Commentary: The McKeown debate: time for burial

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The work of Thomas McKeown, in one form or another, has for several decades featured on countless student reading lists and in virtually all Anglophone accounts of population change and the epidemiological transition. It has additionally provoked or exacerbated a range of fierce debates on the role of medicine, links between nutrition and health, the costs and benefits of industrial capitalism, associations between economic development and population growth, and the influence of bias on research and interpretation of research findings.\(^1\),\(^2\)

All this started with an article published in Population Studies in 1955 (with RG Brown) in which McKeown entered a debate on the causes of population growth during the 18th century.\(^3\) In the chapter considered here—‘Medical issues in historical demography’—McKeown\(^4\) rehearsed and elaborated the arguments developed in this initial paper and a series of subsequent ones; arguments subsequently dubbed ‘the McKeown thesis’. So what in this work has provoked such fierce debate?

‘Medical issues in historical demography’ is largely concerned with the 18th century which McKeown identified as a pivotal period during which mortality decline in Britain ushered in an unprecedented period of increasing population growth—the ‘modern rise of population’.\(^5\) That such a rise occurred is beyond dispute. In 1750 the population of England stood at around 5.9 million, by 1801 it had reached 8.7 million, and in 1851 stood at 16.7 million. McKeown was aware of arguments that the initial rise in population in this period was driven by rising fertility, rather than reduced mortality, but dismissed it on the grounds that higher fertility would have meant higher mortality of infants due to more births to high-risk high parity mothers and so could not have accounted for such a high rate of growth. (It should be acknowledged that he did rather half-heartedly hedge his bets by arguing that even if the rise of population had been influenced by fertility, the question of what caused fertility patterns to change would remain.) McKeown attributed this population increase to mortality decline and identified the cause of this decline as the central question to be answered. The prevailing orthodoxy at the time was that the answer lay in medical advances including the rise of the hospital movement in the 18th century, smallpox inoculation and vaccination, and later advances in scientific medicine and the public health movement. McKeown pointed out that mortality rates for most serious infectious diseases, such as tuberculosis, plummeted long before there were any effective individual preventive or therapeutic medical measures and argued that such measures had little effect on mortality before around 1935. He suggested that the hospital movement if anything had a negative effect, at least in the 18th and early 19th centuries, as risks of infection were so high. Additionally he concluded that public health measures, particularly sewage disposal, supply of clean water, and milk pasteurization, were important only from around 1870. This left the question of what caused declining mortality before this? McKeown’s answer was improved living standards. In his earliest papers he used this term in a fairly general sense and referred to a range of improvements in socio-economic conditions; later he came to emphasize in particular improvements in nutrition consequent on the success of the Agricultural Revolution in increasing food supplies. This, he argued, increased host resistance to airborne infectious diseases, especially tuberculosis.
These conclusions were based on McKeown’s analysis of the mortality declines of the (later) 19th century using cause-specific mortality data available for the post-registration period (1838 onwards) and a process of elimination. McKeown made an important contribution by considering means of transmission of disease and relating this to interpretation of declines in mortality from specific causes (although he was hindered by rather poor quality and specificity of the available data; typhus and typhoid, for example, which have very different modes of transmission, were not initially distinguished, and medical certification of death was not required until 1874).

McKeown’s thesis has come under fire on several counts. Firstly he relied on backward extrapolation of a deductive kind for his assertions about trends in the pre-registration period. Secondly, his analysis of the post 1838 cause of death data has been criticized and it is claimed that his overemphasis on the role of tuberculosis led him to overstate the role of changing living standards and nutrition.6 Thirdly, it is argued that some early medical interventions, such as smallpox inoculation, were more effective than McKeown allowed7,8 (although there is no real disagreement with the contention that individual-level therapies were only a minor influence prior to 1900, and certainly a very minor one in the 18th century).9 Fourthly, there is still a real debate about whether standards of living, including nutrition, really did increase in the 18th and early 19th centuries and indeed whether there was an association between nutrition and risk of death from the prevalent infectious diseases.10–12 Finally, it has been suggested that both McKeown’s analysis, and the use he made of it, were unduly influenced by his views on the role of medicine and the best deployment of resources in his own time.13

It seems best to start with the additional knowledge that we now have about fertility and mortality in the pre-registration period. This comes from the monumental work of Wrigley and Schofield and colleagues at the Cambridge Group for the History of Population and Social Structure who used both back projection methods and information from family reconstitution of parish register data to piece together England’s population history from the mid 16th to the late 19th century.14,15 One of their most important conclusions was that a combination of earlier marriage, shorter birth intervals, and reductions in the proportions never marrying produced an increase in fertility in the late 18th and early 19th centuries and that this was the major influence on population growth. McKeown was thus incorrect in attributing all the increased population growth to mortality improvement. He was also wrong in his view of population trends in the 18th and 19th century as part of a continuous process, as in fact there were considerable variations within it in levels and patterns of mortality and fertility (and, importantly, migration).

Although McKeown considerably overemphasized the extent of mortality decline in the late 18th and early 19th century, the Cambridge group, and other scholars, have shown that there were some improvements and mortality by the start of the 19th century was significantly lower than it had been a century earlier (Figure 1). However, this improvement followed a period of deterioration in the 17th century so that by the start of the 19th, mortality was merely ‘back’ at the level of the late 16th century. During the early to mid 19th century (1830s to 1860s) there were no further improvements, and indeed some deterioration within a pattern of fluctuation. (This means that analyses of change from a short index period, as used by Kermack et al., in their seminal early paper, have some limitations; Kermack and colleagues also used data series which have since been adjusted by the Government Actuary’s Department to take account of various probable errors.16,17) From around the 1860s death rates of

Figure 1 Life expectancy at birth England/England and Wales, 1701–2000.
Sources: Wrigley et al.;15 Government Actuary’s Department.
children and young adults aged 5–24 began to fall again, followed by declines in mortality among 1–4 year olds and 25–34 year olds from 1880.\textsuperscript{17} Among infants and those aged \( \geq 35 \) there were no sizeable improvements until the early 20th century. In terms of proximate causes of this latter decline, McKeown's identification of the decline in infectious disease mortality, including respiratory tuberculosis, is of course correct.\textsuperscript{17,18} although, as mentioned above, Szretzer has suggested McKeown overestimated and emphasized the role of tuberculosis.\textsuperscript{9} There is no satisfactory information, however, on the causes of death associated with the 18th century upturns and downturns in mortality.

In terms of the indirect causes, much remains debatable. Whether or not the Agricultural and early phases of the Industrial Revolution were a boon or bane to the poorer classes—the majority of the population—still remains a source of contention. Changes in patterns of production and consumption might benefit some and disadvantage others. The agricultural reforms of the 18th century led, it is accepted, to increases in the overall supply of food but this had to extend to the rapidly growing population. Higher yield methods of production, including enclosure, involved transformation of the remaining peasantry to an agricultural proletariat dependent on casual day labouring with traditional rights to garnering and to game curtailed and, in the later case, now punishable by transportation. Contemporary commentators, notably Cobbett, wrote movingly of the declining living standards and diets of many rural labourers whom he described as generally worse housed and fed than the pigs they could no longer raise on their own plots. Even some increases in overall food production may have had negative rather than positive consequences. Oddy, for example, draws attention to the grain surpluses of the mid 18th century which as well as enabling cheaper consumption of bread, unleashed a ‘torrent of gin’ on London’s poor.\textsuperscript{11} Industrialization brought high wages to skilled workers in some periods and locations, but destitution to displaced craft workers, such as the handloom weavers, and long hours of unpleasant and often dangerous toil for many children as well as adults. (It was not until 1833 that any effective measures were introduced to prevent young children from habitually working \( \geq 80 \) hours a week.) In terms of availability of types of food, the main developments were increased consumption of tea, sugar, potatoes, and, after the dawn of the railway age in the 1830s, easier transport of food, which meant that herrings and other fish became a part of the diet of the inland poor.\textsuperscript{12}

For the increasingly large number of urban poor, problems with storage and cooking of food and food adulteration, as well as purchasing power, are issues of importance. Even greater threats were the heightened exposure to infectious diseases brought by overcrowding in terrible housing with no or poor sanitation.\textsuperscript{19} Outbreaks of cholera—a new disease which spread from Asia—prompted some action, but the raft of public health measures introduced in the mid 19th century were erratically applied until the last quarter of the century.\textsuperscript{20}

Given the difficulties in judging real living standards and intakes of food, a useful adjunct to our knowledge is the information on height assembled by Floud and colleagues.\textsuperscript{21} Their work indicates improvements in the achieved height of adolescents and adult men born between around 1750 and 1820, a decline for those born between 1820 and 1860, followed by an increase. They also found that upper class adolescents (recruits at Sandhurst) were considerably taller than poor London boys, but still much shorter than modern youth, as subsequent commentaries\textsuperscript{22} have noted. These findings fit quite well with broad trends in mortality and to some extent could be viewed as lending support to McKeown’s thesis (although not to his perception of a continuous improvement starting in the 18th century or his identification of mortality decline as the motor of population growth). However, Liv-ı-Bacci and others have disputed whether food intake was related to lower mortality in the disease environment of the time.\textsuperscript{12} It may be that nutritional status was more influenced by exposure to infection than by food consumed. The life expectancy of English peers and other privileged groups, who presumably had the wherewithal to eat adequately, was as high as that of commoners until well into the 18th century (it is possible that different infant feeding practices are a factor to consider). At a societal, rather than social group level, the apparent lack of an association between indicators of economic growth (however imperfectly estimated) and mortality change is also one of the powerful messages of Wrigley and Schofield’s work.\textsuperscript{14} They concluded that in the pre-industrial period there were times when the standard of living increased but mortality worsened, and vice versa, and that it was not until the mid 19th century that real wages and life expectancy moved in the same direction.

One explanation for this counter-intuitive finding may be that economic development led to urbanization and more population movement, both of which increased the risk of infection, the former to a horrifying extent. Even at the end of the 19th century infant mortality among the children of professionals (largely urban) was higher than that of children of agricultural labourers.\textsuperscript{19} The decline of the birth rate from 1870 was itself probably one of the causes of later declines in infant mortality.

So the question remains what is McKeown’s legacy and why is there still such a fierce debate about it? McKeown’s work on historical demography/medical history was important in showing that the medical technologies available at the time in question could not have accounted for mortality decline in the 18th and early 19th century, or indeed for much of the decline of the later 19th century. He did not, however, show that increased food supply and better nutrition led to lower mortality—this was always a residual argument for which he provided practically nothing in the way of evidence. As McKeown himself points out in this chapter, ‘the data are so unreliable that it is all too easy for the investigator to persuade himself that he has found evidence to support any hypothesis that appeals to him’ (he acknowledged that this applied to his own work).

Although McKeown is often associated with dismissal of the role of medicine as a driver of mortality change, he seems to have been convinced that a medical training was necessary to investigate what he considered a medical problem. In this chapter and elsewhere he takes issue with Peter Razzell’s argument that smallpox inoculation had a large effect on mortality decline\textsuperscript{7} partly by challenging Razzell’s credentials and expressing amazement that ‘an economic historian has not hesitated to debate this issue with a distinguished virologist’.\textsuperscript{14} McKeown himself, however, was quite prepared to take issue with historical demographers whose work on the causes of the modern rise in population ran counter to his ideas. His dismissal of fertility rise, rather than mortality fall, as a driver of population growth was perhaps understandable in his early work, but his reiteration of
this creed in his later publications, which post-dated publication of the Cambridge Group results, is less excusable. It seems clear too that McKeown had rather too much faith in 19th century cause of death statistics and made various errors in his analysis of them. It is, however, perhaps unfair to accuse him of underestimating the effect of public health measures, as he acknowledges that these were important in producing mortality decline after around 1870 (which, we now know, marks the beginning of the epidemiological or mortality transition in Britain). Apart from ‘sanitary reforms’ many other changes were also in process in this last quarter of the 19th century, including better storage and handling of food (including milk), improvements in housing, compulsory education, better personal hygiene and of course developments in scientific medicine. Even so at the start of the 20th century, 15% of infants died in the first year of life and male life expectancy at birth was only 45. The real benefits of late 19th century advances were not reaped until the 20th century when mortality rates fell far more swiftly, at least until the mid century, and there were continuing improvements in all relevant parameters, whether social, economic, or medical. The five year gain in average life expectancy secured during the second half of the 19th century was of the same order of magnitude as the gain achieved in Britain since 1971. This more recent advance was the result of reducing death rates from chronic diseases at older ages, rather than reductions from deaths from infectious diseases in earlier life. Even with our vastly improved sources of data and methods of analysis we do not know with any certainty what proportion of this recent change was due to medical advances, improvements in living conditions of the cohorts most concerned, or ‘lifestyle’ changes and there are widely differing views on prospects for mortality in the future. It is therefore not surprising that efforts at disentangling and quantifying the synergistic effects of relevant parameters on mortality improvement in the 18th, 19th, and early 20th centuries have not resulted in a consensus view.

McKeown may have come to cling rather too firmly to views which through frequent reiteration he may have forgotten rested to a large extent on conjecture. However, a reluctance to discard one’s lovingly tended hypotheses in the face of new evidence is by no means unusual. Perhaps the more interesting question is why so much sound and fury continues to revolve around discussion of work which was largely completed 40 years ago. The explanation lies in the general messages McKeown and others tried to draw from his interpretation of the ‘modern rise in population’ and continuing demand for simple explanatory models to fit all circumstances. McKeown was concerned not just or perhaps indeed not primarily, with what happened to mortality in 18th and 19th century Britain, but with the big questions of the balance between population and environment and the best use of medical and health care resources. His conclusions were used in arguments about the value or otherwise of investing in ‘curative’ hospital-based medicine and he also saw them as highly relevant to debates about the course and cause of mortality change in 18th century England, and many too about the drivers of change in the 19th and early 20th centuries. History has many useful messages but whether finding answers to these questions will provide the answer to questions of policy and practice in contemporary contexts is another matter. When all is said and done we know several things: firstly that public health measures can be effective; secondly that modern medicine does have some benefits; thirdly that socio-economic development and organization, including ability to deliver security, and education, are associated with better health and fourthly, in the words of the recent Wanless review: Much of the action required to safeguard and improve the health of society is outside the areas of policy typically seen as health-related. Factors such as income, workplace safety and stress, and the environment have major influences on people’s health.

References


