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Chinese Nutrition Experiments during World War II

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War has an enormous impact on human health. Yet, despite all of the catastrophic effects of war, war has generally not been seen as an integral part of human well-being. In China during World War II, nutritional studies were promoted to improve the physical health of soldiers. These experiments on military nutrition were meant to carry out an old dream—"Rich State and Strong Soldiers" (*fuguo qiangbing*). The dream had two parts: to apply modern nutritional knowledge to win the war and to build the foundation for a stronger state with a healthy population. Discussion on state building and dietary habits has recently become fashionable in the fields of cultural history and sociology. Bryan Turner once revolutionized the way in which we think about our bodies under governmentality. He later extended the argument to the relationship between the political order and the socialized body.¹ Similar works have been done in East Asia. In *Modern Japanese Cuisine: Food, Power, and National Identity*, Katarzyna Cwiertka treats a number of cases in which modernity is measured in food in Japan. She argues that the strength of the Japanese Empire was epitomized by the diets and specific foods prescribed by officials.² Mark Swislocki's *Culinary Nostalgia: Regional Food Culture and the Urban Experience in Shanghai* links Shanghainese to their city, to other parts of China, and to the wider world through food.³ Inspired by previous studies on the relationship between food and self-identity, this chapter adds to this research by considering how improving nutrition would lead to healthier soldiers and a stronger state.

The relationship between diet and health has fascinated Western researchers since the late nineteenth century. The knowledge of dietary studies was used to improve the health of soldiers during World War I. During World War II, the US Army conducted nutritional studies for their soldiers fighting in “all four corners of the world.”⁴ To these American military scientists, adequate diet was as vital to soldiers as proper weapons. Although China applied modern nutritional knowledge in its military prior to the outbreak of World War II, the emergency demand for stronger soldiers at the front soon became a high priority for Chinese defense policy during 1940–1945. The American military ration was introduced as a nutritional supplement to the poor diet provided to Chinese troops. The common idea that “you are what you eat” was behind this action.⁵ However, experiments by Chinese military surgeons suggested that Western food could not be easily digested by the Chinese, who had smaller physiques than Westerners. In addition, China could not distribute American military rations to all of the Chinese soldiers needing additional nutrition. The Chinese military thus could not meet Western nutritional standards. Debates among nutritionists ranged from a strong focus on digestive physiology and nutritional science to culinary habits and even debates on the “fitness” of the Chinese physique. As Chinese surgeons conducted more research, an argument on the Chinese physique seemed to replace the American emphasis on the stronger and bigger physical figures. This chapter demonstrates that the nutritional debate in China during 1940–1945 was a complicated process of negotiation between Chinese dietary tradition, socioeconomic hardship, and Western biomedical criteria in building a modern state and a healthy Chinese body.

Unsettled Nutritional Studies in Prewar China

Modern dietary studies in China were primarily conducted at Western-funded or -influenced universities.⁶ Finding nutrients (*yingyang su*) was one of the early research goals of investigations into the Chinese diet. As early as in 1913, when William H. Adolph of Cheelo (Qilu) University published “Diet Studies in Shantung”⁷ and “A Study of North China Dietaries” (1925),⁸ researchers in North China such as Wu Xian (Wu Hsien) and Daisy Yen Wu of Peking Union Medical College (PUMC) mainly focused on dietary components in villages outside of Peking,⁹ and

usually emphasized nutrients such as protein, fat, carbohydrates, and fiber, and their digestion in the human body.¹⁰ These and later experiments on Chinese diet and digestion tried to generate a fundamental contribution to nutritional science in China with the goals of improving the Chinese physique and building a “modern” state.

During the 1930s, Chinese vitamin studies reflected the idea that healthier and better nutrients would improve the Chinese physique. This work included establishing research institutes for nutritional science and promoting nutritional education as well as publishing nutritional standards for the Chinese population. In 1938, the government-organized Committee on Nutrition set the standards for a nutritional diet for the Chinese people.¹¹ The 1938 research project “Minimum Nutritional Requirements for Chinese” (*Zhongguo minzhong zuidi yingyang xuyao*) also listed daily required nutrients such as protein, fiber, fat, and vitamins. However, the author of the report admitted that no reliable information about vitamins in the Chinese diet was available at that time.¹² The study of vitamins both in the West and in China began to flourish only in the 1930s when Paul Karrer elucidated the correct structure of vitamin A.¹³ In major cities such as Shanghai, surveys paid much attention to the nutritional demands of urban industrial populations.¹⁴ In 1931, the Institute of Chemistry of Academia Sinica completed an investigation of the Shanghai daily diet. According to the report, the main food staples of Shanghai residents lacked sufficient proteins for muscle repair and fats for energy, yet both were required for healthy workers in an industrial economy.¹⁵ The report also stated that the situation could be worse for the middle and upper classes in the cities, as they favored refined rice that could cause beriberi.¹⁶ In addition, a cooperative project between the Shanghai municipal government and the newly established Henry Lester Institute for Medical Research experimented to improve the nutrition of child workers in order to prevent adult beriberi.¹⁷

Between 1925 and 1937, nutritional studies were eventually identified as an applied science to promote healthier workers and, hence, a stronger modern industrial state.¹⁸ China could not afford to slow its economic progress because its workers suffered from malnutrition. At the Lester Institute, Dr. Hou Xiangchuan and his team worked to identify the amount of vitamins in the Chinese diet and to prove the link between certain illnesses and vitamin deficiency.¹⁹ Based on the research by Hou Xiangchuan, Wu Xian, and others, the China Medical Association suggested using the findings in the 1938 project as a basis for the first official “minimum nutritional requirement for

China” published in 1939. Several significant changes from the 1938 research report should be mentioned here. The bulletin “Physiological Bases of Nutrition” by the League of Nations in 1936 helped set the minimum requirements of nutrition for Chinese.²⁰ The nutritional requirements for Chinese were determined by gender, season, occupation, and age, and took into consideration Chinese socioeconomic conditions, the nature of Chinese diets, and the average lighter body weight of the Chinese compared to Westerners.²¹ Finally, vitamins were treated as equal to other nutrients, and the report stated that “to ensure adequate nutrition, at least 25 percent of the caloric intake should be met with foods rich in vitamins.”²²

All these surveys and nutrition proposals for Chinese during the late 1930s virtually overlooked the 90 percent of the population in rural areas that suffered constant malnutrition and even starvation. Moreover, these nutritional studies also could not substantially improve the poor diet of lower-class urban workers in China if the governments took no action. As Angela Leung’s chapter in this volume indicates, nutritional scientists in China were convinced that in the 1930s, at the outbreak of the war, Chinese peasants constituting 80 percent of the population were already undernourished, with insufficient intake of animal proteins; the war obviously made the situation much worse. Moreover, the Japanese occupation of industrial urban areas along coastal China (map 4.1) further stifled nutritional studies in these areas. With the migration of research institutes and teams to the southwestern border, the goal of the strong soldier began to dominate nutritional studies in China.

Nutritional Research for Strong Soldiers in Wartime China

When the nationalist government decamped to Chongqing in 1937, many official bureaus, private companies, and universities also moved their operations to China’s southwest. In September 1938, as the Japanese army invaded, a team of refugee students and faculty from Shanghai’s St. John’s University fled to Kunming, capital of Yunnan Province in southwest China. Among them was Hou Xiangchuan, a laboratory scientist at Henry Lester Institute, a newly founded research institute in the 1930s that carried out various nutritional studies.²³ This move by Hou Xiangchuan and his research team meant that the first generation of Chinese nutrition scientists became involved in war preparations on China’s southwest border.

Legend:

Territories under Chinese rule	Railroads
Japanese occupied areas	Great walls
Japanese colonies	Lakes and rivers
Territories under western powers	

Map 4.1 Map of China in the 1940s showing Japanese-occupied areas. Source: GIS Center, Academia Sinica, Taipei, Taiwan.

Note: The Japanese-occupied areas are shown in gray, while Shanghai (in the East) and Chongqing (the wartime capital of Republican government in the Southwest) are both marked with a rectangle.

To Hou and other Chinese intellectuals, the road to Kunming was not lonely. Between 1937 and 1945, Kunming became the intellectual center of wartime China. In 1938, three of China's most prominent universities—Peking, Tsinghua, and Nankai—jointly established the Southwest National United University, or Lianda, in Kunming. Many studies have discussed the migration of Chinese intellectuals and its impact on the development of Western science in wartime and post-World War II China,²⁴ among which Jia-Chen Fu's works are essential to understanding the war-time situation of nutritional studies by these refugee scholars. According to Fu, by 1942 the Shanghai Refugee Children Nutritional Aid Committee, formed in 1937, which sought to improve refugee children's nutritional health, had created a national network through the Chinese Nutritional

Aid Council, with governmental offices and nutrition clinics in Chongqing, Chengdu, Guiyang, and Kunming. Fu argues that in linking bio-medical understandings of nutrition with social change, this group of Western-trained physicians and young female social workers enacted a new kind of social activism, which seized upon the “food-as-fuel” idea and believed that the welfare of the nation depended on the nutritional health of its citizenry. The Chinese Nutritional Aid Committee articulated an image of professional and specialized expertise in the science of nutrition and care.²⁵ This chapter, examining the wartime nutritional work with military personnel, complements her comprehensive discussion of refugee children and civilians.

At the eastern end of the Burma Road,²⁶ a supply route crossing the Allied China-Burma-India military theater, Kunming hosted several foreign aid organizations,²⁷ including the China Medical Board (CMB) of the Rockefeller Foundation and the American Bureau for Medical Aid to China (ABMAC), which contributed medical aid to the Nationalist cause²⁸: foreigners and Chinese worked together to improve the military diet of soldiers.

The First Survey of Military Diet

For the Americans, the goal of building stronger Chinese soldiers seemed easy: just provide more and better army provisions to China. Walter S. Jones, an American surgeon, stated in a report that medical aid to China during World War II took many forms, including the distribution of large quantities of medical supplies and equipment, the training of medical officers and troops, and the deployment of American medical units with the Chinese army in battle. To help coordinate the Chinese-American medical system, the combat US liaison officer system was extended to medical service, including laboratory work. However, the American liaison office soon complained about the lack of cooperation from the Chinese side. One problem was the lack of nutritional information about the diets of the Chinese soldiers. Without packed military provisions, the Chinese army usually cooked with local ingredients, the nutritional components of which had never been properly analyzed. Finally, Chinese also criticized the taste of American military rations.²⁹ To ease these difficulties, several organizations were established to find solutions.

The Army Health and Nutrition Survey, proposed by American consultants, assessed the health and nutritional status of soldiers and military staff in China through a series of studies designed to measure the diet of Chinese soldiers by American nutrition standards.³⁰ The survey was unique in combining interviews with physical examinations to generate vital health statistics for the state and the military. The survey began in the early 1940s in Yunnan and later conducted a series of experiments focusing on different groups of armed personnel and civilian officials.³¹ An analysis of this research, “The Nutritional Studies of Chinese Troops” (*Zhongguo jundui zhi yingyang yanjiu*), focused on health and nutrition measurements to meet the needs of joint operations among the Allies. The survey’s interviews included demographic, socioeconomic, dietary, and health-related questions.³² The experimental component consisted of medical, dental, and physiological measurements as well as laboratory tests administered by medical personnel, most of whom were army surgeons under the supervision of experienced nutrition scientists.

According to the research, severe malnutrition was common in the Chinese army and caused diseases such as night blindness and edema of the legs,³³ which reduced the fighting ability of the Chinese army. In the early 1930s at the beginning of modern nutrition studies, some Chinese scientists criticized the low quality of the Chinese diet and encouraged people to eat Western food in order to acquire nutrients.³⁴ As American aid arrived and Chinese leaders demanded stronger soldiers, some medical scientists, with the support of the Nationalist government,³⁵ conducted several nutritional experiments under the difficult socioeconomic situations in Yunnan.³⁶ To these researchers, the survey provided important information for calculating proper nutritional intake for soldiers and military staff on the front and even in the rear areas.³⁷ The propaganda slogan “In order to reach the first priority of supporting soldiers, we must first provide them with nutrition” (*yangbing diyi, yingyang diyi*)³⁸ was transformed into a policy of building a modern army for Chinese-American joint military actions.

Malnutrition also caused anemia among Chinese soldiers, who had two main forms: iron-deficiency anemia and pernicious anemia.³⁹ The former was thought to be adequately treated by preparations of iron, and the main goal was to find sufficient supplies of iron supplements from imported medications and from better diets made with local culinary ingredients.⁴⁰ Poor diet and malnutrition became an emergency when general Joseph W. Stilwell

decided to fight in the China-Burma-India military theater. Finding better military dietary provisions to boost the strength of Chinese soldiers therefore became the aim of nutritional experiments during the war.

The “Malnutrition” of American Provisions to Chinese Soldiers

China was in fact only a small part of the entire American war effort in the Far East and the Pacific in the early 1940s, yet American military aid, including medical supplies to the desperate Chinese military, was very important.⁴¹ Although some Chinese troops received food from American resources because they were under Stilwell’s command in the China-Burma-India theater,⁴² most of the Chinese army lacked American supplies and suffered from both hunger and a poor-quality diet.⁴³ General Stilwell—usually backed by the War Department—believed aircraft and supply via “the Hump” across the Himalaya Mountains⁴⁴ failed to use the more plentiful ground forces in India and China. Thus, Stilwell sought to bring about long-term improvement of China’s own military strength.⁴⁵ Stilwell’s medical consultant, Robert K. S. Lim,⁴⁶ a Singaporean Chinese who was chief deputy of the Bureau of Military Surgeons and former dean of Physiology at PUMC, strongly supported these ideas.

However, finding solutions was not as easy as Stilwell and Lim had expected. China’s chronic poverty, deepened by the long years of war,⁴⁷ its complex and uncertain political structure, and the Nationalists’ fears of what the future might bring from the Communist enclave in the north all argued strongly against the forceful levying of grain to implement a costly nutritional improvement for the Chinese military. Stilwell and Lim both believed that properly trained and led Chinese troops, liberally supplied by the Americans and backed with a stable and nutritional food supply, could both fight a war as well as establish a firm foundation for postwar growth and reconstruction. Robert Lim and his colleagues at PUMC, who established a research group on nutrition at the School of Emergency Medical Training in Guiyang, Guizhou Province, advocated similar concepts.⁴⁸ Unlike the Central School of Military Surgeons (Zhongyang junyi xuexiao, CSMS), Robert Lim’s School also favored preserving manpower for postwar public health reconstruction.⁴⁹ This effort later fused nutritional studies in the prewar period with wartime experiments.

In late 1941 Stilwell and Lim were concerned with how to improve the physical strength of Chinese soldiers for cooperation with American soldiers in the rescue mission to Burma planned for 1942.⁵⁰ Additionally, China-Burma-India theater surgeon colonel Robert P. Williams was ordered to organize the Chinese Medical Service (CMS) to supply medicines to China, particularly to prepare for fighting and the rescue mission of British soldiers in the China-Burma-India Theater.⁵¹ After the military expedition to rescue British troops in Burma in 1942, a report to CMS from Chinese military surgeons who had returned from Burma showed that approximately one month after their withdrawal from Burma, thirty-four cases of vitamin B complex deficiency had been admitted to the hospital, including seven cases from the 14th Brigade suffering from multiple neuritis.⁵² CMS noticed that the neuritis among Chinese soldiers did not develop until almost one month after the substitution of "Compo" rations.⁵³ However, according to one source, it was difficult to assess whether the indications of malnutrition in these personnel of the 14th Brigade were due to complications arising from malaria or were the result of postdiphtheritic ulcerations. In the other brigades, another report writer noticed that the symptomatology showed greater variety,⁵⁴ including five cases with a history of malaria, and six that had suffered from dysentery.⁵⁵ Both diseases were pervasive among Chinese troops, and both Chinese and American surgeons believed such physical suffering could trigger various mental problems.⁵⁶ Only in the 1960s did American surgeons start to realize that these manifestations were caused by the depletion of bodily reserves of vitamin B1 during a lengthy period of subsisting on K rations.⁵⁷ However, until they received more Chinese and British cases from Burma, the Chinese officers of CMS believed the cause of depression was malnutrition.

Malnutrition cases appeared more frequently after the evacuation from Burma, and became severe in China. CMS believed this occurred because the 77th and 111th Brigades had subsisted almost entirely on K rations, and that the K rations issued during their march could not replace the body reserves of vitamin B complex that they had depleted in Burma. Avitaminosis, a contemporary pathological term used to describe the general symptoms of nutritional deficit, sporadically appeared in the CMS reports. Despite the symptoms of avitaminosis spotted in the surgeons' clinical observations on the frontline, and later at the rear, in the beginning CMS seemed confident in the effectiveness of K rations. They declared that several illnesses, such as postmalarial complications, postdiphtheritic

paralysis, and failure of intestinal absorption after dysentery or gastroenteritis, were also prevalent among soldiers and could be the etiological factors causing avitaminosis. CMS therefore believed that the nutritional effectiveness of K rations should be sufficient to cure avitaminosis if the whole package was taken properly and fully digested by soldiers who did not suffer from the above-named diseases.⁵⁸

Although the discovery of these cases of avitaminosis would seem to indicate that the vitamin content of the K ration was deficient, the American surgeons disagreed. They also blamed the high morbidity rate in Chinese troops on “bad” eating habits. They argued that the Chinese soldiers refused to eat such parts of the ration as evaporated milk, cheese spread, and cocoa powder, which contained many vitamins.⁵⁹ All of the nutrients of these dairy products accounted for nearly 27 percent of all the nutrition in a pack of K ration.⁶⁰ However, later, when American and British soldiers suffered from severe depression and other physical problems, the K ration was not criticized for its performance in the theater of operations, even though difficulties in obtaining supplies from the bases in India had resulted in the widespread and monotonous use of K rations by American light infantry forces as well as by troops from Nationalist China and the United Kingdom.⁶¹ The number of avitaminosis cases grew continuously for months after the soldiers withdrew to China. The deterioration became obvious in American and British soldiers, while Chinese troops also suffered but rarely reported severe cases. The dilemma forced military surgeons in China to deal with alternative causes of malnutrition in Chinese soldiers. Under the premise that American rations should provide sufficient nutrition, they had to think beyond regular biomedical reasons. Later on, perspectives of the local environment, differences in physique, and Chinese traditional dietary habits were all taken into consideration.

Adjustment and Compromise

Despite the confidence of both the Americans and the Chinese in American military supplies, including weapons and rations,⁶² CMS's report caught the attention of the Nationalist government as well as several foreign medical aid agencies of the United China Relief, including the American Bureau for Medical Aid to China, a civilian institution in Chongqing. To resolve the debate between the Chinese and the Americans

on the dietary needs of Chinese soldiers, a series of experiments was designed. According to the theory, in wartime China, both industrial workers and soldiers required sufficient calories as well as sufficient protein to enable muscle repair. Thus, the nutritional intake necessary for healthy industrial workers should also be the standard in order to build stronger soldiers during wartime.⁶³ Because people such as Robert Lim believed that wartime construction would also serve postwar reconstruction, the nutritional requirements of both soldiers and workers became central to the research during the war.

Inspired by the progress of nutrition studies in the US Army and practical needs in China, attention to nutritional experiments first involved formulating a military food policy in wartime China to satisfy the several dietary improvements that had been recommended by various Western and Chinese scientists before the outbreak of World War II.⁶⁴ The diet of Chinese soldiers was soon under evaluation and linked to American standards of nutrition for soldiers. Army nutrition scientist Wan Xin and colleagues in 1942 generated a series of investigations of the Chinese military diet, thus revealing its nutrient and vitamin components.⁶⁵ One of the goals of the investigation was to use knowledge of workers' diets to understand the nutritional needs of soldiers.⁶⁶ Another goal was to modify American rations in order to produce similar rations from traditional Chinese food, which hopefully could more effectively meet Chinese dietary needs.⁶⁷ All of these goals were very reasonable from the viewpoint of science, but they might have overlooked China's socioeconomic difficulties. In 1942, the Nationalist government had already lost numerous agricultural provinces—as well as major industrial cities such as Shanghai—to Japanese occupation. All of the investigations of local diets in eastern and northern China during the 1930s did not correspond to the very difficult situation in remote southwest China, the poorer home base of the Nationalist government and General Stilwell's troops. Chinese researchers had to work on their own and seek nutrition in local dietary ingredients, thus taking the wartime reality into account.

The Army Institute of Nutrition (*Lujun yingyang yanjiusuo*, AIN) at CSMS was the primary Chinese organization in charge of nutritional research on soldiers.⁶⁸ From 1943 onward, AIN conducted periodic dietary experiments to investigate the nutritional value of the military diet and to assess the nutritional value of various dietary ingredients. Inspired by foreign combat diets, Li Tingan—a PUMC graduate, former director of

Shanghai Municipal Bureau of Public Health, and later, in 1947 the superintendent of the Central Hospital in Canton⁶⁹—proposed the production of “special biscuits” (*tezhong binggan*) for the nutritional needs of Chinese soldiers, a concept that could have been inspired by American military rations. In his article, Li attached a table of the nutrients the biscuits should include, such as protein, calcium, phosphorus, and vitamins A and B derived from beef, pork, lamb, egg whites and yolks, rice bran, bean powder, vegetable oil, bone powder, and salt,⁷⁰ but he made the quantities less than those in the American rations. Li had explained that the physique and digestive ability of Chinese soldiers were weaker than those of Westerners; the smaller Chinese body could have been an evolutionary consequence of a long history of food scarcity in China. He thus asserted that, due to the small body of the Chinese, the daily requirement of nutrients and vitamins for Chinese soldiers could be lower than the international standards for Westerners. For example, a Chinese person would require only 2,400 calories per day, compared to the 3,400 calories of the international standard; 30 grams of fat per day instead of the international standard’s 50 grams; and 660 grams of carbohydrates per day compared to the international standard of 800 grams. Only the 80 grams of proteins per day in Li’s article matched the international standard.⁷¹ Although soldiers would need more energy on the battlefield, Li’s report suggested that the Western standards of nutrition prevailing in prewar years might be too idealistic for wartime China. It seemed the small Chinese physique would “naturally” require smaller quantities of food and less nutritional intake. Such a statement solved the dilemma facing CMS and relieved pressure on the Nationalist government, which was struggling to feed its troops.

The Chinese scientists mainly from AIN conducted several detailed surveys and experiments in which the food was weighed and measured and the diet of soldiers estimated. The analyses worked out the amount of calories, protein, calcium, iron, vitamin A, vitamin B, riboflavin, nicotinic acid, and vitamin C consumed.⁷² During 1944, AIN also investigated the hemoglobin (HbA1c) content of soldiers’ blood.⁷³ Hemoglobin was chosen as the main criterion for nutritional research in wartime China because of its simplicity,⁷⁴ and because any serious long-continued deficiency of iron or protein would be reflected in diminished HbA1c values (i.e., in anemia). All observers used the Haldane-Gowers method, which had recently been standardized by the British Standards Institution.⁷⁵ The figures recorded in the study showed much lower HbA1c levels than those obtained in

American soldiers, and were even lower than the figures obtained in America during the depression in the 1930s. The researchers attributed the difference in part to the fact that the Chinese soldiers were largely recruited from poor peasants or other lower-income groups.⁷⁶ The Chinese researchers were aware that the major reason behind the different nutritional intakes between the Chinese and American soldiers was economic, but they could not solve the problems during the war. Thus, the research on the wartime nutrition of Chinese soldiers had to be saved for the post-World War II reconstruction,⁷⁷ a goal that the Nationalist government could not achieve before its retreat to Taiwan in 1949.

In a 1944 article, the physician Zhou Fengjing encouraged the government to develop nutritional diets for Chinese considering the “Chinese physique” (*Zhongguoren de tizhi*) and “economic possibilities” (*jingji keneng*).⁷⁸ Wan Xin’s 1942 report had already encouraged adjusting the nutrient requirements for Chinese due to their small physiques.⁷⁹ However, the definition of “Chinese physique” could sometimes be arbitrary, as shown by Hilary Smith’s argument concerning good and bad bodies in this book. As the war in China was prolonged, it became difficult to obtain food, and for economic reasons compromises had to be made that lowered the Chinese standards of nutrition intake.

Because of budget cuts and inflation, in 1942, Chinese army surgeon Wang Zhaozhang of AIN suggested a compromise in the military diet by obtaining nutrients from local food and encouraging soldiers to grow vegetables and raise pigs and chickens to supplement food and animal proteins.⁸⁰ Wang Zhaozhang’s view presumed that the digestive system of the Chinese body had adapted over thousands of years to a vegetarian diet, not only because grains and vegetables were traditionally preferred foods, as described in Angela Leung’s chapter in this volume, but also a result of chronic famines and wars. Based on investigations of nutrients, army official Chen Liang suggested substituting soybeans for animal protein.⁸¹ Nutrition scientists such as Jin Baoshan, director of the National Health Administration,⁸² and Army physiologist Chen Meiyu⁸³ of AIN made similar suggestions. Research between 1942 and 1945 also sought to find local nutritional sources for the majority of Chinese troops on the front line in central China. These troops did not join the military expedition under Stilwell’s command, and received almost no American supplies, including military rations; for their food supply they had to be self-sufficient. However, to scientists such as Jin Baoshan and Chen Meiyu, the lack of a

stable and nutritional food supply should not mean sacrificing the health of soldiers or their fighting strength. Local grains and vegetables were therefore analyzed for their nutrition. Based on the assumption that vegetable proteins were easily digested by Chinese, the soybean was seen as the “fittest” replacement for animal proteins in “Western meals.” Meanwhile, eating grains became a symbol of being patriotic, while consuming refined rice was criticized for both economic reasons and for being unpatriotic.⁸⁴ It is interesting to note that Jia-Chen Fu’s chapter in this volume shows the possibility of linking the wartime diet to the long history of soybean consumption in China. Both the vegetarian diet and soybean consumption had indeed been central in Chinese culinary culture historically. Because of the wartime hardship, traditional cooking with many vegetables and soybeans was promoted for the “fitness” of the Chinese physique and for economic considerations.

It is worth noting that the suggestion by Jin Baoshan and Robert Lim to find local sources for the nutrition of soldiers was adopted by the Nationalist government to set new standards for the minimum nutrition intake of civilians as well. Thus, both troops and civilians were encouraged to grow their own vegetables for sufficient nutrition with a “familiar taste.”⁸⁵ We have no information regarding whether these new Chinese formulas were adopted by American experts in China. The research of Chinese scientists should, however, be seen as part of the “research and development” of modern military science when food consumption became aligned with the patriotic obligation to build a “rich state and strong soldiers.”

Due to cooperation with the United States, nutritional studies were promoted by the Chinese army beginning in 1942. The cooperation between China and the United States introduced modern nutritional knowledge into China and merged military nutritional studies with previous civilian studies from before the war. These efforts contributed to the continuation of nutritional studies after the war as well, when the two issues of “Chinese physique” and “economic possibility” remained prominent.

Concluding Remarks

Chinese nutritional studies began before the outbreak of the Sino-Japanese War (1937–1945), soon after Western studies of vitamins began,⁸⁶ at a time when the majority of the Chinese population suffered from malnutrition.

Most pre–World War II nutritional experiments laid much concern on improving Chinese dietary intakes. This prewar research confirmed the old saying “You are what you eat.” To these prewar Chinese scientists, modernization of the diet would compensate for centuries of physical weakness. This would, in turn, transform Chinese society and economy. The war between China and Japan further exacerbated the political unrest and economic chaos in China and the economic situation deteriorated very quickly. The authorities needed stronger soldiers for defense, but they also lacked the ability to feed their soldiers and civilians. The American supply of rations was helpful but could not support the whole Chinese army. The Nationalist government needed ways to lift the morale of Chinese soldiers who lacked sufficient food.

In his new book, John Watt claims that the Kuomintang (the Nationalist Party, or KMT) did not provide adequate nutrition or health care for its conscript armies or for its civilians.⁸⁷ However, as mentioned above, surveys by CMS and AIN used Chinese soldiers as test subjects for American military-dietary research and to explore whether the nutritional needs of Chinese differed from those of Western people. The debate over the effectiveness of applying American K rations to Chinese soldiers and further studies by AIN revealed that the KMT did make efforts to alleviate malnutrition among soldiers. These efforts also brought renewed emphasis to prewar ideas of a healthy vegetarian diet and soybean consumption. Owing to the small “Chinese physique,” the dietary consumption of Chinese could be less than for Westerners. The transforming focus of war-time nutritional studies seemed to change the argument from “You are what you eat” to “You eat what you are.” As the Chinese physique required less food and a lower quantity of nutrients than the American, the government’s burden to feed its people and soldiers was reduced. With such a viewpoint, a final victory was possible despite scarce resources.

Notes

1. Bryan S. Turner, “The Government of the Body: Medical Regimens and the Rationalization of Diet,” *British Journal of Sociology* 33, no. 2 (1982): 254–269; Bryan S. Turner, *The Body and Society: Explorations in Social Theory* (London: Sage Publishing, 2008).

2. Katarzyna Cwiertka, *Modern Japanese Cuisine: Food, Power and National Identity* (London: Reaktion Books, 2006).

3. Mark Swislocki, *Culinary Nostalgia: Regional Food Culture and the Urban Experience in Shanghai* (Stanford, CA: Stanford University Press, 2009).
4. Rohland A. Isker, "Dairy Products in the Army Ration," *Military Surgeon* 97 (1945): 277.
5. Albert Field, "Medical Officer in China," *Military Surgeon* 103, no. 4 (1948): 295–296.
6. Zhongguo Yingyang Xuehui (Chinese Nutrition Society), ed., *Zhongguo yingyang xuehuishi* (A history of Chinese Nutrition Society), (Shanghai: Shanghai Jiaotong University Press, 2008), 3–6.
7. William H. Adolph, "Diet Studies in Shantung," *China Medical Journal* 37 (1923): 1013.
8. William H. Adolph, "A Study of North China Dietaries," *Journal of Home Economics* 17, no. 1 (1925): 1.
9. Wu Hsien and Daisy Yen Wu, "Studies of Dietaries in Peking," *Chinese Journal of Physiology Report Series*, no. 1 (1928): 135.
10. Zheng Ji, "Zhongguo yingyangxue sanshi nian (1920–1950)" (Three decades of Chinese nutritional studies [1920–1950]), originally published in supplement to *Kexue* (Science) 32 (1951); reprinted in Zheng Ji, *Zheng Ji kexue wenxuan* (Select scientific work by Zheng Ji) (Nanjing, China: Nanjing daxue chubanshe, 1993), 73–95.
11. Committee on Nutrition, "Committee on Nutrition: Minimum Nutritional Requirement for China." *Nutrition Notes* 10 (1938): 301.
12. Zheng Ji, "Zhongguo minzhong zuidi xiandu yingyang xuyao zhi kuanjian" (An opinion on the minimum requirement of Chinese nutritional intake), *Zhonghua yixuehui zazhi* (Journal of the Chinese Medical Association) 27, no. 5 (1941): 276.
13. On the study of vitamins, see Rohland A. Isker, "Developments in the Field of Vitamins," *Cellular and Molecular Life Sciences* 26, no. 3 (1970): 225–240. On Paul Karrer's elucidation of the correct structure of vitamin A, see Zhongguo yingyang xuehui, *Zhongguo yingyang xuehuishi*, 3–6.
14. For example, Zhu Zhangjun, "Shanghairen zhi shanshi" (The diet of Shanghai residents), *Kexue* 18, no. 9 (1934): 1174–1192.
15. John Komlos, "Nutrition, Population Growth, and the Industrial Revolution in England," *Social Science History* 14, no. 1 (1990): 81.
16. Zhu Zhangjun, "Shanghairen zhi shanshi," 1191–1192.
17. Anonymous, "Shanghai gongbuju shiyan gailiang tonggong shanshi" (Shanghai Municipal Council experiments on improvement to child workers' diet), *Zhonghua yixue zazhi* (JCMA) (Shanghai) 23, no. 1–2 (1937): 395.
18. Kenneth J. Carpenter, "A Short History of Nutritional Science: Part 1 (1785–1885)," *Journal of Nutrition* 133, no. 3 (2003): 641–642; and Kenneth J. Carpenter, "A Short History of Nutritional Science: Part 2 (1885–1912)," *Journal of Nutrition* 133, no. 4 (2003): 975–977.
19. Hou Xianchuan published a great deal of research on these topics, such as Hou Xianchuan, trans., "The Physiology of Nutrition" (Yingyang zhi shengli jichu), *JCMA* (Shanghai) 22, no. 4 (1936): 251–259; and "Food and Nutrition" (Shiwu yu yingyang), *Wenzai* 1, no. 1 (1937): 128–129.
20. The League of Nations, ed., "Physiological Bases of Nutrition," *Quarterly Bulletin of the Health Organization* 5 (1936): 391.
21. Committee on Nutrition, "Committee on Nutrition," 303–304.

22. Committee on Nutrition, "Committee on Nutrition," 306.
23. Hou Xiangchuan was a PUMC graduate in 1924, returned from studies in the United States and Canada to serve at PUMC between 1928 and 1932, and was a nutritional scientist at Lester Institute in Shanghai from 1932 to 1948. He was also the major figure to develop the early military ration in the 1960s. See Ku Jinfan, "Hou Xiangchuan jiaoshou zhuanlue" (Profile of a nutritionist—Professor Hou Xiangchuan), *Sheng Li Ke Xue Jin Zhan* 14, no. 1 (1983): 89–91.
24. The long list includes John Israel, *Lianda: A Chinese University in War and Revolution* (Stanford, CA: Stanford University Press, 1998); Daniel Bays and Ellen Widmer, *China's Christian Colleges: Cross-Cultural Connections, 1900–1950* (Stanford, CA: Stanford University Press, 2009); and Stephen R. MacKinnon, *Wuhan, 1938: War, Refugees, and the Making of Modern China* (Berkeley: University of California Press, 2008).
25. Jia-Chen Fu, "Scientising Relief: Nutritional Activism from Shanghai to the Southwest, 1937–1945," *European Journal of East Asian Studies* 11, no. 2 (2012): 259–282.
26. The Burma Road linked Lashio in Burma with Kunming in southwest China. For details, see Donovan Webster, *The Burma Road: The Epic Story of the China-Burma-India Theater in World War II* (New York: Farrar, Straus & Giroux, 2003).
27. For a brief introduction of American aid to China during the World War II period, see John D. Plating, *The Hump: America's Strategy for Keeping China in World War II* (Austin: Texas A&M University Press, 2011).
28. John R. Watt, *A Friend indeed: ABMAC and the Republic of China, 1937–1987* (New York: ABMAC, 1992), 2–8. For more details of American medical aid to China during the World War II period, see John R. Watt, *Saving Lives in Wartime China: How Medical Reformers Built Modern Healthcare Systems amid War and Epidemics, 1928–1945* (Leiden: Brill, 2014). The author of the book, however, does not touch nutritional studies during the period.
29. James H. Stone, comp. and ed., *Crisis Fleeting: Original Reports on Military Medicine in India and Burma in the Second World War* (Washington, DC: Office of the Surgeon General Department of the Army, 1969), 73–75.
30. Wan Xin, "Lujun yingyang yanjiusuo" (Army Institute of Nutrition), *Junyi zazhi* 2, no. 3/4 (1942): 360.
31. Zhang Ji of the Medical College, National Central University (Zhongyang Daxue), later joined Wan Xin's team to expand the survey. See Luo Dengyi, "Zhanshi woguo yingyang kexue zhi Dongxiang" (The trend of nutritional science in our country in wartime), *Xin Zhonghua* 3, no. 1 (1945): 129.
32. Wan Xin, Chen Shunzhao, and Chen Shangqiu, "Zhongguo jundui zhi yingyang yanjiu" (Nutritional studies of Chinese troops), *Junyi zazhi* 2, no. 1 (1942): 16–24.
33. On night blindness, see Tang Gongyin, "Yingyang buliangxing zhi yamang-zheng" (Nyctalopia caused by malnutrition), *Junyi zazhi* 2, no. 3/4 (1942): 386–393. On edema of the legs, see Li Deming, "Yingyang buliangxing shuizhong—fu biao" (The edema caused by malnutrition with tables), *Junyi zazhi* 4, nos. 7–8 (1944): 18–20. Hou Xianchuan had started studies of malnutritional edemahenceforward. See Hou Xianchuan, "Yingyangbuliang zaocheng zhi shuizhong" (Edema due to malnutrition), *JCMA* 31, nos. 1–2 (1945): 99. The concern about nyctalopia also had roots in the nutritional studies during the 1930s; see Xu Peiquan, "Yingyang jingji yu sushi zhi

guanxi" (The relationship between nutritional economy and vegetarian diet), *Kangjian zazhi* 3, no. 2 (1935): 26–30.

34. Zhang Ji and Zhou Tongbi, "Minzu weisheng: Yingyang jianghua" (Racial hygiene: Talk about nutrition), *Kexue* 23, no. 2 (1939): 91–93.

35. Anonymous, "Yingyang quexian bujiu fangfa" (Remedies for malnutrition), *Xinan yixue zazhi* 2, no. 3 (1942): 11–12.

36. Jin Xin, "Kuanyu shibing yingyang bugou de yixie waizai yuanyin" (On several external causes of soldier's nutritional deficiency), *Lujun jingli zazhi* 5, no. 3 (1943): 33–34.

37. Bai Xin, "Jundui yingyang wenti-fu biao" (Problems of military nutrition [with tables]), *Nuchao* 5 (1946): 27–30.

38. Anonymous, "Yingyang zhuanze: Yangbing diyi, yingyang diyi" (Special issue on nutrition: The first priority is to nourish soldiers with nutrition), *Tujidui* 6 (1944): 20.

39. Jin Baoshan, "Gaishan woguo jundui yingyang yenjiu de jishu" (Collection of studies to improve troop's nutrition in our country), *Lujun jingli zazhi* 4, no. 5 (1942): 19.

40. Yan Kuan, "Zengjin shibing yingyang zhi zhongyaoxing jiqi duice" (The importance and strategies to improve soldier's nutrition), *Lujun jingli zazhi* 6, no. 3 (1944): 31.

41. Stone, *Crisis Fleeting*, 74.

42. Anonymous, "Zhuyin guojun yingyang youliang" (Good nutrition of our troops in India), *Lujun jingli zazhi* 5, no. 5 (1943): 104.

43. Wan Xin, "Health and Nutrition of Chinese Army," *Chinese Journal of Nutrition* 2, no. 1 (1947): 40–41.

44. The name "Hump" was given by Allied pilots in World War II to the eastern end of the Himalayan Mountains over which they flew military transport aircraft from India to China. John T. Correll, "Over the Hump to China," *Air Force Magazine* 92 (2009): 68–71.

45. "China Defense Supplies, Inc., Liaison Agency between the Chinese Government and American Authorities on Lease-Lend Programme," 1941 May–1943 January, MAF 97/774, National Archives, Kew, Richmond, Surrey, UK.

46. Robert Lim was also the chair of China Red Cross, which received donations from American Red Cross. George E. Armstrong, *Robert Kho-seng Lim / Lin KeSheng: Doctor, Soldier, Patriot, in Health Care and National Development in Taiwan, 1950–2000: How Medical Leaders in Taiwan, with the Aid of American Medical Advisors, Built a Modern, Health-Oriented Society in Post-War Taiwan* (New York: ABMAC, 2008), 14–17.

47. Zhonghua yixuehui, ed., "Zhanshi xuesheng yingyang zhuangkuang zhi yanjiu (Chongqing zhongxuesheng sanshi zhi diaocha)" (The study of student's nutrition in wartime [A survey of student's diet at middle schools in Chongqing]), *JCMA* 34, no. 10 (1948): 18.

48. ABMAC, "Medicine on a Mission: A History of American Bureau for Medical Aid to China, Inc., 1937–1954," Collection: RF, RG: 2–1954, Series 200, 12–18 (section I) and 1–3 (section II), Rockefeller Archive Center, Sleepy Hollow, New York.

49. Liu Yungmao, "Kangzhan ba nian zhuisui Lin Kesheng xiensheng de huiyi" (Memories of following Mr. Lin Kesheng during eight years of War of Resistance), in *Zhou Meiyu xiensheng fangwen jilu* (Records of interviewing Zhou Meiyu), interviews

by Zhang Pengyuan, recorded by Lo Jiuorong (Taipei: Institute of Modern History, Academia Sinica, 1993), 147.

50. Charles F. Romanus and Riley Sunderland, *Stilwell's Mission to China* (Washington, DC: Office of the Chief of Military History, Department of the Army, 1953).

51. The theater surgeon colonel Robert P. Williams, MC, was assigned to organize the Chinese Medical Service, to deploy the small Seagrave medical unit, and to relieve the existing inadequacy. "Chapter XV: The China-Burma-India Theater," *The Second World War*, 507. Office of Medical History, US Army Medical Department, accessed October 15, 2016, <http://history.amedd.army.mil>.

52. Chinese Medical Service, ed., "With Wingate's Chindits: A Record of Heedless Valor," in Stone, *Crisis Fleeting*, 281.

53. The abbreviation "Compo" in the note could mean any packed provision or early development American military rations, such as types A to D.

54. Chinese Medical Service, "With Wingate's Chindits," 282.

55. Chinese Medical Service, "With Wingate's Chindits," 283.

56. Zhang Yingzeng, "Luetan shibing de yinyang wenti" (Talk on soldier's nutritional problems), *Fendou Yuekan* 2, nos. 5–6 (1942): 16–17; Shao Pei, "Zanzheng yingyang shitiaozheng" (War-caused nutritional deficiency), *Kexue shibao* 13, no. 3 (1947): 59–61.

57. The K ration was an individual daily combat food ration that was introduced by the US Army during World War II. See John B. Youmans, "Chapter IV Nutrition," in *Preventive Medicine in World War II*, vol. 3, *Personal Health Measures and Immunization* (Washington, DC: US Army Medical Publications, US Government Printing Office, 1969), 129.

58. Chinese Medical Service, "With Wingate's Chindits," 283.

59. Chinese Medical Service, "With Wingate's Chindits," 286. Interestingly, American soldiers also threw away some of the K ration's components. See Barbara Moran, "Dinner Goes to War: The Long Battle for Edible Combat Rations Is Finally Being Won," *American Heritage's Invention & Technology* 14, no. 1 (1998): 10–19.

60. Isker, "Dairy Products in the Army Ration," 281–282.

61. James Hopkins, Henry Stelling, and Tracy S. Voorhees, "The Marauders and the Microbes: A Record of Righteous Indignation," *Infantry Journal* 64 (March 1949): 302.

62. Anonymous, "Meiguo shibing de yinyang" (Nutrition of American soldiers), *Xibei jingli tongxun* 28 (1945): 35–37; Anonymous, "Guanyu gailiang jundui yinyang—yingyang xiaoxi" (On the improvement of military nutrition—news of nutrition), *Shibing yuekan* 12 (1943): 15–16.

63. Jin Baoshan, "Gaishan woguo junduiyingyang yenjiude jishu," 19.

64. Zhang Ji and Zhou Tongbi, "Minzu weisheng," 92–3.

65. Wan Xin, Chen Shunzhao, and Chen Shangqiu, "Zhongguo jundui zhi yinyang yanjiu," 16–24.

66. Wan Xin, Chen Shunzhao, and Chen Shangqiu, "Zhongguo jundui zhi yinyang yanjiu," 42, "Fubiao 3: Zhongguo gongren shanshi zhi chengfen (Table 3: The dietetic components of Chinese worker)."

67. Anonymous, "Guanyu gailiang jundui yinyang," 15–16.

68. Anonymous, "Xiaoxi: Junyi xuexiao lujun yinyang yanjiusuo gongzuo jinkuang" (News: Latest work at the Army Institute of Nutrition, Central School of Military Surgeon), *Kexue* 27, no. 3 (1944): 49.

69. By 1947, only six Central Hospitals had been established or designated under the Department of Health. They were in Nanjing, Chongqing, Guiyang, Canton, Tianjin, and Lanzhou. See Chen Jichan, *Zhuisu wushi nianlai cujin wo weisheng sheshi zhi kuanjian shiji* (Tracking back the key events to promote our public health infrastructures in the past five decades) (Taipei: Cheng Chung Book Company, 1981), 14–15.

70. Li Tingan, “Yi tezhong binggan buchong guojun yingyang zhi jianyi” (Suggestion to supplement soldier’s nutrition by special biscuits), *Lujun jingli zazhi* 4, no. 5 (1942): 151.

71. Li Tingan, “Yi tezhongbinggan buchong guojunyingyangzhi jianyi,” 150 (appendix table).

72. Wan Xin, Chen Shunzhao, and Chen Shangqiu, “Zhongguo jundui zhi yingyang yanjiu,” tables 1–3, 8, 12, and 14.

73. Wan Xin, Chen Shunzhao, and Chen Shangqiu, “Zhongguo jundui zhi yingyang yanjiu,” table 7.

74. Anonymous, “Xiaoxi: Junyixuexiao lujunyingyangyanjiusuo gongzuo jinkuang,” 49.

75. Jing Libin, “Yinguo zhanshi yingyang” (Nutrition in wartime Britain), *Kexue* 28 (1945): 188.

76. Xu Te, “Zhanshi houfang yige zuizhong de wenti—yingyang” (The most serious problem at the home front during the wartime—nutrition), *Junyi zazhi* 6, no. 4 (1946): 19.

77. Shen Tong, “Jundui yingyang yu minzu jiankang” (Military nutrition and national health), *Ziran* 224, no. 22 (1945): 10–14.

78. Zhou Fengjing, “Muqien yu jinhou woguo guomin yingyang wenti zhi yantao” (Discussion on contemporary and future nutritional issues of our nationals), *Liangshi wenti* 1, no. 2 (1944): 54–55, 60.

79. Wan Xin, Chen Shunzhao, and Chen Shangqiu, “Zhongguo jundui zhi yingyang yanjiu,” 17.

80. Wang Zhaozhang, “Gaijin houfang budui yingyang liangke juti banfa zhi shangque” (On two specific strategies to improve military nutrition at the home front), *Lujun jingli zazhi* 4, no. 5 (1942): 154–155.

81. Chen Liang, “Gaishan shibing yingyang wenti fubiao” (Improving soldier’s nutritional problems [with tables]), *Lujun jingli zazhi* 4, no. 5 (1942): 11.

82. Jin Baoshan, “Gaishan woguo junduiyingyang yenjiude jishu,” 19.

83. Chen Meiyu, “Dou de yingyang” (The nutrition of beans), *Lujun jingli zazhi* 4, no. 5 (1946): 120.

84. Chen Meiyu, “Zalian de yingyang” (The nutrition of multiple grains), *Lujun jingli zazhi* 4, no. 5 (1946): 110–113; see also Chen Meiyu, “Dou de yingyang,” 114–120.

85. Xingzheng yuan (Executive Yuan), ed., “Zhanshi yingyang teji: Gailiang minzhong yingyang gaishuo—xingzhengyuanyanjiu baogao” (The special issue of wartime nutrition: A summary of improving civilian nutritional intake—Research report by Executive Yuan), *Zhongyang zhoukan* 4, no. 29 (1942): 4–5.

86. Kenneth J. Carpenter, “A Short History of Nutritional Science: Part 3 (1912–1944),” *Journal of Nutrition* 133, no. 10 (2003): 3023.

87. John R. Watt, *Saving Lives in Wartime China: How Medical Reformers Built Modern Healthcare Systems amid War and Epidemics, 1928–1945* (Leiden: Brill, 2014).