

# HISTORICAL ARTICLE

## Feeding Babies in the Battle to Combat Infant Mortality a Century Ago\*

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### Abstract

At the end of the nineteenth century Glasgow, like many large industrial European cities, had an infant mortality rate (IMR) of well over 100 deaths per 1000 live births. Recognition that 'improper feeding' was a significant factor in accounting for this prompted public health authorities to establish infant milk depots, to support breast-feeding mothers and to provide artificial milk feeds for their babies if necessary. The initiative was led by the medical officer of health of Glasgow, Archibald Chalmers, who promoted welfare services for mothers and infants during the first decade of the 20th century. However these initiatives were questioned by an up-and-coming paediatrician, Leonard Findlay, who was to go on to be Glasgow's first professor of medical paediatrics in 1924. Nevertheless IMRs started to go down from 1900 and have continued steadily ever since; and while artificial infant milks clearly posed a risk to the health of babies, attention to infant nutrition, growth and feeding may have played a part in initiating and perpetuating this decline in IMR and improving infant survival and welfare during the last century.

### Key words

Infant, mortality, nutrition, feeding, Glasgow.

The health of Glasgow's children was not good 100 years ago. It had improved somewhat from the darkest days of the 1860s when 'upwards of half' of all deaths were in children less than five.<sup>1</sup> Glasgow grew from a small settlement on the Clyde into a major industrial centre – 'the Second City of Empire' – with a doubling of its inhabitants, from around 200,000 to 400,000, between 1830 and 1860.<sup>2</sup> This rapid population rise outstripped its housing supply, water and sewerage provision. An effect of overcrowding in the dark closes and tenements, many with open drains and a single tap, was infectious disease, ill health and early death. Children were especially vulnerable, and with little sunlight or ventilation, large families and poor diet, they were also susceptible to rickets, undernutrition and their consequences.<sup>3</sup>

While death rates overall declined from 22.6 to 16.9 per 1000 during the second half of the nineteenth century, infant mortality (IMR) remained stubbornly high, at around 150 per 1000 live

births, and was as high at the end of the century as it was in 1850 (fig 1).

Figure 1: Death Rates of the Population as a Whole Compared to Infant Mortality Rates 1851-1901.

Years	Death-rate per 1,000 population	Deaths under one year per 1,000 births
1851-1855	22.6	156
1856-1860	21.8	151
1861-1865	22.5	151
1866-1870	22.4	156
1871-1875	21.9	153
1876-1880	20.8	144
1881-1885	19.4	138
1886-1890	18.8	145
1891-1895	18.7	150
1896-1900	17.6	156
1901	16.9	151

In Glasgow, just as in most European cities, the principal causes of infant mortality were diseases of the digestive, respiratory, and nervous systems, largely due to infection. Prematurity contributed to the malnutrition, marasmus and wasting that often accompanied infection and poor feeding.<sup>4</sup> Infant mortality was well recognised as a sensitive index of public health and sanitary conditions by the 1880s. Surviving to the first birthday added 6.36 years to life expectancy of boys, while living another three years added only another 0.48 years (fig 2).

Figure 2: Expectation of Life at Ages from Birth to Four Years in Glasgow. The table, which compares figures in the 1880s with those of the early 1920s, is taken from Chalmers 1930 (ref 1).

AGE.	1881-90.		1920-22.	
	Expectation of Life in Years.	Added Years.	Expectation of Life in Years.	Added Years.
0, . . . . .	35.18	..	48.41	..
1, . . . . .	41.54	6.36	54.25	5.84
2, . . . . .	45.25	3.71	55.95	1.70
3, . . . . .	46.55	1.30	55.95	0.00
4, . . . . .	47.03	0.48	55.44	0.51
Years added to expectation of life at beginning of fifth year, . .	..	11.85	..	7.03

The highest loss of life was in the first year, and within infancy the first three months took the greatest toil. Moreover while death rates overall were going down, birth rates were also declining. Such figures were recorded throughout Europe and were of particular concern to those responsible for the health and welfare of the people of Glasgow.<sup>1</sup>

Archibald Chalmers, author of many of the data quoted above, was medical officer of health (MOH) of the city of Glasgow, a post established first in 1867 to safeguard the public health. In spite of the dreadful problems of poor sanitation and overcrowded housing, by the turn of the century the city had become one of the richest manufacturing centres of Britain.<sup>2</sup> The prosperity enjoyed by the rising middle classes generated a surge of building in the 1870s and 80s, when Hillhead and Kelvinside, for instance, replaced open fields. Grand terraces appeared on either side of the Great Western Road. These new suburbs were also the site of grand, public institutions, such as the University, Western Infirmary and Glasgow Academy. In these spacious, well-lighted and ventilated surroundings lived families whose children enjoyed a privileged education and grew up relatively free of the childhood diseases that often led to premature death. There was a big contrast between the health and wealth of the rich and poor. Prosperity did not eliminate inequality; it did the opposite.

Infant mortality was closely related to the number of rooms and the number of people living in them (fig 3). In the 1880s, even in households with more than three rooms, each occupied by less than two people, IMR was 130 per 1000. With greater overcrowding it was 177 per 1000 live births. James Burn Russell, MOH from 1872,<sup>5</sup> who did much to improve the housing supply, described what life - and death - in one room was like in the 1880s.

**Figure 3: Mortality Rates in Relation to Density of Room Occupation in Glasgow.** Taken from Chalmers 1930 (ref 1).

Census Data, 1881. Rates, 1880-82.	Group I.	Group II.	Group III.	Group IV.
Mean No. of Rooms per House,	3.295	2.121	1.910	1.885
” ” Persons per Room,	1.521	2.251	2.436	2.510
” Death-rate, . . . . .	19.2	23.9	28.7	31.8
” Birth-rate, . . . . .	31.7	41.0	37.7	38.3
” Death-rate under 1 per 1,000 born,	130	136	170	177

*There they die, and their little bodies are laid on a table or on the dresser, so as to be somewhat out of the way of their brothers and sisters, who play and sleep and eat in their ghastly company. From beginning to rapid ending, the lives of these children are short parts in a continuous tragedy. A large proportion enter life by the side-door of illegitimacy. One in every five of all who are born there never see the end of their first year. Of those who so prematurely die, a third have never been seen in their sickness by any doctor.*

Medical services for sick children were almost non-existent in Glasgow. Poor-law doctors did what little they could, and after many years of agitation by those concerned for the health of children, a Hospital for Sick Children was established in 1883.<sup>7</sup> Burn Russell and his successor as MOH, Chalmers, were both directors of the children's hospital and champions of child welfare.<sup>1,5,7</sup>

However the children's hospital catered mostly for the chronically sick and those requiring surgery. Children under two

years were as a rule excluded, and the vast majority of sick children were seen at the Children's Dispensary nearby.<sup>8</sup> From 1888, when the Dispensary opened its doors, the number of children attending each year rose steadily to over 27,000 in 1900 and to 46,000 by 1910. The cases seen reflected the principal causes of death - acute and chronic infections. Rickets, common in all the large and populous industrial cities of Europe, accounted for around 10% of attendances.<sup>9</sup>

Infant mortality was strongly associated with undernutrition, and this paper explores the development of paediatric and child public health services in Glasgow during the late nineteenth and early twentieth centuries. This was an international problem, and the measures taken in Glasgow to combat infant mortality, through efforts to improve infant nutrition and feeding, are described in the context of initiatives in England and France, whence they originated.

### Infant Feeding and Infant Mortality

Dirty, contaminated and adulterated cow's milk was a potent cause of infant mortality, and well recognised throughout Great Britain as such by the 1860s. Milk was dangerous because of the risk of adulteration and contamination during its journey from the milking shed to the table.<sup>10</sup> Concern about the association between 'improper' infant feeding and premature death inspired the 'clean milk movement', which brought together members of the nascent public health profession with physicians and philanthropists. The Lancet championed the cause with an editorial entitled 'The murder of the innocents'.

*Meat, potatoes, often gin; scant nourishment drawn from the breasts whose secretive power cannot eliminate milk from a half-starved frame, and the unwholesome diluted milk of unhealthy badly-fed cows; such is the nourishment afforded to thousands of children on this day of an enlightened age, in this capital city of a civilised country...<sup>11</sup>*

Breast-feeding was recommended by most medical men.<sup>12</sup> Wet nursing was not a practical solution, and 'farming out' babies, as it became known, was pretty much their death sentence. Shaftsbury's Act of 1872, for the better protection of infant life, had some effect. However the Lancet boldly suggested that: '*...poor mothers are supplied gratuitously with feeding bottles, and with each are given sensible counsels and warnings as to child feeding...*'<sup>11</sup> The quest for 'pure, clean milk' was helped by the discovery and application of pasteurisation and sterilisation, and the application of chemistry and microscopy to the analysis of foods.<sup>13</sup>

This became possible through the development of methods of measuring the nutrient composition of foods, and the process of modifying cow's milk to resemble human milk began to assume a scientific basis alongside developments in food technology. By the 1860s artificial feeds started to appear on the market. In the same year (1868) that Henri Nestlé opened his first factory for the manufacture of his patent infant food, Burn Russell, Glasgow's MOH, warned that: '*A woman who can suckle her child, and will not, increases a hundred-fold the risk that child runs of losing its life*'.<sup>14</sup> Nevertheless, by the 1890s many paediatricians, while stressing the dangers of artificial feeding were producing handbooks of infant feeding that included recommendations of how to feed infants with artificial milk formulas.<sup>15,16,17,18,19,20</sup>

All the while alarm about national efficiency and physical degeneration was growing, fuelled by the finding that in the run

up to the Boer War one in three recruits was unfit to serve in the armed forces. Royal Commissions were established, Parliamentary Enquiries set up, and the attention of MOsH concentrated on maternal health and infant feeding. This was the start of the 'decade of child welfare'. The BMJ championed the 'campaign for clean milk'.<sup>21</sup>

*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.*<sup>22</sup>

In France the association between bottle-feeding and early death was equally well recognised and had prompted public health concern and action. The principal danger to babies of unwholesome raw cow's milk was gastroenteritis, vividly illustrated by Pierre Budin who showed the much higher death rates of artificially-fed babies than those breast-fed during an epidemic of summer diarrhoea in 1898.<sup>23</sup> Budin was professor of midwifery at the Charité Hôpital in Paris and a pioneer of the *consultations de nourrissons*, which were postnatal clinics designed to support breast-feeding mothers. Budin stressed that careful follow-up of newborn infants, with advice and support of breast-feeding, examination by a doctor, and weighing, were vital.

*Nous encourageons de toutes nos forces l'allaitement au sein. ... 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.*<sup>23</sup>

**Figure 4: The work of the Goutte de Lait.** Print of a painting by Jean Geoffroy of 1901 now hanging in the Musée d'Assistance Publique in Paris.



*“L'Œuvre de la Goutte de Lait” (Belleville Dispensary, Paris).  
From the painting by M. Jean Geoffroy, exhibited in the Paris Salon in 1909, now the property of the municipality of Paris.*

A propaganda picture (fig 4), painted in 1901, depicts the work of a *goutte de lait* (a term used to describe the *consultations* and other infant feeding clinics) in Paris. The left panel of the triptych shows a baby being weighed, the weight recorded by a doctor. On the right a mother is collecting a bottle of milk for her baby. The middle panel shows the paediatrician Gaston Variot, a colleague of Budin's, advising a mother about feeding her baby. At the centre are mother and child. The eye is led to the doctor, and his concern and interest in both – which draws the eye back to the breast – the real subject of the painting – the *goutte de lait*. On the right, bathed in bright light, are healthy babies, dominated by the smiling, confident mother and child, surrounded by sturdy toddlers and young children. In the background stand responsible, elder citizens or grandparents.

**Figure 5: The Central Infant Milk Depot in Osborne Street, Glasgow.**



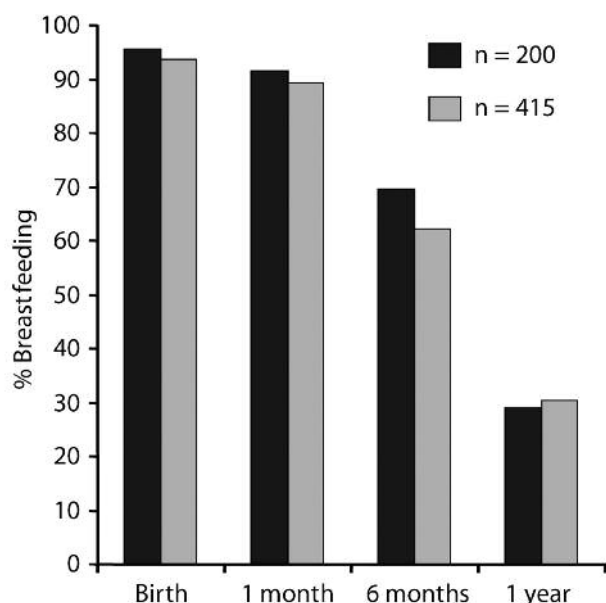
British MOsH quickly realized the potential of the *gouttes de lait* and the Glasgow Corporation established an infant milk depot in Osborne Street (fig 5) in 1904.<sup>24</sup> Supplied by farms in the countryside around the city, cow's milk arrived daily at St. Enoch's Station. The milk was pasteurised, modified into mixtures mimicking the composition of human milk, bottled and then delivered to 18 satellite infant milk depots around the city by horse-drawn cart. Two blocks from the Children's Dispensary was the Maitland Street Milk Depot, where babies were weighed and their mothers given advice about feeding them.<sup>25</sup> To exercise some sort of supervision and control of the use of depot milk, and to prevent abuse of its use, every applicant had to have a doctor's certificate, and failing that the baby had to be seen and examined. This practice reflected the rules of the French *gouttes de lait*.

While breast-feeding was well recognised as the optimal way of feeding babies, the British infant milk depot movement put less emphasis on supporting it, and more on the provision of clean milk. Nevertheless breast-feeding was also the norm among the multiparous mothers attending the Glasgow Children's Dispensary. In 1910, Leonard Findlay, then a physician to the Dispensary, recorded the duration of breast-feeding of two groups of babies (fig 6). The majority were fed on the breast from birth, and at six months more than 60% were still receiving mother's milk.<sup>26,27</sup> Findlay was a firm advocate of breast-feeding:

*No person who has given serious attention to the subject of the nutrition of the infant has the slightest doubt that the best results are obtained by breast-feeding. It is one of the greatest calamities that can befall a newborn child to be deprived of its natural nourishment. We know nothing that can compensate for this loss, and the only consolation is the fact that the inability to suckle is much rarer among the mothers of the poor than among those of the rich.*<sup>28</sup>

However commercial babies milks had advanced in quality, were widely available, and promoted with persuasive claims.<sup>29</sup> Textbooks of childcare carried advertisements for patent milks,

**Figure 6: Breast-Feeding Rates of Women in Glasgow in 1910 Recorded by Leonard Findlay.** Taken from Findlay (refs 29 and 30).



as well as weighing scales and feeding bottles. In Glasgow an artificial formula, named Sister Laura's Infant Food was developed and marketed by the nurse in charge of the Children's Dispensary.<sup>30</sup> Artificial milks became increasingly popular, and the Glasgow infant milk depots were closed down in 1910, having been deemed to have served their needs.<sup>31</sup> As in other towns and cities in Great Britain in which milk depots had been established, by the outbreak of the Great war most were being shut or transformed into infant welfare clinics of various sorts.<sup>32</sup>

Fought on a number of fronts, the battle to combat infant mortality was intensified by the war.<sup>33</sup> At a time when hospital care for children was rudimentary, before antibiotics were invented and when immunisation (apart from small-pox vaccination) was undeveloped, the chief weapons in the battle were feeding babies and safeguarding their nutrition through support of their mothers. Clinical paediatric care, municipal and philanthropic welfare initiatives, scientific endeavours, technological advances and market opportunities converged, even if driven by different motives.<sup>34</sup> Breast-feeding was generally regarded by many as a 'national duty', even when natural and artificial feeding were becoming increasingly medicalised and scientised. Findlay's views were not unusual.

*Breast feeding is the salvation of the poor child, for it is the only thing which gives it a chance in this life. It is the virtue of breast feeding that the children of the poor have the resistance to withstand infection by disease with which they are invariably surrounded.*<sup>28</sup>

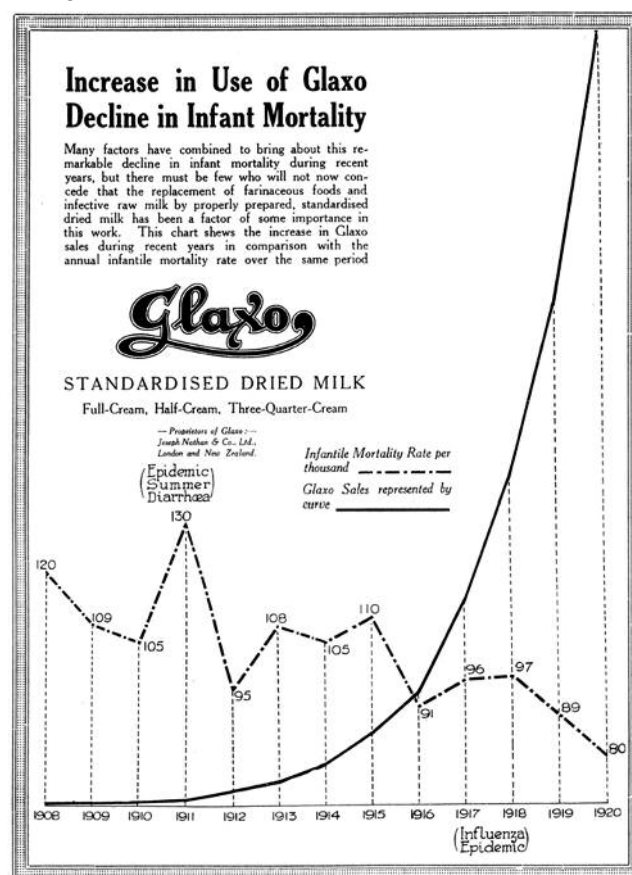
However he was sceptical about the value of public health initiatives:

*Much has been said lately of the desirability of Government action towards the inauguration or encouragement of ante-natal and post-natal clinics, milk depots and similar institutions. It is very doubtful, however, if the good that will accrue from institutions of this kind will be at all commensurate with the expectations that have been aroused or with the expense that would be entailed.*<sup>35</sup>

But by the end of the Great War dried milk had come available and popular, largely because it was easier and safer to store and distribute than liquid milk. Commercial baby food companies exploited the newest developments in the 'humanisation' of cow's milk, and with further advances in food technology, the mass production of feeding bottles, and advertising directly to the public, artificial feeding became increasingly popular.<sup>29,30</sup>

The positive outcomes for the survival and health of infants and children may have been, and was represented as, a consequence of the combined effects of state intervention and public demand, by Glaxo in the 1920s (fig 7).

**Figure 7: Advertisement for Glaxo Infant Milk Comparing Decline in Infant Mortality Rate Compared with Rise in Sales.** Taken from *Nursing Times*, 1920.



But it is unclear what actually caused the decline in IMR. It has been argued that the active promotion of breast-feeding, the discouragement of early supplementation and premature weaning, and the provision of clean, nutritionally-balanced artificial feeds when necessary, were all instrumental in bringing down the high levels of infant mortality that had been around 150/1000 live births for half a century.<sup>36</sup> Infant mortality rates from all causes started to decline in Glasgow from 1900 (fig 8). They did so not just in Glasgow, but also in other cities, whether or not served by milk depots throughout Great Britain (fig 9).

Despite the contrast between cities and countries, for all causes of infant mortality the breast-fed had the greatest chance of survival.<sup>37</sup> The rates of breast-feeding recorded in Glasgow were comparable with those in other poor parts of Great Britain, as shown by Findlay in 1917 (fig 10) when IMR was down to 108 in Glasgow, and 105 in Scotland.

Figure 8: Infant Mortality Rates for Certain Principal Diseases in Glasgow 1903-1925. Taken from Chalmers, 1930 (ref 1).

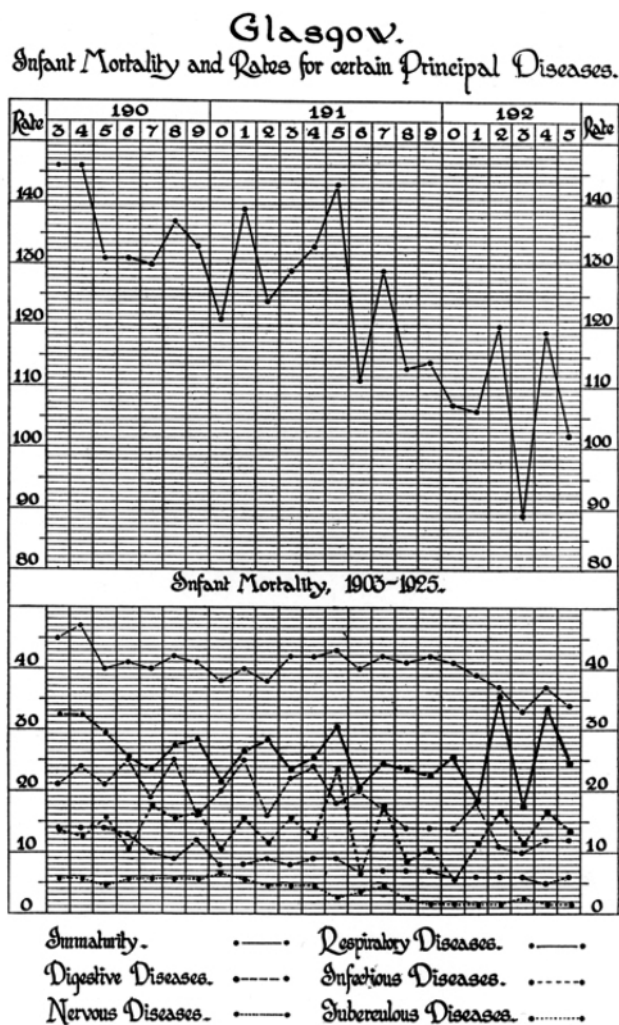
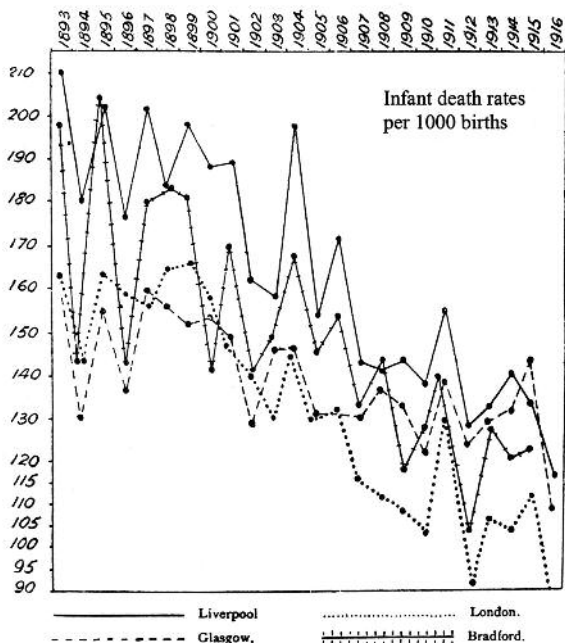


Figure 9: Infant Mortality Rates in Liverpool, London, Glasgow and Bradford. Taken from Findlay, 1918 (ref 35).



Breast-feeding rates had declined slightly from 1910 (fig 6) and Findlay emphasised how vitally important breast-feeding was, while expressing grave doubts about artificial infant milks.

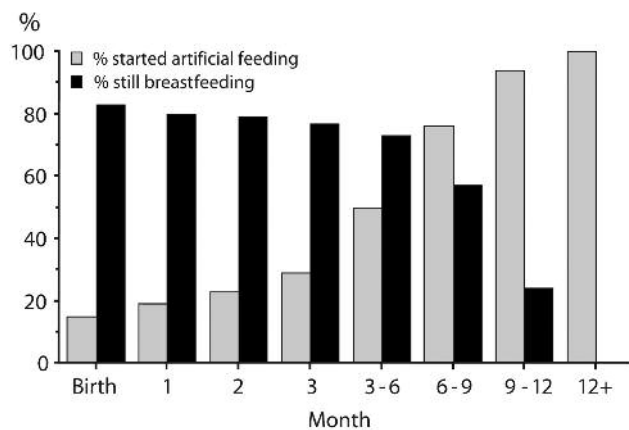
*Rational modification of cow's milk is impossible... Humanisation of cow's milk is no more than a figment of the imagination....One might as easily hope to convert St Paul's Cathedral into Westminster Abbey by altering the shape of the dome and steeples, as to change the one milk into the other by simply varying the amounts of protein, fat and sugar.<sup>38</sup>*

### Conclusions

The collection of mortality statistics by the registrar generals of England and Scotland, starting in the 1836 and 1845 respectively, forced attention on young children, and with it the emergence of a potent new statistic: the infant mortality rate.<sup>39</sup> By the 1870s, with rates of 150 or more death per 1000 live births, infant mortality became a subject of social and then political concern because of its implications for society as a whole. Coupled with a declining birth rate, this persistently high IMR generated increasing anxiety about physical degeneration and national inefficiency, and the newborn baby became the *subject* of public health interest, and transformed from a dispensable *object* to one of social value. How babies were fed was a subject of national concern.<sup>40</sup>

The decade of child welfare – 1900-1910 - appears to have been a critical period in the fortunes of babies; the start of a steady decline in IMR which has continued ever since. The decade marks a shift in thinking about infants, from the private to the public, from the family to the state, and with it growing responsibility and control by the latter, which was both benevolent and eugenic in character. This was also the time of a shift from paternalism to feminism, and with the emancipation of women came not just their control of child-bearing, but also child-rearing – safer artificial feeding grew alongside safer contraception. It was also a time of medicalisation of child-care, the coming of age of paediatrics and the wider application of nutritional science to social policy and public health. However it remains an open question as to what degree infant feeding, itself a controversial subject at the time, contributed to the decline in IMR which began during the first decade of the 20th century and has continued ever since.

Figure 10: Breast-Feeding Rates of Mothers in Glasgow in 1917. From Findlay L. *The Causes of Infantile Mortality*. MRC Special Reports Series 10. 1917: 37-42



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