

Poverty or Privies? The Pellagra Controversy in America

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In 1908, Dr. Charles Wardell Stiles, Chief of Zoology for the United States Public Health and Marine Hospital Service, visited Columbia, South Carolina. The stop was part of a fact finding mission dispatched to the southern United States to determine the etiology of indolence; the so-called “disease of the cracker,” widely blamed for the long-term economic malaise in the postbellum South. If hunting for the “germ of laziness” seemed a laughable notion, the credentials of the well-connected Connecticuter and European-educated acolyte of Pasteur certainly were not. Stiles was widely considered the nation’s foremost expert on hookworm disease and was no stranger to the South by 1908. Indeed, he was an anomaly to the uneasy egoism of the New South; he represented a rare sort of progressive Yankee expert, never deriding Southerners for their perceived backwardness, but rather, demonstrating a heartfelt desire to do whatever was in his power to alleviate rural and small-town misery. During his many visits, Southern newspaper editors and local politicians came to know him and looked forward to his calls, offering what support they could to his cause.¹

In short order, Stiles positively identified hookworm in some twenty-four local townspeople, most of whom were being uselessly treated for anemia. However, a new scourge dominated the fears of the area—pellagra.² Symptomatically similar to hookworm infestations, characterized by eczema, yellowish skin, and a distended stomach, pellagra also visibly marked its sufferers with peculiar skin eruptions on the arms, feet, and around the neck and face. Unlike

¹F. G. Brooks, Charles Wardell Stiles, *Intrepid Scientist Bios*, Vol. 18, No. 3 (Oct., 1947): 157–160, 164–165 04/19/2012

² *The State*, “Investigating the “Hook Worm” the Parasite Which Causes Shiftlessness. Pellagra Also Found,” (January 7, 1908):9

hookworm, caused by the already-identified parasitic roundworms *Necator americanus* (first identified by Stiles) and *Ancylostoma duodenale*,³ pellagra, a long-standing disease of the European poor, had no certain causative agent. Upon pellagra's arrival in America, Southern news men were quick to correlate the two maladies, likening a possible parasitic cause for pellagra, a disease popularly connected with the European agricultural poor, to that of the hookworm outbreak. Soon, various theories of parasitosis infested local newspapers. Even as Stiles continued his investigations, *The State* (Columbia, South Carolina) posited the consumption of maize infested with weevils, "which find their way into the human stomach and burrow into the muscles," as a possible cause.⁴ This possible association between hookworm disease, an ailment linked with the lack of proper sanitation in the South, and pellagra, a disease synonymous with poverty, led the Rockefeller Foundation to create the Rockefeller Sanitary Commission. In 1909, an endowment of \$1,000,000 was disbursed to fund an investigation of the problem.⁵ Stiles, the scientific secretary for the commission, was soon confronted by the high hopes of an uninformed public that the anti-parasitic thymol treatment for hookworm might be the panacea for pellagra as well.

Perhaps the death-by-weevil supposition of *The State* was a bit far flung, but not so far as the idea presently seems. The turn of the twentieth century was marked by a geometric growth in medical knowledge, which in turn, spawned a renaissance in medical thought. The breakdown of millennia-held humoral and miasmatic theories left a gaping hole in the bastion of the medical sciences and new theories, approaches, and practices flooded the breach. A surprising number of these new sciences proved their mettle over the forty years

³ <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001653/> (accessed 04/19/2012)

⁴ Ibid.

⁵ Elizabeth W. Etheridge, *Butterfly Caste*, Westport, Connecticut (Greenwood Publishing Company:1972)13; F. G. Brooks, "Charles Wardell Stiles, Intrepid Scientist" *Bios*, Vol. 18, No. 3 (Oct., 1947), 164.

between 1880 and 1920: viruses such as yellow fever were identified and equated with insect vectors, as was the protozoan responsible for malaria; the cholera bacterium, *Vibrio cholerae*, was identified in contaminated drinking water; *Mycobacterium tuberculosis* was isolated and its mode of transmission described. Even if outright cures for such afflictions remained evasive, the widespread application of preventative measures became possible for the first time ever. Pellagra, described in European medical literature since the eighteenth century, was not immune to these speculative vicissitudes. Indeed, conjecture became pellagra's greatest collaborator. Its unproven etiology spawned a raging and dichotomous argument amongst social and scientific theorists. Upon its discovery in America, new investigators reacted vigorously and swiftly, initially confident that they would solve the puzzle in a few years at most,⁶ only to find themselves stuck fast in the dogmas of their personal fields. The rise of pellagra in America is not a story of epidemiological conquest, but rather, a story of intellectual conflict, made all the more tragic because the solution to the problem was known, if not understood, by nearly every party involved.

Pellagra was indeed a frightening disease, its symptoms described by period authors as *the three D's*: dermatitis, diarrhea, and dementia.⁷ The most prominent symptoms of pellagra were dermatological—burn-like eruptions on the face, the tops of the hands and feet, forearms, and around the neck. In essence, these markers appeared any place where sunlight made normal contact. Before, during, following, or sometimes in the absence of the skin eruptions,⁸ sundry gastronomical conditions arose—loss of appetite,

⁶ South Carolina State Board of Health, "Transactions of National Conference on Pellagra Held Under Auspices of South Carolina State Board of Health at State Hospital for the Insane, Columbia, S.C. November 3 and 4 , 1909," Columbia, S.C.(The State Co.: 1910) 19.

⁷ Daphne A. Roe, *A Plague of Corn*, Ithaca, New York (Cornell University Press: 1973)3.

⁸ George M. Niles, *Pellagra: An American Problem*, Philadelphia (W. B. Saunders Company: 1912) 88. The concept of pellagra-sine-pellagra or pseudo-pellagra was a

ulcerated mouth, cramps, diarrhea, constipation, and bloody stool were all common markers. Adding complexity to the mystery was pellagra's seasonal nature, seeming to increase in spring, ebb during high-summer, resurge in the fall, and disappear in winter. Although in many cases, pellagrous delirium, the third D, set in at once, for some victims, many seasonal eruptions might pass before the neurological symptoms associated with the disease set in. Marked by forgetfulness, depression, fantasies of persecution, and suicidal tendencies, the neurological symptoms of pellagra turned many underfunded state institutions, particularly in the American South where pellagra was most prevalent, into ill prepared nexuses for the seasonally mad.⁹ If the three D's were insufficient in their fearsome rages, over time many physicians augmented the list with a fourth D: death.¹⁰ During the thirty year reign of pellagra in America, death seemed to be the inevitable result for forty to seventy percent of those diagnosed.¹¹

Today, it is understood that pellagra is a nutritional deficiency disease caused by a diet lacking in niacin, commonly called vitamin B3. Ironically, the chemical structure of niacin had been understood

much disputed topic in both Europe and America; see also Daphne A. Roe, *A Plague of Corn*, 67.

⁹ Botho Sheube. *The Diseases of Warm Countries*, Edited by James Cantlie, Translated by Pauline Falcke, London(John Bal, Sons & Danielsson, Ltd., 1903)314–315; J. W. Babcock and W. Cutting jr, *Prevalence of Pellagra*, Washington (Government Printing Office: 1911) 17;

¹⁰ E. W. Patterson, "The Treatment of Pellagra," *The Journal of the American Osteopathic Association*, Vol. 14, No. 6 (Feb. 1915), 284–287, p. 287 Accessed 04/07/2012.

¹¹Carl Voegtlin, "Recent Work on Pellagra," *Public Health Reports* (1896–1970), Vol. 35, No. 25 (June 18, 1920), 1435–1452, p. 1437. Accessed 04/05/2012.; J. G. Wilkinson, "Pellagra—Symptoms, Diagnosis and Treatment," *Southern Medical Journal*, vol. 4 no. 8 (September 1911) 609; Daphne A. Roe, *A Plague of Corn*, 78, 88; Etheridge, *The Butterfly Caste*, 6; C. W. Garrison, "Economic Aspects of Pellagra" *Southern Medical Journal* vol. 21 no. 3 1928. Dr. C. W. Garrison stated that by 1928, pellagra mortality in Arkansas had reached 85–90%; Sheube simply notes prognosis as "generally unfavourable." Sheube, *The Diseases of Warm Countries*, 320; Illinois Pellagra Commission. *Pellagra in Illinois: Condensed Report*, Chicago (American Medical Association: 1912)7.

since the 1870s (the first major vitamin to be synthesized) and the vitamin isolated by 1911, a scant four years after pellagra's first known appearance in America. However, the nutritional functions performed by niacin were only nominally studied until the 1930s. In fact, until the 1920s, no nutritional deficiency diseases at all were understood except in the most general terms, i.e. specific foods added to marginal diets seemed to prevent certain diseases. By the time pellagra was discovered to be active in America, the weapon for its speedy defeat had been in hand for nearly forty years, but nobody knew to use it, nor would they for nearly two more decades.¹²

Perhaps the strangest impediment facing American pellagra researchers was that the disease was not a new phenomenon, but rather, was merely new to America. Pellagra was first observed some 170 years before its American visitation by the Spanish physician, Dr. Gaspar Casal, for whom one of its dermatological symptoms, "Casal's collar," is named. Concluding that the disease was prevalent in several impoverished provinces in Spain, Casal devoted the lion's share of his remaining years to studying the disease. It is noteworthy that Casal, unable to provide a definite cause, though he believed the maize-intensive diet of the poor responsible, was able to deduce that the addition of milk, cheese and meat to the diet improved pellagrous conditions and prevented further outbreaks. Following the posthumous publication of Casal's life work, the *Historia natural y medicia de el Principado de Asturias* in 1759, other physicians began noticing similar maladies among the rural poor throughout Europe.¹³ Pellagra went by many regional names such as *mal de la rosa*, *mal el monte*, *mal de la Teste*, and *flema salada*, before being conclusively linked together as the same disease by the French physician Théophile Roussel in 1861. Roussel opted for a single name, *pellagra*,

¹² Richard D. Semba, "The Historical Evolution of Thought Regarding Multiple Micronutrient Nutrition," *The Journal of Nutrition*, vol. 142, no. 1 (January 2012) 144S.

¹³ Roe, *A Plague of Corn*, 30–31; Arturo Warman, *Corn & Capitalism: How a Botanical Bastard Grew to Global Dominance*, Translated by Nancy L. Westrate, Chapel Hill (University of North Carolina Press: 2003)132–133.

coined earlier by Dr. Francisco Frapolli, in 1771.¹⁴ The etiology of this now clearly defined and wide-spread ailment, long a source of heated debate among European physicians, grew increasingly contentious as the numbers of the diagnosed swelled. In time, the European debate settled into two camps, those of the *Zeists* and the *anti-Zeists*. This dichotomous situation would come to dominate the research of American physicians just as it had their European peers, an argument that worked to the detriment of pellagrins on both continents.¹⁵

The Zeist theory, as originally promulgated in 1810 by the Italian Dr. Giovanni Battista Marzari, held that maize was in some way related to pellagra, hence the term *Zeist*, derived from the maize genus *Zea*. However, Marzari blamed the disease principally on poverty, believing it neither hereditary nor contagious. Presciently, Marzari also contended that any diet so restricted as that of the rural Italian poor was likely to cause the infection. As the century progressed, nutritional studies seemed to confirm Marzari's theories, maize having been found very low in protein, widely believed to be the key nutritional element.¹⁶ Unfortunately, there was one hole in Marzari's theory; the rural poor had always had a monotonous, high-

¹⁴ A. Marie, *Pellagra*, Translated by C.H. Lavinder and J.W. Babcock, Columbia, South Carolina (The State Co. Publishers: 1910) 19–20. Marie stated that the name pellagra was a vernacular term used by farmers living in central Lombardi and Milan. Pellagra is derived from *pelle* –“skin” and *agra* –“rough.”; Daphne A. Roe, *Plague of Corn*, 34–35, 37; Arturo Warman. *Corn & Capitalism: How a Botanical Bastard Grew to Global Dominance*, 133; a more complete list of synonyms is provided in Sheube; Botho Sheube, *The Diseases of Warm Countries*, 311.

¹⁵ Pellagra was also ravaging North Africa by the 1890s, but the English epidemiologist Dr. Fleming Sandwith seemed the only interested party. Sandwith's expertise, however, proved pivotal for the American study of pellagra as it was primarily through his efforts that any English language literature on the subject was available at all. See Daphne A. Roe, *Plague of Corn*, p. 69–76, for Sandwith's experiences in Egypt.

¹⁶ Arturo Warman. *Corn & Capitalism: How a Botanical Bastard Grew to Global Dominance*, 133–135; Renato Mariani-Costantini and Aldo Mariani-Costantini. “An Outline of the History of Pellagra in Italy,” *Journal of Anthropological Sciences*, Vol. 85 (2007) 167; www.isita-org.com. (Accessed 04/23/12).

starch diet. If a low protein dietary was the cause, how had pellagra not been noticed much earlier? Under the guidance of Dr. Lodovico Balardini, the Zeist theory matured at the Italian Scientific Congress of 1844. Likening pellagra to ergot, Balardini posited that the true cause of the malady was neither poverty nor maize, but rather, a toxic fungal infestation of improperly stored maize or flour. Following in Balardini's footsteps, Zeist theorists unsuccessfully attempted to isolate the mysterious intoxicant, referred to as *pellagrozeina*, well into the next century.¹⁷

The anti-Zeist camp reflected the opinions of a range of naysayers rather than a single, cohesive theory. Indeed, the arguments among their own ranks were often as rancorous as their debates with the Zeists. Essentially, as noted by W. Bayard Cutting, American vice council in Milan in 1908, the anti-Zeists fell into two categories. The first, primarily economists and social activists, held firm to Marzari's original theory, believing pellagra a disease wholly caused by poverty, the maize argument seeming to them

not so much false as inadequate. . . it appears in districts where corn is either not cultivated or constitutes only a small part of the peasant's diet. In France, the inhabitants of the Landes used to eat corn, but other grains as well, and in far larger quantities. Even in Italy, some of the largest corn-growing districts have the least pellagra, or none at all.¹⁸

¹⁷ Babcock and Cutting, *Prevalence of Pellagra*, 19–20. The term *pellagrozeina* was coined by the physician/psychologist Cesare Lombroso (1835–1909), likely the most respected and published zeist theorist. Lombroso's influence over time caused many publications to cite the maize-toxin theory simply as "Lombroso's Theory." Lombroso's Darwinian psychological theories regarding the physiognomy of criminals were also lent in support of heredity as a predisposing condition of pellagrins. See Daphne A. Roe, *Plague of Corn*, 59, 63.

¹⁸ Babcock and Cutting, *Prevalence of Pellagra*, 20.

The second anti-Zeist camp included traditional miasmatic theorists following the teachings of the eighteenth century physician Pierre Thouvenel, who contended that contaminated vapors lifted from pools of torpid water, spreading the disease among the poor. Several more modern concepts concerned unseen germs. Other anti-Zeists implicated the generally filthy and miserable living conditions of the poor, referring to the phenomenon as *morbus miseriae*.¹⁹ Among the most modern, and best received, of the anti-Zeist theories was that of the English entomologist Louis Sambon, whose investigations of pellagrous Italian districts in 1900, led him to conclude that the disease was caused by a microorganism spread by biting-flies of the *Simulium* genus.²⁰ Sambon's insect vector theory was considered by many publications as the most likely cause of pellagra well into the 1920s.²¹

All of this, however, received little attention from physicians in the pellagra-free United States. Naturally, news articles with fearful headlines occasionally drifted into nineteenth century American newspapers. But such anecdotes as an 1881 Chicago *Daily Inter Ocean* article about the ongoing epidemic in Italy, "The Terrible Pellagra," also tended to emphasize the different "soil, climate, race, social regulations, manners, and customs" of the victims, implying that the century-long scourge resulted in some way from the *Italianness* of the sufferers rather than the maize they consumed.²² Whether bitten by the ethnocentric media-bug or not, American physicians had no experience and only scant knowledge of pellagra. One of the better sources available to American physicians was a translated German text, Dr. Botho Sheube's, the *Diseases of Warm Countries* (1903), which offered a fair diagnostic of pellagra and a typical range of Zeist-preferred treatments including salt-baths,

¹⁹ Roe, *A Plague of Corn*, 65-67; Sheube, *The Diseases of Warm Countries*, 311.

²⁰ Roe, *A Plague of Corn*, 84-86.

²¹ G. Howard Bailey, *The Etiology of Pellagra*, 3; A. Marie, *Pellagra*, 139-141.

²² "The Terrible Pellagra," *The Daily Inter Ocean*, no. 131 (August 1881).

appropriate dietary changes, and arsenical treatments.²³ In her 1972 retrospective of the pellagra years, *The Butterfly Caste*, Dr. Elizabeth Etheridge asserts that most American medical texts failed to mention pellagra at all, or at best, provided brief accounts of the strange and foreign ailment. For Americans, pellagra was simply another exotic affliction for Old World peasants and savages.²⁴

Pellagra remained an Old World disease until 1907 when a definitive diagnosis was made by Dr. George H. Searcy, following an investigation of an unknown epidemic spreading among the patients at the Alabama Institution for Negroes. Of the eighty-eight cases so-diagnosed, fifty-seven died.²⁵ Soon after, the *Journal of the American Medical Association* published Searcy's findings, detailing the course of the disease. Following the publication, many American physicians began looking back on some of the more puzzling cases they had encountered over their years of practice.²⁶ As stated by Dr. J. W. Babcock, Physician and Superintendent of the State Hospital for the Insane in Columbia, South Carolina, the realization quickly grew that pellagra had "probably occurred in general practice, and especially in asylums and hospitals, for the last half-century, although the diagnosis may not have always been correctly made."²⁷

The initial reaction of the American medical community to the arrival of pellagra was marked by a frantic search for information.

²³ Sheube. *The Diseases of Warm Countries*, 314-318, 320-321.

²⁴ Etheridge, *Butterfly Caste*, 4. Etheridge cites examples from Flint's *A Treatise on the Principles and Practices of Medicine* (1866-1894), Musser's *A Practical Treatise on Medical Diagnosis* (1904), and Osler's *The Principles and Practice of Medicine* (1892-1909). With the exception of English translations of Scheube's *Diseases of Warm Countries* (1903), I found Etheridge to be correct. Standards such as Vierordt's (translated by Stuart) *Clinical Textbook of Medical Diagnosis* (1892) make no mention; indeed, even later publications such as Cole's 1913 *Mental Diseases*. . . frequently offer only a paragraph or so of information, Cole noting that "occasional examples have been reported in Scotland and in this country."

²⁵ Etheridge, *Butterfly Caste*, 4; Roe, *A Plague of Corn*, 78-79

²⁶ Etheridge, *Butterfly Caste*, 5.

²⁷ Babcock and Cutting, *Prevalence of Pellagra*, 10.

Among the first physicians to grasp the importance of the Alabama outbreak was the aforementioned Dr. J. W. Babcock. Using his personal friendship with South Carolina Senator James W. Tillman as a lever, in 1908 Babcock requested and received a synthesis of European statistics and thinking about the disease in the form of a consular report compiled by W. Bayard Cutting, American vice council in Milan. Babcock attached Cutting's informative report detailing the frightening pervasiveness of pellagra in Italy to his own investigations of pellagra's domestic incidence. In 1910, both documents were published together as the "Prevalence of Pellagra in the United States," first by the *Journal of the South Carolina Medical Association* and several months later as a public document disseminated by order of the United States Senate. Citing initial estimates of 1,000 victims spread over thirteen southern states, with over half the cases lodged in insane asylums, as grossly inaccurate, Babcock produced tables indicating that at least 3,000 sufferers were spread out over thirty-four states and the District of Columbia.²⁸ Moreover, noting that "it is no surprise for us to find, in running down one case, four or five additional cases in the same house," Babcock conservatively posited that the real number was likely 5,000 or more. Equally disconcerting, Cutting's donation to the document noted that the most compelling European scientific contributions to the issue were "insusceptible of direct proof and of direct disproof," and the popular European social critiques were "almost too indefinite to criticize." Cutting asserted the argument in toto as "little more than a criticism."²⁹ If American physicians were hoping for any meaningful input from European expertise, they were sadly mistaken—all they had to go on was European clash and criticism.

More than any other voice, J. W. Babcock drew attention to pellagra in America. Impugning his own practice in *The Prevalence of Pellagra* by declaring that "I know now that I should have made the

²⁸ Babcock and Cutting, *Prevalence of Pellagra*, 10; Niles, *Pellagra: An American Problem*, 27–31.

²⁹ Babcock and Cutting, *Prevalence of Pellagra*, 7–9, 20–21.

diagnosis of pellagra in South Carolina nearly nineteen years ago,” Babcock invited a response to the problem: “Shall we not learn a lesson therefrom and hereafter be on the alert for other so-called tropical diseases?”³⁰ Babcock’s early bravery in vocally arousing concern over pellagra should not be underestimated. As Physician and Superintendent of the State Hospital for the Insane (Columbia, South Carolina), Babcock was the party most responsible for the health and welfare of his patients. Moreover, many powerful voices, such as Josephus Daniels, the editor of the strongly pro-New South *Raleigh News & Observer* (Raleigh, North Carolina), were already expressing anger over the growing national ridicule lately heaped on the South over hookworm; Daniel’s writing that “many of us in the South are getting tired of being exploited by advertisements that exaggerate conditions . . . Let us not canonize Standard Oil Rockefeller by putting laurels on his head because he seeks to buy the appreciation of the people whom he has been robbing for a quarter of a century.”³¹ Obviously, an additional association with a distressing disease of poverty was the last thing anybody wanted. Unfortunately, as the disease spread to affect some 16,000 people in eight Southern states by 1911, the South became popularly derided as “the land of hookworm and pellagra.”³² Although no criticism seems to ever have been leveled at Babcock, or Superintendent Dr. George Zeller, similarly opening the doors of his Peoria State Hospital

³⁰ Babcock and Cutting, *Prevalence of Pellagra*, 10

³¹ William J. Cooper Jr. and Thomas E. Terrill, *The American South: A History, Volume II*, New York (Rowman & Littlefield: 2009) 614. Daniels was quite well connected, becoming Secretary of the Navy under Wilson and Ambassador to Mexico under Franklin Roosevelt. His negative critique of the Rockefeller Sanitary Commission, however, fails to mention that over one million southerners were ultimately examined and 440,000 of them freely treated.

³² William J. Cooper Jr. and Thomas E. Terrill, *The American South: A History Volume II*, 615; Southern fears of this stigma were well founded. The conceptual “Land of Hookworm and Pellagra” outlasted the prevalence of both diseases, regularly being plied against the South at least into the 1950s. A fine example can be found in the song “I Wanna Go Back to Dixie” by Tom Lehrer. Tom. Lehrer, “I Wanna Go Back to Dixie,” *Songs by Tom Lehrer*, 1953.

in Illinois to outside investigators in 1909, doing so clearly imperiled their professional reputations.³³

With several cities and counties having been proven endemic to pellagra, the strongest initial response from the scientific community came from the 1909–1912 Illinois Pellagra Commission, primarily studying at George Zeller’s Peoria asylum.³⁴ Many of the Illinois researchers, such as Drs. W. J. MacNeal, Henry Nichols, and Joseph Siler became synonymous with the pellagra investigations that followed for the next two decades.³⁵ With no information beyond European theories to start them off, the Illinois commission’s avowed initial efforts were set toward disentangling European thoughts on pellagra:

With regard to the etiology of pellagra numerous views have been promulgated and it is well to say that the members of this commission entered on this study without prejudice or preconceived ideas with regard to the nature of the disease or its causation. The plans on which the work has been organized have been aimed toward the consideration of all the manifold theories which have evolved in order, if possible, to

³³Daphne A. Roe, *A Plague of Corn*, 88.

³⁴ *Pellagra in Illinois: Condensed Report of the Illinois Pellagra Commission*, 6–7, 8. It is also noteworthy that the State of Illinois was far better equipped to fund such research than any of the more seriously impacted Southern states.

³⁵ *Pellagra in Illinois: Condensed Report of the Illinois Pellagra Commission*, cover sheet. Interestingly, sitting on the board of the Illinois Pellagra Commission was Dr. Howard T. Ricketts, noted for his discovery of the *Rickettsiaceae* family of bacterium. Not long after, Ricketts died from typhus contracted incidental to his research on that disease. The presence of Dr. Ricketts and other noteworthy pathologists on the ground floor of American pellagra research indicates the seriousness which State governments (and soon after, the Federal) assigned to the disease. A professional relationship with Ricketts may also correlate to W. J. MacNeal’s relentless pursuit of a sanitation related cause to pellagra.

narrow down the lines of research into some more or less definite channel.³⁶

However, on the very same introductory page of their report, the commission discarded nearly the entire Zeist argument, alluding to the failures of Zeist-inspired Italian government programs and paraphrasing the *Simulium* vector theorist Louis Sambon's snide comment that "the Italians have been studying corn rather than pellagra."³⁷ Thus, several of America's top researchers determined at once that a biological agent of some sort was responsible for the disease; a dictum preordained to cause argument. Polarization set in quickly as American pathologists became embroiled in debates, each doggedly pursuing his theory to the near-exclusion of all others. An early example of this unfortunate tenacity took place in the search for an enteric cause of pellagra. Likely inspired by the gastric anomalies symptomatic to pellagra, the most promising early Illinois research centered around Dr. Henry Nichols' search for intestinal diseases. Theorizing protozoan infections as a likely predisposing condition to pellagra, in 1909, Nichols scrutinized and cultured stool samples from 88 pellagrins at Peoria State Hospital against a control group of 101 presumably healthy patients. Although 85.3 per cent of the pellagrous samples proved positive for parasites, so too did 48.6 per cent of the control group. An outside control group of 453 soldiers was added to the test. Neither pellagrous nor open to any exposure peculiar to the Peoria hospital, 51.2 per cent of the soldiers tested similarly to the positive test group. Moreover, the varieties of intestinal flora discovered varied greatly between many of the subjects and too few were found in subsequent blood tests to be a discreet cause.³⁸ Over the next three years, several more exhaustive

³⁶ *Pellagra in Illinois: Condensed Report of the Illinois Pellagra Commission*, 4.

³⁷ *Ibid.*, 4.

³⁸ *Pellagra in Illinois: Condensed Report of the Illinois Pellagra Commission*, 28; Roe, *A Plague of Corn*, 87-88.

examinations ensued at different Illinois institutions. All shared similar results, leading the team to officially conclude in their 1912 report that “in all probability, the majority of these organisms are non-pathogenic.”³⁹ However, Nichols remained unconvinced, maintaining his theory that the harmful effects of the intestinal parasites might offer an infectious conduit for a yet-to-be identified maize-toxin.⁴⁰ By doing so, his theory called into question the commission’s oblique disavowal of the Zeist pellagrozeina theory. Moreover, Nichols left the possibility of enteric causality open and valuable time and resources were subsequently squandered by the recently formed Thompson–McFadden Pellagra Commission.

Formed in 1912, the Thompson–McFadden Pellagra Commission represented the federal government’s first foray into pellagra research, although it was largely funded through the private donations Col. Robert M. Thompson of New York and Mr. J. H. McFadden of Pennsylvania. Both men had been approached to this end by Dr. George M. Miller, president of the New York Post-Graduate Medical School. The contribution of the federal government was represented in the salaries of Dr. Philip E. Garrison of the U. S. Navy and Captain Joseph. F. Siler of the U. S. Army Medical Corps, formerly of the Illinois Pellagra Commission, as was Dr. W. J. MacNeal, representing the New York Post-Graduate Medical School. Henry Nichols was notably absent from the line-up. The commission was formed, in part, to investigate the disconcerting increase of pellagra in the general populations of several southern states. Siler and Garrison were to head up the direct investigations in Spartanburg County, South Carolina, a known pellagra hotspot, while McNeal would handle the biologic and pathologic investigations in New York. Two Department of Agriculture entomologists, A. H. Jennings and W. V. King, already searching for a pellagrous insect vector in South

³⁹ *Pellagra in Illinois: Condensed Report of the Illinois Pellagra Commission*, 30.

⁴⁰ Roe, *A Plague of Corn*, 87–88.

Carolina were also redirected to Spartanburg.⁴¹ Many observations and conclusions from the commission's several annual progress reports are of particular interest, less for what was learned than for the singular logic with which the findings were interpreted.⁴²

The Thompson–McFadden team was charged with two missions: first, to uncover any socioeconomic contributions to the spread of pellagra. Barring any significant findings, they were then to move on to epidemiologic investigation. However, the group discarded any serious socioeconomic studies out of hand, noting in their 1914 Progress Report only that “in the majority of the cases (85 per cent.) economic conditions are poor and the disease is most prevalent among people of insufficient means,” and moving on to loosely connect the observation to poor sanitation.⁴³ This is actually of little surprise, as all three of the principle members were bacteriologists, MacNeal, the group's de facto leader having taken a lecturing position in this study with the New York Post–Graduate Medical School in 1911.⁴⁴ There were some half-hearted attempts made to ascertain whether diet was a significant causal factor presented in the 1915

⁴¹ J. F. Siler, P.E. Garrison and W. J. MacNeal, “Pellagra: A Summary of the First Progress Report of the Thompson–McFadden Pellagra Commission,” In *Pellagra [I]–III. First–Third Report of the Robert M. Thompson Pellagra Commission of New York Post–Graduate Medical School and Hospital*, by New York Post–Graduate Medical School and Hospital, (1914) 3–4.

⁴² The Thompson–McFadden reports were individually published documents disseminated upon each study's completion, generally in the Archives of Internal Medicine (AIM) or in the Journal of the American Medical Association (JAMA). Each completed year from 1914–16, the commission issued an annual compilation of all their work in the form of an Annual Progress Report. This essay makes use of these annual reports rather than the individually published releases, so studies cited to a particular year were actually conducted in the preceding year.

⁴³ Siler, Garrison and MacNeal, “Pellagra: A Summary of the First Progress Report . . .,” 6–7.

⁴⁴ American Society for Microbiology, *The Ward J. MacNeal Papers*, 2012, <http://www.asm.org/asm/index.php/membership/the-ward-j.-macneal-papers.html?title=The+Ward+J.+Macneal+Papers> (accessed 5 may, 2012). MacNeal, a full professor by 1912, went on to perform valuable penicillin research during WWII. Accessed 05/05/2012.

Progress Report, but the food studies were conducted solely by uniform census cards filled out by Spartanburg County pellagrins themselves and built around vague food quality judgments and whether particular foods were eaten daily as opposed to the quantities in which they were eaten. No direct observations of the pellagrins' diets were made by the Thompson–McFadden team members. Moreover, much of the limited information that was gathered was dismissed; grits, for example were disregarded entirely because the poll indicated a local preference for wheat flour. The most telling observation of the food study was a well-documented pellagra corollary. Since 85 per cent of the pellagrins were quite poor, animal protein featured only a meager portion their daily fare.⁴⁵ The dietary study was nonetheless adequate for the Thompson–McFadden Commission to determine that “the supposition that the ingestion of good or spoiled maize is the essential cause of pellagra is not supported by our study”⁴⁶ and to dismiss dietary deficiency altogether as a possible cause.

Confident that such European contentions as maize diets, the mythical *pellagrozeina* toxin, and miserable poverty had been answered to, the Thompson–McFadden Commission moved on to epidemiological inquiry. The major foci of the work centered on the possibilities presented by the deplorable sanitary conditions of many of the mill villages in Spartanburg County. Noting in the 1915 Progress Report that that the twenty-eight villages with the highest rates of pellagra also seemed to have unscreened privies, the

⁴⁵ J. F. Siler, P.E. Garrison and W. J. MacNeal, “A Statistical Study of the Relation of Pellagra to use of Certain Foods and to Location of Domicile in Six Selected Industrial Communities,” In *Pellagra [I]–III. First– Third Report of the Robert M. Thompson Pellagra Commission of New York Post–Graduate Medical School and Hospital*, by New York Post–Graduate Medical School and Hospital (New York: 1915) 15–95, 17

⁴⁶ J. F. Siler, P.E. Garrison and W. J. MacNeal, “Further Studies of the Thompson–McFadden Pellagra Commission: A Summary of the Second Progress Report,” In *Pellagra [I]–III. First– Third Report of the Robert M. Thompson Pellagra Commission of New York Post–Graduate Medical School and Hospital*, by New York Post–Graduate Medical School and Hospital (New York: 1915) 1.

possibilities for bacterial contamination of food or for an insect vector to directly transmit the offending germ seemed likely.

Beginning in June of 1912, the Department of Agriculture entomologists Jennings and King began their studies of possible insect vectors for the Thompson–McFadden Commission. A series of tests and questionnaires were designed to winnow down the list of likely contenders; ticks, lice, bed–bugs, cockroaches, horse–flies, fleas, mosquitoes, buffalo gnats (*Simulium*), house flies and stable flies (*Stomoxys*) were under consideration. The two realized at once that Sambon’s choice of *Simulium* as a likely vector was couched in observations of the prevalence of pellagra among Italian farmers. The majority of the Spartanburg cases, however, were village dwelling mill–hands not likely to be in regular contact with the generally rural *Simulium*.⁴⁷ Jennings and King were able to eliminate many other candidates due either to their high local prevalence or lack thereof. Fleas, for example, were eliminated due to a surprising scarcity among the pellagrins, few of whom could afford to keep livestock, or even dogs.⁴⁸ In a truly masterful exhibition of deductive reasoning, several possible vectors were eliminated because of an etiological peculiarity of pellagra in Spartanburg, where the disease seemed to strike women, mostly housewives married to mill hands, some four times more than their husbands.⁴⁹ Eventually, the two settled on *Stomoxys*, or the stable fly, as the likely culprit. Unlike *Simulium*, *Stomoxys* was not a picky breeder and happily propagated anywhere that feces could be found. Furthermore, the stable fly was a daytime

⁴⁷ Alan H. Jennings and V. W. King, “An Intensive Study of Insects as a Possible Etiologic Factor in Pellagra,” In *Pellagra [I]–III. First– Third Report of the Robert M. Thompson Pellagra Commission of New York Post–Graduate Medical School and Hospital*, by New York Post–Graduate Medical School and Hospital (New York: 1914) 94–100.

⁴⁸ *Ibid.* 91

⁴⁹ J. F. Siler, P.E. Garrison and W. J. MacNeal, “Pellagra: A Summary of the First Progress Report of the Thompson–McFadden Pellagra Commission,” In *Pellagra [I]–III. First– Third Report of the Robert M. Thompson Pellagra Commission of New York Post–Graduate Medical School and Hospital*, by New York Post–Graduate Medical School and Hospital (New York: 1914), 5–6.

feeder known to frequently enter the unscreened windows of homes, often biting the wives of mill hands.⁵⁰ Logically, *Stomoxys* seemed the perfect culprit. However, like the already highly contested *Simulium* vector theory, no amount of blood testing was able to find a protozoa or bacterium common to both host and insect.⁵¹

Easily connected to the *Stomoxys* theory, but also attractive as a stand-alone means of transmission was the general filth associated the aforementioned open privies. Even without the stable fly, enough opportunities for food and water contamination were offered by the squalid sanitary situation to encourage a round of intensive blood and fecal surveys. From his lab at the New York Post-Graduate Medical School and Hospital, MacNeal picked up where his former colleague Nichols left off, performing an additional 2000 agglutination tests and isolating 693 bacterial strains, ultimately concluding that “there was no indication of a substitution of the normal intestinal bacteria by an abnormal invader. The abnormal types were various in nature and in no case dominant in numbers.”⁵² Undaunted by his negative findings, MacNeal summarized the commission’s overall conclusions for 1912 through 1913 by announcing that pellagra, nonetheless, was “in all probability a specific infectious disease communicable from person to person . . . we are inclined to regard intimate association in the household and the contamination of food with the excretions of pellagrins as possible modes of distribution of the disease.”⁵³ These convictions, made in spite of extensive contrary evidence, were in part bolstered by observations made over the previous two years which indicated that the communities with the most primitive means

⁵⁰ Jennings and King, “An Intensive Study,” 100–110.

⁵¹ Roe, *A Plague of Corn*, 87.

⁵² W. J. MacNeal, “Observations on the Intestinal Bacteria in Pellagra,” in *Pellagra [I]–III. First– Third Report of the Robert M. Thompson Pellagra Commission of New York Post-Graduate Medical School and Hospital*, by New York Post-Graduate Medical School and Hospital (New York: 1914).

⁵³ Siler, Garrison and MacNeal, “Further Studies of the Thompson-McFadden,” 1.

of sewage disposal were also those with the highest prevalence of pellagra.⁵⁴

For the 1914 study-year, it was decided that the best means of testing this hypothesis was to install a modern sanitary disposal system in the town of Spartan Mills, “a conspicuous endemic center of pellagra for as long as the disease had been recognized in this region.” The numbers of newly diagnosed cases in Spartan Mills had indeed increased steadily from five in 1909 to thirty in 1913; poor hygienic conditions along with the close contact between the sick and the healthy seemed the obvious cause. In August of 1913, construction began. By May of the following year, the entire town, except for six poorly situated homes, was connected to a modern sewage system. The six non-connected homes were equipped with “fly-proof pail closets” and the town’s older privies were knocked down and carted away. Over the following two years, the incidence of new pellagra cases did indeed decline, from thirty in 1913 to only two in 1916. The team painstakingly interviewed the newly infected parties and in all cases was able to place them in close proximity with previously diagnosed pellagrins, either through familial connections or through visits with nearby friends. For example, Pellagrin 1377, stricken in June, 1916, lived across the street from Pellagrin 1356 who seemed to have contracted the disease from her daughter, an established pellagrin (# 1167) with whom she was previously living. The 1916 numbers suggested that with modern sanitation and a little caution, the disease would soon fade away.⁵⁵

⁵⁴ J. F. Siler, P.E. Garrison and W. J. MacNeal, “The Relation of Methods of Disposal of Sewage to the Spread of Pellagra,” In *Pellagra [I]-III. First- Third Report of the Robert M. Thompson Pellagra Commission of New York Post-Graduate Medical School and Hospital*, by New York Post-Graduate Medical School and Hospital (New York: 1915): 97.

⁵⁵ J. F. Siler, P.E. Garrison and W. J. MacNeal, “The Relation of Methods of Disposal of Sewage to the Spread of Pellagra,” In *Pellagra [I]-III. First- Third Report of the Robert M. Thompson Pellagra Commission of New York Post-Graduate Medical School and*

On the surface, it seems that the Thompson–McFadden Commission thoroughly tackled the pellagra problem and arrived at a reasoned etiological determinacy for pellagra. However, the structure of the theory was entirely framed in preconceived notions and unproven theories. For example, MacNeal, Siler and Garrison, bacteriologists one and all, only noted in a general way that the vast majority of the Spartanburg County pellagrins were very poor and that the food they could afford was limited in nature. Only the frequency of consumption for certain foods was tracked, not the quantities which were consumed. Furthermore, no consideration was given to the varied definitions applicable to the food consumed. For example, to the impoverished pellagrins, “fresh meat” essentially meant pork fat, or at best, bacon. One of the most glaring considerations omitted from the food study was the peculiar prevalence of pellagra among the wives of the mill-hands. The best explanation for this inconsistency is that the wives saved the best and most plentiful portions of the daily repast for their husbands and children, not that they were any more regularly bitten by the ubiquitous swarms of *Stomoxys* at home than their husbands were at work.⁵⁶ But perhaps the commission’s most egregious scientific sin was the use of an unproven human contagion hypothesis to verify the seemingly positive results of their sewage disposal test at Spartan Mills. The continuing, though reduced, incidence of new cases of pellagra was explained by contact with known pellagrins in the area—were pellagra a human contagion, the density of the population in the area would have been adequate to foster its spread alone, regardless of the sanitary upgrades. A far more likely explanation for the decline in

Hospital, by New York Post–Graduate Medical School and Hospital (New York: 1917): 155–166.

⁵⁶ Female mill-hands tended to demonstrate susceptibility roughly equal to that of the men. See J. F. Siler, P.E. Garrison and W. J. MacNeal, “Pellagra: A Summary of the First Progress Report of the Thompson–McFadden Pellagra Commission,” In *Pellagra [I]–III. First– Third Report of the Robert M. Thompson Pellagra Commission of New York Post–Graduate Medical School and Hospital*, by New York Post–Graduate Medical School and Hospital (New York: 1914): 6.

pellagra incidence in Spartan Mills was the year-long economic infusion that the construction project offered to the local denizens. In short, the extra work provided additional earnings, likely spent to supplement their meager daily rations which were no longer being tracked by the commission.

At around the time that the Thompson–McFadden Commission was razing the primitive privies of Spartan Mills, Surgeon General Rupert Blue, responding to requests from several southern Congressmen, commissioned the United States Public Health Service (PHS) to launch their own investigation. Because much of the then-current epidemiological debate was divided between Sambon and Jennings’s vector theories, the assignment was given to Dr. Joseph Goldberger, a relatively unknown PHS officer, likely chosen because his earlier work with yellow fever and *tabardillo* qualified him as an insect vector specialist.⁵⁷ However, Goldberger proved quite different from his colleagues. Likened by Dr. Joann Elmore, co-author of the textbook *Epidemiology, Biostatistics and Preventative Medicine*, as “an American John Snow,” Goldberger entertained no predilections about pellagra at the onset of his studies.⁵⁸ Indeed, Goldberger was a fearless researcher who thrice fell ill from the maladies he studied, contracting and surviving typhus, yellow fever, and dengue fever during his career.⁵⁹

⁵⁷ Roe, *A Plague of Corn*, 99.

⁵⁸ Joann G. Elmore and Alvan R. Feinstein, “Joseph Goldberger: An Unsung Hero of American Clinical Epidemiology,” *The History of Medicine*, (September 1, 1994: 372); *University of Washington Department of Epidemiology* (2008) http://depts.washington.edu/epidem/fac/facBio.shtml?Elmore_Joan (accessed May 6, 2012); Milton Terris, then–Professor of Preventative Medicine at New York Medical College and editor of a compendium of Goldberger’s reports, *Goldberger on Pellagra*, made a similar comment in his introduction. See Joseph Goldberger, *Goldberger on Pellagra*, ed. Milton Terris, (Baton Rouge: Louisiana State University Press; 1964): 5–6.

⁵⁹ Alan M. Kraut, *Goldberger’s War: The Life and Work of A Public Health Crusader*, New York (Hill and Wang: 2003) 7.

Goldberger's first step was to critically analyze nearly two-hundred years of literature, familiarizing himself with everything from the earliest work by Casal to the latest contributions by the Thompson-McFadden Commission. Taking Marzari's early-Zeist dietary critiques at face value, Goldberger considered the contributing role that a maize-only diet might play and studied the latest literature on scurvy and beriberi as well. Finally, Goldberger isolated an often noted, but little considered fact common to much of the literature:

although many inmates develop pellagra after varying periods of institutional residence, some even after 10 to 20 years of institutional life, and therefore it seems permissible to infer, as the result of the operation within the institution of the exciting cause or causes, yet nurses and attendants living under identical conditions appear uniformly immune. If pellagra be a communicable disease, why should there be this exemption of the nurses and attendants?⁶⁰

There was only one clear answer to this question. Pellagra was neither communicable through close contact nor through an insect vector. Upon his earliest visits to various institutions and orphanages in Mississippi, Goldberger was further able to conclude that, since the attendants and inmates took their meals from the same trays in the same cafeterias, the likelihood of the disease resulting from the ingestion of contaminated food was remote. Apprehending that the attendants generally enjoyed first pick of the served dishes and the inmates portions were thus largely reduced to starches, Goldberger "gained the impression that vegetables and cereals form a much greater proportion" of the diets of the poor than "in the dietaries of well-to-do people; that is, people who are not, as a class, subject to pellagra." Pending further study, Goldberger's immediate suggestion

⁶⁰ Joseph Goldberger, "The Etiology of Pellagra. The Significance of Certain Epidemiological Observations with Respect Thereto," *Goldberger on Pellagra*, ed. Milton Terris, Baton Rouge (Louisiana State University Press: 1964): 20.

was an improvement in the diets of the most susceptible Southern populations, in and out of institutions, including “a reduction in cereals, vegetables, and canned foods . . . and an increase in the fresh animal food component, such as fresh meats, eggs, and milk.”⁶¹

Resisting the temptation to singularly follow his dietary theory without first following up on similarly compelling evidence that pellagra might be caused by an infection, Goldberger enlisted the services of C. H. Lavinder, Passed Assistant Surgeon of United States Public Health and Marine–Hospital Service to perform a series of communicability tests on rhesus monkeys. Goldberger described the experiments in his second progress report to the PHS, noting that “although every kind of tissue, secretion, and excretion from a considerable number of grave and fatal cases was obtained and inoculated in every conceivable way into over a hundred rhesus monkeys, the results have so far been negative.”⁶² Having satisfied himself for the moment that pellagra was non–communicable, Goldberger launched his first round of “Human Experiments” in two Mississippi orphanages and at the Georgia State Sanitarium in the summer of 1914.

Understanding that the Mississippi and Georgia institutions were already grossly underfunded (and believing this a likely cause for pellagra therein) and would be unable to participate in the study otherwise, Goldberger secured additional funding from the PHS to defray the costs of additional and higher quality food. Beyond funding the studies, Goldberger also had to overcome concerns that pellagra was communicable, a fear made all the more real by the published suppositions of the Thompson–McFadden Commission. Motivated by these concerns, many institutions isolated pellagrins in

⁶¹ Ibid, 21–22.

⁶² Joseph Goldberger, “The Cause and Prevention of Pellagra,” *Goldberger on Pellagra*, ed. Milton Terris, Baton Rouge (Louisiana State University Press: 1964): 24. Lavinder, though not a big part of this essay, was a major contributor to pellagra research throughout the entirety of its prevalent years in America

locked cells or quarantine wings. Thus, the three test sites were chosen based on their willingness to follow Goldberger's protocols for the proper management of pellagrins and secondly for their established histories as endemic centers for the disease. Two wards of the sanitarium patients and all of the children in the orphanages enjoyed better rations; oatmeal "replaced grits as the breakfast cereal and the allowances of fresh animal protein foods (milk, meat and, at the orphanage, eggs) and legumes was greatly increased. The allowance for maize was thus reduced but not abolished." By October of 1915, toward the end of the first year of the study, out of 172 orphans affected, only one retained any pellagrous symptoms. None of the 72 pellagrins tested at the Georgia State Sanitarium showed any signs of the disease at all. Conversely, almost half of the sanitarium's pellagrin control group continued suffering recurrent attacks from the disease.⁶³

Having demonstrated that a diet enriched with animal foods and generally reduced in carbohydrates seemed to cure pellagra, half of Goldberger's deficiency hypothesis seemed proven. Notably, Goldberger had also proven that maize alone was not culpable as a cause of pellagra. In order to complete his deficiency hypothesis, however, he would have to prove that a poor, excessively starchy diet actually caused the disease. Finding a group of people desperate enough to try out an experimental cure is one thing; finding a group of healthy people willing to be sickened is quite another. Goldberger's answer to this dilemma was found at Rankin Farm, one of the many gang-labor colonies operated by the Mississippi State Penitentiary System. Beginning in April of 1915, twelve participants underwent a rigorously monitored dietary experiment in exchange for pardons to be granted them by Mississippi's Governor Earl Brewer

⁶³ Joseph Goldberger, "Pellagra Prevention by Diet Amongst Institutional Inmates," *Goldberger on Pellagra*, ed. Milton Terris, (Baton Rouge: Louisiana State University Press: 1964): 45,46,47, 48-53.

(1912–1916).⁶⁴ The Pellagra Squad members, as they came to be known, were not starved but to the contrary, were well fed by all appearances. A typical meal, served three times daily, included “fried mush, biscuits, rice, gravy, sirup [sic], coffee, sugar,” or any number of other variations including sweet potatoes, grits, and gravy thickened with cornmeal.⁶⁵ The major difference between the control population diet and that of the Pellagra Squad essentially came down to a complete lack of “animal protein” in the latter.⁶⁶ By the end of October, six of the volunteers had contracted pellagra, as verified by two outside physicians. The control group, as well as the *general population of Rankin Farm, remained healthy.*⁶⁷

Anxious to inform the public about the dietary cure for pellagra, Goldberger and the PHS contacted news outlets nationwide prior even to the causal experiments at Rankin Farms. This was not a spontaneous act on the part of the PHS, but rather, a reaction to a growing national fear of the disease for which the organization believed it had a cure. Goldberger’s “cure” was published often within weeks or months of such articles as a December, 1912 *New York Times* piece putting national prevalence in excess of 50,000 victims; or another, published in October of 1915 bleakly noting Surgeon General Rupert Blue’s estimation of 100,000 victims across the nation.⁶⁸ The media reception was indeed warm. Papers across the nation judged Goldberger’s triumph “epochal.” The Biloxi *Daily Herald* and others circulated interviews with the celebrity scientist: “It is all so simple,” said Dr. Goldberger, “that many people refuse to believe in our theory . . . I have been flooded by letters from every

⁶⁴ Jon M. Harkness, “Prisoners and Pellagra,” *Public Health Reports*, vol. 111, no. 5 (Sep.–Oct.: 1996): 463.

⁶⁵ Joseph Goldberger, “The Experimental Production of Pellagra in Human Subjects by Means of Diet,” *Goldberger on Pellagra*, ed. Milton Terris, (Baton Rouge: Louisiana State University Press: 1964): 45, 46, 47.

⁶⁶ *Ibid*, 65, 69.

⁶⁷ *Ibid*, 72–73.

⁶⁸ *The New York Times*, “100,000 Cases of Pellagra,” (October 10, 1915); *The New York Times*, “Put Cases in South at 50, 000,” (December 3, 1912).

part of the South asking my advice as to what prescriptions to offer . . . I reply that it is a question of a balanced and proper diet. Now that all seems so simple some people want to laugh.”⁶⁹

But others in the scientific community were not laughing, especially W. J. MacNeal of the Thompson–McFadden Pellagra Commission. Part of this resistance is understandable, even if it seems petty. These were among the best and brightest medical researchers in the world; if it were *all so simple*, they would have produced the same results in the same short amount of time. The first salvos from the Thompson–McFadden contingent came swiftly, MacNeal publicly accusing Goldberger of falsifying the results of the Rankin Farm experiment during a meeting at Bellevue Medical School, *Goldberger’s alma mater!*⁷⁰ Writing to the *Journal of the American Medical Association* (JAMA) a year later, MacNeal challenged the accuracy of the Rankin Farm diagnoses as well as the reliability of Goldberger’s outside medical verification. To the JAMA readership, MacNeal warned that “the claim that pellagra had been produced by a restricted diet should be regarded with suspicion and it would be well for those who have not yet acquired knowledge of this disease by personal observation or by a somewhat comprehensive study of its literature to retain an open mind concerning the essential factors of its causation.”⁷¹ Goldberger shot back that due to “the tone and personal character of MacNeal’s criticism we have not felt that it required any special notice, preferring to let the record of our work

⁶⁹ *The Daily Herald*, “Diet Cure of Pellagra Epochal, Is Opinion of Government Physician,” *America’s Historical Newspaper*, (September 9, 1914), <http://infoweb.newsbank.com/iw-search/we/HistArchive> .Accessed April 2, 2012.

⁷⁰ *A Plague of Corn*, 108. Roe cites this event to M. F. Goldberger, “Dr. Josef Goldberger: His Wife’s Recollections,” *Journal of the American Dietetic Association* 32 (1956): 724–727. I was unable to obtain a copy of this article for personal review.

⁷¹ W. J. MacNeal, “Correspondence,” *The Journal of the American Medical Association* 66, no. 13 (1916): 976–977.

speak for itself.”⁷² With no middle ground between the camps, the ongoing European Zeist/anti-Zeist conflict fully emerged in the American medical community.

The flames of the dispute, unfortunately, were fanned by certain questions left unanswered by Goldberger’s theory. The most obvious of these detractions was that if pellagra was entirely the result of an impoverished diet, it seemed that nearly every sharecropper, tenant farmer, and urban laborer in the nation should have had the disease. Obviously, this was not the case. Instead, it was often pointed out, pellagra tended to arise among specific communities or in other limited geographic areas. Clearly, pellagra resulted not from indigence, but from infection. Goldberger’s rigid association of pellagra with poverty was further undercut by story after story of well-heeled pellagrins. Typifying such stories are those of Dr. Toulmin Gaines of Mobile Alabama. Speaking out at the 1927 annual meeting of the Southern Medical Association, Gaines described that “a lady in the best of circumstances and with proper diet lived next to an infirmary and was visited by one of the inmates who had pellagra. This lady developed an uncontrovertible case of pellagra.” Gaines continued, telling the tale of a girl “from one of the best families in town” who was wont to associate with pellagrins, contracted the disease and died.⁷³ Naturally, the long-standing customs of doctor/patient confidentiality prevented such concerned medical men from proffering specific details! To the remarks of Gaines and others at the same meeting, Goldberger wearily replied,

⁷² Joseph Goldberger, “The Experimental Production of Pellagra in Human Subjects by Means of Diet,” In *Goldberger on Pellagra*, ed. Milton Terris, (Baton Rouge: Louisiana State University Press: 1964): 73.

⁷³ C. W. Garrison, “Economic Aspects of Pellagra,” *Southern Medical Journal*, vol. 21, no. 3 (March 1928): 239. The argument of the ‘well-heeled pellagrin’ was very successfully bandied about well into the 1930s. The Funk & Wagnalls New Standard Encyclopedia for 1931 observing that, “The theory of a deficient diet as responsible for this disease has been partly exploded by the discovery that, in California and Louisiana, prosperous and well-nourished people had developed pellagra . . .” Funk & Wagnalls, 458.

“What I have to say about pellagra I have already said, and it is in print. I would really appreciate it as a high compliment if some of you people who apparently differ from me would read what I have printed.

...

Sometime ago, (probably two or three years ago) Dr. Justine, of Boston, in a paper appearing in one of the journals reported on a very interesting case. He reported that somewhere in Massachusetts there was a house in which a family at one time lived and a member of the family developed diabetes. That family moved from that house; another family came and occupied it again. A case developed in this household. Another family, and again diabetes developed in this third family. I cannot recall how many generations of tenants moved in and out of this house, and each time at least one case of diabetes developed. This is exceedingly excellent evidence that diabetes is a highly communicable disease.⁷⁴

Such mudslinging was by no means unusual; particularly as the majority of the public health forums regarding pellagra tended to take place where the disease posed the greatest problems—in the South. This regional importance also encouraged continuing resistance. Acutely aware of the Southern reputation as the “land of hookworm and pellagra,” many Southern physicians adamantly refused admission that the malady correlated with poverty. To do so was tantamount to an admission of Southern backwardness. MacNeal used such provincialism to his advantage, commenting at a 1922 symposium of the Southern Medical Association that Goldberger’s “proposition has come from a source [the PHS] such as to give it wide

⁷⁴ Garrison, “Economic Aspects of Pellagra:” 239–240.

currency in the Northern portion of our country, where the physicians are generally less familiar with pellagra.”⁷⁵ Exactly how his own status as a full professor and lecturer at the New York Post-Graduate Medical School failed in offering MacNeal a similar measure of influence among Northern physicians is left for us to ponder.

The schismatic debate of Goldberger and MacNeal aside, the lion's share of the American failure in dealing with pellagra lay in government inaction. Whether one espoused the theory that pellagra was a dietary deficiency disease of impoverished people, or an enteric disease caused by primitive public sanitation measures was immaterial. The actual issue was poverty and the unwillingness or inability of any organization of governance, be it local, state, or federal, to act on the problem. To be sure, various government agencies defended their inaction by using the apparent lack of certainty posed by the ongoing scientific argument. Typifying such schismatically induced government inertia, in 1921 President Warren G. Harding responded to a request from South Carolina Representative James F. Byrnes for federal support in dealing with the growing pellagra epidemic. Harding responded to the request in a letter dated July 28, 1921 and published in the *New York Times* two days afterward:

While assuring you that I speak the views of our people in expressing gratitude to you for the generous spirit that prompted you to make this appeal for aid, I am confident in South Carolina there exists at this time no necessity for any greater cooperation on the part of the Public Health Service than is rendered at all times. And as the existence in South Carolina at this time of either a plague or a famine is an utter absurdity, there is no necessity for the Red Cross furnishing aid. Should the State ever be unfortunate enough to suffer a disaster

⁷⁵ W. J. MacNeal, "The Infectious Theory of Pellagra," *Sothorn Medical Journal* 15, no. 11 (November 1922): 899.

with which the people of the State cannot cope, we will gladly welcome aid and ask for it, but I think it would be unfortunate if the Red Cross is called upon to relieve a plague and a famine of which the people in South Carolina are unaware.

Harding went on to suggest a full investigation of the problem, warning that "if these reports have misrepresented conditions in any part of the South . . . a full and official refutation of them would be highly desirable."⁷⁶

Tragic in its absence, government follow-through on either Goldberger's or MacNeal's theories would have been of enormous public benefit. Any sizeable public sanitation effort in the South would unquestionably have saved a magnitude of victims from the ravages of hepatitis A and E, typhus, Legionellosis, and dysentery, to name but a few diseases. With our present understanding of its veracity, the benefits of acting upon Goldberger's theory would have been self-evident. Instead, pellagra's decline in America had almost nothing to do with direct government or scientific action. Ironically, the beginning of the end for pellagra was ushered in by the collapse of the Southern cotton economy during the Great Depression. The economic disaster forced many tenant farmers and sharecroppers off of their land and into urban areas. Many of those who stayed on the land were relieved of cotton-only planting requirements and their resulting crop debts, creating room for livestock and gardens. More and better nutrition opportunities arose for both of these beleaguered groups even as their actual earnings plummeted. This especially became the case in the 1930s as New Deal labor programs such as the Civil Works Administration (CWA) and its sundry offspring provided earnings for millions of displaced American laborers. Tax dollars flowed into CWA sponsored public works and sanitary programs nationwide. MacNeal, no doubt, was beside himself.

⁷⁶ *The New York Times*, "Harding Favors Pellagra Inquiry," (July 30, 1921).

Finally, the mass population movements associated with the Second World War shut the door on pellagra completely. In the meantime, another New Deal bill, the Food, Drug, and Cosmetic Act of 1938 empowered the United States Food and Drug Administration (FDA) to create standards of identity for the fortification of flour with a range of only recently understood nutritional components—vitamins. Based on recommendations provided by the FDA, in 1943 the War Food Administration promulgated Food Order Number 1, standardizing and requiring flour fortification with niacin, thiamin and riboflavin (the major B vitamins) and iron. ‘Enriched flour’ was officially born. Following the war, most states passed laws requiring maintenance of these expired wartime standards.⁷⁷ It became quite difficult for Americans to *not* get their daily dose of pellagra-preventing niacin! Goldberger, dead since January of 1929, no doubt would have nodded in approval.

In the end, it took the greatest economic disaster in modern history and the largest military conflict in human history to compel the United States government to act on the conflicting theories of Goldberger and MacNeal. Perhaps the only triumphs to be found in this story of scientific deadlock are that, right or wrong, both propositions were disseminated with the purest of intentions for the least represented of social classes. Furthermore, in spite of their egos and emphases, both the theorists and their theories demanded of an apathetic government a more active role in vouchsafing the health and welfare of all citizens—a role which the federal government eventually embraced, guided in part by the controversial ideals of Joseph Goldberger and William J. MacNeal.

⁷⁷ The Historical Evolution of Thought Regarding Multiple Micronutrient Nutrition, 147.