Tables and Malnutrition,” *Arch. Pediatr.* 41 (1924): 677–85, quotation on 680–81.

23. *Annual Report on the Medical Inspection of School Children in Dunfermline* (1912–13), 18–20; Taliaferro Clark, “Nutrition in Schoolchildren,” *J. Amer. Med. Assoc.* (August 12, 1922): 519–25.

In general, the Dunfermline Scale made physicians more likely to classify a child as malnourished (i.e., in one of the lower two categories) than with a binary system. This stemmed from the fact that physicians using the Dunfermline Scale were making not only a diagnosis but also a prognosis, a prediction about whether a child would require assistance to attain “good” or “excellent” status. Instead of looking for the obvious signs of poor health, with the attendant assumption that the absence of those signs signified good health, physicians actually had to assign children to categories, a process likely to produce more false-positive diagnoses than false negatives.

When school medical inspectors in New York City began using the Dunfermline Scale in December of 1915, the number of reported cases of malnutrition almost tripled. (Although some of this increase may have been caused by high food prices, which were rising faster than wages in New York City, this would not have produced such a dramatic and abrupt increase in prevalence.) More problematic, however, was the relativistic nature of the diagnoses: “[I]n examining children of a certain school the physicians consciously or unconsciously take the average of the school as a standard and accordingly divide the children into four groups,” observed the pediatrician E. Lewinski-Corwin, who made several studies of malnutrition on behalf of the New York Academy of Medicine. “In the schools located in the poorer districts of the city it may happen that virtually all of the children suffer from some degree of malnutrition. Yet grades 1 and 2 [Excellent and Good] show relatively the same percentage as in the schools in the better sections of the city where the majority of the children are fairly robust and well nourished.”²⁴

The difficulty of standardizing the four categories of the Dunfermline scale limited its utility as a reporting tool. Pediatricians and public health physicians turned instead to the research on human growth and development in the hopes that anthropometry would provide a standardized, quantifiable method of diagnosis.²⁵ The most commonly used approach was to measure a child’s weight and height on a regular basis and compare the measurements to standard tables that listed average weights either by height and sex or by age, height, and sex. Children who consistently deviated from these averages were potentially malnourished.

24. E. H. Lewinski-Corwin, “Malnutrition among School Children: A Study,” *Med. Rec.* 93, no. 8 (1918): 311–18, quotation on 312. See also John C. Gebhart, *Malnutrition and School Feeding* (Washington, D.C.: U.S. Department of the Interior, Bureau of Education, 1921), 3.

25. On the history of anthropometry, see J. M. Tanner, *A History of the Study of Human Growth* (Cambridge: Cambridge University Press, 1981); James Allen Young, “Height, Weight, and Health: Anthropometric Study of Human Growth in Nineteenth-Century American Medicine,” *Bull. Hist. Med.* 53, no. 2 (1979): 214–43.

Pediatricians saw great potential for the use of scales and standard tables to diagnose malnutrition. As one noted at the turn of the twentieth century, the method was “commendable and properly used would unerringly detect defects in methods of feeding.”²⁶ Although standard tables of varying quality were available beginning in the late nineteenth century, physicians had used them primarily to chart the growth, development, and overall health of children whom they examined on a regular basis (longitudinal evaluation). After World War I, such tables were increasingly used as a screening device in surveillance programs (cross-sectional evaluation). Health workers generally used either 7 percent or 10 percent of the average to mark the boundary between malnourishment and relative health. For example, if a ten-year-old boy who is 52 inches tall should weigh 65 pounds, according to a standard table, then a ten-year-old boy of the same height who weighs less than 60.5 pounds (by the 7 percent standard) or less than 58.5 pounds (by the 10 percent standard) was likely to be malnourished. By this metric, a certain percentage of the average defined the minimum threshold of the normal zone.

American involvement in the war stimulated the desire to create a standard, simple, and widely applicable method for the diagnosis of malnutrition. Of the over three million young men who applied for military service in 1917–18, more than 30 percent were rejected on medical grounds; the fifth leading cause of rejection was underweight, and 8 percent of those rejected suffered from some physical, developmental defect.²⁷ Surgeon General Rupert Blue and other health authorities drew a clear connection between many of these defects and chronic malnutrition during childhood.²⁸ Although statisticians and epidemiologists cautioned against exaggerating the importance of the findings—the purpose of the exams was to evaluate men for soldiering, not basic health—the results of the medical exams mobilized the nascent child health movement.²⁹

The high number of malnourished schoolchildren “is the shame of our civilization,” social worker Sally Jean told a gathering of her colleagues in

26. John L. Heffron, “The Diet of School Children,” *J. Pedagogy* 12 (1900): 285–94, quotation on 286.

27. Frank R. Keefer, “Causes of Army Rejections: What Health Officers Can Do to Remedy Conditions,” *Amer. J. Pub. Health* 10, no. 3 (1920): 236–39, data on 237. See also *Defects Found in Drafted Men* (Washington, D.C.: Government Printing Office, 1919); Frederick L. Hoffman, *Army Anthropometry and Medical Rejection Statistics* (Newark: Prudential Press, 1918).

28. Rupert Blue, “Are We Physically Fit? United States Handicapped in Coming Period of Commercial and Industrial Competition,” *Amer. J. Pub. Health* 9, no. 9 (1919): 641–45; Taliaferro Clark, “The Need and Opportunity for Physical Education in Rural Communities,” *Amer. Phys. Educ. Rev.* 24, no. 9 (1919): 436–43.

29. On the child health movement, see Kriste Lindenmeyer, “A Right to Childhood”: *The U.S. Children’s Bureau and Child Welfare, 1912–46* (Urbana: University of Illinois Press, 1997).

1918. "The recent draft revelations of deplorable physical deterioration in the flower of our young men, have demonstrated that these children who do not measure up to standard become in later years the men and women who do not measure up in their country's time of need."³⁰ Thomas Wood, professor of physical education at Columbia University, addressed the National Education Association in much the same way: "[W]hile the magnitude of this item of national weakness defies over-emphasis, yet the health deficiencies of the children are even more impressive and menacing."³¹ This concern was not limited to professionals. A survey of periodic literature conducted in 1925 found that the number of articles on malnutrition appearing in twenty popular magazines and professional journals rose from one in 1917 to nearly sixty in 1922.³²

The war created extensive public interest in the anthropometric evaluation of nutrition, which pediatricians and public health authorities heartily endorsed. Although typically encouraging physical examination as well, most physicians supported the use of anthropometric assessment as a public health measure. According to L. Emmett Holt, president of the Child Health Organization (CHO) and author of the widely read parenting book *The Care and Feeding of Children*, weight and height measurements were "by far the best guide" to nutritional health.³³ The pediatrician and infant feeding specialist Lulu Peters agreed.³⁴ A study in the *Archives of Pediatrics* found that "the weight to height basis is the most reliable standard of judging nutrition."³⁵ Such statements were also widely disseminated in popular literature. In the introduction to one cookbook, a pediatrician from Cleveland wrote that "after much study in this country and abroad, it has been quite well established that the best index we have of a child's nutrition is his weight."³⁶

30. Sally Lucas Jean, "The Educational Opportunities Presented by the School Lunch," in *Proceedings of the National Conference of Social Work* (Chicago: Rogers & Hall, 1918), 68–75, quotation on 70.

31. Thomas D. Wood, "The Nation's Duty to the Health of the School Children" (paper, 58th Annual Meeting of the National Education Association, 1920), 79–81, quotation on 80.

32. Rama V. Bennett, "An Analysis of the Development of the Interest in Malnutrition of Children as Reflected in Periodical Literature" (University of Chicago, 1925), data in appendix.

33. L. Emmett Holt, *Food, Health and Growth: A Discussion of the Nutrition of Children* (New York: Macmillan, 1922), 212.

34. Lulu Hunt Peters, *Diet for Children (and Adults) and the K calorie Kids* (New York: Dodd, Mead, 1924), 70.

35. Murray B. Gordon and Elias H. Bartley, "Malnutrition in Children: A Study of the Examination of Nine Hundred Children under Eight Years of Age," *Arch. Pediatr.* 36 (1919): 257–67, quotation on 266.

36. Barbara Webb Bourjaily and Dorothy May Gorman, *The Mother's Cook Book: How to Prepare Food for Children* (New York: Appleton, 1926), 2.

Anthropometric assessment was endorsed by numerous state and local health departments, the Bureau of Education, the Children's Bureau, the American Child Health Association, the National Tuberculosis Association, and the Young Men's Christian Association. The use of scales and standard tables in the schools and at health fairs became standard practice. Indeed, the method was so simple as to require "no expert medical knowledge," according to the U.S. Bureau of Education. "The weight of the child and his rate of gain usually tell the story."³⁷ This made it possible for teachers and parents without any special training to employ the method, and they became an integral part of one of the largest children's health campaigns in U.S. history.

By the early 1920s, weighing and measuring had become an almost universal aspect of schooling (see Figure 1). In Newton, Massachusetts, for example, "the monthly weights are not only entered on the classroom charts but are also reported to the homes on special report cards. In addition, these new records are sent each month by the principal to the school department offices where the weight records of every classroom in the city are studied and progress commended."³⁸

Scales were placed in every New York City school "to encourage children to watch their physical condition by means of weight tests."³⁹ Nurses from the Health Department in Racine, Wisconsin, weighed and measured all schoolchildren once a year, and weighed and inspected underweight children every two months.⁴⁰ From California to the Carolinas, scales were becoming a routine part of schooling. Never before had so many children received health assessments and routine medical attention.

In 1925, the American Child Health Association (ACHA) surveyed eighty-six cities with populations between forty thousand and seventy thousand people. Of those, 71 percent claimed that weighing and measuring were part of the school health program, 56 percent reported that all schools had scales, and 80 percent weighed schoolchildren at least once a year.⁴¹ The scale had become a regular apparatus of school health programs and the primary metric of nutritional status. Indeed, weight became an indicator not just of nutrition but of health more generally. "There is no such thing as a measure of health," the epidemiologist George Palmer

37. Lucy Oppen, *Wanted: Teachers to Enlist for Child Health Service* (Washington, D.C.: U.S. Department of the Interior, Bureau of Education, 1919), 4.

38. Anne Whitney, *Who's Who in Healthland* (Washington, D.C.: U.S. Department of the Interior, Bureau of Education, 1923), 7.

39. "School Lunches in New York City," *Sch. Soc.* 11, no. 262 (1920): 20.

40. George T. Palmer, Philip S. Platt, W. Frank Walker, Annetta J. Nicoll, and Anna Jablonow, *A Health Survey of 86 Cities* (New York: American Child Health Association, Research Division, 1925), 487.

41. *Ibid.*, 153.



Figure 1. A public health nurse weighs and measures children in a classroom. Source: National Library of Medicine, WA 11 C29 no. 76, box 8.

stipulated. "In the absence of such a measure we have come to regard nutritional status . . . as a rough index."⁴²

The message that good health corresponds directly to appropriate weight proved to be a powerful one, and it spread well beyond the confines of specific public health programs. Numerous children's books took up this motto, encouraging all to gain weight through proper diet, adequate rest, and regular outdoor play. In Antoinette Peterson's *Child Health Alphabet*, "**G** is for *Gaining*, / as every Child could; / A half pound a Month / is the least that he should."⁴³ J. Mace Andress wrote a number of children's books for the CHO in the 1920s. In one of them, a young girl meets the King of Health Land, who is disappointed with her measurement card.

42. George T. Palmer, "The Measurement of Nutritional Status," *Child Health Bull.* 6, no. 2 (1930): 45–50, quotation on 45.

43. Mrs. Frederick [Antoinette] Peterson, *Child Health Alphabet* (New York: Macmillan, 1918).

"Do you see that chart over there?" Nellie nodded her head. "Let us look it over. It will tell you just how much you ought to weigh." Together they looked it over. "Well, what does it say?" asked the King. "It says that I ought to weigh sixty-four pounds. I weigh only fifty-four pounds." "Yes; that is correct. You know that healthy children gain in weight. Every child in Health Land is expected to gain in weight throughout the year."⁴⁴

Naomi Washington (b. 1902) recalled the importance of weight during her childhood in Harlem. "We were plump, and my father was proud of his children because of our size. There was a man who was a deacon at Metropolitan Baptist Church. His daughter and my sister were as wide as this table. The two fathers would be walking and talking, and they'd be so proud of their children. 'Oh, mine is larger.' 'No, mine is larger.' Then they'd weigh 'em."⁴⁵ Through school instruction, medical advice, and popular stories, children and their parents were encouraged to base their dietary practices on the readings of scales and the numbers on tables.

However, the use of scales and standard tables ultimately had a short life span in children's health campaigns. When the prosperity of the 1920s gave way to the Great Depression in the 1930s, many surveillance programs were curtailed or discontinued altogether. Although weighing and measuring children—once scales were purchased—was virtually without expense, thus sheltering them from the economic privations of the 1930s, pediatricians and nutritionists became increasingly critical of the use of scales to measure anything but weight.

One problem was that there were many different standard tables in use, and health authorities questioned the validity (or applicability) of the data. The *homme moyen* proposed by the Belgian mathematician Lambert Quetelet in the early nineteenth century appeared instead to be *beaucoup d'hommes moyenne*. Of the thirty-six standard tables surveyed by one professor of public health in 1929, thirty-three gave different average weights for an eleven-year-old boy, with a range of 29.0 to 34.4 kilograms (63.8 to 75.7 pounds); the variation in averages was even greater for girls.⁴⁶ Many of the tables were based on the measurements of children in private schools with "decided economic advantages" over those attending public or parochial schools.⁴⁷ The assumption that these children represented optimal

44. J. Mace Address and Annie Turner Address, *A Journey to Health Land* (Boston: Ginn, 1924), 32–33.

45. Jeff Kisseloff, *You Must Remember This: An Oral History of Manhattan from the 1890s to World War II* (San Diego: Harcourt Brace Jovanovich, 1989), 269–70.

46. C. E. Turner, "Precision and Reliability of Underweight Measurement," *Amer. J. Pub. Health* 19 (1929): 969–79, data on 970.

47. Emerson and Manny, "New Weight-Height Tables" (n. 22), 678.

health went unchallenged, but physicians debated how much deviation constituted the normal zone.⁴⁸

This issue was complicated by racial disparities and the categorization of bodies into types of build. The physiologist Henry Bowditch had noted in the 1870s that children of different races had different average heights, and both Franz Boas and Charles Davenport had published numerous studies on the effects of heredity and environment on physical and physiological attributes. By the 1920s, however, there was no consensus among anthropologists and physiologists as to the relationship of race, environment, and stature.⁴⁹ At times, the standard tables could not even be used. The authors of one study “encountered a serious shortcoming of the standard tables in that they gave no weights corresponding to the very short children occurring among Italians.”⁵⁰ Health authorities also questioned the usefulness of averages that did not take into account body types. Researchers at the ACHA noted that “[u]nderweight for age and height is by no means the same as underweight for skeletal build.”⁵¹ As physiologists learned more about the growth process, they came to understand that the extent and pace of growth were determined by copious factors, including heredity, geography, climate, general health, amount of exercise, diet, and even the time of the year.⁵² Furthermore, aggregate data could be applied to individuals only in certain circumstances. The New York Nutrition Council’s Committee on Statistics argued in 1922 that “[t]here is no warrant for assuming that the average height and weight of a large number of children is the ‘normal’ weight for any particular child under consideration.”⁵³

48. See, for example, Clark, “Need and Opportunity” (n. 28), 441.

49. Henry P. Bowditch, *The Growth of Children: A Supplementary Investigation* (Boston: Rand, Avery, 1879). On the difficulty of identifying hereditary and environmental contributions to body composition, see Franz Boas, *Changes in Bodily Form of Descendants of Immigrants* (Washington, D.C.: U.S. Government Printing Office, 1910); C. B. Davenport, *Body Build: Its Development and Inheritance* (Long Island: Carnegie Institute of Washington, 1925).

50. Louis I. Dublin and John C. Gebhart, “Do Height and Weight Tables Identify Undernourished Children?,” *Amer. J. Pub. Health* 13, no. 11 (1923): 920–27, quotation on 921.

51. *Physical Defects: The Pathway to Correction* (New York: American Child Health Association, 1934), 63. See also Hugh Chaplin and Edward A. Strecker, *Signs of Health in Childhood: A Picture of the Optimal Child* (New York: American Child Health Association, 1927); H. B. Pryor and H. R. Stolz, “Determining Appropriate Weight for Body Build,” *J. Pediatr.* 3 (1933): 608–22; C. Rosenow, “Weight and Skeletal Build,” *Amer. J. Orthopsychiatry* 3 (1933): 55–64.

52. Bird T. Baldwin, “The Use and Abuse of Weight-Height-Age Tables as Indexes of Health and Nutrition,” *J. Amer. Med. Assoc.* (January 5, 1924): 1–4.

53. *Height and Weight as an Index of Nutrition* (New York: New York Nutrition Council, Committee on Statistics, 1922), n.p. The application of aggregate data to individuals without having performed a regression analysis is a basic statistical fallacy (ecological fallacy).

There were also numerous variables that affected both the calculation of standard values and the way any given table could be used: Was the table constructed with longitudinal or cross-sectional measurements? Were the children weighed clothed or nude? Was age determined by the last birthday or the closest birthday? From which race, class, and background did the children come? Were the children inspected by a physician? Did the same person take all of the measurements? Were all measurements included in the tables? Anthropometry, despite its promise for public health work, lacked accuracy if the methods employed in the field did not match those employed in the construction of the standard tables or if the population under examination was not well understood in relation to that represented in the tables.⁵⁴

Physicians and nutritionists also grew increasingly wary of the assumptions entailed in diagnosis by anthropometry, especially the equating of malnutrition with underweight. To assume "that weight is an accurate measure of nutrition and to make dogmatic statements . . . on this basis alone," the nutritionist Lydia Roberts wrote, "is an unwise and unsound procedure."⁵⁵ Even the studies designed to test the efficacy of the tables produced highly varied results. In one study conducted in 1923, "the determination of degrees of nourishment by means of the height and weight standards according to Dr. Wood's tables shows a lesser incidence, 22.2%, than the results of the complete physical examination [25.0 per cent]."⁵⁶ In a different study conducted that same year, "The physician's careful examination showed that 34 per cent of the children were malnourished; the weight tables with the 7 per cent limit would have selected 12.4 per cent and with the 10 per cent limit, only 6.2 per cent as requiring nutrition care."⁵⁷ The degrees of discrepancy were different, but the con-

Anthropometrists had cautioned against commission of this fallacy as early as the mid-nineteenth century. See, for example, Benjamin Apthorp Gould, *Investigations in the Military and Anthropological Statistics of American Soldiers* (New York: Hurd & Houghton, 1869), 116; W. Townsend Porter, "On the Application to Individual School Children of the Mean Values Derived from Anthropological Measurements by the Generalizing Method," *Quart. Publications Amer. Statistical Assoc.* 3 (1893): 576–87, esp. 579.

54. Baldwin, "Use and Abuse of Weight-Height-Age Tables" (n. 52), 1; Dorothy Reed Mendenhall, *Milk: The Indispensable Food for Children* (Washington, D.C.: U.S. Department of Labor, Children's Bureau, 1926), 11n5.

55. Lydia J. Roberts, "How a Teacher Can Judge the Nutrition of School Children," *Elementary Sch. J.* 29, no. 3 (1928): 189–97, quotation on 190.

56. S. Josephine Baker and J. L. Blumenthal, "Methods of Determining Malnutrition: Comparison of Pelidisi, Wood Height and Weight, and Dunfermline Methods," *Nation's Health* 5, no. 1 (1923): 47–53, quotation on 49.

57. Dublin and Gebhart, "Do Height and Weight Tables Identify Undernourished Children?" (n. 50), 922.

clusions were the same: the standard tables resulted in an *underestimation* of the prevalence of malnutrition. Physicians grew more critical of the method because simplifying (i.e., quantifying) the *diagnosis* of malnutrition seemed to have simplified the *definition* of malnutrition as well.⁵⁸

Perhaps the most damaging attack on the scales programs came from physicians—in public health work and private practice—who regarded such endeavors as infringing on their professional prerogatives. Assistant Surgeon General Taliaferro Clark criticized the conducting of weighing and measuring by people with “limited training and experience in health matters.” He lamented that “the veriest tyro in public health work, after placing a child on a scale and noting comparative results, gravely announces the percentage of malnutrition in a given population group.”⁵⁹ A physician from Chicago argued that a diagnosis of malnutrition “can be determined only by careful physical examination by an expert physician who is qualified to check up not only his digestive, respiratory and nervous systems, but every other system of his body. . . . [T]he grocery clerk system of weighing, aging and measuring must be abandoned for one conducted by trained medical men.”⁶⁰ This issue pitted predominantly male physicians against the mostly female nurses, teachers, and dietitians who composed the majority of the labor force in most weighing and measuring programs. The historian Jeffrey Brosco has argued that physicians, despite their initial support of anthropometric diagnosis, ultimately rejected it to consolidate their authority over children’s health and become the sole providers of well-child care. “The irony of promoting a simple measure of nutrition . . . was that physicians placed the diagnosis of malnutrition within the competence of nonmedical personnel. Arguments by physicians that the diagnosis required an expert clinical decision,” a decision only they themselves could provide, were “an important component in the emergence of pediatrics as a primary care specialty.”⁶¹

By the early 1930s, the anthropometric assessment of all pupils had ceased to be a routine part of school health programs. The report of the White House Conference on Child Health and Protection, held in 1930,

58. See, for example, Harold K. Faber, “A Weight Range Table for Children from 5 to 15 Years of Age,” *Amer. J. Dis. Child.* 38 (1929): 758–61; Hugh McCulloch, “Standards of Nutrition and Growth,” *Trans. First Annu. Meeting Amer. Child Health Assoc.* (1923): 324–33; Louis C. Schroeder, “Do Height and Weight Tables Identify Undernourished Children?,” *Trans. First Annu. Meeting Amer. Child Health Assoc.* (1923): 253–56; Borden S. Veeder, *Preventive Pediatrics* (New York: Appleton, 1926).

59. Clark, “Nutrition in Schoolchildren” (n. 23), 519.

60. *Ibid.*, 524–25. See also Veeder, *Preventive Pediatrics* (n. 58), 154.

61. Brosco, “Weight Charts and Well Child Care” (n. 5), 109–10.

declared that “[W]eight is no longer considered as a satisfactory measure of nutrition, nor as a scientifically dependable index of health.”⁶² The ACHA, an organization that had previously promoted the use of scales in the schools, stated that they were of limited usefulness for the determination of nutrition status, and should be used only to assess growth.⁶³ Health departments also removed their endorsements. For example, in 1920, the Wisconsin State Board of Health had begun to include instructions for the regular weighing and measuring of children under “Suggestions for School Boards,” confident that “the day is not far distant when scales will come to be considered as essential a part of schoolroom equipment as the blackboard, map, and globe have been.”⁶⁴ On the contrary, the same recommendations published in the 1930s contain reference neither to scales nor to the weighing and measuring of schoolchildren.

The programs were even lampooned in *Ballyhoo*, a popular humor magazine. The caption to one cartoon from 1932 reads, “A mother bringing her child to the Ballyhoo Institute because it hasn’t gained a pound in months. We filled the little brat up with rocks, and it gained plenty. Modern science finds a way.”⁶⁵ The cartoon satirized anthropometric diagnosis, portraying it as little more than blind adherence to the tyranny of the scale; if weight is the only thing that matters, then one may as well eat rocks as food. “[P]hysicians, school and public health officials and even laymen,” observed a physician from Cleveland, “have come more and more to treat simple physical measurements, such as weights and heights, as all but worthless.”⁶⁶

The rapid transition of anthropometric diagnosis from the cutting edge to the cutting-room floor raises several questions. Did health authorities come to regard malnutrition as a false epidemic, little more than an artifact of a flawed method of surveillance? Was the widespread concern that seemed to fill newspapers, magazines, and professional journals and conferences ultimately perceived as little more than a mania, as the cartoon in *Ballyhoo* suggests? Levenstein has referred to these events as “the Great Malnutrition Scare,” arguing that by the 1930s, estimates of the

62. *White House Conference on Child Health and Protection: Preliminary Committee Reports* (New York: Century Co., 1930), 210.

63. Anne Whitney, *Weighing School Children* (New York: American Child Health Association, 1930).

64. *Rules of the State Board of Health Relating to the Sanitary Care of Schools* (Madison: Wisconsin State Board of Health, 1920), 8.

65. “The Ballyhoo Institute and Medical Center,” *Ballyhoo* (1932): 26.

66. Norman C. Wetzel, “Physical Fitness in Terms of Physique, Development and Basal Metabolism,” *J. Amer. Med. Assoc.* (March 22, 1941): 1187–95, quotation on 1187.

prevalence of malnutrition were considered vastly overblown.⁶⁷ Brosco has taken a more measured approach, characterizing the 1920s as a period of “epidemic” malnutrition caused not by a change in prevalence but by the introduction of anthropometric methods that quantified the condition. “The epidemic did not end because children were healthier and better fed; it ended because there were no more population-based studies of malnutrition.”⁶⁸

There is some truth to these interpretations, as the 1930s witnessed a significant reduction in diagnostic certitude. “We are indeed,” wrote the nutritionist Lydia Roberts in 1935, “at the moment in a situation where we have lost confidence in the old methods and as yet have nothing new that is satisfactory to take their place.”⁶⁹ However, malnutrition itself was not, as both Brosco and Levenstein suggest, a transient phenomenon, nor was its perceived existence linked solely to anthropometric evaluation. Medical concern about the high prevalence of malnutrition did not diminish, nor did the search for reliable diagnostic methods end; the uncertainty felt by health professionals was not about the existence or severity of malnutrition but about how to address a condition so difficult to define and yet so clearly detrimental. Indeed, pediatricians and numerous other health experts had based their professional status in part on the existence of widespread malnutrition, and experience on the ground suggested that malnourishment, though hard to identify reliably, was not a phantom condition.

Both routine surveillance and population-based studies of malnutrition continued in the 1930s, albeit with greater sensitivity to the limitations of simple screening tools, and the results still revealed high levels of malnourishment. During the Depression, state relief agencies assessed children’s health on a routine basis, often resorting to simple physical examinations. In Missouri, for example, physicians employed by the Civil Works Administration inspected almost 300,000 schoolchildren in 1934 and considered 14 percent of them malnourished.⁷⁰ In other cases, weight charts were used in such a way as to avoid ecological fallacy. A longitudinal study conducted in Pittsburgh found that the proportion of schoolchildren who were significantly underweight began increasing in 1928. Between 1923

67. Levenstein, *Revolution at the Table* (n. 4), 112ff.

68. Brosco, “Weight Charts and Well Child Care” (n. 5), 91, 106.

69. Lydia J. Roberts, *Nutrition Work with Children* (Chicago: University of Chicago Press, 1935), 43.

70. William Gammon, *U.S. Civil Works Administration of Missouri: A Review, November 15, 1933, to March 31, 1934* (Jefferson City: Missouri State Relief & Reconstruction Commission, 1934), Table XI.

and 1927, the percentage of children 14 percent or more below the average weight was consistently around 7 percent; by 1932, it had risen incrementally to 12.6 percent.⁷¹ Dietary surveys, which evaluated nutritional health from the supply side, also became increasingly common. According to data collected by the U.S. Departments of Agriculture and Labor in 1936–37, over a third of the families surveyed—“[r]epresentative nonrelief families, each with a husband and wife, both native-born”—had diets that did not meet the minimum standards established by nutritionists.⁷² Studies of impoverished and disenfranchised groups revealed considerably higher rates of malnourishment and dietary insufficiency.⁷³

The failure of the weight–height tables to reliably identify individual cases of malnourishment only stimulated physicians, nutritionists, and anthropometrists to find new, more effective methods of diagnosis. The U.S. Children’s Bureau conducted one of the most comprehensive studies of the new (and old) methods; between 1934 and 1936, researchers evaluated a variety of procedures for determining physical fitness, including biochemical tests, functional tests, dietary investigation, socioeconomic inquiry, physical examination, and anthropometry. Anthropometry remained the most promising for public health programs due to its low cost, relative ease of application, and instantaneous results. Many different anthropometric methods had been proposed, and the Children’s Bureau tested four of them: the Baldwin–Wood tables, which compare weight to height and age;⁷⁴ the Pryor tables, which compare weight to bi-iliac width;⁷⁵ the ACH Index, which compares arm and chest girth to height;⁷⁶ and the Nutritional Status Index (NSI), which compares weight, arm girth, and subcutaneous tissue to height and skeletal build.⁷⁷

71. Allen M. Kerr, “Effect of the Economic Crisis on the Nutrition of School Children,” *Pennsylvania Med. J.* 37 (1933): 232–34.

72. Hazel K. Stiebeling, *Are We Well Fed? A Report on the Diets of Families in the United States* (Washington, D.C.: U.S. Department of Agriculture, Bureau of Home Economics, 1941), 3, 7.

73. See, for example, Alberta B. Childs, “Some Dietary Studies of Poles, Mexicans, Italians, and Negroes,” *Child Health Bull.* 9 (1933): 84–91; Mary E. Frayser and Ada M. Moser, *The Diet of School Children in Relation to Their Health* (Clemson: South Carolina Agricultural Experiment Station, Clemson Agricultural College, 1930); Jet C. Winters, “A Study of the Diet of Mexicans Living in Texas,” *J. Amer. Dietetic Assoc.* 8, no. 1 (1932): 47–55.

74. Bird T. Baldwin, Thomas D. Wood, and Robert M. Woodbury, *Weight-Height-Age Tables* (Washington, D.C.: American Child Health Association, 1923).

75. H. B. Pryor, *Width-Weight Tables for Boys and Girls from 1 to 16 Years [and] for Men and Women from 17 to 24 Years* (Stanford: Stanford University Press, 1936).

76. Raymond Franzen and George T. Palmer, *The ACH Index of Nutritional Status* (New York: American Child Health Association, 1934).

77. *Nutritional Status Indices: Method of Obtaining Measures of Musculature, Subcutaneous Tissue, and Weight with Allowance for Skeletal Build* (New York: American Child Health Association, 1935).

After two years of field testing, the study's authors determined that each method diagnosed different medical issues. The Baldwin-Wood and Pryor tables identified children who were underweight for age and body build, respectively; the ACH Index identified children who had underdeveloped soft tissue for body build; and the NSI identified children who were inferior to others of the same height and skeletal development in subcutaneous tissue, arm girth, or weight. However, none of the four indices was "an efficient method of identifying children . . . [who] are likely to be physically unfit. The indices are neither selective nor sensitive," and all resulted in numerous false-positive and false-negative diagnoses of malnourishment.⁷⁸

Although pediatricians had used the failures of anthropometry to consolidate their authority over children's health, their clinical judgments, when based on the brief examinations necessary in public health work, were also "liable to considerable error."⁷⁹ An investigation conducted by the ACHA in 1938 concluded that differences in diagnoses between physicians were "so great that estimates based on a single examination are of little value in determining the relative amount of malnutrition among any group of children at any one time or changes in the amount from one time to another. Neither are these nutritional estimates reliable bases for determining which children of a group are malnourished."⁸⁰ Although this research left little hope for the development of effective surveillance methods to identify malnourished children, health authorities remained convinced that malnutrition was as great a problem as ever.

In 1941, the National Research Council's Food and Nutrition Board evaluated the medical evidence on the prevalence of malnutrition in the United States. After demonstrating that the methods employed to assess malnourishment were consistently unreliable, they concluded nonetheless that "dietary inadequacies and malnutrition of varying degrees are of frequent occurrence in the United States and that the nutritional status of an appreciable part of the population can be distinctly improved." The

78. Rachel M. Jenss and Susan P. Souther, *Methods of Assessing the Physical Fitness of Children* (Washington, D.C.: U.S. Department of Labor, Children's Bureau, 1940), 19, 94. See also Delmar Isaac Allman, "A Comparison of Nutritional Indices," *Res. Quart.* 8 (1937): 79-93; Everett L. Marshall, "A Comparison of Four Current Methods of Estimating Physical Status," *Child Dev.* 8, no. 1 (1937): 89-92.

79. Jenss and Souther, *Methods of Assessing the Physical Fitness of Children* (n. 78), 95. See also Raymond Franzen, *Physical Measures of Growth and Nutrition* (New York: American Child Health Association, 1929), 3; Frank G. Boudreau and H. D. Kruse, "Malnutrition—A Challenge and an Opportunity," *Amer. J. Pub. Health* 29, no. 5 (1939): 427-33.

80. Mayhew Derryberry, "Reliability of Medical Judgements on Malnutrition," *Pub. Health Rep.* 53, no. 7 (February 18, 1938): 263-68, quotation on 268.

prevalence of malnutrition, the authors argued, was consistently under-reported in the literature and thus represented an even greater problem than most studies indicated.⁸¹

This assessment, which led to the inaugural publication of the Recommended Daily Allowances just two years later, corroborated the views of other public health leaders. According to Surgeon General Thomas Parran, “children with half-starved bodies” were one of the most pressing health concerns in the nation: “Something like 9,000,000 school children are not getting a diet adequate for health and well-being. And malnutrition is our greatest producer of ill health.”⁸² An editorial in the *Journal of the American Medical Association*, a publication that had at times opposed the notion that malnutrition was a rampant public health problem, noted that malnourishment was “probably far more prevalent among the population of the United States than is generally recognized.”⁸³ This assumption was broadcast widely, even to the lay public. In 1945, the nutritionists Icie Macy and Harold Williams published *Hidden Hunger*, a book whose cover depicted a pensive skeleton perched atop a cornucopia, reflecting the message that “[b]y whatever tests used, the amount of undernutrition and malnutrition in the United States appears to be large” despite the availability of plentiful food.⁸⁴ Malnutrition remained, as one public health campaign portrayed it, a significant hurdle on the road to good health (see Figure 2).

The continued prevalence of malnutrition was also once again reflected in military draft examinations. During World War II, medical examiners rejected 45 percent of the 2.7 million men who were examined, a considerably higher rejection rate than that of World War I.⁸⁵ Direct comparison of

81. Norman Jolliffe, James S. McLester, and Henry C. Sherman, “The Prevalence of Malnutrition,” *J. Amer. Med. Assoc.* (March 21, 1942): 944–50, quotation on 950. See also “Recognition of Early Nutritional Failure in Infants, Children, Adolescents and Adults,” *J. Amer. Med. Assoc.* (February 21, 1942): 615–16; John F. Kendrick, “A Cooperative Nutrition Program in North Carolina,” *Pub. Health Rep.* (May 21, 1943): 797–803; H. D. Kruse, Otto A. Bessey, Norman Jolliffe, James S. McLester, Frederick F. Tisdall, and Russell M. Wilder, *Inadequate Diets and Nutritional Deficiencies in the United States: Their Prevalence and Significance* (Washington, D.C.: National Research Council, 1943).

82. *School Lunches and Education: Helps from Federal Agencies* (Washington, D.C.: U.S. Office of Education, Vocational Division, Cooperating Committee on School Lunches, 1942), 4. There were approximately 27 million schoolchildren in the United States in 1942.

83. “Recognition of Early Nutritional Failure in Infants, Children, Adolescents and Adults,” *J. Amer. Med. Assoc.* (February 21, 1942): 615–16, quotation on 615.

84. Icie G. Macy and Harold H. Williams, *Hidden Hunger* (Lancaster, Pa.: Jaques Cattell Press, 1945), 67.

85. Antonio Ciocco, Henry Klein, and Carroll E. Palmer, “Child Health and the Selective Service Physical Standards,” *Pub. Health Rep.* 56, no. 50 (1941): 2365–75; *Our Country’s Call to Service* (Washington, D.C.: U.S. Office of Education, Federal Security Agency, 1942).



Figure 2. Malnutrition as a hurdle on the road to good health. WPA Federal Art Project, Chicago, 1939. Source: Library of Congress, POS-WPA-ILL.K744 no. 2.

the two cases is virtually impossible; some of the differences between the rejection statistics of the two wars can be attributed to changes in military benchmarks, diagnostic standards, and examination techniques, both comprehensive and individual.⁸⁶ Furthermore, during World War II, physicians examined only those men with no dependents or other reason for deferment; they had examined all men seeking deferment during World

86. Clark, "Need and Opportunity" (n. 28); G. St. J. Perrott, "Findings of Selective Service Examinations," *Milbank Memorial Fund Quart.* 22 (1944): 358–66.

War I. However, as the chief of the Division of Public Health Methods of the U.S. Public Health Service noted, "there is certainly no evidence of any improvement in the physical status of young men since World War I."⁸⁷ Between the wars, the national mortality rate dropped by over three per thousand despite the hardships of the Great Depression, but morbidity rates seemed to be increasing.⁸⁸ According to Surgeon General Parran, "undoubtedly a large amount of ill health and a large amount of rejections under Selective Service have a nutritional base."⁸⁹ Indeed, children with low weights were more likely to be rejected by draft boards as adults than were children with normal weights, suggesting significant long-term consequences for even moderate malnourishment.⁹⁰ Malnutrition was not epidemic but endemic, and concern about its prevalence had not abated; although its exact nature and extent remained controversial, it was neither a health fad, as Levenstein has argued, nor an artifact of anthropometry, as Brosco has suggested.

What concerned health authorities most was what had come to be known by the late 1930s as "early nutritional failure" or "latent malnutrition." The Second World War, like the first, made apparent once again the end consequences of malnutrition, but health professionals still lacked a reliable method for identifying malnourishment before it produced gross, often permanent, effects. Many hoped that biochemical tests for the essential vitamins and minerals, most of which had only recently been discovered, would finally allow for reliable early detection.⁹¹ However, determining biochemical normality was no easier than determining anatomical normality, and the greater cost and expertise involved made blood tests unrealistic for public health programs.⁹² X-rays, too, proved unhelpful, because they could identify skeletal malformations only after they had already occurred. Malnutrition, ever the "medical octopus,"

87. Perrott, "Findings of Selective Service Examinations" (n. 86), 358.

88. G. St. J. Perrott, "Selective Service Rejection Statistics and Some of Their Implications," *Amer. J. Pub. Health* 36, no. 4 (1946): 336–42, esp. 340–42.

89. "Bills Relating to the School Lunch Program: Hearings before the Committee on Agriculture, United States House of Representatives, 79th Congress, 1st Session, on H.R. 2673, H.R. 3143 (H.R. 3370 Reported)" (Washington, D.C., 1945), 22. See also 78th Congress, 2nd Session, *Cong. Rec.* (May 2, 1944): 3845.

90. Ciocco, Klein, and Palmer, "Child Health and the Selective Service" (n. 85), 2372.

91. See, for example, William Schmidt, "Newer Medical Methods of Appraisal of Nutritional Status," *Amer. J. Pub. Health* 30, no. 2 (1940): 165–68; H. D. Kruse, "A Concept of the Deficiency States," *Milbank Memorial Fund Quart.* 20, no. 3 (1942): 245–61 and references.

92. Elmer Verner McCollum, "Report of Round-Table on Nutrition and Public Health," in *New Health Frontiers: Proceedings of the 15th Annual Conference of the Milbank Memorial Fund* (New York: Milbank Memorial Fund, 1937), 61–75, esp. 69–70.

repeatedly defied attempts to characterize it. "As yet no simple field technic has emerged," Wilson Smillie, professor of public health administration at Harvard University, wrote in 1949, "no single test or combination of tests has been formulated that can be utilized with confidence and ease in order to determine the exact degrees of malnutrition in any given population of children."⁹³

Physicians increasingly sought to identify malnourishment in children before the appearance of acute symptoms. Latent malnutrition, once an illness, an amorphous progenitor of disease, became instead a manifestation of risk, an early sign of possible deficiency disease, disability, or impaired immunity, the widely recognized but ineffable cause of American children's undeniably poor health. Frank Boudreau and Harold Kruse, physicians and nutritionists at the Milbank Memorial Fund, argued in 1939 that the goal of public health nutrition was "to find a latent period before certain states of malnutrition declare themselves frankly." Although they acknowledged that this would generate many false positives, cases where the latency never evolved into actual illness, they noted that "if our standards are to provide a safe margin above the minimum, and if we would strive for abounding health rather than for a so-called normal existence on the lowest or average level, we cannot afford to neglect these latent states of malnutrition." This made effective surveillance even more important, and they regarded "the detection of latent states of malnutrition as one of the most important tasks of health agencies."⁹⁴

Throughout the 1930s, public health authorities had continued to regard surveillance as essential to the control of malnutrition among children despite the lack of even one reliable method for doing so. "Basic to much of the public health program," a group of nutrition and public health experts reported at the Annual Conference of the Milbank Memorial Fund in 1937, "is the important and difficult question of selecting the malnourished child and of measuring the extent and distribution of nutritional deficiencies in the population."⁹⁵ In part due to the persistent failure of such efforts and attendant with the risk-based understanding of nutritional health, the dominant approach to malnutrition changed from a policy of assessment, based on diagnosis and surveillance, to one of management, based on the theory that all children could benefit

93. Wilson G. Smillie, *Public Health Administration in the United States* (New York: Macmillan, 1949), 363.

94. Boudreau and Kruse, "Malnutrition—A Challenge and an Opportunity" (n. 79), 430.

95. McCollum, "Report of Round-Table" (n. 92), 69. The group included Martha Eliot, Elmer McCollum, James McLester, George Palmer, W. H. Sebrell, Henry Sherman, Hazel Stiebeling, and Frederick Tisdall.

from nutritional improvement, thus negating the need for positive identification of latent malnutrition. "The public health program for better nutrition is dependent upon three factors," argued Norman Jolliffe, who subsequently became director of the Bureau of Nutrition in the New York City Department of Health. "The first is education, to make people want the proper foods and includes by necessity the teaching of the wise use of income. The second is nutritional improvement of staple foods [i.e., fortification], in order to surround people with better food. The third is economic, to make more and better food purchasable at every income level."⁹⁶ Jolliffe made no mention of diagnosis or surveillance. Over the 1940s, health authorities abandoned attempts to identify children with latent malnutrition in any systematic way, relying instead on education, fortification of foods, and other endeavors to improve the nutritional health of all children, not just the malnourished ones.⁹⁷

This shift came at precisely the time that a new biomedical paradigm was emerging, one based on the statistical analysis of massive epidemiological investigations and a biochemical approach to the understanding of health and disease. The concept of risk factors, which developed in the context of research into coronary heart disease in the 1940s and 1950s, was emblematic of this new approach. As the historian Robert Aronowitz has argued, risk factors introduced both complexity and simplicity to nosology. On one hand, they evoked tacit acknowledgment that the causes of disease were diverse, involving both social and biological elements; on the other hand, risk factors were narrowly quantitative, specific, and mechanistic in ways that scarcely differed from the ontological reductionism of earlier etiologies.⁹⁸

The transition to a risk-based understanding of nutritional illness ultimately simplified the etiology of malnutrition, which physicians had previously regarded as highly complex. "Many factors are conducive to

96. Norman Jolliffe, "Nutritional Failures: Their Causes and Prevention," *Milbank Memorial Fund Quart.* 20, no. 2 (1942): 103–25, 116.

97. Fortification, once limited primarily to iodized salt and vitamin D-enriched milk, expanded tremendously during the war. Most flour mills voluntarily enriched their products with iron, niacin, thiamine, and riboflavin, and War Food Order No. 1 made this practice mandatory in 1943. Of course, education had long been common in public health nutrition campaigns, but uncoupled from surveillance, targeted teaching and assistance became impossible.

98. Robert A. Aronowitz, *Making Sense of Illness: Science, Society, and Disease* (Cambridge: Cambridge University Press, 1998), 112ff. See also Jeremy A. Greene, *Prescribing by Numbers: Drugs and the Definition of Disease* (Baltimore: Johns Hopkins University Press, 2008); William G. Rothstein, *Public Health and the Risk Factor: A History of an Uneven Medical Revolution* (Rochester: University of Rochester Press, 2008).

underweight,” Assistant Surgeon General Taliaferro Clark had observed in 1922. “Of these may be mentioned causes relating to the diet, to personal and general hygiene, to lack of exercise or to overexercise, to defect and disease, to possible inherited tendencies and to environment, all modified in varying degree by the economic and educational status of individual parents, and the disciplinary control exercised by them over their offspring.”⁹⁹ This diffusion of causation across medical, biological, social, and economic scapes was part of the reason that so many had hoped for a basic diagnostic test, one that could reduce the messiness of malnourishment’s root causes to a simple measurement of its manifest symptoms.

With the adoption of a risk-based understanding, physicians, who had once opposed reductionist understandings of nutritional health, increasingly redefined malnutrition as the lack of sufficient or sufficiently nourishing food. “This problem of adequate nutrition is so different from other health problems that it requires a new approach by the health officer,” W. H. Sebrell, medical director of the U.S. Public Health Service, argued in 1943.

It is vast in its ramifications, involving as it does such diverse problems as crop production programs, farm machinery and manpower, food distribution and rationing, food preservation, processing and transportation, storage and proper food preparation, as well as nutrition education, and the diagnosis, prevention, and treatment of specific dietary deficiency diseases.¹⁰⁰

Sebrell made no mention of factors not related to food and diet. The understanding of malnutrition as a manifestation of risk and the shift from assessment to management resulted in abandonment of the nuanced, individualized definition of malnutrition. It became solely a problem of insufficient or inadequate food.

As public health programs targeting infectious diseases moved from the environmental approach of the nineteenth century to the individualized approach of the twentieth century, public health nutrition campaigns increasingly abandoned targeted, individualized methods for a universal approach based on education, food security, and fortification of foods; the broader role of the social, cultural, and physical environment in nutritional health was no longer prominent in the etiology of malnutrition. Juxtaposed with the successes of bacteriological and chemical analyses in the suppression of infectious diseases, the failures of anthropometry and other diagnostic techniques only underscored the near impossibility of

99. Clark, “Nutrition in Schoolchildren” (n. 23), 520–21.

100. W. H. Sebrell and Walter Wilkins, “The Role of the Health Department in the National Nutrition Program,” *Pub. Health Rep.* 58, no. 21 (1943): 803–13, quotation on 805.

ascertaining, or even defining, nutritional health. Despite the repeated failures of numerous methods of nutritional assessment, health authorities remained certain that malnourishment was both widespread and detrimental, an endemic condition with severe consequences for the health of children and the adults they would become. With the emergence of a new biomedical paradigm, which developed around epidemiological research, the risk factor, and pharmaceutical prevention, assessment became less important; nearly all children could benefit from nutritional improvement, and public health nutrition programs abandoned the assessment model (derived from germ theory) for a management model commensurate with risk-based medicine.



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