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CATTLE DIP AND SHARK LIVER OIL IN A TECHNO-CHEMICAL COLONIAL STATE: THE POISONING AT MALANGALI SCHOOL, TANGANYIKA, 1934*

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Abstract

In October 1934, a group of schoolgirls at Malangali School in Iringa Province, Tanganyika received doses of what the school headmistress thought was shark liver oil. Many girls began to spit and vomit the medicine, while others attempted to leave the school grounds to return home. Within three hours, several pupils had died and within three days, another 32 girls succumbed to the toxic draught. This article examines this little known and poorly understood tragedy through the lens of the scientific and social experimentation that occurred at Malangali School. As one of two government- run schools that enrolled girls, Malangali provided the colonial state with an opportunity to conduct a variety of experiments upon a captive audience. This article argues that the 'discovery of colonial malnutrition' in the interwar period not only depoliticized hunger but its emphasis on techno-chemical approaches to social and material problems led to tragedy.

Key Words

Tanzania, East Africa, medicine, nutrition, education, health, development, colonial policy.

[At] about 12:30 pm [on 25 October 1934], the girls (and 1 or 2 small boys that were in the girls' school) were lined up inside the school compound. On Mrs Wallington's instructions the 'Compound Mother' (a native woman who helps to look after the children) gave the supposed Shark Oil to the children in tea-spoonful doses.

One by one they showed signs of nausea and most went out through the doorway of the compound. The nausea caused no surprise at first and the administration of the stuff was continued until altogether about 57 children received a dose.

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> The behavior of the children soon aroused suspicion and Mrs Wallington who was in the vicinity all the time concluded that there was something seriously wrong with the 'oil' and took a dose herself to be on par with the children. She then immediately set about to attend to those who were sick, but she had to give up eventually. After a rest she tried to help again but eventually collapsed.[1]

Dr George Maclean's report was the first accounting of a dramatic poisoning that eventually took the lives of 37 children, between the ages of 3 and 12, at the government-run Malangali School, in Iringa District, Tanganyika. Instead of shark liver oil, the children received a toxic draught of arsenic-based cattle dip.[2] Today, there is little historical memory of the poisoning other than a plaque on the wall of Malangali Secondary School that acknowledges their passing.[3]

The poisoning at Malangali School exposed the problematic consequences of the experimental nature of colonial rule, what some officials came to regard as a 'laboratory' suitable for scientific inquiry during the interwar years.[4] From 1927 to 1935, colonial officials used the Iringa District as the site for multiple, loosely-framed experiments in social, economic, and agricultural development.[5] There was considerable crossover with anthropological studies, conducted by colonial authorities and academic anthropologists with the goal that such knowledge could 'be applied to the problems of native administration' to improve efficiency.[6] The emergence of nutritional science during the late nineteenth century eventually led to the 'discovery of malnutrition' during the interwar period, depoliticizing hunger in the empire and encouraging technical remedies.[7] To understand how efforts to allay

1 Tanzania National Archives, Dar es Salaam (TNA), G. Maclean, Sleeping Sickness Officer, Report on Sickness and Deaths from Poisoning at Malangali School, 29 Oct. 1934.

2 British National Archives at Kew (BNA) CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

3 Communication with M. Walsh, 26 Apr. 2016 and M. Benjamin, 28 Apr. 2016. Alison Redmayne reported that her informants claimed the poisoning involved only Bena girls 'and this ghastly tragedy is not remembered by many Wahehe today nor given specifically as a reason for not sending children to school'. A. H. Redmayne, 'The Wahehe People of Tanganyika' (unpublished PhD thesis, Nuffield College, Oxford, 1964), 282. There is one further account, in the memoir of a former teacher at Malangali School, who taught there in 1938; E. A. M. Mang'enya, *Discipline and Tears: Reminiscences of an African Civil Servant on Colonial Tanganyika* (Dar es Salaam, 1984), 68–72.

4 M. Graboyes, *The Experiment Must Continue: Medical Research and Ethics in East Africa, 1940–2014* (Athens, OH, 2015); H. Tilley, *Africa as a Living Laboratory: Empire, Development and the Problem of Scientific Knowledge, 1870–1950* (Chicago, 2011).

5 C. W. Hobley, 'Soil erosion: a problem in human geography', *The Geographical Journal*, 82:2 (1933), 139–46; Editorial Notes, *Journal of the Royal African Society*, 30:121 (1931), 415–32; W. B. Mumford, 'The Hehe-Bena-Sangu peoples of East Africa', *American Anthropologist*, 36:2 (1934), 203–22; W. B. Mumford, 'East Africa: some problems in Native economic development and a possible solution in cooperative societies', *Africa: Journal of the International African Institute*, 6:1 (1933), 27–37; W. B. Mumford, 'Education and the social adjustment of the primitive peoples of Africa to European culture', *Africa: Journal of the International African Institute*, 2:2 (1929), 138–61.

6 G. G. Brown and A. McD. B. Hutt, *Anthropology in Action: An Experiment in the Iringa District of the Iringa Province, Tanganyika Territory* (London, 1935), 1. Another was A. T. Culwick, also a district officer, and his wife, G. M. (Shepard) Culwick, who studied Bena diet and demography. See V. Berry (ed.), *The Culwick Papers, 1934–1944: Population, Food, and Health in Colonial Tanganyika (now Tanzania)* (London, 1994).

7 M. Worboys, 'The discovery of colonial malnutrition between the wars', in D. Arnold (ed.), *Imperial Medicine and Indigenous Societies* (Manchester, 1989), 209. For medical and legal constructions of hunger from the nineteenth to the twentieth century, see J. Vernon, *Hunger, A Modern History* (Cambridge, MA, 2007). The interwar period benefited from veterinary and human-subject experiments conducted from 1911–17.

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hunger and malnutrition led to tragedy, this article examines why colonial officials embraced a scientific culture that emphasized chemical interventions above other approaches. Moreover, I analyze the Malangali School poisoning to argue that development in this period was constructed around quick remedies to agricultural famine, livestock disease, and human malnutrition through the newly developed techno-chemicals that officials believed were the answer to the complex social and environmental problems associated with colonial rule. The chemicals in use included both the cattle dip for better livestock health and shark liver oil for improved human welfare, the latter an experimental substance of questionable nutritive value.

The interwar years were critical ones for the rise of medical and technological experts, who worked to devise numerous campaigns to measure and improve human productivity; nutritional science with its focus on quantifying diets suggested itself as a natural companion, within a technocratic system, to a notion of progress based upon tangible measurements.[8] Malangali School fit into the larger research aims of nutritional science with its plans to bring about social and economic change for its students by improving their diet and exposing them to new practices meant to alleviate what officials perceived as a poorly constituted diet.[9] The attempted nutritional intervention at Malangali School was part of a larger, territory-wide effort to improve health in Tanganyika from 1930–4 by adding shark liver oil to peoples' diets.[10] The Report of the Colonial Development Public Health Committee promoted

> the health of the people as a primary factor in the economic development of a territory … Indifferent health, whether from disease of malnutrition, reduces the capacity for work [and] … The value of other forms of expenditures, e.g., on education, is largely dependent on the standard of health.[11]

Although poorly conceptualized, the supplement program was an early attempt to put into action the knowledge gleaned by John Boyd Orr and John Gilks during the 1920s, but preceded the larger, Nyasaland (Malawi) Nutrition Survey of 1938–9.[12] Moreover, Tanganyika was the site of two small-scale nutrition studies during the 1930s, followed

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See R. Smith, 'The emergence of vitamins as bio-political objects during World War I', *Studies in History and Philosophy of Biological and Biomedical Sciences*, 40 (2009), 179–89.

8 J. M. Hodge, *Triumph of the Expert, Agrarian Doctrines of Development and the Legacies of British Colonialism* (Athens, OH, 2007), 118–25, 166–78; H. Moore and M. Vaughan, *Cutting Down Trees: Gender, Nutrition, and Agricultural Change in the Northern Province of Zambia, 1890–1990* (Portsmouth, NH, 1994), 20–1, 46; T. Mitchell, *Rule of Experts: Egypt, Techno-Politics, Modernity* (Berkeley, 2002), 15, 81.

9 Mumford, W. B. Mumford, 'Malangali School', *Africa: Journal of the International African Institute,* 3:3 (1930), 281.

10 TNA 19343, letter from J. O. Shircore, Director of Medical and Sanitary Services to Chief Secretary, Dar es Salaam, 22 July 1930; TNA 22511, letter from H. MacMichael, Governor of Tanganyika to Secretary of State, London, 30 Oct. 1934.

11 TNA 19310, Misc. No. 413, Report of the Colonial Development Public Health Committee', July 1930.

12 C. Brantley, 'Kikuyu-Maasai nutrition and colonials science: the Orr and Gilks Study in late 1920s Kenya revisited', *The International Journal of African Historical Studies*, 30:1 (1997), 49–86; C. Brantley, *Feeding Families: African Realities and British Ideas of Nutrition and Development in Early Colonial Africa* (Portsmouth, NH, 2002); Worboys, 'The discovery of colonial malnutrition', 210.

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by a third after the Second World War.[13] The decision to use shark liver oil in Tanganyika stands out as something of an anomaly, given the limited investment for the time in medical services for Britain's African subjects. But in a territory where Britain held a mandate to develop the people under the pretext of external oversight by the League of Nations, British colonial officials regarded science, with its techno-chemical remedies, as the most rational means to overcome environmental and cultural challenges.[14]

Located in the Iringa District, Malangali is a town approximately 600 km southwest of Dar es Salaam, in the southern highlands. According to the 1931 census, approximately 86,795 Hehe and Bena peoples inhabited a district of 12,000 square miles.[15] The Sangu people lived in the adjacent Mbeya District and numbered approximately 15,913 in 1931.[16] Most inhabitants farmed maize or millet, with rice cultivation occurring in lowlands and river valleys. Livestock was also prized, with approximately 120,000 heads of cattle along with herds of goats and sheep. In addition to Hehe and Bena farmers, there were 376 Europeans who had farms, along with 315 South Asians engaged in trade.[17] The Southern Province had relative food security as the one region to 'have escaped famine' from 1927–37.[18] The Hehe were the dominant community, both politically and demographically since 1875, and resisted the imposition of European rule across generations, with the last paramount chief, Mkwawa, 'killed by his own hand' to avoid capture by the Germans in 1898.[19] Less than a decade later, the Hehe, Bena, Ngoni, and other communities of southern Tanganyika were engulfed in the Maji Maji Wars from 1905–7.[20]

During the Great War both British and German armies conscripted villagers to carry large loads, and villagers were frequently harassed and endured crop destruction and other privations as the armies fought or marched through their territories. According to historian James Giblin's account, battlegrounds and piles of skulls framed journeys and the landscape in the same ways that family stories explained the lost kin. This terrible

13 TNA 25540, Summary of Action Taken on Nutrition Report, 6 Jan. 1938; TNA 19/50, Hilary Dewey, Nutrition Officer, Nutrition Report, Makonde Plateau, 15 Oct. 1949.

14 TNA 15/35, R.D. Lawton, District Agricultural Officer, District Tour Report, 7 Mar. 1931. Walter Bruchhausen cites the 1925 *Report of the East Africa Commission* as the impetus behind the shift toward the 'health problems of the African population – for humanitarian as well as economic reasons'. W. Bruchhausen, 'From precondition to goal of development: health and medicine in the planning and politics of British Tanganyika', in J.M. Hodge, G. Hödl, and M. Kopf (eds.), *Developing Africa: Concepts and Practices in Twentieth-Century Colonialism* (Manchester, 2014), 209.

15 *Census of the Native Population of Tanganyika Territory, 1931* (Dar es Salaam, 1932), 12.

16 *Census, 1931*, 25.

17 Brown and Hutt, *Anthropology*, 5–6.

18 TNA 19/50, A.E. Kitching, Provincial Commisssioner, 'Human Nutrition in Tanganyika', Lindi, 30 Jan. 1937.

19 J.L. Giblin, *A History of the Excluded: Making Family a Refuge from State in Twentieth-Century Tanzania* (Athens, OH, 2005), 24, 29; Brown and Hutt, *Anthropology*, 5.

20 The complexities around Maji Maji indicate that more than one type of war occurred south of the Rufiji River, pointing toward multiple conflicts between communities in addition to resistance against colonial rule. See Giblin, *A History of the Excluded*, 28–34; J. Monson, 'Relocating Maji Maji: the politics of alliance and authority in the southern highlands of Tanzania, 1870–1918', *The Journal of African History*, 39:1 (1998), 95–120; and J. Giblin and J. Monson (eds.), *Maji Maji: Lifting the Fog of War* (Leiden, 2010).

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violence of conquest, global war, and brutality formed the historical memory of the communities surrounding Malangali School.[21]

Malangali was the intersection of wider scientific research into vitamins, the application of chemical remedies for human and veterinary health, and schools as venues for social experimentation. Colonial officials had only a nascent understanding of Africa's complex disease environments and problems associated with malnutrition, and their emphasis on single remedies ('silver bullets'), can only be described in quasi-religious terms.[22] During the Great War, British scientists became convinced that vitamins were a means to overcome wartime food shortages and community health problems. The limitations of knowledge and lack of agreement about the value of vitamins did not stop some from lauding the potential benefits of these inchoate discoveries. Scientists had yet to isolate specific vitamins, but they 'became increasingly *real*' as 'objects with the power to manifest unknown futures'.[23] As a new field of inquiry, nutritional science approached nutritional disease through a growing emphasis on vitamins, but much like the germ theory of disease, these were microscopic objects that escaped quick isolation and description.[24] As an emergent science, those who studied vitamins hoped to explain problems with human health despite the complex and unpredictable outcomes of their subject. The mysterious molecular structures of nutrients required painstaking care to discern and eluded quick answers, yet the desire to see change occur led to predictions and grand claims about the potential benefits of supplements.

The elusive quality of nutrients and how they contribute to human health took decades to unravel, but medical personnel and colonial officials wanted to believe that cheap and simple remedies existed. Nutrients became a 'bio-political' tool with important social implications for reducing the effects of food scarcity in England.[25] Meanwhile, colonial officials used nutritional science to depoliticize hunger and poor health in the empire, by relegating these problems to applied science, medicine, and technological experts.[26] Officials wanted affordable remedies to hunger and its concomitant maladies, without disrupting imperial processes tied to labor migration, cash crops, and tax collection. They chose shark liver oil over cod liver oil because it was cheaper to acquire at six shillings, nine pence per gallon compared to nine shillings per gallon, respectively.[27] The cost for the shark liver oil was to be debited to the Native Administration treasury.[28] Consistent with this practice, improvements to diets for African labor were generally passed through

21 One of Giblin's informants was among the first class of students to attend Malangali School and recounted how he saw piles of skulls on his journeys to and from Malangali School in 1928. See Giblin, *A History of the Excluded*, 35.

22 Warwick Anderson refers to this type of obsession with a single remedy as 'magical thinking', see W. Anderson, *Colonial Pathologies: American Tropical Medicine, Race, and Hygiene in the Philippines* (Raleigh, NC, 2006), 5.

23 Smith, 'The emergence of vitamins', 180 (emphasis added).

24 *Ibid.* 180, 185–7.

25 *Ibid.* 180–1, 187.

26 TNA 19343, '*Mafuta ya Afya*' [Oil of Health], 15 Oct. 1930.

27 They offered a four-pence discount for cod liver oil and seven-pence reduction for shark liver oil orders in bulk. See TNA MOH 450/75/3, letter from Burgoyne, Burbidges and Co., London, to Director of Medical Services, Dar es Salaam, 23 July 1930.

28 TNA MOH 450/75/3, letter from Howse and McGeorge, to Director of Medical and Sanitary Services, Dar es Salaam, 8 May 1931.

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to the industry that relied upon the workers. For example, a fragmented report indicates that a preliminary study conducted in Tanganyika led the government to seek ways 'of making more meat available for [sisal] estate labor' and 'to lay down minimum scales of rations and, by proper inspection and supervision to ensure that the changes of dietary habits which are introduced shall be in the right direction'.[29] By the Second World War, the government required sisal plantations to tender food rations to workers' families, extending the responsibility of the state in regulating industry and effectively incorporating the household as a labor unit on sisal plantations.[30]

Like the sisal plantation dietary guidelines, the nutrition schemes of the era sought to engage in social engineering. The most powerful sites for altering communal practice and the transfer of new ideas were at missionary and government-run schools. The Malangali School, founded by the government in 1928, presented an opportunity for the colonial state to alter African social and agricultural practices in tandem. Moreover, the school employed a broadly understood British 'adapted education' approach that emphasized skills that officials deemed appropriate to 'local development'.[31] While education eventually became an avenue for greater female autonomy and claims to 'respectability' in British Africa, education during the early twentieth century focused on girls' moral education under missionary tutelage.[32] In contrast, Mumford's views on education aligned with the objectives and findings of the Phelps-Stokes Commissions of 1922 and 1924, which sought to bring a particular skills-oriented education that was used to educate 'rural black communities in the Southern [United] States' through the education model established at Hampton and Tuskegee.[33] This model did not provide a complex curriculum comparable to the English academic system, but along what Mumford claimed were 'lines suited to the needs of rural Africa ... [to train] African boys as farmers and African girls to be wives and mothers'.[34] The method aimed to educate the male and female youths of

29 TNA 25540, Summary of Action Taken on Nutrition Report, 6 Jan. 1938.

30 TNA 13/54, 'Employment of women and young persons', Ordinance No. 5 of 1940; Bruchhausen, 'Health and medicine', 213; and for general rationing practices from 1945–7: see TNA 13/67, letter from Tanganyika Sisal Grower's Association, Lindi to Labor Commissioner, Dar es Salaam, 9 May 1947.

31 P. Kallaway, 'Welfare and education in British colonial Africa and South Africa during the 1930s and 1940s', *Paedagogica Historica: International Journal of the History of Education*, 41:3 (2005), 343.

32 The Arab Girls' School in Zanzibar, according to one visitor, was the 'most important educational experiment going on in the island'. See R. Smith, 'Education in British Africa', *Journal of the Royal African Society*, 31:122 (1932), 70. The concept of 'respectability' came to inform the value and eventual outcomes of a colonial education for both men and women. Eventually, respectability created openings for a level of women's autonomy that presaged '*maendeleo ya wanawake*' (women's progress/development) in 1950s Kenya. See C. Decker, *Mobilizing Zanzibari Women: The Struggle for Respectability and Self-Reliance in Colonial East Africa* (New York, 2014), 1, 3, and 21; C. Summers, *Colonial Lessons: Africans' Education in Southern Rhodesia, 1918–1940* (Portsmouth, NH, 2002), xix, 19; C. Summers, '"If you can educate the native woman...": debates over the schooling and education of girls and women in Southern Rhodesia, 1900–1934', *History of Education Quarterly*, 36:4 (1996), 449–71; and A. Wipper, 'The Maendeleo ya Wanawake organization: the co-optation of leadership', *African Studies Review*, 18:3 (1975), 99.

33 Quote from, U. Bude, 'The adaptation concept in British colonial education', *Comparative Education*, 19:3 (1983), 341, 345; Mumford, 'Education and the social adjustment of the primitive peoples', 141.

34 W. B. Mumford, 'Education in British African dependencies: a review of the 1935 annual reports on native education in Nyasaland, N. Rhodesia, Tanganyika, Uganda, Gold Coast, Nigeria, and Sierra Leone', *Journal of the Royal African Societies*, 36:142 (1937), 28.

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Bena, Hehe, and Sangu peoples, in a region undergoing rapid material changes.[35] In this way, schools were experimental sites for the transfer of new ideas and practices, but also ethnographic study.[36]

EDUCATION

Malangali School was one of two government-run schools in Tanganyika with girls during the interwar period.[37] The first school, located in Tabora, north of Malangali, was based on the English 'Public School' model and was 'specially designed for sons of chiefs'. Once these elite pupils completed their education, there were not sufficient youths to take their place, and the school made the transition to one that prepared the territory's most promising students for further education at secondary schools in Uganda.[38] Mumford designed Malangali School along what he perceived to be educational practices most similar to 'Bantu society. The school de-emphasized the 3 Rs', while promoting crafts and spear throwing.[39] Mumford claimed that the school would synthesize 'tribal tradition' with carefully selected 'suitable elements of European culture so as to produce a healthy evolution of native culture'.[40] He selected the Bena, Hehe, and Sangu based upon six criteria: 'union in warfare, political unity, endogamy, common language, extreme similarity in customs, and territorial continuity', though he placed the most emphasis on shared culture and common linguistic origins.[41] Although Malangali School was intended to incorporate all three ethnicities, demographic information on the students was not recorded in the files. However, few Sangu children attended the school because the Sangu leadership mistrusted Mumford.[42] Before opening the school, Mumford sent two of the school's 'native teachers' on a several months-long ethnographic study of Bena, Hehe, and Sangu child-rearing and socialization practices.[43]

35 Mumford, 'Malangali School', 280; Brown and Hutt, *Anthropology*, 216.

36 Peter Kallaway notes the lack of cross-references between anthropology and education in the journals of the 1930s despite the clear intersection of the fields in colonial educational policy. See P. Kallaway, 'Science and policy: anthropology and education in British colonial Africa during the inter-war years', *Paedagogica Historica*, 48:3 (2012), 419; and N. Bonini, 'Un siècle d'éducation scolaire en Tanzania [A century of schooling in Tanzania]', *Cahiers d'Études Africanes*, 43:169/170, Engseignements (2003), 45–6.

37 There is no clear date for when the girls joined the school. In a 1930 publication, Mumford mentioned enrollment numbers, but only for the boys. In 1928 there were sixty boys and in 1929, 117 boys enrolled: see Mumford, 'Malangali School', 268. However, in 1929, Mumford gave an outline of the curriculum with specific differences between girls' and boys' education. The school was gender-segregated in all facets, including instruction and habitation. See Mumford, 'Education and the social adjustment of the primitive peoples', 155. In addition to the schools at Malangali and Tabora, there were three government 'Central Schools' located in Bukoba, Tanga, and Dar es Salaam in 1925. See T. J. Jones, *Education in East Africa* (New York, 1925), 181.

38 W. B. Mumford, *A Comparative Survey of Native Education in Various Dependencies* (London, 1937), 20–1.

39 G. P. Kelly, 'The relation between colonial and metropolitan schools: a structural analysis', *Comparative Education*, 15:2 (1979), 211.

40 Mumford, 'Malangali School', 266, 279.

41 *Ibid.* 266–7.

42 M. Walsh, 'Misinterpretation of chiefly power in Usangu, south-west Tanzania' (unpublished PhD thesis, Wolfson College, Cambridge, 1984), 63.

43 One of the teachers, Odilo Roser (who Mumford identified as a Hehe man), lost his six-year-old son in the poisoning. See Mumford, 'Malangali School', 268. Roser, however, had a German father and his mother was Wemba. See BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

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His aim in 1928 was to 'discover what are the "sound and healthy elements" of native social life', with the aim to preserve what he considered beneficial elements in an organized school.[44]

The school curriculum was not designed to prepare students to eventually take the reins of their country. Rather, Mumford framed it in the context of the two Phelps-Stokes Commission reports on education in British Africa, and subsequent funding from the Rockefeller Foundation facilitated his consultation with anthropologists and psychologists in the United States, Canada, and England.[45] Mumford cited the Colonial Office Advisory Committee on Native Education in Tropical Africa's statement that 'education should be adapted to the mentality, aptitudes, occupations, and traditions of the various peoples, conserving as far as possible all sound and healthy elements in the fabric of their social life.'[46] Mumford claimed that careful educational development would limit 'the downfall of the primitive peoples' who suffered from 'an uncompromising, unsympathetic, and unintelligent superimposing of the culture of the white races upon that of the Natives, and secondly a failure on the part of native culture to adjust itself to changed social conditions.'[47] He wanted slow, measured change to occur, a process meant to improve agricultural productivity and animal husbandry, while also preparing students to work for Europeans in these same tasks. Malangali School was an experiment meant

> to see how far it was really possible 'to preserve' in a school 'what is good in native life' … Secondly, it aimed at taking small easily assimilable steps in its European teaching … nothing was used in the school which could not be obtained by pupils on leaving. Thirdly, it was a farm school aiming at building up a prosperous peasantry.[48]

He received criticism from colleagues who argued against his 'model', which exposed how the government lacked a central idea of how to create an educational prototype that was both conducive toward colonial ruling agendas and the needs of African communities. Some argued for a system that provided a more comprehensive education toward future political development, since 'the Native must be Europeanized in thought if he is to co-operate in the government of his country'. Echoing this sentiment, one argument stated 'the purpose of education is to Europeanize, why disguise it?' Others warned that Mumford's experiment was unsound because his methods lacked predictable results or that Africans would choose what to adopt and reject on their own. Another suggested that this proposal was dangerous because 'it is unfair to fence the native off from the world, he will not always be grateful'.[49]

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44 Mumford, 'Education and the social adjustment of the primitive peoples', 151.

45 Frederick Lugard's 'Dual Mandate' was further echoed in Mumford's accounting of his educational theory. See T. J. Jones, *Education in Africa* (New York, 1922); Jones, *Education in East Africa* 169–92; F. D. Lugard, *The Dual Mandate in British Tropical Africa* (London, 1922); and Mumford, 'Education', 138.

46 Mumford, 'Education and the social adjustment of the primitive peoples', 140; Mumford, *A Comparative Survey*, 17.

47 *Ibid.* 139–40.

48 Mumford, *A Comparative Survey*, 20–1.

49 Mumford did not identify his critics, but his 1929 paper was circulated among his colleagues in the colonial government. See Mumford, 'Malangali School', 286–7.

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Despite criticism, Mumford was resolute that gradual change was less stressful for the students and his theories at Malangali were later implemented more systematically in Jeanes schools in Kenya, Nyasaland, Northern Rhodesia (Zambia), and Southern Rhodesia (Zimbabwe) by the mid-1930s.[50] Half of the school's curriculum emphasized indigenous agricultural and cultural practices, shifting the emphasis toward European methods in agriculture over time. These efforts intersected with programs to increase livestock raising for meat consumption and the dairy industry, with the notion that animal-based foods provided more and better quality nutrients to the consumer.[51]

In addition to education, schools in East Africa operated as sites for other forms of experimentation, particularly in anthropology and the new scientific field of clinical nutrition.[52] Institutional settings served as excellent sites for social-scientific research on local communities. Mumford's plan to use 'tribal tradition' as an educational foundation required careful study of Bena, Hehe, and Sangu sociocultural practices and taboos.[53] Children, because of their youth, were also more readily malleable to new practices, in other words they were less 'contaminated by native customs'.[54] Based on the British boarding school model, children presented an excellent captive audience because they came to Malangali to live, study, and work. Most of the children at Malangali School boarded; of the 58 girls at the school in 1934, 56 boarded.[55] The first class of male students helped to construct the school buildings and compound, as part of their exposure to improved construction techniques and materials.[56] All facets of the education program focused on practical skills.

A central pillar in Mumford's curriculum focused on agriculture and animal husbandry for the boys and domestic skills for the girls. He divided the curriculum by gender, with gender-segregated instruction. Mumford was replaced in 1930 with a married headmaster and headmistress, Mr R. A. Wallington and Mrs St Clair Hamilton Archer Wallington, who led the school and shaped its programs.[57] Mrs Wallington also ran the small school clinic and dispensary.[58] Another married English couple, Mr S. Roach, who was an

50 Mumford, 'Malangali School', 286–7. For information on the Jeanes schools, see Bude, 'The adaptation concept', 345–6; T. O. Ranger, 'African attempts to control education in East and Central Africa, 1900–1939', *Past and Present*, 32 (1965), 68.

51 TNA 6/6, Ghee Industry Report, Aug. 1933; TNA 25540, Summary of Action Taken on Nutrition Report, 6 Jan. 1938.

52 Kallaway, 'Welfare', 346–7; Kallaway, 'Science', 419–20, 424; Decker, *Mobilizing*, 43, 50–3, and 61–5; Summers, '"If you can educate"', 464.

53 Mumford, 'Malangali School', 268.

54 Protestant missionary, Mrs Maynard, as quoted by Bruchhausen, 'Health and medicine', 211.

55 The number of boys boarding at Malangali School in 1934 was not stated. See BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935. Familial anxieties about girls' moral corruption limited their interest in boarding schools. See Decker, *Mobilizing*, 21–2 and R. Smith, 'Education in British Africa', 71. Most girls in S. Rhodesia attended rural schools near their homes. See Summers, '"If you can educate"', 458.

56 Mumford, 'Malangali School', 276.

57 While some changes occurred after Mumford left, there is little evidence of a dramatic shift to a more conventional 'English' academic education until 1938. See Mang'enya, *Discipline and Tears*, 63–6.

58 St Clair Hamilton Archer (née Baynes) Wallington, graduated from the University of Birmingham with her MB ChB. See *British Medical Registry* (London, 1934).

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agricultural instructor, and his wife, Mrs Ella Roach, assisted the Wallingtons with managing the school.[59] Girls learned domestic crafts that focused on hygiene, child welfare, first aid, cooking, and some horticulture for the kitchen garden and flowers.[60] Cooking classes were particularly popular as a mechanism to advance colonial ideologies about appropriate foods and cleanliness standards.[61] Boys trained in income-generating competencies such as agriculture and animal husbandry, selectively in trades (furniture making, construction) as apprentices, and learned about the rudiments of politics, justice, and governance.[62]

Iringa was a rural province with no outside (European or Indian) investment in plantations or other large-scale labor economies, though officials did expect that Hehe would take the 'opportunity of working for wages near their homes' on European farms. Officials also hoped that education might inculcate a desire to increase earnings and thereby consumption of furniture, clothing, and other goods through the sale of livestock and food crops to Europeans.[63] Moreover, the province was important as a cattle-keeping area on the edge of a tsetse zone, which attracted considerable interest in veterinary controls to prevent tsetse infestations, along with reducing other vector-borne veterinary diseases.[64] As such, peasant agriculture prevailed and colonial officials targeted it for significant improvements in production quality and volume, which Mumford argued would lead to multiple social gains. In addition to a dairy, male students had access to a small veterinary dispensary to help them address minor cattle infections, joint problems, and animal hygiene. He wanted students to appreciate how the new milking, breeding, and hygiene practices allowed them to 'profit from their stock' and would expose them to 'fresh varieties of foodstuffs with which to supplement their home diets'.[65] The emphasis on improved diet points toward an emergent concern as officials began to notice that Africans suffered disproportionately from various diseases. The colonial state came to view nutrients as a bio-political tool that might prove relevant outside of warfare conditions, it was a mechanism toward greater study and analysis of how different people and cultures responded to nutrients and what they required for survival.

59 BNA CO 691/140/16, Telegram notation, 31 Oct. 1934; and BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

60 Only a few girls' schools existed outside of the missionary context well into the 1950s. See Decker, *Mobilizing*, 5; H. E. Hanson, 'Indigenous adaptation: Uganda's village schools, ca. 1880–1937', *Comparative Education Review*, 54:2 (2010), 155–74; Summers, '"If you can educate"', 458; and A. M. Tripp, 'A new look at colonial women: British teachers and activists in Uganda, 1898–1962', *Canadian Journal of African Studies*, 38:1 (2004), 123–56.

61 Students learned to cook local and European-style meals and were allowed to take the food home to demonstrate what they had learned to their families. See Decker, *Mobilizing*, 43, 53, and 65. In S. Rhodesia school officials learned that the absence of the right type of food was cause for protest. See Summers, *Colonial Lessons*, 36–9, 94, and 184.

62 Mumford, 'Education and the social adjustment of the primitive peoples of Africa to European culture', 155.

63 Brown and Hutt, *Anthropology*, 220–1.

64 The practice of cattle dipping to regulate biting insects is mentioned in, TNA 25540, Summary of Action Taken on Nutrition Report, 6 Jan. 1938. For monthly veterinary reports of livestock disease. See TNA 6/5, Livestock Disease.

65 Mumford, 'Malangali School', 281.

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A TECHNO-CHEMICAL STATE

There exists a direct connection between nutritional science and colonialism, which yielded valuable information for colonial medical personnel on the relationship between diet and poor health that reached back into the nineteenth century. The introduction of shark liver oil in 1930 to Tanganyika was an early attempt to mitigate perceived nutritional deficiencies, which W. D. Raymond attributed to 'the misinformed Africans' who selected foods for their filling qualities without considering nutritional value.[66] Just as colonial rule used 'biomedicine as a cultural system' to frame Africans, colonial personnel relied upon a medicalized techno-cultural epistemology to shelter their policies and missteps.[67] Nutrition was both a bio-political tool and a measure of food security that officials used to evaluate community welfare. Contradictions abounded as officials struggled to formulate a suitable nutritional policy with limited knowledge. Raymond's 1941 report, *Reasons for a Nutritional Policy in Tanganyika*, gives some contours to the type of nutritional research across the empire, such as feeding studies at schools in Australia, India, and England. He finds that for Tanganyika,

> there is an absence of accurate data on the composition and nutritive value of many of the foodstuffs which are utilized by the indigenous population. Too often agricultural policy lacking this data has been based upon purely economic considerations and without regard to its effect on changing food habits and altering health of population … Little information is available except in respect of the sisal industry. Here the position is far from satisfactory … In the past the employer seems to have learnt his food policy from the misinformed African, whose main concern in a land of famines has been to fill his belly. The cheapest method of achieving this aim is to fill it with maize and beans.[68]

The standard daily ration in Morogoro included one and one-and-a-half pounds maize meal and six ounces of beans, with an additional four ounces twice weekly of groundnuts (peanuts) and some sort of fish or meat.[69] In other areas, where livestock was less plentiful, such as the southern coast near Mikindani, protein rations were absent and appeals for government assistance in procuring meat were ongoing until 1947.[70] While the research was conducted during the 1930s, many of the findings weren't published until later, if at all.[71] Emphasis on the experimental nature of development deflected responsibility for

66 W. D. Raymond was the chemist who analyzed the shark liver oil in 1934, by 1941 he was shaping nutritional policy in Tanganyika. See TNA 19/50, W. D. Raymond, *Reasons for a Nutritional Policy in Tanganyika*, Medical Pamphlet No. 35 (Dar es Salaam, 1941), 5; and TNA 22511, letter from W. D. Raymond, Analytical Chemist to Director of Medical and Sanitary Services, Dar es Salaam, 1 Nov. 1934.

67 Megan Vaughan notes that while many view African 'indigenous' healing systems as unusual, 'biomedical practices can be as ritualised and exotic as any other healing practices', M. Vaughan, *Curing Their Ills: Colonial Power and African Illness* (Stanford, 1991), x.

68 TNA 19/50, Raymond, *Reasons for a Nutritional Policy*, 5.

69 *Ibid.*

70 TNA 25540, Summary of Action Taken on Nutrition Report, 6 Jan. 1938; TNA 13/67, letter from R. Johnston, Provincial Commissioner, Southern Province to Labor Commissioner, Dar es Salaam, 8 Aug. 1947.

71 TNA 19/50, Raymond, *Reasons for a Nutritional Policy*, 1; Brantley, *Feeding Families*, xi.

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problems and allowed colonial officials to claim scientific credence for the haphazard application of practical rule from terracing campaigns to improved seeds.[72]

The 1930 public health report for Tanganyika noted that the territory's medical services lacked adequate preventive health programs to change African social and cultural practices that the state deemed unsound or unhygienic.[73] Following the report, the colonial medical services drafted a letter to raise the alarm that African diets were deficient in specific nutrients. The recent, if incomplete, 'discovery' of vitamins A and D made it possible for doctors to claim that a supplement held the answer in areas where a dramatic increase in meat and milk consumption was unlikely, noting that these nutrients were readily available in fish liver oils.[74] Although Dr Harkness at Iringa hospital lamented 'evidence of gross deficiency disease' and the 'grave food lack of the people', he was unable to explain the reasons for poverty in the empire without implicating the imperial project.[75] Colonial scientists couched their recommendations for health in terms that proved both plausible and impossibly elusive, focusing on the shark liver oil. This emphasis upon science as a panacea, built around an increasingly quantified construction of health, led officials to employ techno-chemicals against perceived cultural and environmental blights, ignoring the complexities of veterinary and human disease patterns. The nutrition report and subsequent letter spurred the next phase of action, a techno-chemical intrusion into African lives that eventually led to the deaths at Malangali.

Doctors attributed the numerous weeping sores and physiological problems, such as skin ulcers, stunting, blindness, and bone deformities to problems rooted in either African folly and sloth or environmental forces.[76] At Malangali, Mrs Wallington told the girls they needed to take the shark liver oil for their skin problems.[77] Although some nutritional illnesses were recognized and a few nutrients isolated, how these individual vitamins informed one's overall health was not fully understood.[78] Outward signs of nutritional deficiency appeared readily, but answers came only in fits and starts, through experimentation and peculiar remedies with unknown consequences.[79] The nutrition studies relied upon a mixture of scientific hypotheses that mingled with supposition and an entrenched belief that their theories of human health could be measured. Moreover, perceived differences in climate, physiology, and race came to form part of the predictive science that colonial officials and scientists employed. The questionnaire for the planned nutritional survey for Tanganyika in 1949 replicated parts of the Nutrition Report from the Nyasaland

72 Hodge, *Triumph*, 95–6, 156–8. When food shortages did occur, responsibility was shifted to African cultivators. See TNA 15/55, letter from D. J. Jardine, Governor's Deputy to Sir Philip Cunliffe-Lister, Secretary of State for the Colonies, London, 19 Oct. 1933.

73 TNA 19310, Misc. No. 413, Report of the Colonial Development Public Health Committee, July 1930.

74 TNA 19343, letter from J. O. Shircore, Director of Medical and Sanitary Services to Chief Secretary, Dar es Salaam, 22 July 1930.

75 TNA MOH 450/75/3, letter from J. Harkness, Medical Officer, Iringa Hospital to Director of Medical and Sanitary Services, Dar es Salaam, 30 Sept. 1934; Bruchhausen, 'Health and Medicine', 212.

76 Vaughan, *Curing Their Ills*, 33.

77 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

78 E. J. Bigwood, *Guiding Principles for Studies on the Nutrition of Populations* (Geneva, 1939), 72.

79 Some of these signs of deficiency included pellagra, rickets, scurvy, and beriberi – old conditions that only recently had causes attributed to them. See TNA 19/50, Raymond, *Reasons for a Nutritional Policy*, 4.

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Nutrition Survey over a decade earlier; for example, food taboos were of particular concern, as was protein consumption, and the number of hours women spent preparing meals.[80] Only after decades of failed development and eventual study and analysis of African soil, crop yields, and human heath did answers become available.[81] In the 1930s, however, colonial officials and scientists had limited knowledge about what caused many premature deaths and less understanding of how nutrients and dietary supplements conferred their protective actions on the human body.

The Malangali School's adaptive educational model made it an ideal site for a small-scale study in human nutrition with a captive audience of what appeared to be reasonably healthy girls.[82] Government-driven experiments relied upon a scientific approach to multiple concerns that attempted to gather information about communities, while also altering them in the name of development.[83] Chemists and doctors slowly learned of the unique characteristics and health benefits of various 'vital amines' (vitamins) that traveled in foods, and their presence or absence appeared to play a critical role in human health and disease.[84] Aside from citrus fruits to treat scurvy, cod liver oil was the first widely used nutritional supplement, but what it provided remained unknown until the late 1920s.[85] Originally used to treat rheumatism and gout, it fell out of favor with influential late-Victorian chemists and pediatricians who claimed that cod liver oil 'was of no particular value.'[86] Following the Great War, cod liver oil returned to favor as an antirachitic supplement, but why it prevented rickets was not understood.[87] During the interwar period, colonial officials noted that Africans suffered from numerous wasting diseases, dysentery, and other conditions that appeared to be linked to sociocultural practices or dietary

80 TNA 19/50, 'Nutrition Survey', 1949; Brantley, *Feeding Families*, 69, 111–13.

81 S. A. Mohamed and J. McKeag, 'Human nutrition activities in Tanzania', Draft Report (Dar es Salaam, 1970); P. Wagner, 'Meeting human nutritional needs', in A. Hansen and D. E. McMillan (eds.), *Food in Sub-Saharan Africa* (Boulder, CO, 1986), 274–91; K. C. Flynn, *Food, Culture, and Survival in an African City* (New York, 2005); J. D. Wylie, *Starving on a Full Stomach: Hunger and the Triumph of Cultural Racism in Modern South Africa* (Charlottesville, VA, 2001); J. C. McCann, *Maize and Grace: Africa's Encounter with a New World Crop, 1500–2000* (Cambridge, MA, 2007). The most well-known failed development project in Tanganyika was the Groundnut Scheme. See Hodge, *Triumph*, 209–11; D. R. Myddleton, *They Meant Well: Government Project Disasters* (London, 2007), 72–4; and M. Rizzo, 'What was left of the Groundnut Scheme? Development disaster and labor market in Southern Tanganyika, 1946–1952', *Journal of Agrarian Change*, 6:2 (2006), 210.

82 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

83 C. Bonneuil, 'Development as experiment: science and state building in late colonial and postcolonial Africa, 1930–1970', *Osiris*, 15 (2000), 260–1; Brown and Hutt, *Anthropology*, 1; Tilley, *Africa as a Living Laboratory*, 10.

84 The term 'vitamin' was coined by Casimir Funk in 1912, while studying the causes of beriberi: K. J. Carpenter, *Beriberi, White Rice, and Vitamin B: A Disease, a Cause, and a Cure* (Berkeley, 2000), 25; E. Souganidish, 'Nobel laureates in the history of vitamins', *Annals of Nutrition and Metabolism*, 61 (2012), 266.

85 Vitamin C was isolated in crystalline form during 1932, after nearly two centuries of efforts to explain how citrus fruits worked to prevent scurvy. K. J. Carpenter, *The History of Scurvy and Vitamin C* (Cambridge, 1986), 187–91; R. A. Guy, 'The history of cod liver oil as a remedy', *American Journal of Childhood Disease*, 26:2 (1923), 112–16.

86 Guy, 'History of cod liver oil', 115.

87 *Ibid*. 116.

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taboos. A few scientists claimed that certain dietary habits led to health problems, most notably polished rice and maize.[88]

Nutritional science benefited from both its imperial context, which provided a useful theater for studying human health, and the greater specialization of veterinary medicine as officials frequently emphasized animal husbandry projects as part of their development goals.[89] The shift from observed phenomenon to experimental analysis began shortly after the germ theory of disease gained traction. Colonial doctors in Asian colonies as disparate as Indonesia, China, and Ceylon began to study a wasting condition called beriberi that occurred with frequency among soldiers and prisoners. Doctors originally claimed beriberi was an infectious disease, but efforts to induce the disease by injecting healthy subjects failed.[90] The discovery and isolation of thiamin (the vitamin deficiency which caused beriberi) in 1933 led to greater awareness that numerous foods conferred powerful biological elements to humans and small changes, such as polishing rice, held the potential to induce illness.[91]

African colonies were the next significant site for scientific study as the colonial powers, with support from large philanthropic and scientific organizations, sent teams 'into the field' to analyze social and material practices.[92] The most extensive survey of African health and nutrition was conducted from 1938–9 in Nyasaland (Malawi), but little of that information was publicized.[93] The larger study was triggered by the preliminary work begun by John Boyd Orr and John Gilks, who exemplified the techno-chemical approach in their veterinary and human nutrition studies in Kenya. Orr began his nutritional studies on livestock and attributed poor animal health to low quality pasturage. In 1925, he claimed that the veterinary problem was easily corrected through fertilizers for improved silage and supplements for the cattle. Together, Orr and Gilks initiated a comparative human dietary study between the Kikuyu and Maasai communities of highland Kenya. Their findings were skewed toward their own cultural views about diets; they disparaged the Kikuyu 'vegetarian' diet, claiming that it made the men small and

88 Cecily D. Williams named a complex early-childhood malnutrition syndrome, 'Kwashiorkor', which she associated with a maize diet. See C. D. Williams, 'Kwashiorkor: A nutritional disease of children associate with a maize diet', *Lancet*, 226:5866 (1935), 1151; and Michael Krawinkel, 'Kwashiorkor is still not fully understood', *Bulletin of the World Health Organization*, 81:12 (2003), 910–11. Coordinated research and intervention was limited until the 1950s, when colonial officials became increasingly concerned to 'develop' various territories as decolonization loomed. See J. Tappan, 'The true fiasco: the treatment and prevention of severe acute malnutrition in Uganda, 1950–1974', in T. Giles-Vernick and J. L. A. Webb, Jr (eds.), *Global Health in Africa: Historical Perspectives on Disease Control* (Athens, OH, 2013), 92–113; and M. Graboyes, 'Fines, orders, fear … and consent? Medical research in East Africa, *c.* 1950s', *Developing World Bioethics*, 10:1 (2010), 34–41.

89 Mohamed and McKeag, 'Human nutrition', 14; Hodge, *Triumph*, 166–76.

90 Beriberi caused 'weakness and loss of feeling in the legs, commonly proceeded to a swelling (or dropsy) of the lower half of the body, and could end in heart failure and death' (xi). For the microbial theory of beriberi, see Carpenter, *Beriberi*, 31–2.

91 Carpenter, *Beriberi* vol. 28, 100–15.

92 The two large philanthropic funds came from the Rockefeller Foundation and the Carnegie Corporation of New York. See Tilley, *Africa as a Living Laboratory*, 99–103; and T. Willoughby-Herard, *Waste of a White Skin: The Carnegie Corporation and the Racial Logic of White Vulnerability* (Berkeley, 2015).

93 Brantley, *Feeding Families*, 5.

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sickly. Orr and Gilks preferred the Maasai diet, which was protein-rich in meat and milk, and associated the Maasai's taller stature with vigorous good health.[94] Orr and Gilks later turned their studies to colonial institutional settings such as schools, hospitals, and prisons.[95] The predilection toward singular solutions shows the intersection of veterinary medicine, early nutritional science, and the nature of socio-scientific experimentation.[96]

Scientists managed to isolate a few vitamins from their food sources, but the variety of nutrients and their properties proved elusive to fully explain. The shark liver oil program in Tanganyika was intended to mitigate deficiencies in vitamins A and D, which contribute to vision problems, eczema, and bone malformations (rickets). Vitamins A and D were two of the earliest nutrients that scientists managed to describe, isolate, and synthesize. From the 1880s to the 1930s, scientists in laboratories in Europe and the United States carried out a series of experiments on dogs and rats, providing and withholding different types of foods based upon known macronutrients – carbohydrates, proteins, fats, salts, and water—to study the diseases and pathologies triggered by foods.[97] Some fat-rich foods, such as milk, carried 'unsuspected dietetic factors' but the actions of the nutrients could not be explained with specificity or detail.[98] By 1918, scientists came to understand that not all fats carried the newly named vitamin A; however, butter fat and cod liver oil both appeared to prevent blindness and diarrhea in rats when it was added to a diet of carbohydrates and proteins.[99] Fish liver oils carried both vitamins A and D. The difference in activities between vitamins A and D was demonstrated in 1922, when scientists heated and aerated cod liver oil. The process rendered vitamin A inactive but left D untouched.[100] In 1931, a Swiss chemist isolated and described the chemical structure of vitamin A from cod liver oil, which moved the study to its next phase, the quest for its presence in other fats including vegetable oils or eventual synthesis.[101] The Medical Research Council's Nutritional Laboratory at Cambridge University found that palm oil from Nigeria was rich in carotene (vegetable-based vitamin A). Studies on prisoners at Kaduna, Nigeria indicated that not all vegetable oils provided carotene. Groundnut oil proved inadequate in solving the nutritional deficiencies that many prisoners suffered. Dr McCulloch recommended that prisons needed to transition to the palm oil immediately because it was

94 Brantley, 'Kikuyu-Maasai nutrition', 64–6; Worboys, 'The discovery of colonial malnutrition', 210–11.

95 Brantley, 'Kikuyu-Maasai nutrition', 52. The discovery of the source of beriberi was based on observations of prisoners and soldiers in Java. The veterinary connection further enhanced research because Dr Christiaan Eijkman noted that fowls when switched from raw to polished rice diet exhibited similar health complications. See Carpenter, *Beriberi*, 38–44; and Souganidis, 'Nobel laureates', 266.

96 Worboys, 'The discovery of colonial malnutrition', 210.

97 Anthony Norman refers to nutrition as an 'infant field' during the 1920s, its maturation decades away. A. W. Norman, 'The history of the discovery of vitamin D and its daughter steroid hormone', *Annals of Nutrition and Metabolism*, 61 (2012), 201.

98 R. D. Semba, 'On the "discovery" of vitamin A', *Annals of Nutrition and Metabolism*, 61 (2012), 194.

99 The rats that consumed fats from lard and olive oil died. Semba, 'On the "discovery"', 196.

100 Norman, 'The history of the discovery', 201.

101 Vitamin A is a fat-soluble nutrient (unlike water-soluble vitamins B_1, B_3, and C), carried in butter and milk fats and in cod liver oil. In 1920, the terminology for the vital amines was standardized to vitamins with letters, to denote the differences. As a result, 'fat soluble A' became vitamin A. See Semba, 'On the "discovery"', 195–6.

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'the great protective vitamin'.[102] Palm oil was not recommended for use in Tanganyika because it had no vitamin D value.[103]

While scientists agreed that vitamin A traveled in certain foods, vitamin D was more elusive because it presented two different subtypes. One form manifested through biological chemical synthesis from ultraviolet light exposure (sunlight or irradiation), which suggested it was a hormone produced by the body. Vitamin D is the only nutrient that the human body can make from exposure to sunlight.[104] The second was a substance found in fatty fish liver oils; few other foods supply adequate levels of vitamin D for life. The deficiency disease associated with too little vitamin D, rickets, was more common in northern European climes during dark winter months. In more tropical settings, getting sufficient vitamin D might seem a foregone conclusion with the long hours of sunlight, but skin with more melanin requires lengthier exposure to sunlight to generate hormonal activity. Cultural practices (that is, purdah/veiling) also prevented adequate skin exposure to sunlight. In Tanganyika, the combination of veiling practices among Muslim communities and darker skin might be a factor in the colonial decision to introduce fish liver oils to prevent rickets. Cod was the most common European source of fish liver oil, but other fish could be used. The twin breakthrough that vitamin D was both a hormone and a food-borne nutrient happened in 1936, when two labs isolated the same crystalline structure, one through irradiation and the other from tuna liver oil.[105]

The colonial experiments with dietary supplements were coeval with the emerging science and in some cases made prognostications ahead of significant revelations. Despite limitations in knowledge, the information gleaned from these projects had far-reaching implications for the future of colonial rule and economic productivity in the empire. By exposing the specific nutrients, scientists delivered two different answers to the broader question about what caused deficiency diseases such as beriberi, pellagra, and rickets.[106] First, the absence of one or more nutrients in a person's diet created the health problems that now appeared ripe for remediation. Second, the discovery of specific foods or substances rich in a particular nutrient suggested a technological breakthrough that the colonial government used to focus on supplements and additives rather than socioeconomic changes. With little practical evidence that the addition of minute quantities of vitamins might improve health, and not fully understanding the interactions between micronutrients and foods, simple solutions emerged as answers to complex problems.

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102 McCulloch protested that much of Nigeria's palm oil was exported for use in the cosmetics industry, leaving little for local consumption, causing vitamin A deficiencies in the population. See TNA 19343, Memorandum, W. E. McCulloch, Pathologist, Dietetics Research, Katsina to Director of Medical and Sanitary Service, Lagos, 13 Oct. 1931.

103 TNA MOH 450/75/3, Abstract, W. J. Dann, 'The vitamin D content of red palm oil', *Biochemistry Journal*, 26:1 (1932), 151–4.

104 Norman, 'The history of the discovery', 199.

105 Vitamin D's molecular structure was mapped in 1948. Norman, 'The history of the discovery', 202.

106 Pellagra occurs in societies that rely upon maize as a staple because it is deficient in niacin (B_3). In Mesoamerica pellagra is rare because the grain is mixed with the mineral lime, and consumed with beans and chillies: see J. M. Pilcher, *¡Que vivan los tamales!: Food and the Making of Mexican Identity* (Albuquerque, NM, 1998), 95–6. For information on pellagra in Italy and parts of Africa, see McCann, *Maize and Grace*, 74–7, 119, 198–9.

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British officials were accustomed to the concepts and practices associated with consuming specialized products 'for health' and embraced the techno-chemical approach, even in cases where the benefits were not clear. Officials ingested cod liver oil and a variety of other dietary supplements at home and abroad. The weekly newspaper, *The Tanganyika Standard,* written by and for Europeans, was full of advertisements for techno-chemicals for health and dietary gains.[107] The ads targeted colonial officials and promised to deal with a variety of problems, appealing to the officials' anxieties about overwork and more serious problems related to recovering from bouts with malaria. Products such as *Bynin Amara* claimed that it helped check 'loss of appetite, indigestion, lack of energy, worry and overstrain'.[108] *Bynin* was a malt extract.[109] Other dietary aids and food adjuncts included *Eno, Sanatogen, and Bovril*, with each making fantastic, if not potentially dangerous, claims. *Sanatogen* promised to 'banish malarial debility' by providing a 'short cut to health' and vitality.[110] Pharmacological advertisements and labels emphasized the benefits or appealed to the health anxieties of the consumer. No prohibitions against such specious claims existed, despite a *British Medical Journal* investigation from 1911, which revealed that the 'secret formulas' behind several popular remedies were of limited value. Some preparations, *Cocaphos, Phospherine,* and *Damaroids* contained minute amounts of quinine, but mostly alcohol if liquid, and sugar if in tablet form.[111] Advertisements for some brands of drugs carried no description of their properties or what they cured; *Eno* was particularly vague, which suggests that most consumers were already familiar with its properties as an antacid.[112] The few products that did deliver some benefits were advertised in the same way as those with few health-giving properties, which established that colonial officials inhabited a techno-chemical culture that was less concerned with why a supplement worked than the act of consuming these remedies.

SHARK LIVER OIL OR 'MAFUTA YA AFYA' (OIL OF HEALTH)

Following their own predilection for techno-chemical answers to health, colonial officials approached malnutrition through predictable stopgaps based upon practical knowledge, if not scientifically backed evidence. Medical officers claimed that supplements held the long-term answer rather than a holistic approach that considered communal welfare in conjunction with broader socioeconomic transformations. The shark liver oil project was the first

107 The *Tanganyika Standard* covered events of interest to Europeans in Tanganyika, such as a bomb plot against Benito Mussolini, as well as other global news. Most of the paper gave briefings on events around the British Empire, in Africa and elsewhere. The advertisements in the paper targeted a European audience and its concerns, with images and commodities that ranged from automobiles to fine liquors, furs, and travel. See *Tanganyika Standard* (Dar es Salaam), 3 Nov. 1934.

108 *Bynin Amara* advertisement, *Tanganyika Standard*, 13 Oct. 1934.

109 *Lancet*, 26 Dec. 1903.

110 The *Sanatogen* advertisement ran next to the article about the poisoning at Malangali, on page 11 of the newspaper. See *Tanganyika Standard*, 3 Nov. 1934.

111 'The composition of certain secret remedies, nerve tonics, etc.', *The British Medical Journal*, 1:2610 (1911), 26–8.

112 *The Tanganyika Standard*, 3 Nov. 1934.

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documented effort to improve purported vitamin A and D deficiencies in Tanganyika. In 1930, in response to the Colonial Development Public Health Committee report issued in July, Dr J. O. Shircore, the Director of Medical and Sanitary Services, wrote a letter to the Chief Secretary to exhort the colonial state to use its newly created Tribal Dispensaries, funded through the Native Treasury, to improve African diets through 'practical relief' efforts.[113] Although he encouraged the use of 'fish liver oil' as a 'prophylaxis', Shircore was cautious that, 'prejudice might exist amongst some of the tribes, against fish oils', and he declared, 'no mention of shark oil or fish oil should be made on the drum'. Rather, it should be labeled Mafuta ya Afya, 'Oil of Health'.[114] For Shircore, the program was an opportunity to implement a grand nutritional intervention. He asserted that vitamin A was 'a factor intimately associated with growth of the young and is a promotor [*sic*] of resistance against infective processes, more especially of the respiratory and alimentary tracts.' And vitamin D was a nutrient that promoted growth 'and regulates the absorption of calcium and phosphorous ... thus acting as an anti-rachatic [*sic*] and prophylactic against the maldevelopment [*sic*] of bones and caries of the teeth.'[115] Under Shircore's direction the merchants Howse and McGeorge imported a large stock of shark oil in anticipation that Tribal Dispensaries would successfully deliver the substance to large numbers of people who wanted better health.[116]

Shircore tasked African 'tribal dresser' dispensaries with distributing the shark liver oil, but usage in Iringa was extremely low and the amount 'requisitioned by Tribal Authorities has been negligible'.[117] One possible explanation, beyond an unpleasant taste, for low consumption was how Dr Shircore framed the benefits of the shark liver oil. Consistent with the medical knowledge about nutrition for the time, Shircore makes several statements that would lead people to reject the oil as a routine addition to their diets. He wanted the document translated into Swahili and 2,000 copies distributed to the Tribal Dispensaries. In the '*Mafuta ya Afya*' pamphlet from 1930, he stated the following:

1. It is of great importance for the welfare of the race that certain substances contained in ordinary foodstuff, in generally small and varying quantities, be supplied in order to keep people healthy.
2. Healthy people, living on a proper varied diet, do not need these substances, known as 'vitamins', to the same extent as the sick or people who are living in districts or areas where, for one reason or another, a variety of food and fat, animal and vegetable, are not easily available.

113 TNA 19310, Miscellaneous, No. 413, Report of the Colonial Development Public Health Committee, July 1930.

114 TNA 19343, letter from J. O. Shircore, Director of Medical and Sanitary Services to Chief Secretary, Dar es Salaam, 15 Oct. 1930; Circular Letter No. 43 of 1930, 13 Nov. 1930.

115 TNA 19343, letter from J. O. Shircore, Director of Medical and Sanitary Services to Chief Secretary, Dar es Salaam, 22 July 1930.

116 TNA 19343, letter from J. O. Shircore, Director of Medical and Sanitary Services, Dar es Salaam to Burgoyne, Burbidges, and Co. Ltd, London, 15 Oct. 1930. While Shircore wanted the ingredients to remain secret, others disagreed; noting that fish was often relished as a delicacy and deception was likely to cause trouble (handwritten note, 6 Nov. 1930).

117 TNA 19343, letter from Howse and McGeorge, Ltd, to Chief Secretary, Dar es Salaam, 17 Oct. 1933.

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3. Besides this point it is known to those who have studied the question that expectant mothers, whose vital resources are being drained by the children they are carrying, and the infants for some months after birth, require two of the important vitamins i.e., A and D, in order that the bones of the skeleton might develop strongly and be well shaped, and particularly that good strong teeth be formed.
4. To bring this about it is necessary that expectant mothers be given a course of '*Mafuta ya Afya*' for about 2 or 3 months before the child is due to be born, and that the infant after birth be also given a course for a similar period.

   The dose for a woman is one teaspoonful, and for a child half a teaspoonful, twice a day.

   Children up to the age of 12 years who are not thriving might also be given the oil.[118]

In effect, Shircore constructed the supplement as a medicine, a remedy, to be used during times of ill health, for pregnant women or for the extremely young, not as a routine health measure. This medicinal approach to the shark liver oil was reflected in the language used by the Hehe and Bena; they referred to it as '*dawa*' (medicine).[119] *Dawa* suggested that the techno-chemical was only for short-term use and recommended for the most vulnerable members of the community, which followed the veterinary model for applying technological solutions.

Colonial veterinary medical practices also relied upon a variety of techno-chemical substances, which game wardens, district officers, and agricultural officers applied on an occasional basis to manage livestock diseases. Following the model established by Orr and Gilks, colonial officials applied fertilizers to improve soils and distributed toxins to manage pests. Arsenic was the toxin of choice, which the colonial administration purchased in large drums and was readily compounded into several uses. Agricultural officers used arsenic in a mixture with grain to exterminate rat infestations.[120] For protecting livestock from ticks, flies, and other biting insects, arsenic was mixed with liquefied soap for livestock dips. Cattle dipping was an efficient 'control measure for certain disease and as such an increase in dipping facilities is desirable. It is noted, however, that many Africans display a prejudice against dipping their cattle.'[121] Dipping was the most common method for protecting against East Coast Fever in cattle and desirable with European farms in the region.[122] Between the cattle dip and the shark liver oil, Shircore and other officials gave indications that the people of Tanganyika mistrusted these techno-chemical applications, whether for animal or human benefit. There is little in the archival evidence to explain why, but

118 TNA 19343, '*Mafuta ya Afya*', J. O. Shircore, Director of Medical and Sanitary Services, Dar es Salaam, 15 Oct. 1930.

119 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

120 In this instance, eighty pounds of pure arsenic powder was mixed with maize to form a toxic mash. See TNA 15/35, District Tour Report, R. D. Lawton, District Agricultural Officer to Director of Agriculture, Morogoro, 7 Mar. 1931.

121 TNA 25540, Summary of Action Taken on Nutrition Report, 6 Jan. 1938.

122 Brown and Hutt, *Anthropology*, 6; E. G. Van Voorthuizen, 'Cattle dips are used as a tool for range management in Masailand, Tanzania', *Journal of Range Management*, 24:4 (1971), 314–15; R. Waller, '"Clean" and "dirty": cattle disease and control policy in colonial Kenya, 1900–1940', *The Journal of African History*, 45:1 (2004), 45–80.

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perhaps with more poisons in circulation there were frequent cases of misuse of these substances occurring in Iringa district and elsewhere during the 1930s.[123]

Although the inquest did not find murderous intent in the poisoning at Malangali, there was a history of arsenic poisoning in Iringa district. As explained in the Brown and Hutt anthropological study of the Hehe, during 1932 a series of feuds between Hehe lineages led to the poisoning death of at least six people with a further four deaths suspected. Brown and Hutt noted that arsenic 'fits so well in their [Hehe] concepts [of witchcraft medicines] that it may cause much mischief.'[124] They went on to state that, 'in 1933 the number of deaths seems to have diminished; but if the poison is still in the possession of the people who had it formerly, it is well within the bounds of possibility that a new series of poisonings may occur, as a result of new feuds.'[125] While it is not the intent of this article to question the findings of the inquest, the problem of poisons as one part of the techno-chemical culture of colonialism created the opening for the tragedy at Malangali School.

A strange set of circumstances was set into motion when the oil was distributed during 1931, not only were there objections to the smell and taste, but some chemists wondered if shark liver oil might also be dangerous. With the exception of a few institutionalized uses, no one consumed the oil of their own accord and the benefits of the remedy proved elusive to gauge. Harkness administered doses of shark liver oil to patients at Iringa Hospital 'with success', and recommended in 1934 that 'schools, dressing stations, dispensaries should be requested to issue daily [doses] to children, mothers, and young adults.'[126] Colonial interests, however, were not in agreement about the value of the shark liver oil as a nutritional supplement. The controversy stemmed from competing claims by analytical chemists. The chemists, at Allen and Hanbury's, questioned if shark liver oil was a reasonable substitute for cod liver oil. They claimed that shark liver oil for medicinal purposes was risky since 'it may contain toxic constituents owning to faulty methods of manufacture since the same care would not be taken in the preparation of this oil as in that of most cod liver oils.'[127] The chemists, at Burgoyne, Burbidges and Co., argued that shark liver oil was perfectly safe and of three to four times the nutritive value of cod liver oil for both vitamins A and D.[128] The doubt surrounding the value and safety of shark liver oil was not sufficient to dissuade those who claimed its utility, however, it did become suspect when the children were poisoned.

Most of the shark liver oil remained in storage, despite reports that 'no tribal prejudices against the use of the oil' existed. The lack of interest in it was because people in Iringa

123 Brown and Hutt, *Anthropology*, 181; TNA 22527, A. Richie, Entomological Field Station, Bukoba to Director of Agriculture, Morogoro, 'Labeling of Poisons', 25 May 1935; TNA MOH 779, letter from R. R. Scott, Director of Medical Services to Chief Secretary, Dar es Salaam, 8 June 1937.

124 Brown and Hutt, *Anthropology*, 181.

125 *Ibid.* 182.

126 TNA MOH 450/75/3, letter from J. Harkness, Medical Officer, Iringa Hospital to Director of Medical and Sanitary Services, Dar es Salaam, 30 Sept. 1934.

127 TNA MOH 450/75/3, letter from Howse and McGeorge Ltd, Nairobi to Director of Medical and Sanitary Services, 16 July 1931.

128 TNA MOH 450/75/3, letter from Burgoyne Burbidges and Co., London to Director of Medical and Sanitary Services, 15 Sept. 1931.

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found it 'decidedly unpalatable'.[129] The mercantile house of Howse and McGeorge 'decided to close down [its] Iringa Branch owning to the depressed conditions in that district', and petitioned the colonial government to absorb seven, five-gallon drums of shark liver oil that were between two and three years in storage.[130] While Shircore projected the dispensaries would need 10,000 gallons, Howse and McGeorge Ltd reduced the order to 3,000 for the entire territory. They made no further orders for shark liver oil.[131] The acid value of the oil had diminished considerably. Compared with the medical stores held in Dar es Salaam, the Howse and McGeorge oil was poor. The analytical chemist showed that the oil from Dar es Salaam had an acid value of 7.9, meanwhile the shark liver oil that went to Malangali had a 4.1 acid value.[132] Unaware of the supplement's poor quality, in August 1934, the colonial government purchased the entire stock of oil because it had initiated the requisition back in 1930.[133] The stock from the Iringa branch of Howse and McGeorge made its way into the district officer's storehouse and eventually to Malangali, at the request of Mrs Wallington.[134]

On the advice of Dr Harkness, Mrs Wallington added the shark liver oil to the school clinic and outpatient dispensary, to introduce it to the pupils.[135] At the inquest, she stated that she deviated from her usual practice of acquiring all medical stores from the medical department in Dar es Salaam when she arranged for the school's first supply of shark liver oil to come from the supply transferred by Howse and McGeorge to the Iringa District Office.[136] The district officer, A. McD. Bruce Hutt, brought three bottles of oil to Malangali School on 5 September 1934, shortly after the provincial government was cleared to take possession of the drums. The containers of shark liver oil were wrapped in newspaper. He advised Mrs Roach, who received them in the Wallingtons' absence, to store the bottles outside of the house because they had an unpleasant odor.[137] The oil remained outside for several days until the Wallingtons' return, at which time the three bottles of shark liver oil were placed in the clinic, still wrapped in paper, until Mrs Wallington unwrapped them on 22 October. She noticed no peculiar odor during that time.[138] When the

129 TNA MOH 450/75/3, letter from O. Guise Williams, Acting Provincial Commissioner, Iringa, to Medical Officer, Iringa, 18 Sept. 1934.
130 TNA 19343, letter from L. A. Howse, Howse and McGeorge, Ltd, Nairobi to Chief Secretary, Dar es Salaam, 17 Oct. 1933.
131 TNA 19343, 'African Diet – File Notes', 17–18 Aug. 1934.
132 TNA 22511, G. Maclean, Sleeping Sickness Officer, Report on Sickness and Deaths from Poisoning at Malangali School, 29 Oct. 1934.
133 TNA 19343, letter from L. A. Howse, Howse and McGeorge Ltd, Nairobi to Chief Secretary, Dar es Salaam, 17 Oct. 1933. A series of file communications between Shircore and the Chief Secretary explained that Howse and McGeorge purchased the oil in 1930 at a cost of £300 to distribute to Tribal Dressers. In turn, the government issued a special warrant to buy the oil at full cost, further indication that the oil never made it beyond the druggist's backroom. See TNA 19343, Special Warrant, No. 121 of 1934, 9 Oct. 1934.
134 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.
135 TNA 22511, letter from J. Harkness, Medical Officer, Iringa to Director of Medical and Sanitary Services, Dar es Salaam, 6 Nov. 1934.
136 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.
137 TNA 22511, G. Maclean, Sleeping Sickness Officer, Report on Sickness and Deaths from Poisoning at Malangali School, 29 Oct. 1934.
138 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

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children fell ill on 25 October, the shark oil was suspected because this was the first time any of the children had received the nutritional supplement.[139] All the bottles, two Haig whiskey bottles and a Gordon's gin bottle, were shipped to the analytical chemist at the Amani Research Station.[140] The contents of the whiskey bottles were tested first and proved to be shark liver oil; the gin bottle was found to hold some sort of disinfectant or poison. Further tests established that the gin bottle held cattle dip, only then did officials question what types of poisons were housed on the school grounds or the district officer's storehouse.[141]

Two types of arsenic preparations were in use at Malangali School: one in a powder form and the other a liquid. These poisons were kept on the school grounds as part of the school's educational mission to improve the region's cattle and reduce agricultural pests. While arsenic is an inorganic toxin, it can be compounded in multiple ways to render slightly different variations. The Agricultural Department employed a gray sodium arsenite ($NaAsO_2$) powder for locust control. Despite its gray coloration, when dissolved in water it did not resemble the solution administered at Malangali. Instead, the schoolgirls had consumed a proprietary cattle dip composed of arsenic trioxide (As_2O_3) suspended in soap, distributed by the Veterinary Department, which contained 19.3 per cent arsenic by weight.[142] The Veterinary Department had twice sent one five-gallon drum of Cooper's Improved Cattle Dip to Malangali School, in July 1932 and another in March 1933. In addition, Hutt's storage facility at the District Office in Iringa held two five-gallon drums of shark liver oil and one five-gallon drum of cattle dip. The shark liver oil drums were labeled, '*Mafuta ya Afya*' with no other distinguishing marks, the cattle dip was unmarked.[143] Arsenic added to liquefied soap makes the poison more effective at 'wetting' the animal's hide, by breaking through the various layers of hair and oils. This 'wetting' action increased its economic utility, as less insecticide was needed because the soap broke down the oils in the animal's coat. Under typical usage, farmers added one part aqueous solution of arsenic trioxide in soap to 600 parts water (for example, one gallon of cattle dip added to 600 gallons of water) – which reduced costs while increasing efficacy.[144] The children ingested approximately 5 milliliters, which contained 1.23 grams or 19 grains of arsenic trioxide. For an adult the minimum lethal dose varies from 2–4 grains, though some adults have reported surviving larger doses. In another recorded case, a child of 4 years died after ingesting 4.5 grains.[145] At 19 grains, the

139 TNA 22511, G. Maclean, Sleeping Sickness Officer, Report on Sickness and Deaths from Poisoning at Malangali School, 29 Oct. 1934.

140 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

141 TNA 22511, letter from W. D. Raymond, Analytical Chemist to Director of Medical and Sanitary Services, Dar es Salaam, 1 Nov. 1934; 'Medical Noes in Parliament', *British Medical Journal*, 2:3859 (1934), 1184.

142 The arsenic trioxide was incorrectly referred to as arsenite trioxide by Raymond in his letter. See TNA 22511, letter from W. D. Raymond, Analytical Chemist to Director of Medical and Sanitary Services, Dar es Salaam, 1 Nov. 1934. In the inquest file, arsenic trioxide was called arsenite of soda ($NaAsO_2$), which is the gray powder pesticide. See BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

143 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

144 W. F. Cooper and W. H. Nuttall, 'The theory of wetting, and the determination of the wetting power of dipping and spraying fluids containing a soap basis', *Journal of Agricultural Science*, 7 (1915), 219–39.

145 TNA 22511, letter from W. D. Raymond, Analytical Chemist to Director of Medical and Sanitary Services, Dar es Salaam, 1 Nov. 1934.

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Malangali cattle dip was four times more potent; it was a wonder that anyone survived the poisoning.

Although Hutt, the Wallingtons and the Roachs were cleared of criminal negligence by the inquest, parents' questions about the poisoning were not included in the proceedings. Instead, the coroner who supervised the inquest stated that Mrs Wallington and Mr Hutt showed 'an absence of care according to the circumstances and consequently amount to negligence'. Though critical, he found that the 'deceased children died by misadventure' and not a crime 'deserving punishment'.[146] The finding appeased colonial authorities and their supporters back in the United Kingdom, but the misgivings of Hehe and Bena parents about the deaths were effectively silenced by the inquest.[147] The official findings give little suggestion that the community attempted to understand the event through their own cultural views.

However, rumors and discussion among Bena and Hehe parents suggested that they understood the poisoning to be intentional. They questioned why Mrs Wallington continued to administer the substance after several girls

> were obviously lying on the ground writhing in agony? Why was the medicine given to healthy children? From the foregoing it would appear that they seemed to think at the time that the administration of poison was premeditated, and that it had been deliberately administered out of sheer vindictiveness.[148]

Parents of Hehe girls raised the specter of malfeasance or even witchcraft given that the word 'medicine' (*dawa*) has a particular duality among the Hehe. *Dawa* can heal or provide a means to do harm to another.[149] Magic and medicine were closely connected for the Hehe and 'if properly administered or applied, will accomplish certain results'.[150] According to Brown and Hutt's ethnography of the Hehe, 'witchcraft is a means of explaining death or misfortune. Death and serious misfortune are not believed to occur from natural causes; human agency is nearly always blamed.'[151] Concerns about malfeasance, however, were not centered on communal conflict or directed toward the school officials with the intensity that officials in Dar es Salaam feared.

The person the communities mistrusted was Mr Hutt, the former district officer, who delivered the whiskey and gin bottles to the school.[152] In light of the deaths, N. T. Owden Mwansongwe, a Bena elder at the school, dictated a letter stating that Hutt was responsible for the girls' deaths

146 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.
147 *Ibid*.; BNA CO 691/140/16, Note, T. H. Lee, 14 Feb. 1935.
148 TNA 22511, letter from Acting Provincial Commissioner, Iringa to Chief Secretary, Dar es Salaam, 13 Nov. 1934.
149 Brown and Hutt, *Anthropology*, 175–84. Some families questioned why healthy children received 'medicine' (*dawa*). See TNA22511, letter from Acting Provincial Commissioner, Iringa to Chief Secretary, Dar es Salaam, 13 Nov. 1934.
150 Brown and Hutt, *Anthropology*, 177.
151 *Ibid*. 178.
152 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

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> on account of his intrigues against Mr Wallington. I know quite well that he was making intrigue and he supplied poison and put it in the health medicine and sent it to Malangali. Sir, this European is very bad, he likes to listen to sedition.[153]

Mwansongwe also witnessed the death of his three-year-old granddaughter, Zenab binti Hussein (daughter of his son-in-law), who was one of the first children to die.[154] Hehe parents also expressed the sentiment that Hutt was responsible for the poisoning since 'it was rumored [he] had brought the medicine to Malangali ... an impression was gaining ground that there was a deliberate plot against the lives of the children.' The dispatch went on to state that 'a suggestion had been made [at Malangali] that perhaps Mr Hutt obtained [cattle] dip from one of the merchants in Iringa to bring down to a planter and had brought down the wrong bottles.'[155] These accusations, while serious, were not repeated at the inquest. What was revealed with Hutt's testimony was that he was careless in managing his storerooms' inventories and in supervising his workers, so careless that he was unaware that one of his storerooms held a drum of cattle dip near the drums of shark liver oil.[156]

For at least one month after the poisoning, parents and villagers questioned the intent of giving the girls medicine. According to the testimonies of their kin, most of the dying girls, who were able to speak, said they received 'medicine' for some type of skin condition.[157] All of the statements at the inquest came from parents or kin who had witnessed their children die and were required to describe in what manner and where each child succumbed to the poison. No Sangu girls died in the poisoning.[158] One father, Moses Mamba (Bena, Protestant), described the situation as follows:

> I arrived at the school at 2:30 pm that same day. I saw Hana [11 years old] daughter of Moses lying on the ground just outside the school. She was very ill; she was trying to stand up but staggered like a drunken person. In reply to my question as to what was the matter she said that the Memsahib had given them some medicine to cure a rash [the word used is *upele*]. I saw her vomit blood. She said she had a stomachache.

153 TNA 22511, Translated Statement by N. T. Owden Mwansongwe, Malangali, 7 Dec. 1934. At the inquest, this informant was called Mahwala bin Masawange. See BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935. They are the same person since both reference the death of three-year-old Zenab binti Hussein. Perhaps Hutt's contributions to the anthropological study with Gordon Brown led to this sentiment. See Brown and Hutt, *Anthropology*, vi.

154 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

155 TNA 22511, letter from Acting Provincial Commissioner, Iringa to Chief Secretary, Dar es Salaam, 13 Nov. 1934.

156 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

157 Eczema can be a sign of vitamin D deficiency, but it is not clear if the girls exhibited such symptoms. TNA 22511, letter from Acting Provincial Commissioner, Iringa to Chief Secretary, Dar es Salaam, 13 Nov. 1934.

158 Most of the kin who testified were male; only four women appeared before the coroner. One woman was widowed, one woman's husband was away at the time of their daughter's death, another carried her husband's testimony in a note because he was too ill to appear, and the fourth was Luhuwile, the school's matron (compound mother) whose niece died from the poison. See BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935. Walsh notes that the Sangu leadership was mistrustful of Mumford and sent few children to the school. See Walsh, 'Misinterpretation of chiefly power', 63.

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> At that time Anyuwise [second daughter, 7 years old] was lying on a bed. She complained of pain in the back. I saw her vomit. Mrs Roach was attending to the many sick children.[159]

Another witness, Salehe bin Madanganya (Bena, Muslim), stated that his daughter, Chausiku told him, 'that she had drunk some medicine given her by the memsahib. She said that she told the memsahib that she had no '*upele*' (rash) but that she was compelled to drink it.'[160]

Although the witness recollections appear rational and calm, as presented in the inquest transcripts, the colonial administration removed the Wallingtons and Roachs from Malangali during the pre-dawn hours on 31 October.[161] In the immediate aftermath of the poisoning, parents of sick or dying children were too involved in their care or burial to express their views about what happened. Parents appeared to mistrust the medical services offered and refused to bring their children to the hospital for treatment. The sub-assistant surgeon arrived at the school within one hour of the poisoning and began treating the children with Milk of Magnesia.[162] Shortly thereafter, Dr Harkness, the medical officer arrived; he described a terrifying situation wherein parents carried their children home in various states of toxic distress. African dressers or the South Asian sub-assistant surgeon provided palliative care to keep Europeans out of the line of attention. The sub-assistant surgeon traveled to the girls' homes to administer opium to those in severe, terminal collapse, while he treated others with warmth, brandy, and oil. Every child had symptoms consistent with acute arsenic poisoning – severe stomach pains, vomiting bile, foaming at the mouth, delirium, and shock – those who survived suffered complications of edema, suppression of urine, muscular spasms, and hemorrhaging. One girl failed to recover after ten days of care and finally endured two days of vascular hemorrhage before succumbing to the poison.[163]

Colonial anxieties about local protest were at a fever pitch. *The East African Standard*, Nairobi, claimed that 'there is unrest among the tribes', and that

> the Native peoples, overwhelmed by the castastrophe [*sic*] are probably unable to appreciate the sorrow and the anxiety which that staff has experience on their behalf or to understand that the tragedy of Malangali will probably come between these white people and their work in Africa for many a year.[164]

The provincial officer requested two European officers and fifty armed soldiers to keep guard at the school in case of the event hostilities did break out.[165] According to observers,

159 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935. The Swahili word '*upele*' can refer to a variety of rashes, but is more commonly used to reference to scabies: N. Awde, *Swahili-English Practical Dictionary* (NY, 2004), 252; and *Kamusi ya Kiswahili-Kiingereza* (Dar es Salaam, 2001), 346.

160 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

161 TNA 22511, letter from H. MacMichael, Governor, Dar es Salaam to Sir Cunliffe-Lister, Secretary of State for the Colonies, London, 31 Oct. 1934.

162 TNA 22511, letter from P. S. Paranjpe, Sub-Assistant Surgeon to Director of Medical and Sanitary Services, Dar es Salaam, 1 Nov. 1934.

163 TNA 22511, letter from J. Harkness, Medical Officer, Iringa Hospital to Director of Medical and Sanitary Services, Dar es Salaam, 6 Nov. 1934.

164 TNA 22511, Fragment, 'Malangali Tragedy', *East African Standard* (Nairobi) (10 Oct. 1934) (date incorrect on sheet), most likely 1 Nov. 1934.

165 TNA 22511, Telegram, Provincial Officer, Iringa to Chief Secretary, Dar es Salaam, 31 Oct. 1934.

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'Hehe fathers with sick children [were] showing by [their] demeanor that they [we]re suspicious, seething inside and likely to be source of danger at any moment.' At the funerals, colonial officials cut the lamentations (*kilio*) short and pushed the 'drinking ceremony' to forestall any angry outbursts.[166] Bena families lost the largest number of daughters. Twenty-six Bena girls died, according to the inquest.[167] Officials did not anticipate trouble from Bena households, however, officials did fear unrest from Hehe fathers at the very least, based on the assumption that Hehe were 'pagan' while Bena had mostly converted to Christianity[168] The picture was more complicated: both Bena and Hehe were a mix of Christian, Muslim and 'pagan' religious identities, but the bias against the Hehe as a fierce and uncooperative community was a carry over from their resistance to colonial rule and subsequent participation in Maji Maji.[169] The administration attempted to regain trust by distributing eggs, milk, and oil to families with dead or sick daughters each morning. Eventually, a few families carried their poisoned children to the hospital for care.[170] By 3 November, community elders acknowledged this was an 'act of God' rather than an intentional poisoning, which allowed for a cautious shift toward community reconciliation with the school.[171] Although the crisis had calmed by the time *The Tanganyika Standard* printed its article about the poisoning at Malangali, the paper claimed the consequences of the poisoning were likely to prevent any further use of shark liver oil outside of hospitals, cast a deep shadow over the future of 'this experiment in African education', and further delay development of the region.[172] The push for shark liver oil appeared to wane and there is little subsequent mention of the substance in the documents. Instead, the colonial government shifted its attentions to regulating the distribution and disposal of poisonous substances.[173]

The tragedy at Malangali School was part of wider social and medical experiments with African culture and health. The scientific emphasis on predicting health and wellbeing through measured indices that relied upon targeted programs suggested that the imperial problems of hunger, disease, and poverty could be mediated through technocratic remedies, which left structural causes untouched. While schools and other institutional settings

166 After extensive research through the anthropological works of Alison Redmayne, Benjamin Martin, and Martin Walsh, there is little to indicate what a 'drinking ceremony' involved – it appears to be a colonial invention.

167 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935.

168 *Ibid*. TNA 22511, Telegram, Provincial Officer, Iringa to Chief Secretary, Dar es Salaam, 31 Oct. 1934; Draft of statement to be made by Chief Secretary to Legislative Council after Minutes, n. d.; TNA 22511, *Volume* II, letter from Provincial Commissioner, Iringa to Chief Secretary, Dar es Salaam, 4 Feb. 1935.

169 BNA CO 691/140/17, Inquest No. 9 of 1934, 20 Dec. 1934–17 Jan. 1935; Giblin, *A History of the Excluded*, 70–1; S. I. Nyagava, 'Were the Bena traitors?: Maji Maji in Njombe and the context of local alliances made by the Germans', in Giblin and Monson (eds.), *Maji Maji* (Leiden, 2010), 241–57.

170 TNA 22511, letter from J. Harkness, Medical Officer, Iringa Hospital to Director of Medical and Sanitary Services, Dar es Salaam, 6 Nov. 1934.

171 TNA 22511, letter from Provincial Commissioner, Malangali, to Chief Secretary, Dar es Salaam, 3 Nov. 1934.

172 The debate over shark liver oil's utility went on for several years, its similarity in appearance with 'other oils and occasionally poisons' was an ongoing cause for concern. See TNA/MOH450/73/3, letter from Director of Medical Services to Pharmacist, Dar es Salaam, 15 July 1938; and *Tanganyika Standard* (Dar es Salaam, 1934), 19.

173 TNA 22527, 'Custody and Labelling [*sic*] of Poisons', Circular No. 2 of 1935 (Jan. 1935).

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offered the state a prime site for social and scientific experimentation, the risk of conflict was high when officials introduced new practices and materials without careful analysis. The poisoning at Malangali School was a symptom of a poorly constructed approach to broader socioeconomic development in an impoverished region.[174]

Scientific methods made it possible for the state to elude the underlying questions of how an extractive colonial system undermined social welfare and community health. Officials used the turn to quantify communal wellbeing through microscopic approaches as a means to claim that science and techno-chemicals might reveal secrets to cheap and easy fixes. While the facile application of nutritional science failed to alter public health outcomes, Malangali became a known tragedy with no context. Thirty-six young girls and one boy died at a government-run school because the state and its officials sought quick remedies to complex problems. Officials introduced chemical remedies for veterinary and human health with little oversight in storage, distribution, management, and testing. Mrs Wallington administered a new substance to her pupils without pausing to test the material, and she ignored the protestations of the children when they retched, spat, and ran away. While the shark liver oil carried vitamins A and D of some potential value, the children never received the dietary supplement because of carelessness. The shark liver oil project was destroyed by the tragedy, as officials turned away from wide distribution of nutritional supplements to focus on poison management.[175] The poisoning had negative ramifications for the future of girls education through state institutions and generated sufficient mistrust that Malangali School stopped educating Hehe, Bena, and Sangu girls, though the boys school continued.[176] The future of African health proved elusive and costly; though the push for new techno-chemicals continued, it did not target supplements for human consumption.

174 Martin Benjamin notes that well into the 1990s, Malangali was among the 'poorest of the poor' according to World Bank and Concern Worldwide, a charitable agency: M. Benjamin, 'Development consumers: an ethnography of the "poorest of the poor" and international aid in rural Tanzania' (unpublished PhD thesis, Yale University, 2000), 3.

175 TNA 22527, 'Custody and Labelling [*sic*] of Poisons', Circular No. 2 of 1935 (Jan. 1935).

176 Mang'enya, *Discipline and Tears*, 66–9; TNA 22511, letter from R. R. Scott, Dar es Salaam to Capt. J. L. Berne, Iringa, 19 Feb. 1935.

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