

THE MILK OPTION AN ASPECT OF THE HISTORY OF THE INFANT WELFARE MOVEMENT IN ENGLAND 1898–1908

by

DEBORAH DWORK*

The history of the English infant welfare movement is a complicated story of both successful action and failed initiatives.† Two of these abortive ventures were the campaign to improve the bacteriological quality of the milk supply in general, and the establishment of milk depots to provide clean milk for infants and young children alone. At the turn of the twentieth century, diarrhoea was considered to be the single most preventable cause of infant death, and as milk was the primary nutrient of infants, it was investigated as the most probable agent of infection.

In this paper, I shall discuss how attention came to be focused on the health of infants and on the role milk played in their morbidity and mortality. I shall trace the initiatives to ameliorate the milk supplied to the public and to organize a pure milk source solely for infants. During the first decade of the twentieth century, these attempts failed. Nevertheless, they are of interest to us in providing a case study of the interaction of a macroscopic problem reflected in statistics and the microscopic search in bacteriological laboratories, the intersection of scientific research and medical practice, and the relation between what is known and what action is taken. In short, three themes emerge: the general problem of infant health delineated by statistics, the specific questions asked by science, and the concrete answers provided by public health practice.

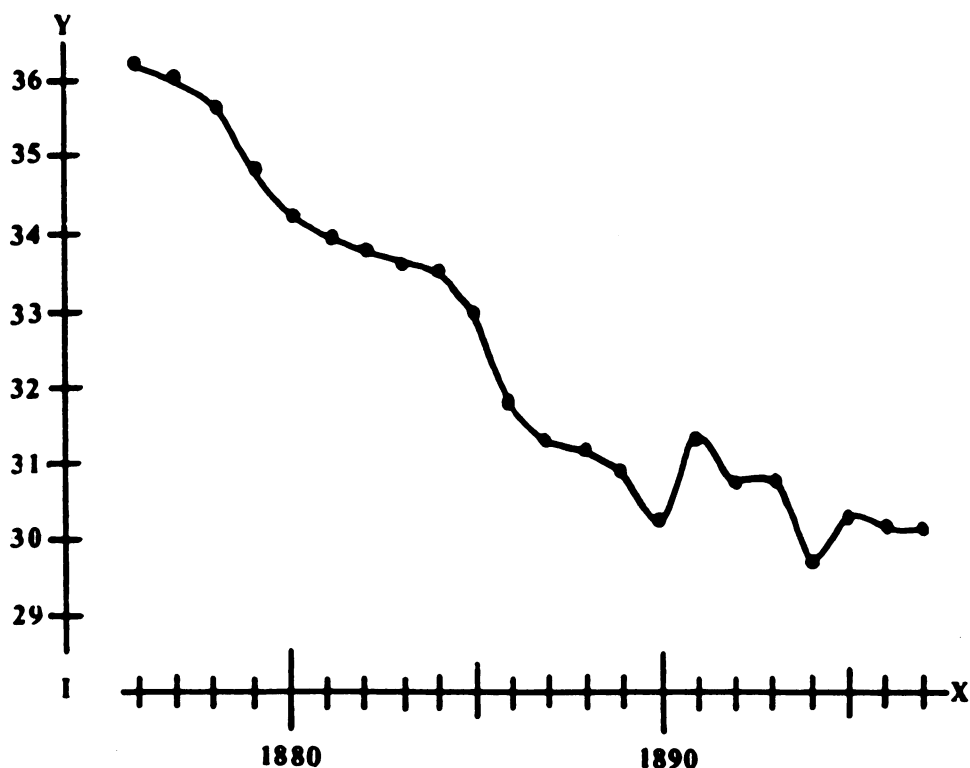
By the turn of the twentieth century, the annual reports of the Registrar General announcing the yearly crop of babies and the toll of infant life had become a cause for concern. Failure to register both births and deaths was negligible by this time, and the data thus collected made precise calculations of vital statistics possible.¹ Between 1876, when the first returns under the compulsory Births and Deaths Registration Act of 1874 were collected, and 1899, the crude birth rate per 1,000 population dropped from 35.5 to 30.5, a decrease of 14.1 per cent² (fig. 1). Although the birth rate in other European countries showed a similar decline, this was little cause for solace, given contemporary notions of imperial responsibility, and given the fact that, except for France, the percentage decrease in England and Wales was greatest.³

* Deborah Dwork, MPH, PhD, Department of Public Health Policy, University of Michigan SPH II, Ann Arbor, Michigan 48109–2029, USA.

† The history of the infant welfare movement in England, 1898–1918, was the subject of my doctoral dissertation (1984). A revised and expanded version was published by the Tavistock Press in 1986.

¹ Arthur Newsholme, *Vital statistics*, 3rd ed., London, Swan Sonnenschein, 1899, p. 73.

² *Ibid.*, 4th ed., London, George Allen & Unwin, 1923, p. 115.

FIGURE 1 CRUDE BIRTHRATE PER 1000 POPULATION
IN ENGLAND AND WALES, 1876-97

Source: Arthur Newsholme, *Vital Statistics*, 3rd edition, 1899, p. 78.

During the same period, the general mortality rate decreased while the infant mortality rate actually showed a slight increase. In 1876, the death rate per 1,000 population was 21.0; by 1899, this had dropped to 17.4, a net reduction of 17.1 per cent.⁴ The infant mortality rate, by contrast, was 146 per 1,000 live births in 1876 and rose to 156, an increase of 6.8 per cent.⁵ In other words, in terms of percentages, during the last quarter of the nineteenth century, fewer babies were born and, especially during the final years of that period, more of those born, died. This was clearly of concern to politicians, physicians, and the public. The rhetoric of both the contemporary popular and professional press emphasized the national importance of these trends. The graphic representation of the annually diminishing net population gains was an omen of inevitable imperial decline.

³ See, for example, the discussion of the importance of the falling birth rate in *Br. med. J.*, 1901, i: 55.

⁴ PP, *39th Annual Report of the Registrar General (for 1876)*, C. 2075, London HMSO, 1878; PP, *60th Annual Report of the Registrar General (for 1897)*, C. 9016, London, HMSO, 1899.

⁵ Newsholme, *op. cit.*, note 2 above, p. 115.

There was also concern about the physical and mental condition of future generations, as well as about their numbers. Not only was quantity needed, quality was wanted as well. Late-nineteenth-century ideas about the improvement of the population stemmed from scientific discussions following the publication of Charles Darwin's *Origin of species* in 1859. The theory of evolution led directly to questions about the transmission of characteristics or traits from one generation to another. As relating to man, this involved the incredibly complex conundrum of the transmission of physical and intellectual qualities from parents to children. Once the concept of evolution had been accepted, the process by which it occurred had to be understood so as to be tamed to social purposes; thus it would be possible to control the quality of progeny.

Biological arguments were reflected in, and provided a structure for, sociological models, reform programmes, and political platforms. Social Darwinists, environmentalist reformers, eugenicists, and Fabian-liberal imperialists used the theory of evolution as a paradigm.⁶ Their solutions were radically different, but they had a shared objective: the improvement of the quality of the race. Their common goal arose from a common fear, that, due to physical and moral ill health, racial inferiority, inadequacy, and deficiency, Britain would fail, or be found wanting, in the struggle for national existence. It seemed as if their fears came true all too soon.

The reverses suffered by the British Army during the Boer War (1899–1902) crystalized and emphasized the hitherto relatively latent fears of national inefficiency and race degeneration. The campaign in South Africa suggested that the army, which excelled at ceremonial displays, was ineffective as an instrument of imperialist policy. While the news from South Africa of military failure reflected the incompetence, amateurishness, and deficient education of the officers, the news at home of eager but unfit recruits demonstrated the physical debility and ill health of the would-be soldiers. If the graph of a dropping birth rate was perceived as an omen of an expected (future) imperial decline, the recruitment statistics—three out of every five volunteers had been rejected as physically unfit⁷—were a statement of immediate national poverty. This

⁶ There is a wealth of relevant primary literature to illustrate the use of the theory of evolution in sociological models, reformer programmes, and political platforms. See, for example, the work of Francis Galton, T. H. Huxley, Karl Pearson, Caleb W. Saleeby, Herbert Spencer, and Sidney Webb. See also the extremely interesting secondary literature relating to this: Donald MacKenzie, 'Eugenics in Britain', *Soc. Stud. Sci.*, 1976, 6: 449–532; H. C. G. Matthew, *The liberal imperialists*, London, Oxford University Press, 1973; G. R. Searle, *The quest for national efficiency*, Oxford, Blackwell, 1971; *idem*, *Eugenics and politics in Britain: 1900–1914*, Leiden, Noordhoff, 1976; Bernard Semmel, *Imperialism and social reform: English social imperialist thought 1895–1914*, London, Allen & Unwin, 1960.

⁷ Arnold White, a journalist with jingoist and racist predilections and eugenic interests, may have been the first to write incendiary, alarmist reports focusing on the recruitment statistics. Arnold White, 'Efficiency and Empire', *Weekly Sun*, 28 July 1900, p. 5. He expanded on and extrapolated from this in a book by the same title, *Efficiency and Empire*, London, Methuen, 1901. B. Seebohm Rowntree discussed the enlistment rejection figures within a totally different context, correlating poor health and stunted stature with the living conditions which arise out of penury, in his book *Poverty: a study of town life*, London, Macmillan, 1901, esp. pp. 216–218. While White's and Rowntree's works elicited a response from certain sectors of the population, concern about the physical condition of recruits became a national issue subsequent to the publication of an article by Major-General Sir John Frederick Maurice under the pseudonym "Miles". 'Where to get men', *Contemp. Rev.*, January 1902, 81: 78–86. This was followed by another article published under his own name a year later: Maurice, 'The national health: a soldier's study', *ibid.*, January 1903, 83: 14–56.

was a problem of the here and now, and reaction to the statistics reverberated throughout the country. Shortly after the war, at the height of the national deterioration discussion, even the *British Medical Journal*, which was generally sceptical of the alarmist announcements, declared:

Now, more than at any other time in the history of the British people, do we require stalwart sons to people the colonies and to uphold the prestige of the nation, and we trust that the searching inquiry which the Duke of Devonshire's speech seems to foreshadow if it does not dispel the fears engendered by the memorandum of the Director-General [*sic* Inspector General] may, at any rate, be a means of arresting the physical decline of the nation.⁸

On 2 September 1903, the Inter-Departmental Committee on Physical Deterioration was appointed to investigate and report on this issue. Precisely five months earlier, on 2 April 1903, Surgeon-General Sir William Taylor, Director-General of the Army Medical Service, had issued a memorandum addressing the questions of "whether [the] impeachment of the national health has a solid foundation in fact, and . . . whether the condition is true of the population as a whole, or only a certain section of it."⁹ Taylor began with a direct reference to the enormous response to contemporary articles on the subject. "A deep interest has been aroused, both in the lay and medical press, by the writings of Sir Frederick Maurice . . . pointing to the fact that there is an alarming proportion of the young men of this country, more especially among the urban population, who are unfit for military service on account of defective physique."¹⁰ He noted indications that this was a problem found in the labouring class only, and he associated this with poverty-related social conditions, quoting the studies of Charles Booth and B. Seebohm Rowntree. Taylor questioned Maurice's evidence, but agreed that the rejection percentage was alarming; it "is not only serious from its military aspect, it is serious also from its civil standpoint, for if these men are unfit for military service, what are they good for?"¹¹ The Director-General summed up with an environmental, not eugenic, argument. "Were all classes of the community able to provide their offspring with ample food and air space, a healthy race would be produced, and the proper material to fill the ranks of the Army would probably soon be obtained."¹² In conclusion, Taylor called for a commission to conduct an inquiry into the causes of and remedies for physical deficiency, and he appealed to the Secretary of State to obtain the advice of the Colleges of Physicians and Surgeons as to the necessity for, composition, and scope of such a commission.

It took three months for the Home Secretary to take up this suggestion, and in early July both colleges appointed committees to consider the questions. The Royal College of Physicians responded on 27 July with the recommendation that "an enquiry . . . into

⁸ 'National health and military service', *Br. med. J.*, 1903, ii: 208.

⁹ PP, *Report of the Inter-Departmental Committee on Physical Deterioration*, vol. I, Appendix I, 1904, cd. 2175, XXXII, p. 95. The medical press reported this issue extensively. The memorandum was issued as a Parliamentary paper by the War Office in July, and press coverage consequently increased during that month. Note, for example 'Medical notes in parliament: the physique of the people', *Br. med. J.*, 1903, ii: 99–100; the abstract of the memo: *ibid.*, pp. 202–203; and the editorial 'National health and military service', *ibid.*, pp. 207–208.

¹⁰ *Report*, *op. cit.*, note 9 above, p. 95.

¹¹ *Ibid.*, p. 95.

¹² *Ibid.*, p. 97.

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the present physical condition of the nation . . . would be of great value; but one dealing with a portion only of the population would be likely to lead to error.”¹³ Furthermore, the Committee* noted that no evidence had been adduced to prove physical degeneration of the urban population generally, and that remedies for “existing defects in and improving the national health may . . . be briefly summed up as those which tend to diminish poverty.”¹⁴

The Royal College of Surgeons, in its letter of 4 August, stated plainly that Taylor’s recruitment statistics did not in any way demonstrate the progressive physical deterioration of the nation, and therefore there was no need “for a large enquiry into the National Health”. Emphasizing the importance of a healthy environment and proper food, the Committee suggested that if the government did decide to institute an inquiry, “employers of labour, representatives of the working-classes, [and] persons who have specially studied matters relating to public health”, among others, should be included on the Commission.¹⁵

As in earlier studies of social conditions, the Inter-Departmental Committee on Physical Deterioration inquired into the concomitants of urbanization: overcrowding, pollution, poor conditions of employment. And, like its predecessors, it discovered the concomitants of poverty: malnutrition, disease, deprivation. It is striking, however, that while the discussions of the ill effects of urbanization, in addition to those regarding reproduction rates and recruitment statistics, occupy the first half of the report, the second is devoted entirely to a consideration of the conditions of the life of the juvenile population.¹⁶ Starting with an examination of the physical condition of grown men, the Committee then turned to the next generation. The genesis of the inquiry had been the recruitment rejection figures, but the culmination of the evidence was a series of recommendations pertaining to the improvement of child health. A *British Medical Journal* editorial on the Committee’s work commented:

The most impressive conclusion arrived at . . . is that at the root of the unfitness which undoubtedly exists in the ranks from which our soldiers are drawn, is the question of proper infant feeding. It cannot too often be repeated that a child wisely fed for the first two or three years of its life has every chance of growing up into a strong man or woman; a child rendered rickety and puny by ignorant feeding will in all probability never make up the ground it has lost. A great number of infants, especially in towns, have from one cause or another to be fed artificially. The natural substitute for the mother’s milk is cow’s milk. At present cow’s milk is too often, when it reaches the houses of the poor, in a state which renders it dangerous to life. Can any reasonable mind be surprised at the great infant mortality and at the unfitness of the majority of the survivors? Without clean milk there will be continued death and unfitness; the moral is that every effort should be made to get clean milk. . . . Then, and only then, will this great national problem be satisfactorily solved.¹⁷

This emphasis on clean milk reflected the generally accepted idea that feeding was a major determinant of infant health. The graph in fig. 2 illustrates the relative

¹³ *Ibid.*, p. 98. Note also coverage in *Br. med J.*, 1903, ii: 345, and 1339–1340.

* The Committee was composed of Drs Poore, Longstaff, Pringle, Newsholme, and J. F. W. Tatham.

¹⁴ *Report*, op. cit., note 9 above, p. 98.

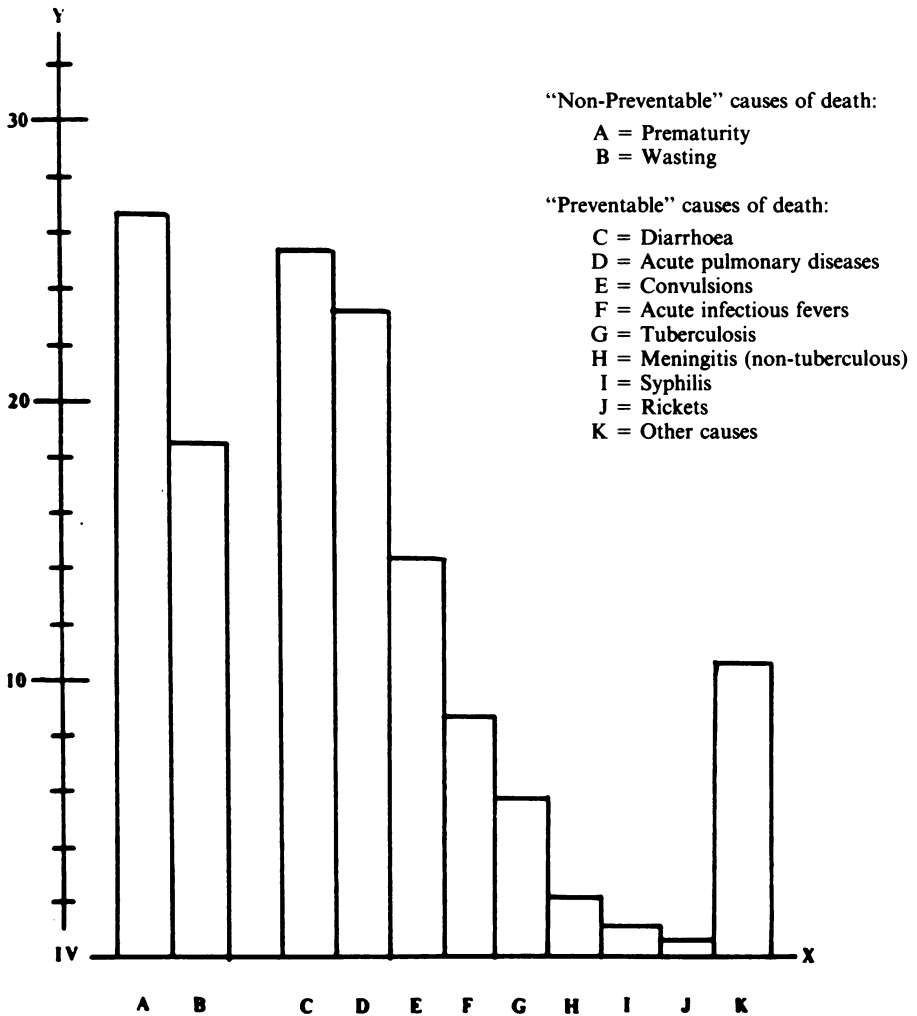
¹⁵ *Ibid.*, p. 99. Note also coverage in *Br. med. J.*, 1903, ii: pp. 1101 and 1340.

¹⁶ PP, *Report of the Inter-Departmental Committee on Physical Deterioration*, vol. I, Cd. 2175, XXXII, London, HMSO, 1904.

¹⁷ ‘Physical deterioration’, *Br. med J.*, 1904, i: 319–320.

importance of the primary causes of infant death at the beginning of the twentieth century. The preponderance of the three major categories of wasting, diarrhoeal, and respiratory disease is at once evident.

FIGURE 2 RATE PER 1000 REGISTERED BIRTHS OF INFANT DEATHS DUE TO MAJOR CAUSES OF MORTALITY, ENGLAND AND WALES, QUINQUENNIAL 1901-5



Source: David Forsyth, *Children in health and disease*, London, John Murray, 1909, p. 229.

Infant diarrhoea, or *cholera infantum*, was considered to be a very different sort of pathological condition from prematurity or the “wasting” disorders. Whereas the latter appeared to be a general debility, not assignable to any specific cause, which made it impossible for the infant to thrive, infant diarrhoea was clearly a specific

pathological entity. The disease process was visible: healthy children suddenly sickened violently and all too frequently died. It was precisely because *cholera infantum* attacked healthy children, because the onset was so unexpected and abrupt, that it made immediate demands on the healing skills of medical practitioners. It is thus understandable that they focused on this cause of infant mortality, perceiving it to be “preventable”, while deaths due to “wasting” (prematurity and congenital defects) were termed “non-preventable”. Although some physicians interested in infant welfare, such as George McCleary, the Medical Officer of Health for Battersea, urged their colleagues to “get rid of the expression ‘non-preventable’ in relation to infantile mortality, and set ourselves to investigate the antenatal factors, and to bring them within the scope of our administrative measures”,¹⁸ it was beyond the range of most general practitioners and the majority of medical officers of health to do so. For the time being, therefore, the principal impetus to reduce infant mortality was channelled towards combating the single most obvious, dramatic, and “preventable” cause, infant diarrhoea.

Between 1880 and 1900, infant mortality due to diarrhoeal disease had increased dramatically and without remission. The returns of the local medical officers of health indicated a great variability of the death rate between geographical locations and according to the season, and diarrhoea was found to be primarily a disease of towns with a predominant summer incidence. In the early years of the twentieth century, a number of large-scale epidemiological studies were undertaken to determine the conditions under which urban infants contracted this disease each summer. Were diarrhoeal deaths due to the type of food the infant received? Or, as other investigators claimed, were factors such as housing or maternal employment the determinants of mortality? These studies showed that while factors such as housing and maternal employment were only erratically correlated with diarrhoeal mortality rates, the nature of the food the infant received was the primary determinant for this disease.¹⁹ Breast- versus bottle-feeding was consistently related to a differential in the diarrhoeal mortality rates. Although this was indisputable, the precise reason for it was unclear. What was the aetiology of epidemic diarrhoea? And how did cows’ milk fit in?

The bacteriology of infantile diarrhoea can be said to have begun in Germany in 1885 when Escherich published the results of his seminal study of the bacteriological flora of the infant intestine.²⁰ A decade later, he announced his theory of the aetiology of infant diarrhoea. Escherich believed that the infection was derived from milk, and his research revealed that milk commonly sold contained streptococci from the uterus

¹⁸ George F. McCleary, ‘The influence of antenatal conditions on infantile mortality’, *ibid.*, p. 321.

¹⁹ See, *inter alia*, L.A. Darra-Mair, *Report on back-to-back houses*, Cd. 5314, London, HMSO, 1910; Arnold Evans, ‘Back-to-back houses’, *Trans. Epidem. Soc., Lond.*, 1895, 15: 87–99; William J. Howarth, ‘The influence of feeding on the mortality of infants’, *Lancet*, 1905, ii: 210–213; Herbert Jones, ‘Back-to-back houses’, *Pub. Hlth*, 1892–93, 5: 347–9; George Newman, *Infant mortality: a social problem*, London, Methuen, 1906; Arthur Newsholme, ‘Remarks on the causation of epidemic diarrhoea’, *Trans. Epidem. Soc.*, 1902–03, N.S. 22: 34–43; George Reid ‘Infantile mortality and the employment of married women in factories’, *Br. med. J.*, 1901, ii: 411; *idem*, ‘Infantile mortality and the employment of married women in factory labour before and after confinement’, *Lancet*, 1906, ii: 423–424; H. Meredith Richards, ‘The factors which determine the local incidence of fatal infantile diarrhoea’, *J. Hyg.*, 1903, 3: 325–346.

²⁰ Theodor Escherich, ‘Die Darmbakterien des Neugeborenen und Säuglings’, *Fort. Med.*, August and September 1885, 3: 512–522, 547–555.

of the cow. He presumed, but was not certain, that this streptococcus was the responsible agent, as it was only found in the stool if the intestine was much diseased.²¹

The following summer an American, William D. Booker, began research to follow up on “the fundamental work of Escherich upon the bacteria in the healthy intestine of sucklings”.²² Working from the Johns Hopkins Hospital, Baltimore, and the Thomas Wilson Sanatorium for Sick Children (a richly endowed hospital ten miles from Baltimore devoted exclusively to the treatment of summer diarrhoea, to which 350 to 400 infants were sent each summer—the only season it was open), Booker conducted a bacteriological investigation of the faeces of infants affected with diarrhoea. He presented his work in 1887 at the International Medical Congress in Washington, D.C. The first researcher to attempt an intensive investigation into this problem on a relatively large scale (seventeen infants were examined, sixteen of which were ill and one, a control, healthy), he was nevertheless unsuccessful in isolating one specific responsible organism. Booker, like Escherich, found that the number of organisms in the faeces of the ill and healthy child was equal, but that the variety was greater in the former case. He identified and studied eighteen different strains isolated only from the stools of infants suffering from epidemic diarrhoea.²³

Throughout the next decade Booker continued his research, examining over thirty strains of bacteria discovered in the stools of 123 infants suffering from the disease and in the organs of thirty-three infants who had died of it. In a paper published in 1897, he made some general remarks, based upon the evidence he had obtained during the past ten years, regarding the bacteriological differences found in diseased as compared with healthy infants, concluding “No single micro-organism is found to be the specific exciter of the summer diarrhoea of infants. The affection is generally to be attributed to the result of the activity of a number of varieties of bacteria, some of which belong to well known species and are of ordinary occurrence and wide distribution, the most important being the streptococcus and the proteus vulgaris.”²⁴

Neither Escherich's nor Booker's suppositions were confirmed, and other researchers in Germany, France, the United States, and Great Britain were no more successful. Nevertheless, even though a specific aetiological agent for epidemic diarrhoea had not been isolated, it was commonly accepted that bottle-feeding with cow's milk was the major risk factor for this disease, and amelioration of the supply was clearly needed.

There were two other major factors which added impetus for improvement of milk quality. The first of these was the question of morbidity with the potential sequela of ill health especially in relation to the physical deterioration of the race. As early as 1901, the argument of imperial significance was used to stress the importance of concentrating on, attending to, and ameliorating the milk supply. For instance, in J.

²¹ *Idem*, ‘Ueber spezifische Krankheitserregen der Säuglingsdiarrhöen (streptococcenenteritis)’, *Wien. klin. Woch.*, 1897, 42: 917–920.

²² William D. Booker, ‘A study of some of the bacteria found in the faeces of infants affected with summer diarrhoea’, *Trans. Amer. Ped. Soc.*, 1889, 1: 199.

²³ *Idem*, ‘A study of some of the bacteria found in the dejecta of infants afflicted with summer diarrhoea’, *Trans. Internat. Med. Cong.*, (Washington, D.C., 1887), 3: 598–617.

²⁴ *Idem*, ‘A bacteriological and anatomical study of the summer diarrhoeas of infants’, *Johns Hopkins Hosp. Rep.*, 1897, 6: 159–259.

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W. Byers's presidential address to the Section of Obstetric Medicine and Gynaecology of the British Medical Association, he referred to the value of emulating American work in this field within the context of its national consequence.

We are . . . rapidly in England approaching the condition prevailing for some time in France and America. It is not for me . . . to discuss the causes of this declining birth-rate; rather my duty is to ask what remedy can we as doctors suggest to combat a state of matters which, from a national and imperial standpoint, must be regarded as most unsatisfactory. If fewer children are in the future to be born in this country, we must redouble our efforts to lower the high death-rate of infants . . . Our American friends are far ahead of us in such matters . . . Quite recently the Rockefeller Institution for Medical Research . . . has decided that the first investigations to be undertaken by the scientific experts connected with it will be to co-operate with the New York Board of Health in studying the milk supply and the contaminated article as a source of danger.²⁵

As public anxiety regarding the possibility of national degeneration escalated following the Boer War, concern about milk as a potential factor in that deterioration increased. And just as articles on the physical condition of recruitment volunteers had aroused massive interest in this issue, reports on the hygienic state of the milk supply focused concern on that piece of the imperial problem. The correlation was clear: poor milk led to poor health. The *British Medical Journal* devoted abundant space to this subject, including a series of articles between 21 March and 2 May 1903 entitled 'A report on the milk supply of large towns'.²⁶ This seven-part account was so popular, and generated so much discussion, that it was collated and published as a pamphlet "to be obtained through any bookseller. Price 6d."²⁷ The series concentrated on the "defects and their remedy" of the milk supply, more or less on the macroscopic level; "it would be foreign to our present purpose to go at any length into the subject of the bacteriology of milk", the author, Aimeé Watt Smyth, explained.²⁸ Rather, the point of the report was to discern and clarify various problematic aspects of the milk industry, the effect of dirty milk on the (especially infant) population, and to propose possible reforms or improvements. Watt Smyth noted the potentially poor physical conditions of infant survivors of epidemic diarrhoea caused by contaminated milk, and contended that "an attack of acute diarrhoea often leaves behind a condition of general debility and impaired nutrition".²⁹

In an editorial published in the same issue as the final part of Watt Smyth's report, the *British Medical Journal* directly associated poor milk in infancy with ill health as an adult, and stressed the urgency of this untoward result by reminding its readers of the recruitment statistics. The editors were convinced that bad milk engendered poor health, and fitted this concern within the framework of national deterioration. "The series of articles upon the milk supply of large towns . . . have dealt with a subject with regard to which the medical profession has a duty to inform and guide public opinion", the editorial began. Arguing the case deductively, the editors averred:

²⁵ J.W. Byers, 'Introductory remarks by the president', *Br. med. J.*, 1901, ii: 942–943.

²⁶ Aimeé Watt Smyth, 'A report on the milk supply of large towns', *ibid.*, 1903, i: 678–680; 739–742; 801–802; 876–878; 933–934; 973–977; 1033–1037.

²⁷ Advertisement, *ibid.*, 1903, ii: 1477.

²⁸ Smyth, *op. cit.*, note 26 above, p. 678.

²⁹ *Ibid.*, p. 680.

There can be no doubt that a large part of the heavy infantile mortality from gastro-intestinal disorders . . . is due to improper feeding, and that this very generally resolves itself into the simple fact that infants are given infected or contaminated and decomposing milk. The first year of a human being's life is of special importance; on it depends in no small degree its future health and strength. A rickety, puny infant constantly ailing from improper feeding will be little able to resist the stress of infection; and if it survives, will never attain a good standard of physical development and health.

The strength of the nation is in the brains and thews of her sons and daughters, and it is a national duty to take every means to ensure that the greatest care be used to give the child a good start and to set it up in the world with a vigorous and healthy constitution.³⁰

As the Inter-Departmental Committee on Physical Deterioration sat throughout the winter and spring of 1903–4, both the popular and professional press thoroughly discussed the issue of national degeneration in general, and the role of the milk supply as a primary contributory factor in particular. The *Pall Mall Gazette*, for instance, ran a front-page article 'Milk and men' on 12 April 1904. "The deterioration of the classes from which the bulk of our recruits is drawn has been causing much anxious thought, and on all sides it is sought to come to some definite conclusion as to the causes of the physical deterioration and the best means to check it", the author (noted simply as "an expert") observed. "The subjects of milk and the national physique are so interwoven as to be practically inseparable. No one having studied the subject can overlook the importance of fresh cows' milk for those infants who must be reared artificially, nor the extreme danger of feeding them upon impure milk."³¹ This "expert" emphasized that "year after year thousands of infants under one year die, and an even larger proportion survive puny and diseased", due not "to the ignorance of mothers, [but] to the milk as it reached the poor—'putrescent.'" In short, the expert concluded, "Undoubtedly bad milk in infancy is responsible for a vast amount of the unfitness in the class from which recruits are drawn."³²

In addition to the generally accepted correspondence between filthy milk and high infant mortality from epidemic diarrhoea, and the connexion between such milk and morbidity, possibly producing permanently weakened physical constitutions (with potentially all-too-obvious national consequences), there was another major factor which added impetus towards an improved milk supply: the relation between contaminated milk and the spread of communicable diseases, particularly tuberculosis. The development of the germ theory of disease had led to the rapid recognition during the second half of the nineteenth century of the role of milk in the communication of such diseases as typhoid or enteric fever, scarlet fever and diphtheria, and septic sore throat.³³ Outbreaks of the first three diseases were clearly visible and consequently epidemiologically identifiable. The question was, how great a

³⁰ 'Town milk', *ibid.*, 1903, i: 1039.

³¹ 'Milk and men', *Pall Mall Gaz.*, 12 April 1904, p. 1.

³² *Ibid.*, p. 2.

³³ See, *inter alia*, Ernest Hart, 'The influence of milk in spreading zymotic disease', *Trans. Internat. Med. Cong.*, London, J. W. Kolckman, 1881, 4: 491–544; W. Leslie MacKenzie, 'The hygienics of milk', *Edinb. med. J.*, 1899, N.S. 5: 372–378 and 563–576; George Newman, *The health of the people*, London, Headley Bros, 1907, pp. 50–52; William G. Savage, *Milk and the public health*, London, Macmillian, 1912, esp. pp. 71–102; Swithinbank and Newman, *Bacteriology of milk*, London, John Murray, 1903, esp. pp. 210–319.

danger did tuberculosis-contaminated milk pose to the public health? What percentage of milch cows were infected, and how important was bovine infection as a cause of disease?

By 1890, the question of the pathogenicity of bovine tuberculosis had become so urgent that a Royal Commission was appointed to study the effects upon humans of food from tuberculous animals. In the course of their work, the Commissioners had initially taken evidence but, not finding it sufficiently uniform, they decided to institute original experimental research. These investigations were conducted by outside experts, John McFadyean, Sidney Martin, and Sims Woodhead.³⁴ Not surprisingly, their conclusions were in accordance with the position Woodhead himself (as well as other researchers) had maintained for some time.³⁵ The experimental results were straightforward: a certain proportion of animals fed tuberculous material developed the disease while control animals kept under similar conditions did not become ill. On the basis of both the evidence brought before the Commission and the laboratory research carried out at its behest, the Commissioners were prepared to commit themselves positively. "As regards man, we must believe—and here we find ourselves agreeing with the majority of those who gave evidence before us—that any person who takes tuberculous matter into the body as food, incurs some risk of acquiring tuberculous disease." Furthermore, they said, "We find the present to be a convenient occasion for stating explicitly that we regard the disease as being the same disease in man and in the food-animals."³⁶ While humans could be infected by ingesting tuberculous meat, "the milk of cows with tuberculosis of the udder possesses a virulence which can only be described as extraordinary."³⁷ They concluded, "No doubt the largest part of the tuberculosis which man obtains through his food is by means of milk containing tuberculous matter,"³⁸ children naturally being more particularly at risk. Although there was little information on this point, the Commissioners conjectured that "probably the proportion of tuberculous persons contracting their disease through food is larger among children than among their seniors."³⁹

A second Royal Commission, appointed in 1896 to inquire into administrative procedures to control the danger to man from the use of tuberculous meat and milk, concurred with the findings of its predecessor, as did a growing number of independent investigators in Britain and abroad.⁴⁰ The second Commission reported in 1898,

³⁴ PP, *Report of the Royal Commission Appointed to Inquire into the Effects of Food Derived from Tuberculous Animals on Human Health*, Part I; 'Report', Cd. 7703, London, HMSO, 1895, p. 9.

³⁵ George Sims Woodhead, 'Lectures on tuberculosis and tabes mesenterica', *Lancet*, 1888, ii: 51–54, 99–102; *idem*, 'The channels of infection in tuberculosis', *ibid.*, ii: 957–960; *idem*, 'Prevention of tuberculosis', *Pub. Hlth*, May 1899, pp. 579–582. See also, for example, Sheridan Delépine, 'Tuberculosis infection through the alimentary canal', *Med. Chron.*, 1895, 3: 144–154; *idem*, 'Tuberculosis and the milk-supply, with some general remarks on the dangers of bad milk', *Lancet*, 1898, ii: 733–738.

³⁶ PP, *Report of the Royal Commission on the Effect of Tuberculous Food*, Part I, p. 10.

³⁷ *Ibid.*, p. 17.

³⁸ *Ibid.*, p. 20.

³⁹ *Ibid.*, p. 10.

⁴⁰ Discussions of the cause and effect relationship between tuberculous milk and meat and disease in humans were necessarily based on circumstantial or statistical evidence. In addition, an enormous body of experimental literature accrued, especially from France, Germany, Denmark, and the United States, proving the pathogenicity of milk and meat from tubercular cows for all kinds of animals. See, *inter alia*, the

strongly recommending a number of changes to prevent tuberculous infection from animal products in general and from contaminated milk most particularly.⁴¹

Whatever steps the government may have eventually been tempted or persuaded to take were effectively balked by no less a person than Robert Koch himself. On 23 July 1901, Koch astounded the public in general and the scientific world in particular with his announcement at the British Congress on Tuberculosis that “human tuberculosis differs from bovine, and cannot be transmitted to cattle. . . . Though the important question whether man is susceptible to bovine tuberculosis at all is not yet absolutely decided, and will not admit of absolute decision to-day or to-morrow, one is nevertheless already at liberty to say that, if such susceptibility really exists, the infection of human beings is but a very rare occurrence. I should estimate the extent of the infection by the milk and flesh of tuberculous cattle, as hardly greater than that of hereditary transmission [“though . . . not absolutely non-existent, it is nevertheless extremely rare”⁴²], and I therefore do not deem it advisable to take any measures against it.”⁴³

Given the weight of clinical and bacteriological evidence confirming the identity of human bovine tubercle bacilli and the transmissibility of bovine tuberculosis to human beings through the alimentary canal, which had been presented both prior to and indeed at the Congress itself, the reaction of the participants and the press was to be expected. An editorial on ‘Professor Koch and tuberculous milk and meat’, published four days after Koch’s address may perhaps have described the reaction best. “Already, before these memorable words of Professor Koch could be published in *The Lancet*, they had carried solace or given rise to astonishment, and even incredulity, in most parts of the civilised world. . . . Accustomed as we are to accept the researches of Professor Koch almost without demur, we feel, nevertheless, a little staggered by the directness and conclusiveness of his statement.” It pointed out that in Britain alone “there have recently been two Royal Commissions upon the question of tuberculosis”, which had come to conclusions directly contradictory to those of Koch. And while it was easy to urge continuation of present precautions, “on all sides our medical officers of health will be met” with Koch’s pronouncements, “putting back reform in our milk and meat traffic as those who are familiar with the excuses of sanitary authorities for a policy of inactivity” could well imagine.⁴⁴

Failure to isolate a specific aetiological agent for epidemic diarrhoea, and the loss of the tuberculosis argument were greatly detrimental to the pure milk campaign. The scientific and statistical evidence proving or indicating a causal link between an infected supply and disease, and the scare-mongering rhetoric of national deterioration, were not forceful or powerful enough to catalyse action to improve the purity of the milk supply on a national level. They were, however, sufficient to effect

work of Nocard, Chauveau, Viseur, Calmette, Gerlach, Harmz, Günther, Klebs, Johne, Bang, Ravelin, and Smith.

⁴¹ PP, *Report of the Royal Commission Appointed to Inquire into the Administrative Procedures for Controlling Danger to Man Through the Use as Food of the Meat and Milk of Tuberculous Animals*, Part I: ‘Report’, Cd. 8824, London, HMSO, 1898.

⁴² Robert Koch, ‘An address on the fight against tuberculosis’, *Br. med. J.*, 1901, ii: 190.

⁴³ *Ibid.*, p. 191.

⁴⁴ ‘Professor Koch and tuberculous milk and meat’, *Lancet*, 1901, ii: 217.

local change. The Model Milk Clauses enacted by some authorities were one such local response to the problem of the milk supply. These regulations, focusing primarily on the prohibition of tuberculous milk in a specific district, affected the general milk supply to that area.⁴⁵ Other authorities concentrated on activities to improve the infant milk supply. They made it their business to introduce systems for the provision of clean milk for infants and young children only.

These two forms of local initiative were parallel responses to a common problem. They were born, matured, and died more or less simultaneously during the first decade of the twentieth century. The very same year (1899) the Manchester Sanitary Authority secured the passage of the Milk Clauses, the Health Committee of the St Helens Corporation opened the first milk depot in England, a concept imported from France.

In France, the problem of national depopulation had become a matter of concern a generation earlier than in England. The French birth rate had decreased sooner and more sharply than the English and their infant mortality rate was higher. The profoundly demoralizing débâcle of the Franco-Prussian War gave rise to the fearful spectre of present and future French national impotence (just as the Boer War reverses would do in England thirty years later), and the French began to pay increased attention to their population problems from this point.

The single greatest cause of infant mortality in France was epidemic diarrhoea, and here too it was clear that bottle-fed babies suffered disproportionately. Analogous to the situation in England a decade later, French physicians turned to pragmatic solutions in the hope of immediate results while researchers such as Lesage vainly attempted to isolate the pathogenic agent of this cause of infant death. In 1892, Pierre Budin, Chef de Service at the Charité Hospital in Paris, organized the first formally structured *consultation de nourrissons*. The women who were delivered at the Charité were requested to attend an out-patient clinic, the *consultation*, established for their infants, every Friday morning. There the child was weighed and examined. Budin's primary tenet of infant care was the establishment of and perseverance in breast-feeding. "Nous encourageons de toutes nos forces l'allaitement au sein", he explained to his colleagues at the Academy of Medicine in 1897.⁴⁶ By 1904, he had become even more emphatic on this point: "Dans chacune des communications que nous avons faites, . . . dans tous nos écrits, nous avons insisté sur l'importance de l'allaitement maternel. 'Le nouveau-né doit être mis au sein, il doit être nourri par sa mère: telle est la règle générale à laquelle il sera fait aussi peu d'exceptions que possible' ", he declared.⁴⁷

When it was absolutely impossible to raise the child solely on breast milk, or if the mother had no milk at all, the baby was given sterilized cows' milk which was, in

⁴⁵ The Manchester Corporation (General Powers) Act, 1899, was the first to be passed and was a model for other municipalities. The Manchester Milk Clauses provided for increased power of inspection extending to all localities purveying milk to the city, prohibition of the sale of tuberculous milk within the city, isolation of cattle suffering from tuberculosis of the udder, and compulsory notification of all suspected cases of this manifestation of the disease. During the next few years, a number of boroughs and urban districts adopted similar legislation. See, for example, G.B., *38th Annual Report of the L.G.B.*, 1908–09, Supplement . . . Report of the Medical Officer, Appendix B, no. 5, Report by Professor Delépine, Cd. 4935. London, HMSO, 1909; James Niven, 'The administration of the Manchester milk clauses', *Br. med. J.*, 1901, ii: 314.

⁴⁶ Pierre Budin, 'Sur le lait stérilisé', *Bull. Acad. Méd.*, 1897, 37: 685.

⁴⁷ *Idem*, 'Note sur l'alimentation des enfants', *ibid.*, 1904, 51: 23–24.

general, undiluted. There were, he insisted, “three cardinal laws which govern the use of animal milk. 1st. Give milk of good quality. 2nd Give milk in correct quantities, neither too much nor too little; and 3rd. Sterilize all milk.”⁴⁸ Budin obtained commercially pasteurized milk “to preserve it during transit”.⁴⁹ Upon arrival at the hospital, this milk was measured into “small graduated bottles, which each contain enough for one feed, and which are of the greatest service, for they prevent excess not only in the daily allowance but also in the individual meals”,⁵⁰ and sterilized in a bain-marie at 100°C. The daily milk supply for all the infants receiving cows’ milk was provided each morning at the clinic where it was collected by a member of each child’s family.

Budin’s second principle of successful infant care was his insistence upon maternal compliance with his instructions. When he began the *consultation*, he admitted, women who were successfully nursing their infants ceased after a time to attend, and only those who were receiving the sterilized milk for their babies continued to come. Within a decade, however, he was able to claim that “nowadays mothers are beginning to appreciate the benefits of medical supervision, and many who give their children nothing but the breast now attend with unfailing regularity.”⁵¹ The reason for this maternal loyalty was manifest; Budin’s results were wonderful. His achievement, throughout the 1890s, in slashing the morbidity and mortality rates among the infants attending his *consultation*, especially when compared with the statistics which obtained among the general infant population in the city of Paris, were astonishing and inspiring. The number of *consultations de nourrissons* increased rapidly throughout the 1890s. Budin organized his second *consultation* at La Maternité when he was appointed Chef de Service in 1895, and Charles Maygrier took over the original work at La Charité. Again in 1898, shortly after Budin assumed the Professorship in Clinical Obstetrics at the Faculty of Medicine in Paris, he established his third infant service at Le Clinique Tarnier. The *consultation* at La Maternité was carried on by Dr Porak. That same year another *consultation de nourrissons* was opened by Dr Boissard, who had been Budin’s assistant at La Maternité, at the Hôpital Tenon. Thus, by 1898, four of the twelve *services d’accouchement* in the capital had established *consultations de nourrissons*. In addition to those which were maternity hospital-based, similar services were opened at dispensaries and general hospitals. The ardent advocacy of Paul Strauss, a politician (a member of the Senate) philanthropist, and a friend of Budin, pushed the Conseil Général de la Seine to organize similar services in the municipal dispensaries and charities throughout Paris. The first such city *consultation* was opened in 1895 at the Maison de Secours in the eleventh *arrondissement*.⁵² By 1903, according to Dr Maygrier, there were twenty-five *consultations de nourrissons* in Paris, twelve funded by private charity and thirteen through the municipality.⁵³

⁴⁸ Idem, *The nursing*, London, Caxton Publishing Co., 1907, (originally *Le nourrisson*, 1900), pp. 141–142.

⁴⁹ Ibid., p. 153.

⁵⁰ Ibid., p. 142.

⁵¹ Ibid., p. 149.

⁵² Porak, ‘Rapport au nom de la Commission permanente de l’Hygiène de l’Enfance, sur les mémoires et travaux envoyés à cette Commission en 1902’, *Bull. Acad. Méd.*, 1902, **48**: 786–788.

⁵³ Pierre Budin, ‘Précis de *Consultations de nourrissons*’, par Charles Maygrier, *ibid.*, 1903, **50**: 266.

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Infant welfare work in the provinces was equally energetic—and at least as influential—as that undertaken in the capital. The earliest, and that of greatest consequence, was the system developed by Dr Léon Dufour at Fécamp in Normandy. Unaware of Budin's work in Paris, Dufour in 1894 opened an independent baby welfare clinic, unattached to any hospital or dispensary, and supported by private subscriptions. Dufour named his establishment the “*goutte de lait*”. (This term became so popular and so commonly used that historical accounts of the development of infant welfare clinics used the name anachronistically.) In general, the term “*consultation de nourrissons*” was used for those clinics which were attached to maternity hospitals and thus had a rather large percentage of breast-fed infants in attendance; “*gouttes de lait*” primarily implied those clinics to which children who had already been weaned were taken.

Despite the differences in terminology and with regard to the particulars of the patient population, the principles of Dufour's *goutte de lait* and Budin's *consultation de nourrissons* were essentially identical. The mother was encouraged to breast-feed if at all and as much as possible; even if she could not provide the complete dietary, she was urged not to abandon nursing altogether but only to supplement her own supply with cows' milk. Dufour had a pragmatic approach to the issue. “Le but de l'oeuvre”, he emphasized, “dès sa fondation, a été celui-ci; lutter contre la mortalité des enfants en bas âge.” The important point was to ensure that the child received proper nutrition and attention. This could be achieved, he explained:

1. En donnant aux mères de famille tous les conseils et tous les encouragements possible pour les engager à nourrir leurs enfants *au sein*;
2. En dirigeant l'allaitement mixte toutes les fois que l'allaitement maternel ne peut être fait complètement;
3. En préparant du lait stérilisé, afin d'assurer à l'enfant un lait de bonne qualité dans l'allaitement artificiel, lorsqu'il est bien avéré que la mère est dans l'impossibilité physique, morale ou sociale de nourrir elle-même son enfant.⁵⁴

Medical examination of the infants and hygiene instruction for their mothers were integral parts of Dufour's *goutte de lait*, just as they were of the *consultation de nourrissons*. Thus the three primary principles of the two institutions were identical: to encourage and aid breast-feeding, to supply good quality sterilized milk for those infants who required it, and to provide continuous (weekly) medical care and supervision of the infants during their first one to two years of life.

The results of both types of infant welfare programmes fully justified their existence—and their expense. The results Budin obtained specifically with regard to the reduction in infant mortality from epidemic diarrhoea were splendid. In 1898, fifty-three infants were regularly attending Budin's *consultation* at the Clinique Tarnier, nineteen breast- and thirty-four bottle-fed. The mortality rate amongst these infants was zero.⁵⁵ Dufour's results were almost as spectacular, even though the majority of the infants brought to his *goutte de lait* had already been weaned. The

⁵⁴ Quoted in Porak, 'Rapport au nom de la Commission permanente de l'Hygiène de l'Enfance, sur les mémoires et travaux envoyés à cette Commission en 1901', *ibid.*, 1901, 46: 753–754.

⁵⁵ Budin, *op. cit.*, note 48 above, p. 151.

mortality from diarrhoea throughout the year 1895–6 was 6.80 per cent among the infants attending the *goutte de lait*, while it was 18.18 per cent among the entire population in the town of Fécamp. During 1896–7, the figures were 3.97 per cent and 9.51 per cent respectively; in 1897–8, 2.26 per cent and 12.00 per cent; and in 1898–99, 1.28 per cent and 9.67 per cent.⁵⁶

It is no wonder that when English physicians in general, and medical officers of health in particular, were casting about for a way to prevent infant death they turned to the examples provided by Budin and Dufour. As Dr George Carpenter, the editor of the newly founded (1904) *British Journal of Children's Diseases* (the first English journal devoted exclusively to paediatrics), argued in an article on 'La goutte de lait': "France, faced by a decreasing birth-rate and a high mortality infantile [*sic*] rate, was in danger of extinction. To increase the birth-rate was not feasible, but a reduction in the number of infantile deaths was found well within the powers of preventive medicine, and the advent of the Gouttes de Lait have for the time being solved this social problem. What can be done in France can well be accomplished in England."⁵⁷

This reasoning, which Carpenter expressed so succinctly in 1904, had already moved other physicians to decisive action five years earlier. A leader article in the *Journal of State Medicine*⁵⁸ of December 1898 briefly but enthusiastically describing Dufour's *goutte de lait* at Fécamp caught and held the attention of F. Drew Harris, the Medical Officer of Health for St Helens. "So impressed was I with its possibilities for reducing infant mortality", he told the Section of State Medicine at the 1900 annual meeting of the British Medical Association, "that, acting on the advice of the Chairman of the Health Committee, I at once put myself in communication with Dr. Dufour." Harris wrote a report to his Committee with the information Dufour sent him "which resulted in the immediate appointment of a small subcommittee to visit and further investigate the subject."⁵⁹ Upon their return, the subcommittee (which included Harris) wrote a report successfully urging the Health Committee to commence work along the lines and according to the principles of the Fécamp *goutte de lait*.

The St Helens milk depot was opened on 8 August 1899, and although it was evidently based on the French model, the dissimilitude between the two establishments was clear. They had the same name and looked alike physically, but there the resemblance ended. First of all, Harris did not once mention breast-feeding in his account of his work. The title of his talk, 'The supply of sterilised humanised milk for the use of infants in St Helens', indicated his primary objective. There was absolutely no discussion of any effort to encourage mothers to nurse, nor did he even pay lip-service to this ideal which the French held so dear. Secondly, Harris's system was rather unsuccessful in its attempt to provide medical care for the infant. The mothers were requested to bring their babies once a week to be inspected and weighed but, he confessed, "I regret that it has not been possible to insist on this."⁶⁰ In Dufour's clinic,

⁵⁶ *Ibid.*, p. 155; Léon Dufour, 'L'oeuvre de la goutte de lait', *Bull. Acad. Méd.*, 1897, **38**: 530–531.

⁵⁷ George Carpenter, 'La goutte de lait', *Br. J. Children's Dis.*, May 1904, **1**: 171.

⁵⁸ 'La goutte de lait', *J. State Med.* 1898, **4**: 612–614.

⁵⁹ F. Drew Harris, 'The supply of sterilised humanised milk for the use of infants in St. Helens', *Br. med. J.*, 1900, **ii**: 427.

⁶⁰ *Ibid.*, p. 428.

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by contrast, repeated failure to bring the infant to be examined threatened forfeiture of the milk until the child was presented. Lastly, while in France “the charge of the milk is graduated according to the ability of the parents to pay, being gratuitous to the very poor and increasing gradually . . . the Council at St. Helens . . . felt that it was impossible to follow this plan, and that one uniform rate must be charged. The price was fixed at 2d. per day’s supply, as it was found that this sum rather more than covered the cost of materials and of fuel.”⁶¹ This was twice the price Dufour charged the paying poor of Fécamp. The Corporation paid the rent of the depot, the attendants’ wages, and basic wear-and-tear costs out of the rates. Thus, whereas the French system of payment reflected a determination to procure and secure the attendance of as many mothers with their infants as possible, regardless of the cost to the charity or municipality, the St Helens two-pence charge may well have proved obstructive. In other words, whereas the *consultations de nourrissons* and *gouttes de lait* were designed to provide (possibly gratuitous) medical care for the infants during the first two years of their lives, including a proper milk supply if necessary, the St Helens depot undertook only the latter function.

Although a number of municipalities followed the lead of St Helens and opened similar establishments, the milk depot idea, so accepted and successful in France where it flourished for many years, never really got off the ground in England. As Janet Lane-Clayton, Lecturer on Hygiene at King’s College for Women, University of London, described the situation in 1913, “As a whole, it may be said that the star of the milk depot never rose far above the horizon in England, and is now waning.”⁶² The milk depot system was indeed launched with great enthusiasm, but it did not attract maternal patronage; it simply failed to reach the infants for whom it had been imported. This may have been because comparatively few infants in England were bottle-fed. At the turn of the century, studies of feeding practices had not been undertaken (in 1913, Lane-Clayton observed that data on this subject were still scant) and it was commonly believed that bottle-feeding was both prevalent and on the increase. This may have been partially true, but it may also have been an echo of the general anxiety that the nation was suffering a decline. Seen within the context of the rhetoric of physical deterioration and fear for the future of the empire, it is understandable that both physicians and public commentators jumped on bottle-feeding as an important element in the national devitalization. What did not exist, and what people at that time (with a few exceptions) did not think to obtain was evidence to show, first, what percentage of living infants were breast- versus bottle-fed, and second, precisely when during the first year of life a diarrhoea death occurred in relation to the feeding method for that individual infant. There were, by contrast, plenty of studies to prove that the infant mortality rate from all causes, and from diarrhoea in particular, was several times higher among bottle- as compared with breast-fed babies.

⁶¹ *Ibid.*, p. 430.

⁶² Janet Lane-Clayton, ‘Phases in the development of the infant welfare movement in England’, *Trans. of the Fourth Annual Meeting of the American Association for the Study and Prevention of Infant Mortality*, Washington, DC, G.P.O., 1914, p. 589.

Given this perception of the situation, and the pervasive anxieties and fears, it makes sense that the French *consultations de nourrissons* and *gouttes de lait* appeared to be reasonable solutions to the English problem. But the medical officers of health who had been most influential in establishing the milk depot system (Drew Harris, Hope, McCleary, and Newman) had not critically analysed the different conditions found in France and England. They saw that the French, like the English, suffered a low birth rate and a high infant mortality rate, with a large proportion of deaths due to epidemic diarrhoea. They realized that France, like England, was concerned about the prospect of depopulation and its consequences for the nation. What they did not perceive was that France, with its established wet-nurse system,⁶³ had different infant rearing practices which had a direct bearing on feeding customs and therefore on epidemic diarrhoea; it was no accident that in France (but not in England) this was the greatest cause of infant mortality.

The milk depot system was thus imported on a weak foundation. But this should not be pushed too far. Even if an infant were breast-fed, it is unknown how long this continued. Medical practice in England commonly dictated a maximum of nine months. If mothers agreed, did those newly-weaned infants then contract diarrhoea during the last quarter of their first year of life? In any case, there were two definite reasons for the depots' failure to solve the infant welfare problem. First, the milk was sold, on average, at two shillings for a week's supply. This was far too expensive to be purchased by those women who, due to their own lack of nutrition, most needed to find a substitute or supplement for their own supply in order to feed their infants. Such families lived on incomes ranging between twenty and thirty shillings per week.⁶⁴ Second, the depot system, with daily milk collection and return of empty bottles, was not convenient. A further reason for the failure of the depot to flourish in England may have been because there was no ardent philanthropist devoted to the idea and actively supporting it comparable to de Rothschild and Paul Strauss in France or Nathan Straus in America. The milk depot idea may have been popular in France and America because it was made to be popular: it was successfully sold both to the public and the profession. A sufficient market existed in England, but the price was not right and the advertising inadequate.

That such welfare work had the capacity to reduce the number of infant deaths was, if not proven by the depots' experiences, at least demonstrated well enough to be accepted as true. Those who were involved in public health, paediatrics, or social work were convinced by the results obtained that attention devoted to infants was rewarded by an improvement in both the morbidity as well as the mortality statistics. And as mothers would not, or could not, bring their children to the depots, many authorities decided to expand their out-reach activities which, until that time, by and large had been limited only to depot-enrolled infants.

⁶³ George Sussman, 'The wet-nursing business in nineteenth-century France', *French Hist. Stud.*, 1975, 9: 304–28.

⁶⁴ Maude Pember Reeves, *Round about a pound a week*, London, Virago Press, 1982, (originally published 1913 by G. Bell).

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The milk depot was the end result of the relation of problem, question, and answer. The problem was delineated by statistics on paper, the questions were posed by scientists in bacteriological laboratories, and the answer was the depot on the street trying to respond to the everyday problems of ordinary people. The links between these phases of the same issue are not necessarily logical, and are not a simple matter of cause and effect. Each professional group faced the puzzle of infant health within its own parameters. The words "infant health" were the same, but the conundrum this phrase posed was interpreted by each group according to its *métier*. Fortunately, there was enough overlap of concerns to cross-fertilize, and in this paper we have seen that although the problem depicted by the statisticians did not lead the bacteriologists to a definitive solution, and although the investigations of scientific researchers did not lead the medical officers of health to an entirely appropriate health care programme, they gave each other partial direction. It was not clear and straightforward, but obfuscated and obscure. Nevertheless, while the milk depots were not the ultimate answer, they were on the road to that end. Simply the fact that the depot existed was important; its establishment provided a focus and, consequently a stimulus, for those interested in infant welfare work or paediatric medicine. Furthermore, it was a beginning from which alternative systems could, and did, develop. Even as a negative model it provided an impetus for the study of alternatives. And, finally, not all aspects of the milk depot system failed. While the provision of milk without supervision came to be seen as having only limited usefulness, health visitors were incorporated into the scheme to teach the principles of infant care to the depot mothers. It was this hygiene education which became the unique and lasting English contribution to infant welfare work.*

*Hygiene education, or "mothercraft", is treated in full in my book.