The Protein Gap: The Rise and Fall of a Charismatic Nutrient in International Public Health

HANNAH F. LEBLANC

SUMMARY: From the early 1950s to the early 1970s, international nutritionists considered childhood protein malnutrition the world’s most serious public health threat. By 1974, many believed that this “protein gap” had been exaggerated. Two questions remain: why protein, and why this period? Four converging developments created a network that maintained protein’s “charisma”: new food technology, a growing international health infrastructure, the nominal demise of eugenics, and new geopolitical priorities in a world shaped by both the Cold War and decolonization struggles. A transnational network of nutrition experts argued that protein deficiencies could explain bodily and population differences that would have, in an earlier era, been attributed to race or inheritance. Protein malnutrition could help explain “backward” economies and cultures, they claimed, and protein supplementation would help spur development. The protein gap theory thus framed difference in the language of modernization theory, but left intact older hierarchies of bodies, nations, and races.

KEYWORDS: nutrition, malnutrition, protein, kwashiorkor, public health, modernization theory, mental development, FAO, WHO, eugenics
Starting in the mid-1950s, physicians and nutrition researchers cautioned that “the developing countries” faced a critical gap between their protein requirements and their protein supplies. This crescendo of voices peaked in 1971. That year, the United Nations (UN) issued an ominous warning: “Protein malnutrition, which is a problem of crisis proportions for the developing countries, must be recognized by the entire world community as a threat to world peace and stability which it can ignore only at its own peril.”\(^\text{1}\) Nutrition experts were accompanied in this concern by food technologists, who had spent more than a decade crafting low-cost, high-protein supplements out of everything from cottonseed to algae. In short, in the early Cold War, protein dominated nutrition policy discussions. It was, in sociologist Aya Hirata Kimura’s words, a “charismatic nutrient.”\(^\text{2}\)

It perhaps came as a surprise when, only three years later, the consensus about the protein crisis quickly unraveled. In 1974, physician Donald McLaren published “The Great Protein Fiasco” in the *Lancet*.\(^\text{3}\) The crisis, according to McLaren, was not protein malnutrition but the time, energy, and money wasted on international meetings and high-protein supplements. The next year, two prominent nutrition experts agreed in more sober terms: “The concept of a

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\(^{1}\) UN Department of Economic and Social Affairs, “Strategy Statement on Action to Avert the Protein Crisis in the Developing Countries” (New York: UN DESA, 1971), 5.


worldwide protein gap . . . is no longer tenable,” they wrote in Nature.⁴ By the mid-1970s, the protein era was over; it looked to many like a twenty-year mistake.

The protein gap has been discussed in many histories of humanitarianism, nutrition, and international aid, but those accounts still leave two fundamental questions unanswered.⁵ First, why protein? The prestige of meat and milk—and their long-standing associations with masculinity, whiteness, and imperial might—played a role in the rise of protein’s charisma but does not fully explain it. In particular, a cultural bias toward milk and meat cannot answer the second question: Why did protein become charismatic only in 1952, and why did its charisma end in 1974?

Protein’s charisma required the investment of actors for whom it served some purpose. Starting in the 1950s, physicians, UN bureaucrats, politicians, and corporate food technologists coalesced into a “sociopolitical network” that created protein’s charisma. The post–World War II environment that nourished this network, and by extension protein’s charisma, was shaped by new food technologies, the growth of international public health organizations, the nominal downfall of eugenics, and the emergence of the Third World as a major Cold War ideological battleground. In this environment, nutritionists constructed a chain of reasoning that turned global protein malnutrition into a problem compelling to a growing network of actors.

This chain of reasoning had three major links, around which this article is organized. The first was the consensus that the disease kwashiorkor, first noted in the medical literature in 1935, was the result of severe protein deficiency. This consensus took fifteen years to develop and was spurred in part by the widespread distribution of skimmed milk powder. The second link was the understanding that kwashiorkor represented only the visible tip of a protein malnutrition iceberg. This conclusion drew on the UN’s calculations of global food supplies and prompted calls to develop high protein supplements as replacements for skimmed milk powder. These solutions—which benefitted companies, researchers, and governments alike—expanded the network literally and figuratively invested in protein as a global problem in the late 1950s and 1960s. The final link was new research in the 1960s on protein malnutrition and mental development, which tied protein to modernization. According to this research, malnutrition was widespread and could cause lifelong mental disability, two conclusions that together suggested that protein malnutrition

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undermined other Cold War development plans. Such research also, I argue, provided nutritionists and development experts a way to eschew references to race while maintaining old national and racial hierarchies after the nominal demise of eugenics.

This account of protein’s rise and fall revises some common assumptions about kwashiorkor and the protein era. Existing work on the protein gap has tended to see protein’s charisma as a colonial holdover, which I argue overestimates the colonial focus on a single nutrient rather than dietary patterns and underestimates the postcolonial and Cold War developments that created new enthusiasm for the protein gap theory. Existing accounts also give enormous credit for protein’s rise and fall to individuals like Cicely Williams, who first published the name kwashiorkor, and Donald McLaren. But we must understand why their publications found an eager audience when they did: Why, for example, was Williams celebrated in the 1960s for her earlier role in kwashiorkor’s discovery, and why did initial critiques around the same time fail to make waves? More broadly, the protein gap shows that nutritionism—a reductive focus on nutrients above all other dimensions of food—was in this case the result of protein’s rise and not its cause.7

The story of the protein gap also reveals continuities and discontinuities between development projects directed at increasing food quantity and those intended to improve food quality. A large body of scholarship in the past few decades has shown that since the nineteenth century, nutrition science’s ability to render food quantifiable and calculable has enabled states, international bodies, and nongovernmental organizations to undertake a diverse set of projects to

produce citizens and soldiers, to increase the efficiency and productivity of laborers, and to sway foreign relations. As historian Nick Cullather puts it, the calorie enabled food to become “an instrument of power” in the twentieth century. The result of food’s quantification is evident in many Cold War–era programs aimed at food quantity, most famously the Green Revolution and

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Nutrition programs geared to food quality, however, shared an overlapping but distinct set of assumptions and drivers. Both food quantity and food quality programs were justified by anticommunism and the assumption that need generated political instability, but to protein experts, this reasoning was even more deeply biological and, as I will argue, eugenic. Protein was the first major international charismatic nutrient and, as such, set the stage for later nutrition aid. The concern with quality—of food and humans—later migrated from protein to other nutrients and health conditions. More broadly, it fueled the “basic needs” approach championed by the World Bank in the 1970s and an interest in health as a key dimension of human capital.

The concern with human quality also points to the legacy of eugenics after World War II. Historians looking for this legacy have often examined fields that focus, as eugenics did, on heredity: genetic counseling, medical and human genetics, population control, and marriage advice. This article looks instead to a field that maintained eugenics’ hierarchies and its

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11 Cullather, Hungry World (n. 8); Olsson, Agrarian Crossings (n. 10).


intention to improve nations by improving biology, even as it jettisoned heredity. In other words, it shows that nutrition also became one of eugenics’ intellectual heirs. This is not to say that nutrition contained the same potential for abuses, but rather to point to continuities in how eugenics and postwar nutrition framed questions about race, disability, and national character. The protein gap theory resonated especially with the kind of eugenic dietary determinism that had been prominent in Latin America, but it also drew on the hierarchies that had animated eugenic projects across the world. Especially after the nominal demise of eugenics, measures of protein quality and availability enabled Americans and others to comfortably discuss the biological quality of populations without referring to race or heredity. The protein gap thus shows the way postwar scientists in a wide range of fields both inherited and actively reinvented old hierarchies to fit their new data, obsessions, and the Cold War climate.

Finally, this article extends recent scholarship that shows that food aid cannot be characterized as the imposition of donor ideas on passive host country recipients. As historians of Latin America have shown, for example, health workers, reformers, and social scientists there were active participants in the circulation of medical and dietary knowledge in transnational, if asymmetrical, networks.\textsuperscript{14} Historians of the Green Revolution have likewise revealed competing

visions of modernity, collaborations between countries in the Global South, and long histories of agricultural development. In the case of protein, the U.S. researchers and technologists who became the most vocal proponents of the protein gap were also the beneficiaries of a shifting and transnational network of nutrition experts. Many links in the protein gap theory chain originated in the specific food contexts and intellectual milieux of Ghana, Uganda, Jamaica, Mexico, and Guatemala; critiques emerged from Lebanon and India, where the protein gap paradigm was a poor fit for local conditions. British colonial physicians were especially prominent in early debates about kwashiorkor; the center of gravity shifted to the United States, Mexico, and

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Central America in the later 1960s. The protein gap theory was thus the result of conversations among elite nutrition experts who were able to integrate these different elements and, in many cases, to also overlook their particularities. International organizations dedicated to health and food facilitated these conversations, funded research, and promulgated solutions like protein supplements as part of a broader program of development.

Though it was a global network that created protein’s charisma, it was also an elite one. The perspectives of those judged to be malnourished were not recorded in the sources available to me. Nor is this silence incidental. Physicians and food scientists who experimented with protein products did not collect the testimony of those subjected to protein supplement trials. They appear not to have even informed participants that they were taking part in these trials, in large part because they understood the imperceptibility of new products as equivalent to their

16 This is not to say these were the only conversations about protein and development in the twentieth century. See, for one example, Jia-Chen Fu, The Other Milk: Reinventing Soy in Republican China (Seattle: University of Washington Press, 2018).


18 Jennifer Tappan has analyzed local objections to kwashiorkor research in Uganda and how researchers changed their practices in response. See Tappan, Riddle of Malnutrition (n. 5).
acceptability. The theory that protein malnutrition caused brain damage was also profoundly deauthorizing of those judged to be malnourished. The result is that the story of protein’s charisma is a top-down one.

The Emergence of Kwashiorkor

The first mystery of the protein era is that protein’s charisma arrived only fifteen years after kwashiorkor’s initial identification. In 1933, Cicely Williams, a Jamaican-born English pediatrician working in the Gold Coast (today’s Ghana), described the disease in *Archives of Disease in Childhood*. Two years later, she published the Ga name, *kwashiorkor*, as told to her by a nurse with whom she worked. Many argue that sexism caused the medical community to ignore Williams’s work before rediscovering it in the 1950s. In fact, the fifteen-year gap was due to debate about what caused kwashiorkor—a debate marred by sexism but active nonetheless. The consensus that kwashiorkor was caused by too little protein emerged only in 1952. In other words, protein’s charisma did not follow the initial publication about kwashiorkor because physicians did not agree that protein deficiency caused kwashiorkor.

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22 Some accounts of kwashiorkor have implied that physicians understood it to be protein deficiency from the beginning. Nott, “‘No One May Starve in the British Empire’” (n. 5); Scott-Smith, *On an Empty Stomach* (n. 5); Lola Wilhelm, “‘One of the Most Urgent Problems to Solve’: Malnutrition, Trans-imperial Nutrition Science, and Nestlé’s Medical Pursuits in Late
Sexism and racism did color the reception of Williams’s report. Williams insisted that the disease, marked by swelling, skin lesions, and irritability, was dietary and that it did not match any existing known disease. British physician Hugh Stannus disputed this, arguing that what Williams had uncovered was not a new disease but pellagra, a diet-related disease that he had already identified in 1922 in Nyasaland (today’s Malawi) and that was not yet well understood. Stannus also objected to the Ga name, which he assumed had superstitious origins, and Williams’s reliance on Ghanian explanations of the disease’s etiology. Hugh Trowell, a British colonial medical officer in Uganda, sided with Stannus. Even the later recognition of Williams’s contribution was condescending; Trowell wrote, “Being a lady, and a very gracious lady at that, she arrived by instinct at the correct answer.”

Though kwashiorkor was not yet considered a major public health problem, debate and research about its complex pathology continued throughout the 1930s and 1940s. Other


physicians began identifying similar cases. Trowell led the debate, proposing several new names and explanations before agreeing to kwashiorkor. In the Lancet and other journals, physicians debated many questions: Was this a new deficiency, pellagra, or a complex combination of deficiencies (as Trowell at one point suggested)? Was it the same disease in Ghana, Uganda, Jamaica, and India? Which symptoms were essential and which secondary? There was, however, little debate about the timing of the disease: as Williams had noted in her initial publication, kwashiorkor seemed to affect young children who had been weaned early—because their mothers had become pregnant again or had died—but rarely did it affect infants. Throughout this early debate, kwashiorkor was suspected to be a complex, diet-related syndrome, not the result of too little protein alone.

Two developments created the tentative consensus that kwashiorkor was severe protein deficiency. First, by the late 1940s, more intensive pathological and biochemical work by Trowell and his colleagues at the Mulago Hospital in Uganda—pathologist Jack Davies, biochemist Rex Dean, and physician Eria Muwazi—helped piece together kwashiorkor’s

29 Trowell, “Infantile Pellagra” (n. 25).
30 For more on these debates, see H. C. Trowell, J. N. P. Davies, and R. F. A. Dean, Kwashiorkor (London: Edward Arnold, 1954).
31 Williams, “Nutritional Disease of Childhood” (n. 19).
pathogenesis.\textsuperscript{32} Physicians knew that patients suffering from kwashiorkor had damaged, fatty livers.\textsuperscript{33} Davies showed that patients also had pancreatic damage. He argued the depleted pancreatic enzymes could explain why fat infiltrated the liver, as well as other features of the disease, such as the inability to digest many foods.\textsuperscript{34} In several articles and then a book, the Mulago researchers synthesized this work to argue that a protein-deficient diet caused low levels of pancreatic enzymes, which in turn led to fatty liver, the inability to digest food, and eventually


\textsuperscript{33} Waterlow, “Fatty Liver Disease in Infants” (n. 32).

Moreover, they argued the syndromes identified across Africa, Central America, and South Asia constituted a single disease.\textsuperscript{36}

The second development promoting consensus about kwashiorkor’s cause was the apparent efficacy of skimmed milk powder in the disease’s treatment. Skimmed milk powder was not strictly a new technology, but its production grew enormously after World War II as a result of American overproduction and investments in chemurgic research.\textsuperscript{37} The United States and other countries sold or donated their postwar surpluses to the UN Children’s International Emergency Fund (UNICEF), which distributed as much as one hundred million pounds a year to clinics, schools, and other child-feeding operations.\textsuperscript{38} Trowell described, perhaps apocryphally, how physicians in Uganda received skimmed milk rather than whole milk powder from England.


\textsuperscript{38} Ruxin, “Hunger, Science, and Politics” (n. 5), 99–100.
by mistake and found it a kind of miracle cure for kwashiorkor. They reasoned that patients’ lack of pancreatic enzymes rendered the fat in whole milk indigestible, whereas skimmed milk’s high protein levels restored those enzymes and began the course of recovery. As historian Jennifer Tappan shows, in reality treatment remained complex, but physicians were soon publishing remarkable results: Trowell estimated mortality rates dropped by half at his hospital; a South African doctor reported he saw mortality rates drop from 30 to 40 percent to less than 3 percent. Because it fit with the emerging theory of the disease’s pathogenesis, skimmed milk’s efficacy cemented kwashiorkor’s status as the clinical manifestation of protein deficiency. It also generated excitement that physicians could easily and cheaply treat a deadly disease, even as debates about kwashiorkor continued. As two researchers wrote, whatever dietary factors were involved in addition to protein, they were contained in skimmed milk.

Thus by 1952, the first step in the chain of reasoning was complete. Kwashiorkor affected children who had been weaned early and received sufficient calories but insufficient protein. As historian John Nott has argued, this “timeless and endemic” explanation of kwashiorkor’s origins typically ignored historical and structural factors, including disruptions to birth spacing,
breastfeeding, and agricultural practices, which were often the deliberate or unintentional result of colonial policies.\textsuperscript{44} Abstracted from history, kwashiorkor—though not common—was believed to threaten anywhere protein consumption was low.

Skimmed milk’s efficacy expanded the network of actors interested in this relatively rare but devastating childhood disease. In particular, it caught the attention of two newly formed UN agencies with branches dedicated to nutrition: the World Health Organization (WHO) and the Food and Agriculture Organization (FAO). Nutrition experts at the FAO had, on multiple occasions, failed in their more ambitious plans to mold agriculture to serve nutrition.\textsuperscript{45} In contrast, skimmed milk powder made kwashiorkor seem like an appealingly tractable problem, amenable to what anthropologist Emma McDonell calls a “curative metaphor.”\textsuperscript{46} Whereas malnutrition had been embarrassing to the British colonial government, to the FAO and WHO, it represented an opportunity to use science and technology to promote development (there was,}


\textsuperscript{45} Vernon, \textit{Hunger} (n. 8), 154; Amy L. S. Staples, “Norris E. Dodd and the Connections between Domestic and International Agricultural Policy,” \textit{Agric. Hist.} 74, no. 2 (2000): 393–403.

however, much overlap in the medical personnel). In short, kwashiorkor was understood to be scientifically interesting, easily treatable, and potentially widespread: a good problem for the newly formed FAO-WHO Joint Expert Committee on Nutrition to tackle.

At its first meeting in 1949, this joint committee agreed that, though kwashiorkor remained “ill-defined,” it was “one of the most widespread nutritional disorders in tropical and subtropical areas.” The organizations sponsored two men—a French scientist and a South African physician—to gather data from eleven African states and territories. The resulting report, known as the Brock-Autret Report, added little new to the debates about the disease, but it certified the growing consensus around kwashiorkor. Similar investigations in Central America and Brazil soon followed, sealing kwashiorkor’s status as a global dietary disease. These reports, as well as a series of UN-sponsored international conferences, generated interest among medical researchers and excitement about the condition’s apparently straightforward treatment. By the early 1950s, kwashiorkor had thus become a well-defined problem and an urgent one.

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47 Nott, “‘How Little Progress?’” (n. 5); Staples, Birth of Development (n. 17); Ruxin, “Hunger, Science, and Politics” (n. 5), 70.


49 Brock and Autret, “Kwashiorkor in Africa” (n. 40), 9.

From Kwashiorkor to Protein Deficiency

It might be argued that charisma followed not the naming of kwashiorkor in 1935 but its identification as protein deficiency in 1952. But identifying the disease as protein deficiency did not alone generate charisma: kwashiorkor was a devastating childhood disease, but it was still uncommon. In the mid-1950s, physicians estimated that kwashiorkor affected less than 1 percent of children even in the most vulnerable countries (later, this estimate would be revised upward). Protein’s eventual charisma required a shift to the more amorphous issue of subclinical protein deficiencies. The jump from clinical kwashiorkor to subclinical protein deficiency was aided by the UN and by food technology once again.

In 1946 and 1952, the FAO published the first and second World Food Surveys. Using national agricultural and population data, these surveys provided rough estimates of calories, protein, and food groups available to each person in seventy countries. In anthropologist Tania Li’s words, these surveys “render[ed] technical” the complex and heterogenous food conditions of different locales. They enabled nutritionists and policymakers to discuss a “protein gap” between calculated requirements and available supplies without resorting to unreliable clinical diagnoses. Visually striking charts of these data made a persuasive case for a global protein gap.

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51 Trowell, “Kwashiorkor” (n. 39).
Soon after, the UN sponsored two conferences on kwashiorkor and protein requirements. At these conferences, participants raised the issue that the clear distinction between the syndrome caused by protein deficiency (kwashiorkor) and that caused by caloric deficiency (called marasmus) was in fact messy in practice.\(^{54}\) Patients often had signs of both conditions. Physicians began using protein-energy malnutrition or protein-calorie malnutrition to refer to this clinically messy spectrum of kwashiorkor and marasmus, as well as subclinical states.\(^{55}\) Together with the new data on the protein gap, this change in terminology shifted the conversation from one about a small number of children to one about a potentially enormous public health problem.

It is important to note that the calculation of the protein gap was hardly straightforward. Protein requirements had been and continued to be controversial.\(^{56}\) In brief, the logic behind the gap went as follows. Nutritionists reasoned that if a person consumed foods with a high enough protein concentration, or protein to energy ratio, they would meet their protein requirement by the time they had met their caloric requirement.\(^{57}\) Animal sources of protein were considered

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\(^{56}\) Carpenter, *Protein and Energy* (n. 5); Corinna Treitel, “How Vegetarians, Naturopaths, Scientists, and Physicians Unmade the Protein Standard in Modern Germany,” in Neswald, Smith, and Thomas, *Setting Nutritional Standards* (n. 8), 52–73.

\(^{57}\) The FAO and the U.S. National Research Council disagreed about the protein requirement. *Protein Requirements: Report of the FAO Committee*, FAO Nutritional Studies 16 (Rome: FAO,
especially important: they have higher protein to energy ratios than plant proteins, and they include all of the amino acids humans require, whereas plant proteins typically lack one or more. Nutritionists believed that growing children needed two to three times more protein relative to body size, which in effect meant that children needed not more protein overall but food with higher concentrations of protein—levels typically found only in animal proteins. Most nutritionists thought staples like rice and wheat were inadequate: children eating starchy staples would reach their energy needs or even their stomach’s physical capacity before they consumed enough protein.

Despite the room for error, these calculations created the second link in nutritionists’ chain of reasoning: children who consumed starchy staple foods would be vulnerable to protein deficiency.Clinicians had established that kwashiorkor manifested when children were weaned onto their families’ foods; national agricultural supplies showed that starchy foods composed most food in the so-called developing countries. These data and this reasoning suggested that children in those countries experienced something like mild kwashiorkor even when they were not showing up in clinics. One British chemist, writing in 1961, demonstrated the result of this thinking: protein deficiency is prevalent, he wrote, “in all those areas where food supply data indicate a shortage of animal protein.” He continued, “It has been claimed that there is probably


58 Waterlow and Payne, “Protein Gap” (n. 4); Waterlow, Protein Malnutrition (n. 54), 81.

59 Nutritionists also considered the availability of protein in any given food. For a summary, see Trowell, “Kwashiorkor” (n. 39); Waterlow and Payne, “Protein Gap” (n. 4).
no African child who has not suffered from such a deficiency at some period of its life.” Kwashiorkor thus represented not just the tip of an iceberg but the tip of “an underseas mountain.”

The FAO and WHO thus made possible the shift from the specific condition kwashiorkor to the potentially vast problem of protein malnutrition; protein supplements then expanded the network invested in this newly identified public health threat. Researchers had begun investigating alternatives to skimmed milk powder for the treatment of kwashiorkor in the early 1950s. Skimmed milk was an effective treatment, but its availability depended on continuing donations. Researchers tested common animal feeds—such as soy, cottonseed powder, and fish meal—as a replacement for skimmed milk powder (which, too, had been used as feed). Often these protein concentrates were food-processing waste products rendered edible.

Supplementation appealed to international nutrition experts because it required little dietary, economic, or agricultural change. Fortification of staples was popular in the United States for the same reason. Supplementation represented a compromise between top-down, “high modernist” schemes and a recognition of local foodways. Protein powders and weaning foods required a centralized, industrial food system, but they did not require fundamental changes in

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61 Dean, “Treatment of Kwashiorkor” (n. 36).

diet, which many nutritionists considered inadvisable and unlikely.\textsuperscript{63} Few nutritionists believed supplements were a long-term solution to protein malnutrition, but they seemed feasible when changes to agriculture and food culture did not. These high-protein supplements generated remarkable consensus among international health experts and investors, even though many dimensions of the problem they were intended to solve remained controversial.\textsuperscript{64}

Excitement about high-protein products grew in many quarters throughout the 1960s and into the 1970s, which had the effect of enlarging the network invested, symbolically and financially, in protein. National governments, UN agencies, private foundations, and food companies began investing in protein products.\textsuperscript{65} The Institute of Nutrition of Central America and Panama (INCAP) developed one of the first complete weaning foods, called Incaparina, in the early 1960s. It was made primarily of corn and cottonseed flours.\textsuperscript{66} The U.S. Department of Agriculture (USDA) partnered with U.S. corn millers to develop a similar product, Corn-Soy Milk, to soak up surplus agricultural commodities, the result of the same productivist agriculture

\textsuperscript{63} Pernet, “Between Entanglements and Dependencies” (n. 14).

\textsuperscript{64} For examples of controversy, see Waterlow, \textit{Protein Malnutrition} (n. 54); Waterlow and Stephen, \textit{Human Protein Requirements and Their Fulfilment in Practice} (n. 54).


that had made skimmed milk important in international food aid. Other proposed products were more novel. In the mid-1960s, the U.S. Bureau of Commercial Fisheries and the U.S. Agency for International Development (USAID) began investing in fish flour, a powder made from pulverized, dried whole fish. British Petroleum investigated how to grow algae on oil waste products and process it into high-protein additives; a British biochemist developed a process for extracting protein from green leaves. UN agencies and governments around the world supported these products, offering grants, tax breaks, and sites for mass testing. Starting in 1950, the UN’s Expanded Technical Assistance Program (ETAP)—29 percent of which went to the underfunded FAO—made technical assistance projects, like the development of protein additives, a priority for the organization.


68 “Information Requested from the Department (for Paul Eaton) on FPC Program at College Park,” February 3, 1966, box 1, FPC Correspondence file 5, and “Accelerated Food from the Sea Development Program,” July 7, 1967, box 12, folder 1, Records of the Fish and Wildlife Service, RG 22 Entry P296, NARA.


The U.S. government was especially active in developing these types of foods and courting the country’s growing food industry.\textsuperscript{71} Technical aid to the so-called developing countries had become part of U.S. Cold War foreign policy, and food aid presented opportunities for diplomacy as well as for dumping surplus agricultural products. By 1969, USAID had shipped a billion pounds of Corn-Soy Milk to over a hundred countries. USAID also gave $60,000 grants to food companies to develop new protein products, as well as larger grants to university and hospital-based researchers.\textsuperscript{72} Different branches of the U.S. government had conflicting goals for these programs: the USDA and the Bureau of Commercial Fisheries hoped to support U.S. growers and fishers, while USAID promoted “self-help” in developing countries. In all cases, private industry seemed like an obvious ally. Whereas nutrition education failed to change dietary habits, private industry had radically transformed American diets in a few years. These companies’ power and wealth—some had sales that dwarfed the gross national products of whole countries—suggested to underfunded nutritionists that industry had the resources to develop, market, and sell affordable, nutritious foods.\textsuperscript{73}

Many large food processors took up the challenge: Pillsbury, Monsanto, Del Monte, General Mills, Swift, and Archer-Daniels Midland all won USAID grants, as did several others.\textsuperscript{74} For most companies, protein’s primary draw was that fighting world hunger was good for the


\textsuperscript{73} Berg, \textit{Nutrition Factor} (n. 71), 145.

\textsuperscript{74} “Presidential Transition” (n. 72).
corporate image. Some also hoped that these products would lead to new markets among more affluent Third World consumers.\textsuperscript{75} Food processors understood the fundamental problems with the private industry model, which would become clear to nutritionists and policymakers only later. For fortification to be effective, consumers had to purchase staple foods from large processors rather than from local markets. The poorest consumers, moreover, were the least likely to purchase processed foods; the act of processing and fortifying inevitably meant a higher cost. If governments or industry did not absorb these costs, high-protein products would be more expensive than their plain counterparts. Incaparina, though a cheaper protein source than meat or milk, was four times more expensive than cornmeal.\textsuperscript{76} Despite these challenges, government funding helped bring new actors into protein’s growing network.

High-protein blends were not just a response to protein malnutrition but helped motivate interest in the problem. This dynamic is apparent in the UN’s Protein Advisory Group (PAG). The WHO formed the PAG in 1955 to develop a testing protocol for new protein concentrates; the FAO and UNICEF became full sponsors in 1960 (later the World Bank would join as well).\textsuperscript{77} Created as a watchdog, the PAG would become one of the most vocal proponents of the protein gap and protein supplements. Even as it identified major hurdles to bringing such products to fruition—including potential toxicity, potential loss of nutrients in processing, and problems with

\textsuperscript{75} For non-U.S. corporate investment, see Wilhelm, “‘One of the Most Urgent Problems to Solve’” (n. 22).

\textsuperscript{76} Berg, Nutrition Factor (n. 71), 145–55.

acceptability—the group promoted supplementary food mixtures as a key weapon in the world’s anti-malnutrition arsenal. For some PAG members, professional and humanitarian interest aligned in the protein gap: Nevin Scrimshaw, for example, a vocal member and later chair of the PAG, received a $125,000 grant to develop protein concentrates from USAID in his capacity as MIT professor and INCAP consultant. The PAG fervently kept the spotlight on the “protein problem” even as complications mounted.

From Protein to Peace

By the late 1960s, public health experts, U.S. government agencies, food companies, and food scientists had invested in the protein problem. In 1971, because of the PAG’s advocacy, the UN declared protein deficiency not just a public health crisis but a global security threat. This notion—that protein deficiency was dangerous—formed the final and most overlooked link in the chain of reasoning that upheld protein’s charisma.

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79 “Presidential Transition” (n. 72); Scrimshaw CV, box 10, folder 224, AC 104, MIT Archives and Special Collections, Cambridge, Mass.
81 UN Department of Economic and Social Affairs, “Strategy Statement” (n. 1).
82 For an important exception, see Pilar Zazueta, “‘Hay desnutrición, no hambre’: nutrición y políticas publicas en México, 1960–1997,” in *El hambre de los otros: Ciencia y políticas*
How did the UN come to see protein malnutrition as not just tragic but threatening? The idea that mass hunger could contribute to restiveness was hardly new, but what the UN document referred to was more precise and more biological. Protein researchers posited that childhood protein malnutrition permanently damaged brains and bodies. If protein malnutrition were as widespread as many experts believed, this damage would be pervasive. These hunger-damaged populations, nutritionists argued, would be unable to take advantage of educational opportunities, to adopt new agricultural technologies, to work in new industries, or to undergo the psychological and cultural transformations many U.S. intellectuals believed necessary for national modernization. These damaged people would, moreover, fail to feed their own children well, creating a “spiral” effect with other factors that would lead to generations of malnourished and developmentally impaired individuals.\(^8\) Resistant to modernization, protein-deficient societies would be vulnerable to instability and communism. This mental development hypothesis built on older ideas about diets and bodies, but it gained new energy from fresh research on protein and from U.S. Cold War preoccupations.

Physicians had long worried that childhood malnutrition led to disability, stunted growth, and behavioral problems, but there was little specific research on these questions.\(^8\) Likewise,

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doctors had noted “apathy” and “peevishness” in their acute kwashiorkor patients, and some researchers speculated about the disease’s potential long-term effects.\textsuperscript{85} In the 1960s, researchers in South Africa, India, Yugoslavia, Mexico, Venezuela, and Peru began investigating the speculated links between childhood malnutrition and mental development.\textsuperscript{86} The most important research on protein and brain development came out of Mexico and Guatemala.\textsuperscript{87} One study from the Hospital Infantil in Mexico City, for example, found that children previously hospitalized

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\textsuperscript{87} For more on these investigations, see Zazueta, “‘Hay desnutrición, no hambre’” (n. 82).
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with kwashiorkor had lower IQ scores than their better-nourished siblings. In one of the most cited studies, a group led by Mexican physician Joaquín Cravioto studied the intersensory development of children. The study tested whether children were able to recognize different objects as identical when presented to different senses such as sight or touch; the researchers understood intersensory integration to be a fundamental cognitive skill underlying more specific skills like reading. They showed that among rural children in Guatemala, the tallest children performed better on these tests than the shortest children of the same age. The researchers interpreted this result to mean that a history of malnutrition, as indicated by shorter stature, affected fundamental cognitive skills.

Cravioto, who would later head the PAG, was frank about the interpretation of these studies: malnutrition “may produce a large pool of individuals who come to function in suboptimal ways,” he and his colleagues wrote. This conclusion quickly caught on in international circles. It was shared by an interdisciplinary conference held at MIT in 1967, co-chaired by Nevin Scrimshaw and John E. Gordon, an epidemiologist who had worked with INCAP on nutrition and brain development. Participants from thirty-eight countries shared evidence from animal, clinical, epidemiological, anthropological, and educational research. Critical evidence came from animal studies, where some—but not all—experiments suggested

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90 Ibid., 319.
there was a “critical period” in brain development during which malnutrition had dire effects. Nearly all the participants recognized the limitations of the mental development hypothesis. Estimates of worldwide incidence were still unreliable, confounding variables were impossible to eliminate, and there were few long-term or longitudinal studies. Participants from education, psychology, and anthropology warned about many pitfalls in the conceptualization and testing of intelligence. Yet the nutritionists, biochemists, pediatricians, and public health physicians who led the protein field were altogether confident that, despite the limitations and complications, the evidence was suggestive enough to warrant both more research and action.⁹¹

Why should this hypothesis generate such excitement among international nutrition experts, despite the admittedly limited evidence in its favor? The mental development hypothesis expanded the significance of protein—and thus also nutrition research—beyond public health to questions of national difference, development, and security. In particular, the mental development hypothesis resonated with two major intellectual trends: the nominal downfall of eugenics and the rise of modernization theory.

Eugenics had never been the only resource for understanding individual, national, or racial difference, nor was it ever a unified movement. It also existed alongside and intersected with long-standing discourses of dietary determinism. British and North American commentators had long associated their meat-, wheat-, and dairy-heavy diets with their supposed racial

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superiority. They likewise linked the diets of different African, Indian, and indigenous North American groups to their supposed physical and moral character. Latin America had a particularly robust intellectual tradition that tied diet to race and national development. In Mexico and Colombia, for example, physicians and intellectuals promoted eating habits associated with the United States and Europe to attempt to modernize and culturally whiten indigenous and working-class people.

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94 Jeffrey M. Pilcher, Que Vivan Los Tamales! Food and the Making of Mexican Identity (Albuquerque: University of New Mexico Press, 1998); Pohl-Valero, “‘La raza entra por la boca’” (n. 8); Joel Vargas-Domínguez, “The ‘Problematic’ Otomi: Metabolism, Nutrition, and
Dietary and hereditarian theories of human difference were sometimes understood as complementary and sometimes as contradictory, a fact complicated by different national and transnational eugenic traditions. It is not a coincidence that the most important evidence linking food and mental development came from Mexico, where eugenics, though also heterogeneous, often had a more Lamarckian and environmentalist cast than in the United States and Britain. Even in the United States, some understood eugenics as encompassing both nature and nurture—heredity and environmental factors like diet—while others understood environmental explanations for human traits as contradicting hereditarian explanations.

Though scientists had never agreed about the role of diet in creating human difference, after World War II nutrition experts explicitly rejected race or heredity—concepts that were often muddled—in explaining national differences in characteristics like stature or weight. As


95 “Lamarckian” refers to theories that allowed for the inheritance of acquired characteristics, whereas “Weismannism,” prominent in the United States and Great Britain, held that acquired traits could not be passed on genetically. Nancy Leys Stepan, “The Hour of Eugenics”: Race, Gender, and Nation in Latin America (Ithaca, N.Y.: Cornell University Press, 1996), chap. 1; Pohl-Valero, “‘La raza entra por la boca’” (n. 8).


97 See, for example, Calvin W. Woodruff, “An Analysis of the ICNND Data on Physical Growth of the Pre-school Child,” in Pre-school Child Malnutrition, Primary Deterrent to Human
historians have shown, scientists disavowed eugenics after World War II, even though the hierarchies that animated it continued to haunt the human sciences. The mental development hypothesis thus provided a way to make sense of national difference without recourse to race; it recast old racial and national hierarchies as mutable and thus palatable. It had much in common with older dietary determinism, but, unlike these older ideas, it posited a specific mechanism and a specific culprit: protein operating on brain development.

Federico Gómez, a prominent pediatrician at Mexico City’s Hospital Infantil, epitomized this renewed nutritional determinism:

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Large groups of the Mexican population appear to be weary, sad, indifferent, without sense of responsibility, without ambition. From the economic viewpoint, they scarcely produce or consume, enduring the nutritional misery of their lives with stoic fatalism. . . . Those who examine superficially these human groups may attribute their


condition to racial traits, considering them lazy, filthy, fatalistic and with no ambition in life. Frequently, observers are not aware that these people are sick.\textsuperscript{99} Gómez’s characterization resonates with older dietary reform discourses, but protein malnutrition brings biology back in, turning “racial traits” into dietary ones. Rather than a permanent condition, this supposed Mexican “fatalism” could be corrected, Gómez suggested, with high-protein supplements. The mental development hypothesis, though marred by contradictory evidence, appealed to nutrition experts because it provided a satisfying way to make sense of assumed hierarchies.

The mental development hypothesis was also congruent with modernization theory, whose star was rising, especially in the United States. Modernization theorists conjectured that societies progressed from “traditional” to “modern” along a predetermined path that prescribed transformations in economy, the political system, cultural practices, and even individual psychology.\textsuperscript{100} Research like that of Cravioto’s group made nutrition part of the development equation: if malnourishment affected people’s ability to work, think, and act, it would also hinder

\textsuperscript{99} Federico Gómez, “The Use of Fish Flour in Human Nutrition,” \textit{Boletín Médico Del Hospital Infantil de México} 2, no. 1 (March 1961): 1–8, quotation on 1–2, box 7, “FDA Fish Flour Background Information,” Records of the Fish and Wildlife Service, RG 22 P296, NARA.

their ability to enact modernization. Better nutrition would also aid in efforts to control population: when malnutrition cut children’s lives short, the logic went, families had little incentive to adopt birth control. In linking protein malnutrition to modernization, nutrition experts crafted what political scientist Deborah Stone calls a “causal story” that made protein a compelling problem. This story suggested that a simple, individual intervention might have global political significance. PAG documents began to refer to nutrition as “an investment in human resources,” as crucial as investment in agriculture or industry.


102 Berg, *Nutrition Factor* (n. 71), 31. For more on population control, see Matthew James Connelly, *Fatal Misconception* (n. 17).


For U.S. policymakers, this nutritional investment was also a matter of national security. Development was a prong in the U.S. anticommunist strategy abroad, intended to foster “the right kind of revolution” in postcolonial nations. The U.S. government made the security implications of malnutrition plain. As early as 1965, a U.S. interagency report argued that “the high prevalence of hunger and malnutrition in the world is a leading contributor to human misery, apathy, disease, economic stagnation, and political instability.” According to this group, hunger could foster political instability directly, but it could also do so indirectly. Economic development would be hindered by the “permanent retardation of physical and mental development that results in incalculable losses of human capital,” a condition that the group estimated affected 10 to 25 percent of developing countries’ populations (it is unclear how the task force derived this estimate). This kind of thinking may have been especially prominent at the PAG, where five of the seven chairmen held academic positions in the United States.

The mental development hypothesis and its implications for national defense thus made protein relevant beyond public health circles. It soon caught the attention of development

105 Modernization theory and policy were not, of course, limited to the United States. Engerman et al., *Staging Growth* (n. 101); “Special Forum: Modernization as a Global Project,” *Diplomatic Hist.* 33, no. 3 (2009).


specialists like Robert McNamara and Alan Berg. McNamara, who became World Bank
president in 1968, gave a speech that year in which he described hungry children “stunted in
their bodies, and crippled in their minds,” echoing protein proponents’ most dire warnings.108
Berg introduced a larger audience to these ideas with his acclaimed 1973 book, The Nutrition
Factor: Its Role in National Development. Berg described how better nutrition would result in
better educational retention, more productive workers, longer labor force participation, fewer
accidents, and savings on medical costs. He also noted that protein malnutrition could render
investments in education ineffective and set malnourished children back for life.109 Berg joined
the World Bank in 1972, the year that the bank became the PAG’s fourth sponsor. The same
year, MIT formed a new international nutrition planning program that was shared between its
Center for International Studies—the home of the most prominent modernization theorists—and
its Department of Nutrition and Food Science. This new program soon hosted a conference, with
Scrimshaw and Berg organizing, on nutrition and development, where Cravioto presented his
results to a large interdisciplinary audience.110 Protein’s network expanded once again.

Like the dietary determinists before them, Cold War nutrition determinists largely
understood malnourishment as a long-standing problem rather than the product of history.111

108 Quoted in Deborah Shapley, Promise and Power: The Life and Times of Robert McNamara
109 Berg, Nutrition Factor (n. 71), 10–11.
110 Escobar, Encountering Development (n. 12), 114; Berg, Scrimshaw, and Call, Nutrition,
National Development, and Planning (n. 83).
111 Worboys, “Discovery of Colonial Malnutrition” (n. 93); Nott, “‘No One May Starve in the
British Empire’” (n. 5).
Though nutrition experts understood food as embedded in social and cultural systems, they tended to avoid discussions of history and economy.\(^{112}\) Cold War nutritionists also maintained the sense that something was wrong with poor people in developing countries. Protein deficiency was a new cause for an already accepted fact: these societies, and the individuals that constituted them, were “backwards.” Even as the protein gap theory rendered national differences appealingly mutable, it propagated the national and racial hierarchies that had motivated both older dietary determinism and eugenics. Because the protein hypothesis resonated with these old ideas, it continued to gather support despite the uncertainty of the evidence.

Fred Sai, a Ghanaian physician and PAG member, made a similar argument at the 1971 MIT conference on nutrition and national development. He warned his colleagues that the emphasis on mental development might fail to motivate African politicians as they hoped:

> It is not so long ago that people were making the African, for instance, feel that he wasn’t capable of the same level of intellectual development genetically as the white man. Now, if today we say that in Africa 50 to 60 percent of the population are suffering malnutrition . . . so of the adult population some 30 or 40 percent will have experienced malnutrition and have therefore suffered mental retardation and are incapable of full

\(^{112}\) As critics of development have often pointed out, technical approaches to problems are depoliticizing. James Ferguson, *The Anti-politics Machine: Development, Depoliticization, and Bureaucratic Power in Lesotho* (Minneapolis: University of Minnesota Press, 1990); Escobar, *Encountering Development* (n. 12); Li, *Will to Improve* (n. 53).
mental development, it doesn’t sound quite right to a politician. He will see it as yet another way of the white man’s saying he is inferior.\footnote{Berg, Scrimshaw, and Call, Nutrition, National Development, and Planning (n. 83), 43.}

Sai was one of very few African scientists at the conference.\footnote{Of the forty speakers, three were African: Maaza Bekele from Ethiopia, Mohamed A. Nour from Egypt, and Sai, from Ghana. Fourteen of the 304 attendees came from Africa.} Though he put his critique in the mouths of African politicians, it is possible to read this quote as his own indirect challenge to his colleagues. It seems Sai was one of the few nutrition experts at the meeting to whom estimates of mental disability as high as 40 percent of adults seemed implausible. As Sai argued, this quintessentially “damage-centered research” refurbished old ableist and racist claims.\footnote{Eve Tuck, “Suspending Damage: A Letter to Communities,” Harvard Educ. Rev. 79, no. 3 (2009): 409–27.}

Researchers hoped evidence of irreversible damage would motivate national governments to make nutrition and nutrition research a priority, but they left intact the idea that Third World people themselves posed the greatest barrier to development.

\textit{The End of the Protein Era}

The network that sustained protein’s charisma began splintering in the early 1970s. Protein remained the star, but it was increasingly sharing the stage with other nutrients. Though the rise of vitamin A’s charisma is beyond the scope of this article, it is possible to see it on the horizon:
Berg’s 1973 *The Nutrition Factor* noted that “it would be hard to find a more favorable investment opportunity than avoidance of vitamin A blindness.”\(^{116}\)

As McLaren pointed out in his famous article, the protein hypothesis had not been as ironclad as it sometimes appeared. Many of the debates that had taken place in the early 1950s had never been fully settled. In the late 1960s, questions about the nature of kwashiorkor and the prevalence of protein deficiency began to emerge once again. In 1968 and then again in 1973, prominent Indian nutrition researcher C. Gopalan argued forcefully that an increase in calories—even from cereals—would correct the protein deficiencies of poor Indian children.\(^{117}\) McLaren argued the same was true in Lebanon, where kwashiorkor was rare, but undernutrition was not.

In the mid-1960s, the FAO and WHO dramatically lowered the estimated protein requirement for children. This did not eliminate the protein gap “by the stroke of a pen”: Scrimshaw and the PAG continued to argue that this new, lower protein standard was inappropriate for children facing chronic infections and that global statistics failed to account for food distribution within nations and within families.\(^{118}\) But it ended the language of a “gap” and encouraged reassessment of some of the assumptions underlying the theory. More broadly, nutrition experts began to recognize that different developing countries faced different food situations.


\(^{118}\) Waterlow and Payne, “Protein Gap” (n. 4), 115; PAG Meeting Report, 20th meeting, June 19–23, 1972, document 3.14/17, appendix C, Nevin Scrimshaw Papers, CU.
While many policymakers still expressed enthusiasm for high-protein supplements, their limitations were becoming more apparent. As with other health campaigns that relied on the mass application of technical solutions, protein products appeared to have failed in their mission. Over a decade of experiments had shown that each food presented challenges: upfront investment costs, costs to consumers, the presence of toxins, or problems with color, taste, and texture. All shared the limitation that they needed people to purchase processed foods. The difficulties of the private industry model had become clear: the most successful, profitable ventures failed to reach the people who needed them most. The most ambitious, unconventional protein sources—fish flour, leaf protein, “petroleum protein”—lost the most ground.

By 1973, the food situation had also changed. The oil embargo of that year raised agricultural prices, elevating concerns about food quantity over food quality. The U.S. food aid model came under increasing criticism for undermining local agriculture and contributing to long-term food insecurity. More broadly, the “development decade” had been a disappointment and aid budgets tightened in the wake of oil shocks. Modernization theory increasingly faced critique from the left and right.

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119 See Staples, Birth of Development (n. 17), chap. 10.
120 Berg, Nutrition Factor (n. 71), chap. 9.
In the United States, meat and processed foods came under attack, destabilizing many of the tacit assumptions of the protein era.\textsuperscript{124} The film \textit{Soylent Green}, released in 1973, skewered high-protein additives. Derived from “soy” and “lentil”—two plant sources of protein touted in the protein era—Soylent Green was ostensibly made from plankton, reminiscent of the attempted algae protein products.\textsuperscript{125} In 1974, Biochemist Ross Hume Hall published his thoroughgoing attack on the food processing industry in \textit{Food for Nought}; Nestlé’s unethical tactics for marketing infant formula broke the same year.\textsuperscript{126}

There were shifts in the UN as well. As nutritional planning became a buzzword among international nutritionists, PAG experts were increasingly criticized for ignoring economy, culture, and psychology. The sponsoring UN agencies stopped consulting the PAG, and the group was only nominally involved in the UN’s 1974 World Food Conference. Cravioto, who became PAG chair in 1974, attempted to rename the group the Nutrition Committee, but the

\textsuperscript{123} Latham, \textit{Right Kind of Revolution} (n. 106).
\textsuperscript{126} Ross Hume Hall, \textit{Food for Nought: The Decline in Nutrition} (Hagerstown, Md.: Harper & Row, 1974); Mike Muller, \textit{The Baby Killer: A War on Want Investigation into the Promotion and Sale of Powdered Baby Milks in the Third World} (London: War on Want, 1974).
sponsoring agencies determined that the group had simply outrun its effectiveness. Funding held on for the next two years, but the PAG, and the protein era, was effectively over.127

For three decades, a network of physicians, technologists, UN officials, government bureaucrats, food producers, and development experts first created and then upheld protein’s charisma. Had UN agencies not eagerly connected physicians across the globe, had protein malnutrition’s solutions not been advantageous to national governments and private industry, had the theorizing the protein gap enabled not been politically appealing in the context of the Cold War, decolonization, and the only partial overturning of eugenic and colonial hierarchies, protein would likely never have caught and held international attention. It would not have become a resource for theorizing about national and racial difference or become the subject of technoscientific experimentation and international policy. Kwashiorkor might not have even been identified so securely as protein deficiency: today, the nature of kwashiorkor is once again unsettled.128 To many groups with hammers, protein was a good nail.

Despite the collapse of the consensus about the protein gap and its solution, the protein era had consequences. Even as protein’s charisma faded, the network that had gathered around it did not disperse. Experts and policymakers jettisoned the specifics of protein, but they maintained many of the same theories in modified form. Research on connections between

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nutrition and mental development continued. Nutrition experts’ arguments that better nutrition was an “investment” in human resources had successfully won the attention of the World Bank and contributed to the “basic needs” approach to development prominent in the 1970s. Fortification programs spread throughout the globe, with decidedly mixed consequences. The central idea of the protein era—that the quality of nutrients determined the quality of people—lived on.

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HANNAH F. LEBLANC is a historian of twentieth-century science and medicine. Her forthcoming book is a history of nutrition, defense, and national development in World War II and the early Cold War.

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