Irish Geography
Vol. 55, No. 2 November 2022
DOI: 10.55650/igj.2022.1489

Geographical Society of Ireland
An Cumann Tíreolaíochta na hÉireann

Dealing with epidemics in late nineteenth century Dublin – A case study of typhoid fever

Joseph Brady[1] and Peter Connell[2]
[2]School of Geography, UCD

First received: 7th November 2022 *Accepted for publication: 21 January 2023*

Abstract: Epidemics were a regular fact of life in Dublin during the second half of the nineteenth century. There were many infectious diseases to cope with as well as diseases of the respiratory and nervous systems. Death from such diseases was not an unusual occurrence, particularly among the poorer classes, but occasionally annual rates would surge to epidemic levels. Medical knowledge was undergoing a significant advance with an understanding of the role of bacteria displacing the centuries-old theory of miasma but it would be the following century before the role of viruses would be understood. It took some time for miasma to be entirely discounted with bacteria merely replacing the animal poisons previously believed to be the cause of illness. This was just as well as dealing with miasma involved an emphasis on public sanitation and hygiene: effective whether miasma, bacterium or virus. Dublin experienced a typhoid fever epidemic in 1891 and 1893 and the analysis undertaken at the time was unusual for its depth and the quality of geographical information provided. This paper examines that outbreak and explores the importance of geographical factors in explaining its distribution.

Keywords: *Epidemic, Covid, Charles Cameron, Typhoid, Miasma, Public Health.*

Introduction

Richard Harshorne (1959) in his seminal *Perspectives on the Nature of Geography* defined the subject as being 'concerned with the description and explanation of areal differentiation of the earth's surface'. This was certainly true for generations of geographers up to the 1960s and it even stood the test of the short-lived 'quantitative revolution' of the 1960s and 1970s but it is doubtful that it would apply to more than a niche group today. Even in Hartshorne's day, it was understood that people, objects and

*carto@gladorene.com (Corresponding Author)

ideas travelled from place to place and there was study of the means and mechanisms whereby such diffusion might take place. The study of disease was one area which was obviously amenable to geographic research and so it can be argued that this research fits into a very long tradition of geographical discussion.

That study was often no more than observation. People saw that there were differences in the experience of disease from place to place and they also saw that diseases travelled, often with devastating impacts. In times when travel was slower, populations could literally see an epidemic or a plague coming though unfortunately this advance knowledge tended to be of little use in preparing a defence – flight being the best option for those who could afford it. Shapiro describes how the English royal court, the notables and those with money, including Shakespeare and his colleagues, saw getting out of London as the best defence against the plague (Shapiro, 2016).

Amongst many aspects of the experience of the recent Covid-19 pandemic has been a renewed focus on the means whereby infections spread. Covid-19 demonstrated that globalisation had ensured that no place on earth was immune to infection and that the speed of transmission was now dramatic. It took no more than a few weeks for an initial localised infection in a relatively remote part of China to travel across the globe and become epidemic and later pandemic. There was little or no time to prepare and people found themselves just as confused and concerned as earlier generations, only this time it seemed that flight made no sense.

Attention quickly moved to how to deal with local infections and it is remarkable how little had changed even with the huge advances in modern medicine and modern technology. Because next to nothing was known about Covid-19 except that it was a virus, people looked to the air, water, touch and breath as sources of infection and transmission. These were the same questions which were being asked in Dublin and other cities during the nineteenth century. Of course, answers came more quickly now and knowledge about the virus grew exponentially but not before all kinds of older strategies were tried. Even now people have chosen to forget the steps which were taken to avoid transmission from packaging or postal items. Questions were asked as to whether it was possible to be infected by passing someone on the street. It was suggested that frozen food was particularly dangerous because of the length of time that the virus could survive the cold. The *Irish Times* posted a piece online on 28 February 2021 which listed how thinking evolved (O'Connell and Carswell, 2021). Every possible means was considered and promoted, much as it would have been in the nineteenth century. Gradually it was accepted that the virus could remain airborne for considerable periods and that it was possible for spaces to become contaminated without ventilation. It took some time and a great deal of experience before mask wearing came to be seen as more important than hand washing.

The same iterations were gone through in the nineteenth century but without the medical knowledge or the research technology of the twenty-first century, analysts struggled to find causes for epidemics and therefore struggled equally to find targeted solutions. Fortunately, they hit upon much the same solutions as were found to be useful

with Covid. They determined that good sanitation was key to reducing infection. This meant ventilation, washing, disinfecting and reducing over crowding. In this, they were relying on a very old understanding of disease which they adapted as medical science began to unfold the mysteries of bacteria and, later on, viruses. This paper examines the case of typhoid fever in Dublin which by the early 1890s had become endemic. Its reduction was not due to any specific understanding about the disease but rather to the general principles of public health.

The emergence of Public Health policies

Official intervention in society did not sit well with many Victorians; there was a strong laissez-faire spirit that permeated most aspects of life. Edwin Chadwick's (1842) work was crucially important in changing that attitude in relation to public health. His report on the *Sanitary Condition of the Labouring Population of Great Britain* not only provided graphic accounts of the miserable conditions in which many of the poor lived, it also argued that amelioration of these conditions would not only benefit the poor but it would also improve productivity and reduce costs. It made economic sense as well as social sense to intervene. Chadwick's report was a distillation of a series of reports made to the Poor Law Commissioners between 1838 and 1840 on the nature of diseases, sanitation and the quality of life of the labouring population. Reports were obtained from most parts of Britain, including Scotland, but the enquiries did not extend to Ireland. However, given the circumstances in the city of Dublin it is hardly likely that conditions were any better there. After all, the Revd William Whitelaw had conducted a census during the summer of 1798 which described Dublin in similar terms (Whitelaw, 1805). The annual reports of the House of Recovery and Fever Hospital confirm that little had changed for the poor by the first decades of the nineteenth century. The report for 1829 commented that 'it is not to be denied, that in the last twenty-five years the condition of the lower orders in the city, has been one of continued deterioration... that poverty has increased no less rapidly than disease is indeed a truth so palpable, as to need no proof' (p.5) The study undertaken by Thomas Willis (1845) reported similar conditions while the wider public learned of them from Mr and Mrs Hall's (1841-1843) description of the Liberties. In the reports which Chadwick (1842) distilled, time and time again the connection was made between poor sanitation and the instance and spread of disease. The air which people breathed was polluted and this resulted in the various diseases. The role of poor air or malaria was an accepted truth and this is explored in more detail below.

It was one thing to make the connection between poor sanitation and the spread of disease, it was entirely a different thing to believe that public money should be spent on dealing with it. This was a key element in his summary and recommendations. The first important finding was that the 'the various forms of epidemic, endemic and other diseases caused, or aggravated, or propagated chiefly among the labouring classes by atmospheric impurities produced by decomposing animal and vegetable substances, by damp and filth, and close and overcrowded dwellings prevail amongst the population in

every part of the kingdom'. He argued further that 'such disease, wherever its attacks are frequent, is always found in connexion with the physical circumstances above specified and that where those circumstances are removed by drainage, proper cleansing, better ventilation, and other means of diminishing atmospheric impurity, the frequency and intensity of such disease is abated; and where the removal of the noxious agencies appears to be complete, such disease almost entirely disappears' (p. 369). The role of polluted water was not as clear cut. Certainly, clean water was needed to promote hygiene but it was not seen as an agent of infection on its own.

The value of tackling these problems was that large sections of society would have longer productive working lives; it was estimated at eight to ten years. There would be less need to support the families of those who died prematurely. There would be another more intangible benefit. Living in unhygienic and decayed areas resulted in a population that was 'short lived, improvident, reckless and intemperate and with habitual avidity for sensual gratification' (p. 370). There would therefore be a moral gain to making the appropriate sanitary improvements. So not only would a long-lived population ensue, it would be clean living in all senses.

Implementing such public health measures would require proper and formal administration with similar structures in each area. He suggested the employment of a district medical officer who had appropriate qualifications to initiate sanitary measures and who could apply the law.

Not everyone was convinced that such interventions were necessary but by 1848 the first Public Health Act had been passed. It was not a particularly effective piece of legislation but it placed public health on a statutory basis and gave powers and responsibilities to public bodies to act. Much was clarified and improved in the Public Health Act of 1875, though this applied only to England but an Act tailored to Ireland was passed in 1878. The Public Health (Ireland) Act, 1878 made each local authority the sanitary authority for the area under its control. Each sanitary area was to have a Medical Officer of Health with responsibility for a wide range of activities.

While bad air was accepted as being the main cause of disease, others believed that water could also be a source of infection. One such was John Snow, a physician in London. He was also one of the first in modern times to look at a health issue from a geographical perspective, though being a physician he is claimed as an epidemiologist. In 1854 there was an outbreak of cholera in Soho in London which resulted in hundreds of deaths over a very short period. Snow already believed that cholera could be spread by infected water and by plotting the distribution of cases he came to the conclusion that a public water pump in Broad Street was the source of contamination (Johnson, 2008). He managed to persuade a sceptical local authority to disable the pump and the epidemic ceased but it was some time before a reasonable explanation was found for the pollution of the water.

Public Health in Dublin

It might be argued that Dublin was a little slow in developing its sanitary policy, but it is certain that the general principles of the approach were known and understood in the city. There was a great deal of debate amongst medical people about what to do and this persisted long after there was a formal public health structure in Dublin Corporation. One vocal commentator was Thomas Grimshaw (1872), a medical doctor and medical statistician and physician to the Cork Street Fever Hospital. He would later become Registrar-General for Ireland and serve as president of the Statistical and Social Inquiry Society of Ireland. He was a regular correspondent to the Corporation and was strident in his condemnation of a perceived failure on the part of the authorities to act. He accused the Corporation of being conflicted, much the same accusation as was later made in the 1913 Housing Inquiry.

Whatever about the validity of his accusations, Grimshaw provided an up-to-date picture of the problem. His 1872 report provided vivid descriptions of 'fever nests' in the south city as well as a map of fever cases for 1869-71. Here was detailed evidence that nothing had changed for the better since 1798. His description of 'square courts' of the sort found around Marrowbone Lane and Nicholas Street will provide sufficient illustration here. 'These squares have usually no drainage, and are surrounded by miserable old overcrowded houses, and are generally strewn with rubbish and filth, consisting, to a great extent, of human ordure, and have one or two cess pits near the centre … The ground of all these courts is saturated with decomposing organic matter, chiefly human excrement' (p. 26).

His was not as comprehensive a map as those Cameron (1892, 1894) would produce for 1891 and 1893 but it was based on the premise that there were geographical factors, which explained the concentration of fever. The Coombe, where disease was concentrated, was a hollow and had poor drainage. This allowed the build up of filth and decay and the escape of sewer gas. He did not offer an explanation as to how fever was contracted in such conditions, but his solution was the same as would be followed eventually – cleansing, draining and clearing away. It is reasonable to assume, however, that he agreed with the theory of miasma since he published a paper on the relationship between the spread of cholera and Dublin's geology in 1878 and was co-author with Cameron on the 1888 study of enteric fever in the Royal Barracks where similar issues were examined (Grimshaw and Cameron, 1888).

Grimshaw (1872) was critical of Dublin Corporation's performance and felt that by the early 1870s that they had had long enough to get used to and to implement the new public health regulations. 'First, that the working staff is insufficient and the chief officers badly paid. Secondly, that no sanitary system could possibly work under a body constituted as the Dublin Corporation is at present. Many members of the Corporation are interested in the property, which it should be the duty of a proper sanitary organization to overlook. Thus, some members of the Corporation are owners of tenement houses; others are elected by the owners of such houses; others again, especially the publican class, are supported altogether by customers who own or inhabit these houses' (p. 33).

Figure 1. Map showing the distribution of fever on the south side of the city of Dublin for the period 1869–71 (Grimshaw, 1872, 18). *Reproduced by kind permission of the National Library of Ireland.*

He made similar comments about the police who were employed as sanitary inspectors. Clearly, the Medical Officer of Health had his work cut out!

Edward Dillon Mapother was born in 1835 near Fairview in Dublin and trained as a surgeon. He was regarded as a diligent if not brilliant surgeon, but he did sufficiently well to be appointed as professor of anatomy and physiology in the Royal College of Surgeons in Ireland in 1867. However, his earlier appointment as Professor of Hygiene and Political Medicine is probably more important because it is undoubtedly this interest that led to his appointment as the city's first Medical Officer of Health in 1864. His series of lectures on public health, delivered at the RCSI, set out his thinking on hygiene and sanitary issues and were important in educating a wider public as to the relationship between poor housing, poor sanitation and the spread of disease (Mapother, 1864). Mapother was replaced as Professor of Hygiene and Political Medicine by Charles Cameron who would succeed him in 1874 as Medical Officer of Health and who would be a force in the health and housing policy of the city for the next 50 years. He too gave a series of twelve lectures on the subject of public health in the RCSI, this time in 1868. These were published later in that year at 'the request of the Municipal Corporation of Dublin, who conceive that their circulation might aid in the wider diffusion of a knowledge of the laws of health, and thereby supplement the good work of sanitary reform, in which the 'public health committee' of the Municipality are now so successfully engaged' (Cameron,1868). Cameron was also the Public Analyst and in these early years, he and Mapother formed the kernel of a small but influential team.

They reported to the Committee No. 2 (Sanitary) of the Municipal Council of Dublin – the Corporation. The first of what would become a long series of detailed reports concerned 1865 and Mapother took the opportunity to set out how the public health process worked. As the health officer, his responsibility under the Towns' Improvement Clauses Act was:

> *'To ascertain the existence of diseases within the limits of the Special Act, especially epidemics and contagious diseases, and to point out any Nuisances or other local causes likely to cause and continue such diseases, or otherwise injure the Health of the inhabitants, and to point out the best means for checking or preventing the spread of such diseases, within the limits aforesaid, and also the best means for the ventilation of Churches, Chapels, Schools, registered Lodging Houses, and other public Buildings within the limits aforesaid…'*

The Public Analyst was involved in the practical implementation of these duties and was to analyse food and drink to ensure its safety and also visit factories, breweries, distilleries, gas houses and the like to check for air or water pollution; anything that might impinge on the health of the citizens. The fieldwork was undertaken by sanitary inspectors.

These matters were reflected in the annual report and there was detailed consideration of the death rates from various diseases, noting the importance of a clean water supply, proper sewerage and good ventilation in tenements (Mapother, 1866). Detail was given of the nuisance caused by the various industries in the city, many of which seemed to be

dirty and polluting. There was particular concern about the slaughter houses. A list was provided of the 129 licenced slaughter houses and it showed a close correlation with the areas of densest population. There were concerns that: 'Notwithstanding the best water supply and sewerage, the earth in the neighbourhood of these places becomes imbued with the blood and refuse of the animals, and the air becomes polluted, much to the injury of the health of the surrounding residents' (p.30). Mapother was also concerned that it was impossible to test the quality of the meat which came from so many units and he was also worried that the method of transportation, often slung over the shoulders of carriers, was conducive to spreading disease. There was a strong recommendation that a small number of abattoirs and meat markets be established to replace the existing system. Cows were often kept in proximate locations to people and while the conditions were obviously poor, there was no legislative basis for interfering.

That the Liffey was polluted by sewerage needed no analysis, the smell was sufficient. However, Mapother was of the view that this resulted in increased incidence of diarrhoea and fever in the streets around the quays. Similarly, the poor quality of water from the many wells and pumps was a cause of diarrhoea and cholera. There was general acceptance that this was due to the pollution of the water supply from sewerage and gas products. However, though he and Cameron had taken samples, the limited analysis which they could do had indicated that the matter was complex and there needed to be further study before definite conclusions could be reported (p. 37).

An interesting idea promoted by Dr Mapother was of a disinfecting room: 'It has been found that no means for destroying contagious poisons is so effectual, yet so simple, as an exposure to a temperature of 212 degrees, a dry heat equal to that of boiling water. No injury is done to clothes or furniture by such a heat'. He noted that this service was offered free of charge to the poor in Liverpool where their clothes, bed clothes and other items where 'fever poison' might lurk was treated.

The role of air and water in spreading disease was accepted and ventilation was accepted as being very important in otherwise crowded situations. Cameron's public lectures set out his thinking about the causes of diseases and their remedies. (Cameron, 1868). In his first lecture, Cameron stated: 'There is sufficient evidence to justify the belief that fever, cholera, whooping-cough, and, in a word, all infectious and contagious diseases, are produced by the introduction of an animal poison into the body — each variety of poison producing a different disease. These poisons are as much entities as are arsenic or strychnine; and as they possess in all probability an organised structure, they are capable of reproducing themselves under favourable conditions — that is, when located in the human body. One the other hand, it is nearly certain that these poisons cannot long exist in air, water, or earth' (p.12). In essence, Cameron was arguing that disease was the result of pollution and the key to its elimination lay in sanitation. The 'poisons' which concerned him were organic and capable of reproduction once they found a host. However, these poisons decayed over time so there tended not to be a build-up. Epidemics were the result of short-term events which permitted a rapid concentration.

In stating this, Cameron was asserting the current version of an analysis which had

been held in Classical Rome. One of the sources was Marcus Vitruvius Pollio's ten books on architecture, an accidental survival from the roman period. In his text, Vitruvius discussed the question of city design and in chapter 4 wrote about location as follows:

> *First comes the choice of a very healthy site. Such a site will be high, neither misty nor frosty, and in a climate neither hot nor cold, but temperate; further, without marshes in the neighbourhood. For when the morning breezes blow toward the town at sunrise, if they bring with them mists from marshes and, mingled with the mist, the poisonous breath of the creatures of the marshes to be wafted into the bodies of the inhabitants, they will make the site unhealthy.*

He went on to note:

> *But marshes that are stagnant and have no outlets either by rivers or ditches, like the Pomptine marshes, merely putrefy as they stand, emitting heavy, unhealthy vapours. A case of a town built in such a spot was Old Salpia in Apulia, founded by Diomede on his way back from Troy, or, according to some writers, by Elpias of Rhodes. Year after year there was sickness, until finally the suffering inhabitants came with a public petition to Marcus Hostilius and got him to agree to seek and find them a proper place to which to remove their city.*

It was not surprising that the Roman fever which was understood to emanate from the Pontine marches became known as mal'aria – bad air. Cameron's exposition reflected the modern development of the idea and the explanation as to how it might result in infection. He developed his theme during his 1868 series in the lecture on water. He commented that 'several maladies are directly produced, and others indirectly induced by the constant use of bad water… There is the clearest evidence that cholera is infectious and that the virus of this disease is frequently conveyed through the medium of water. (p.37). Writing of the charcoal filter produced by Mr Maguire of Dawson Street, he said:

> *Some authorities contend that charcoal does not perfectly remove the virus of cholera, nor, probably of other diseases from water; and if zymotic diseases are propagated by low forms of vegetable life, it is most likely that charcoal exercises no effect up such organisms, I believe, however, that there are putrescent animal and vegetable matters in impure water which though not specific animal poisons, are yet capable of inducing disease if permitted to enter the body: these substances are unquestionably destroyed by charcoal (p. 38).*

The annual reports also discussed problems with various industries and workrooms and the remedies applied. Cameron was concerned with patches of marshy ground on the eastern banks of the Liffey. These were breathing grounds (literally) for disease for as he put it 'from which, more especially in warm weather, the most dangerous vapours, gases and miasma were evolved'. He put pressure on the landowners and was pleased to report that reclamation had been actively carried out since 1866 and that only a fraction of the land remained as it was (Mapother, 1868, 20).

Dealing with infections

Temperature and rainfall were seen as important influences on the prevalence and intensity of various infections and it was usual to plot disease levels against both. This, however, tended to be no more than a post facto explanation since weather forecasting was little developed. Improving living conditions was one thing which could be done. Better data collection allowed a focus on the smaller scale geography of the city, looking at conditions in the seven dispensary districts. While the death rate was high generally, it reached over 40 per thousand in the area around Blackhall Street and Meath Street, more than double the rate in Summerhill or around Coleraine Street. However, it was felt that even more detailed reporting was necessary because the districts were not homogenous. Where this detail was available, it was possible to identify the unhealthiest parts of the city and the same streets were identified from year to year. People died from a range of illnesses and zymotic diseases – acute infectious diseases – were particularly problematic. What was described as 'fever' resulted in more deaths during 1865-1867 than from any other zymotic disease. The worst streets in the city included Church Street, Greek Street and Beresford Street, Barrack Street, Marrowbone Lane, Townsend Street and the Coombe and these were to become the focus of the Corporation's first housing schemes in the decades to come. For the moment, intervention was limited to cleaning drains and privies, whitewashing the room in which the fever had occurred and encouraging the inhabitants to have their clothing treated by the hot air method described above, with hospitalisation for the most ill. It seems that not all tenants were minded to follow this advice and Mapother lamented that if they could be compelled to do so, then it would be possible to eliminate an outbreak (p. 8).

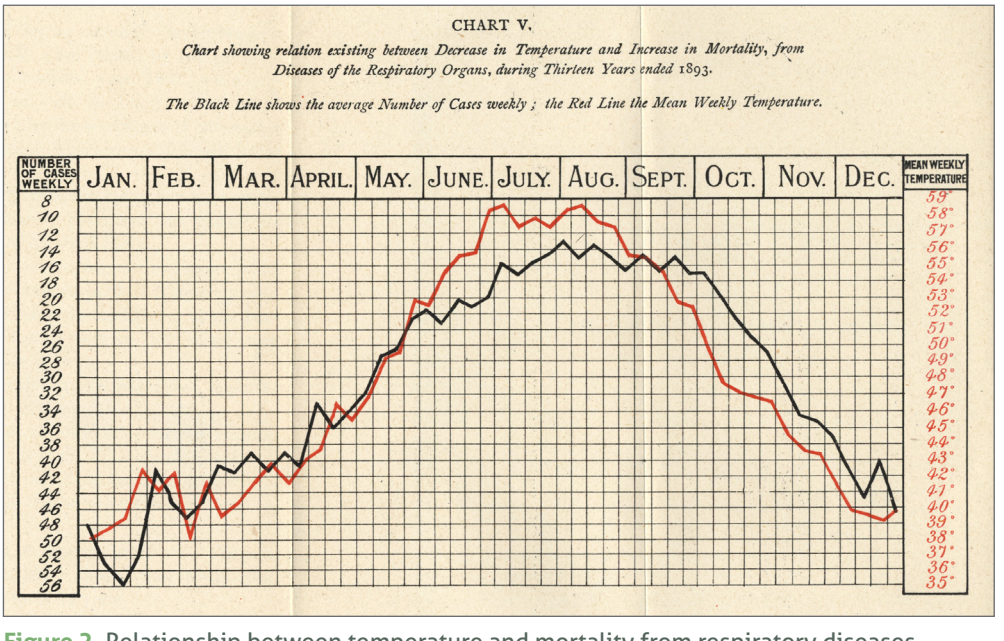

Figure 2. Relationship between temperature and mortality from respiratory diseases *(Report upon Public Health, 1894, chart v).*

Occasionally, as in 1866, a previously unknown disease resulted in deaths. In that year what was described as a cerebro-spinal or purple fever resulted in 90 deaths. Fortunately, given that only one in three survived, it was spatially confined and seemed not be infectious. The outbreak was of sufficient interest and concern for Mapother to publish an article in the *Lancet* (Mapother, 1867) Diarrhoea and cholera were two diseases which were expected in the warmer summer months with temperature and rainfall being noted as the controlling factors. Still, there was no cholera in 1867 despite the summer being as hot as usual but Mapother had caused the drains and sewers to be flushed with carbolic acid and people had been advised to boil water.

The same was not true about consumption (tuberculosis) and deaths occurred throughout the year but were concentrated in the colder months because, Mapother argued, there was poor ventilation in the tenements and windows were often not capable of being opened. Bronchitis was more of a scourge in Dublin than in London with a death rate of 1 in 166 of the population or about 50 per cent higher than London. This was attributed to poor living conditions which resulted in damp and even wet housing. Poverty was a central factor but 'the dwellings of the poor are often badly protected against the weather and many of them are so ruinous that they should be demolished. There is need for the erection of comfortable residences for the humbler classes and the Industrial Tenements Company have just opened a block of buildings containing 120 rooms. It is to be hoped the example will be largely followed' (p. 12). The focus of the Corporation's activity was public health, good housing provision was a means to that end. That subtlety was lost as time went on and social housing became seen as an important 'social good' in its own right. The public health focus was still to the fore, though, when Dublin Corporation began its own housing programme in the late 1880s. Writing about the Bow Lane scheme in his report for 1889, Cameron noted: The tenements are now (1890) all let and the rents punctually paid. The tenants are more than satisfied , both as regards the rent and accommodation and every one who inspects the tenements expresses astonishment that such neat and commodious dwelling could be provided at the rents asked for them… It is to be hoped that this class of dwellings will be multiplied greatly , as there can be no question as to the beneficial effect which they would produce upon public health' (Cameron, 1890, 103).

Better housing

Mapother's hopes remained unrealised for some time and while there had been progress by the time of the parliamentary inquiry into the housing of the working classes in 1885, the situation in Dublin was described in that report as 'less than satisfactory'. Dublin Corporation had used the 1875 Artisans' and Labourers' Dwellings Act to support the housing schemes constructed by the Dublin Artizans' Dwelling Company in Gray Street and Plunket Street. However, the expense associated with the projects had deterred the Corporation from further schemes (see Prunty, 1998). The DADC, though, had plans of its own to accommodate some 6,000 people.

While Cameron, who was by now the Superintendent Medical Officer of Health, painted a grim picture in the 1885 report of the housing conditions of the working classes, he was much more positive about the position regarding public health. He described the powers which he had under the Public Health Acts as 'simply terrific' (p.v). There was regular inspection of housing and the closing or demolition of houses found to be insanitary. The report noted the comments of Mr Wodsworth, Secretary to the Local Government Board, that 'the Corporation have used most extraordinary exertions to improve the tenement houses' (p. vii). This had served to reduce the 'virulence' of typhus and zymotic diseases but the report noted that typhus had not been wiped out and the death rate remained stubbornly high. These public health measures would not be enough in a city where the poor were desperately poor and undernourished and where housing conditions were breeding grounds of disease.

By the early 1890s, medical knowledge had improved to the point that the role of bacteria in the spread of infectious diseases was generally accepted and very soon the importance of viruses would be understood. Notwithstanding this knowledge or the efforts of Cameron and his inspectors, the death rate in Dublin remained high and people died from much the same range of diseases that had been killing them for generations. The report for 1893 (Cameron, 1894) reported that the birth rate in the city for the previous year had been 32 per thousand of the population while in the suburbs it was a considerably lower 21 per thousand. The death rate in the city was 29.1 per thousand of the population. This was at the higher end of the figures for the previous decade which ranged between 26.22 (1888) and 33.2 (1887). Approximately one third of deaths was recorded in hospitals, workhouses and other institutions.

There was now a large sanitary staff and Cameron was now the Superintendent Medical Officer of Health, Executive Sanitary Officer, Inspector of Explosives and City Analyst. This made him a very powerful figure in the city, enhanced by his assertive personality. He enjoyed extensive legal powers and could initiate prosecutions across a wide range of areas that included housing conditions or the adulteration of milk. The staff of the sanitary office had grown as their responsibilities increased. Cameron was now assisted by fifteen district medical officers of health, spread across the various districts. There were inspectors looking at disinfection, sewers, buildings, public baths, artisans' dwellings, food inspectors and a registrar of dairies. Information was gathered through a network of sanitary sub-officers. Here the police force was very important and in 1893, the Superintendent Sanitary Sub-Officer was Inspector James Halligan. While most of the sub-officers were civilians, a number of constables were also involved. Constables walked the beat daily and were perfectly positioned to notice any activities of concern. They also brought an appropriate level of gravitas to any engagement with a breach of regulations. As all officers of the Dublin Metropolitan Police were over six feet in height, they would have made a dramatic impression. The use of the police force as sanitary officers was not unusual in the United Kingdom. In fact, there were complaints that not enough DMP officers were made available for this duty.

There were many diseases whose annual arrival killed people in significant numbers

and fevers and other respiratory illnesses were particularly feared. Little could be done in the absence of antibiotics. Of the 7,139 deaths reported in 1893, a total of 832 were due to zymotic illnesses. This was better than 1892, which Cameron (1894) described as a 'very unhealthy year' (p. 25). In that year there had been an epidemic of measles and a serious problem with flu. The measles epidemic had abated in 1893 and no smallpox was detected, continuing a trend since March 1888. There had been eleven cases of typhus fever but this disease seemed to be in retreat as Cameron noted that 'the disease was not many years ago very fatal in Dublin' (p. 25). A total of 347 died from diarrhoea and dysentery. This is where weather became an important explanatory factor and explains why the early part of the report was given over to meteorological data for the city, including tables showing temperature and rainfall on a monthly basis. The plotting of the instance of disease against temperature and rainfall allowed Cameron to state that the high numbers of deaths from these ailments was 'probably due to the high temperature and extreme dryness of the late summer and early autumnal months' (p. 25).

Respiratory diseases were another problem that Dubliners had to contend with. Deaths varied somewhat from year to year and 1,642 died in 1893 compared to 2,135 in the previous year. Phthisis (TB) was a particular problem. Cameron noted that it was now recognised to be a contagious disease, which was particularly fatal in Dublin though there seemed to be no particular distinction between suburbs and city. Mortality from bronchitis was much lower in 1893 than in the previous year; 957 deaths compared to 1,334. Cameron (1894) attributed the lower figures in 1893 to the fine weather which prevailed during the early months of that year.

Typhoid fever was of particular interest and this report is all the more remarkable for the detail with which these data were reported. Typhoid fever and typhus fever are not the same disease despite the similarity in their names. Typhoid fever is now known to be spread by eating or drinking food or water contaminated with the faeces of a person infected by the bacterium salmonella typhi. Typhus fever is an infection caused by a range of other bacteria, often spread by lice or fleas. There had been significant outbreaks of typhoid fever in 1891 and 1893 and there was concern that it might become more of a problem than it had been. Cameron noted that there was a perception that it was a disease of the upper classes. After all, it was widely believed that Prince Albert had died from typhoid fever, though that diagnosis has been challenged more recently (Paulley, 1993). Cameron suggested that the death rate was higher amongst the poorer classes because they were less able to fight off the infection and presented a table showing fatalities among six social groups. These data did not support his argument, though, it seemed that the middle classes had a higher rate of fatalities than the other classes!

In any event, the Dublin Sanitary Association had become sufficiently concerned to undertake a study of enteric fever (a term used interchangeably with typhoid fever) in Dublin which was published in 1893. This was a voluntary body with members from the professions and business classes and which acted as a lobby group on sanitary matters. The study was undertaken by a committee comprising some of their executive

members, medical experts and people in business. Cameron summarised their report and commented upon it in his 1893 report. The DSA committee accepted the view that the typhoid bacillus was the direct cause of the infection. Cameron did not demur from that explanation but mentioned that this had been challenged by the 'most eminent bacteriologist in England' (p. 33).

Clearly there was an issue because on the one hand there had been great improvements in the sanitary state of the city in recent years and filthy dairy yards and foul water cisterns had been reduced, yet in Dublin this fever had probably become endemic. In the committee's view, typhoid fever had become a malarial disease and the city's soil was an important explanatory factor. This suited Cameron's own thinking – essentially the animal poisons of a previous generation had simply been replaced by a bacillus.

The DSA committee suggested that the bacillus liked living in diluted sewage and infections occurred when it got into the water supply or perhaps into products such as milk in dirty dairy yards. Their report suggested further that when the drains in houses where infection occurred were properly investigated it was found that they were defective. Again, Cameron did not demur from this but there is a sense from reading his text that he was not entirely convinced that this was a complete explanation. Emphasis was placed on the effect of Varty water. It was very clean and not the source of contamination, but it had contributed to the problem inadvertently. Cameron described Dublin as a 'midden city', one in which sewerage had long contaminated the soil and sub-soil. The change from using wells in the city consequent on Varty had resulted in a great increase in stagnant water in the ground. However, the leaking of Varty water into the soil had flushed this to some degree and had reduced the concentration of sewage.

This was to the advantage of the bacillus which did not thrive in concentrated sewage but did far better now that the ground water was cleaner. So, if people were exposed to ground water, through whatever mechanism, they were in danger of infection. The DSA committee's view therefore was that a warm, wet season would result in a high death rate in the city and suburbs, as was the case in 1891. A dry and hot season would be particularly dangerous to the 'water-logged' parts of the city but they did not identify where these places were. All of this led the committee to the view that a flushing of the ground water was a necessary step in bringing this disease under control.

Cameron commented that there was a general view that the 'water logged' areas were the lower lying parts of the city and those parts closest to the river but his view was that not as much was known about the ground water levels as the DSA committee might have suggested. He commissioned the sinking of seven bores and the examination of the rise and fall of ground water showed that levels were not simply a matter of elevation. This led Cameron to an explanation of the concentrations of disease by reference to the nature of the soil, not just its elevation.

Mapping Typhoid Fever

To help in this discussion, Cameron produced a map which showed the location of each case of typhoid fever for 1893 (Cameron, 1894). He had previously done so for 1891 (Cameron, 1892) and this was an impressive level of detail. Cameron was generally thorough in identifying streets with particular characteristics in his annual reports, but it was rare that exact locations were provided. The map showed the area under the control of Dublin Corporation, it did not extend into the suburbs. Each case was shown as a red dot and it is apparent that cases were widespread across the city. Nowhere seems to have escaped though it seemed that there were fewer cases in the better-off area of south east Dublin – the Pembroke estate. There was a large concentration in the Royal Barracks, just north of the river, and it seems that the barracks could be assured of being a hot spot for any infection. Otherwise, the pattern followed the main streets and reflected the varying density of population; greater numbers of cases in the areas where tenements were concentrated for example.

Cameron's theory was that the soil type was a key element in explaining the differences in infection rates. The map showed the distribution of clays and gravels – the main difference in Dublin. Gravels were concentrated in a narrow band along the banks of the Liffey which then widened closer to the bay. This followed a line along Summerhill on the northside and along the southern border of Trinity College Dublin on the southside. Cameron's theory showed that he had not quite abandoned the idea of miasma, even if the vector was now a bacillus. He reasoned that water flowed more easily through the gravels and had easier access to the surface. This allowed the bacillus greater access to the air and so it could spread more readily in those areas. This helped explain why he detected little difference between the clays and gravels in 1893 whereas there had, in his mind, been a significant difference two years previously. In 1891, the infection rate on the gravels had been 1:92.8 but on the clays it was a much better 1:145.3. For Cameron, this 'proved that the clays were safer to live on as far as typhoid fever was concerned' (1894, p. 39) In 1893, the difference was less marked, the data indicated an infection rate of 1:58.5 on the gravels and 1:78.2 on the clays. The summer of 1893 had been hot and dry and this caused the clays to dry out close to the surface and created a more open structure. This facilitated the bacillus to get airborne and the close living conditions in many parts of the city facilitated its transmission.

Cameron was, of course, wrong about the transmission of the bacillus. It was not an airborne pathogen but was highly infectious and could pass from person to person as a result of poor hygiene which resulted in contamination by faeces or, to a lesser degree, urine. However, the measures taken to improve hygiene were valuable even if the analysis was dubious. This meant better housing for the poor, better sewers and the removal of rubbish and contaminants from residential areas. Since none of this was done immediately, the problem did not go away and typhoid fever continued to be identified across Dublin in the following years though not with the same intensity.

The question of cause and therefore remedy was addressed in the Local Government Board's (LGB) inquiry in 1900 into the state of public health in the city (LGB, 1900).

Figure 3. Distribution of Typhoid Fever in Dublin 1891 (Cameron, 1892, 726). *Reproduced by kind permission of the National Library of Ireland.*

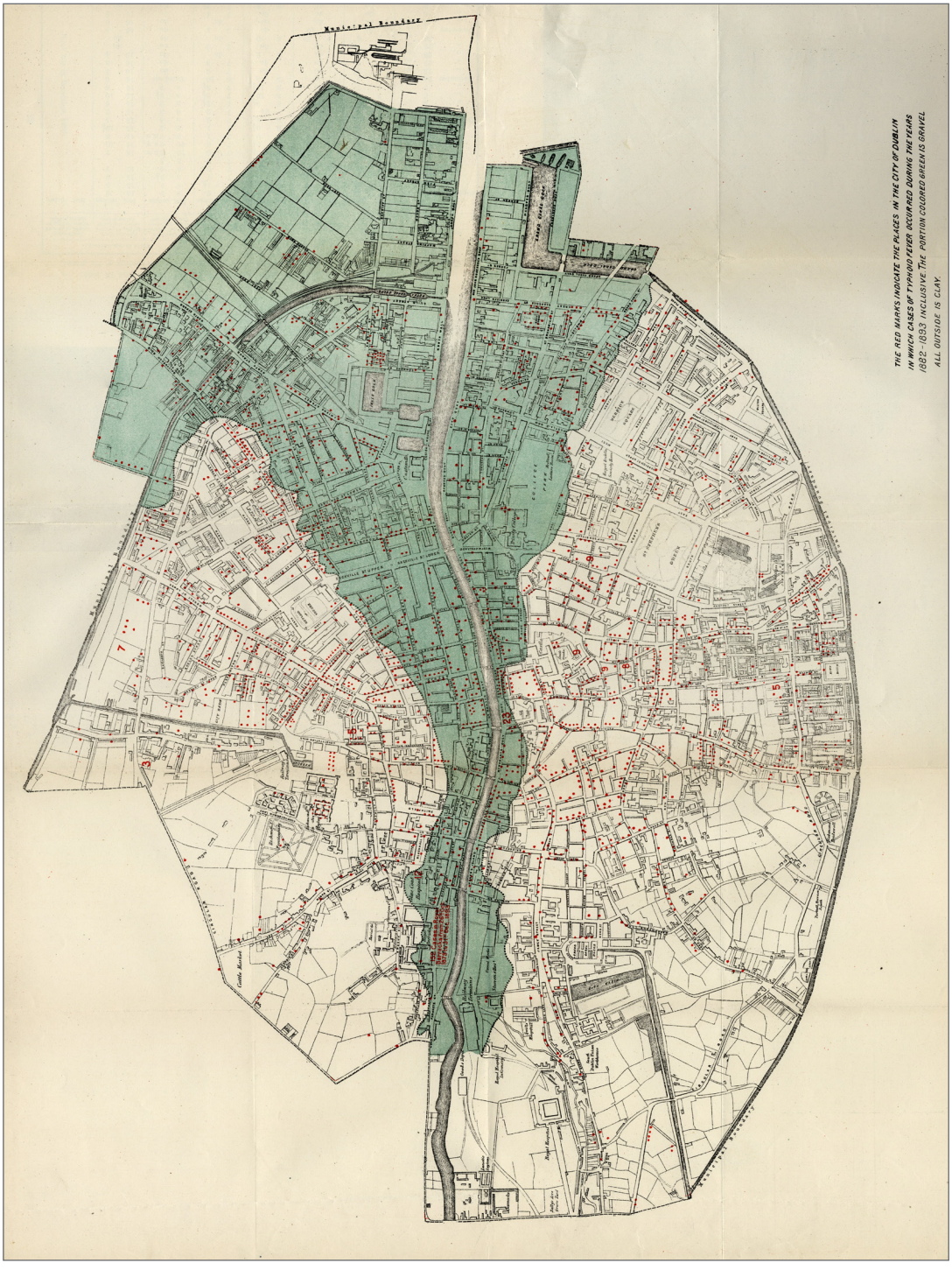

Figure 4. Distribution of Typhoid Fever in Dublin 1893 *(Cameron, 1984, 38)*.

In common with earlier Victorian studies, it was a thorough investigation involving the examination of a wide range of witnesses. Once again, it identified the abject poverty in which so many of the citizens lived. Their poverty led to their living in very insanitary circumstances while their general health was too fragile to withstand the onslaught of infections. As the report put it 'the poverty of much of the population of Dublin is in itself, apart from the insanitary conditions referred to, a serious factor in the high death rate of the city. The concomitants of poverty, more especially insufficient and unsuitable food and scanty clothing, both directly and indirectly exert a marked influence upon the death rate' (p. 10). They had many diseases to discuss but typhoid fever was given detailed attention.

The LGB report noted that the death rate was very high but they were less definite than Cameron as to the factors that caused its spread. The members acknowledged that 'with our present lack of accurate knowledge regarding the manner of propagation of Enteric fever it is not possible to account for this' (p. 10). They accepted that it was 'probably correct' that certain conditions of the soil were an important factor in its spread but that 'it is by no means clear what these conditions are' (p. 10). They acknowledged that there was a general view that the Dublin's soil was polluted from defective drains and the soakage of foul matter from the 'surfaces of filthy house yards and ill-cleansed lanes and alleys'. However, while this was a problem that should be solved, it had to be recognised that fever was present in areas where the soil was not polluted. They also looked at Cameron's suggestion of a difference between clays and gravels together with the level of sub-soil water. While they found it useful to include a map showing the clays and gravels, they decided that the evidence was not sufficiently exact to allow them to draw a definite conclusion. Put simply, there were lots of things that needed to be done to improve the sanitary condition of the city and it was believed that these would help reduce the death rate from the various diseases but it was unclear what could be done in the particular cause of typhoid fever. Their recommendations, however, regarding better housing, cleaning of alleys and lanes, better sanitation within tenements, would have had the effect of reducing the instance of typhoid fever even if they were unsure what was causing its spread. Nonetheless it was felt useful by Flinn to include a map of Dublin's geology in his recapitulation of public health issues published in 1906 (Flinn, 1906).

Miasma as transmission?

Numbers of deaths from typhoid fever fell during the first years of the twentieth century and the epidemics of the early 1890s were not repeated. The number of deaths for 1905-7 were 40, 44 and 32 respectively, the latter only 15 per cent of the 1893 figure. In fact, an increase to 47 in 1908 prompted Cameron (1909) to speak of his disappointment that the fall had not continued. He continued to argue that there was 'some connection' between the spread of the disease and the soil. The use of privies with large ashpits, generally with only clay floors must have polluted the soil. However, as water closets had

almost completely replaced middens, he surmised that this had led to a cleansing of the ground water. Cases still occurred because the cleaning was not complete and he held to his miasma theory. As he put it 'currents of air out of a freshly polluted soil might convey into the atmosphere some typhoid bacilli. In the large volume of air in the gravels there is greater room for the development of microbial life than in the air contained in dense stiff clays' (1909, p. 42)

Cameron found it very hard to give up on the idea that the bacteria were airborne and felt that it was possible for them to get into the air from liquids and vice versa. He accepted that it was possible for humans to be carriers of the disease and that they could contaminate liquids such as milk. Tests had shown that faeces could contain bacilli long after a person had recovered from the fever. However, this did not explain how the primary infection could occur. These issues came into focus in his attempt in the 1908 report to explain a cluster of cases in Clontarf. They were clustered around a dairy and Cameron's initial view was that infected milk was the source. The dairy premises were found not to be source and suspicion fell onto the milkers because the milk was supplied directly from the fields and not from the dairy. A 'boil notice' was published and Cameron believed that the outbreak was ended by virtue of compliance with this advice.

It proved impossible to find a primary cause. One suggestion was that airborne contamination from vegetable matter dumped in the sloblands in Fairview, which were under reclamation into would become Fairview park, had drifted into the area. Equally it was suggested the Dublin Corporation had opened a sewer in the locality and left it open for some days allowing foul emanations. Cameron ultimately dismissed these possibilities and returned to his prior idea that at least one of the milkers had infected the milk but it was unknown how the milker had become infected. There were other cases in the area for which Cameron could not find a connection with milk or the dairy. In his report, Cameron devoted much space to arguing that research showed that it was possible for micro-organisms to pass into the air from sewage. He stated the case against such transmission but also presented the evidence of his own research which indicated that it could happen. He stated that 'I never could persuade myself that bacteria could not escape from liquids' (p. 73). This allowed him to conclude that one outbreak had resulted from a poorly constructed waste water system while another was the result of a child playing in a place where cases had been identified. It is doubtful that Cameron ever gave up on miasma especially as he had found a potent weapon in sealing contaminated ground – the application of concrete or tarmacadam to lanes and yards.

Legacy

Cameron's mapping exercise in 1891 and 1893 was important in suggesting that geography can be important in explaining the spread of disease and harked back to Snow's study. Snow's analysis of pattern enabled the authorities to stop the transmission of cholera at its source – the water pump in Broad Street. For Cameron, some forty years later, identifying the geographical factors that favoured the transmission of

typhoid fever was of immense value, given that there was little that could be done by drugs or other treatments. Though he had an imperfect knowledge of the mechanism of transmission of diseases such as typhoid fever, as a medical man trained in sanitary science, his focus on sanitation, ventilation and better housing resulted in conditions in which these diseases could not thrive. Typhoid fever might not rise up into the air from polluted land as Cameron had thought, but it could not spread where people had clean tarmac or concrete passageways and yards, toilets, hot water and where the density of population was reduced by the building of new houses. Dublin Corporation built healthy homes (Brady and McManus, 2021) and by so doing not only improved the quality of life for Dubliners, but also improved their overall health. Not all diseases went away, many were still the result of poverty and poor nutrition, but Cameron and Mapother's work was a good start. It went to show that good outcomes can be obtained from imperfect research and scientific knowledge.

References

Brady, J. and McManus, R., 2021. *Building Healthy Homes – Dublin Corporation's first housing schemes 1880–1925*. Dublin: Dublin City Council and Four Courts Press.

Cameron, C.A., 1868. *Lectures on the Preservation of Health*. London and New York: Cassell, Petter and Galpin.

Cameron, C.A., 1892. *Report upon the State of Public Health in the City of Dublin for the year 1891*. Dublin: Dublin Corporation.

Cameron, C.A., 1894. *Report upon the State of Public Health in the City of Dublin for the year 1893*. Dublin: Dublin Corporation.

Cameron, C.A., 1909. *Report upon the State of Public Health in the City of Dublin for the year 1908*. Dublin: Dublin Corporation.

Chadwick, E., 1842. *Report from the Poor Law Commissioners on an Inquiry into the Sanitary Condition of the Labouring Classes in Great Britain*. London: HMSO.

Flinn, D. Edgar, 1906. *Report of the Sanitary Circumstances and Administration of the City of Dublin with special reference to the causes of the high-death rate*. London: HMSO.

Grimshaw, T.W., 1872. *Remarks on the prevalence and distribution of fever in Dublin*. Dublin: Fannin and Co.

Grimshaw, T.W. and Cameron, C.A., 1888. *Report on the prevalence of enteric fever in the Royal Barracks*. Dublin. London: HMSO.

Hall, Mr and Mrs S.C., 1841–3. *Ireland: Its Scenery, Character, &c*. 3 Volumes. London: How & Parsons.

Hartshorne, R., 1959. *Perspective on the nature of geography*. USA: Association of American Geographers.

House of Recovery, 1829. *Report of the managing committee of the House of Recovery and Fever Hospital … for one year ending the 4th January 1829 : with the medical report annexed*. Dublin: Bentham and Hardy.

Johnson, S., 2008. *The Ghost Map: A Street, an Epidemic and the Hidden Power of Urban Networks*. UK Penguin.

Mapother, E.D., 1864. *Lectures on public health, delivered at the Royal College of Surgeons (Ireland)*. Dublin: Fannin & Co. London: Hardwick, Piccadilly.

Mapother, E.D., 1866. *Report on the Health of Dublin for the year 1865*. Dublin: Dublin Corporation.

Mapother, E.D., 1867. On the malignant purple fever epidemic in Ireland. *The Lancet*, 90, issue 2289, 13 July, 38–40.

Mapother, E.D., 1868. *Report on the Health of Dublin for the year 1867*. Dublin: Dublin Corporation.

LGB (Local Government Board), 1900. *Report of the Committee appointed by the Local Government Board for Ireland to inquire into the public health of the city of Dublin, 1900*. Dublin: HMSO.

O'Connell, J. and Carswell, S., 2021. Covid-19: 10 things we thought about the virus a year ago – that turned out to be wrong. *Irish Times*, https://www.irishtimes.com/life-and-style/health-family/covid-19-10-things-we-thought-about-the-virus-a-year-ago-that-turned-out-to-be-wrong-1.4494870, 20 February.

Paulley, J.W., 1993. The death of Albert Prince Consort: the case against typhoid fever. *Quarterly Journal of Medicine*, 86(12), 837–841.

Prunty, J., 1998. *Dublin slums 1800–1925, a study in urban geography*. Dublin: Irish Academic Press.

Royal Commission, 1885. *Report of the Royal commission appointed to inquire into the housing of the working classes. Minutes of evidence etc., Ireland*. British Parliamentary Papers, cd. 4547. London: Eyre and Spottiswoode.

Shapiro, J., 2017. *1606: Shakespeare and the Year of Lear*. UK: Faber and Faber.

Whitelaw, J., 1805. *An essay on the population of Dublin, being the result of an actual survey taken in 1798 with great care and precision, to which is added the general return of the district committee in 1804, with a comparative statement of the two surveys, also several observations on the present state of the poorer parts of the city of Dublin*. Reprinted as Slum conditions in London and Dublin. Farnborough, Hants: Gregg International, 1974.

Willis, T., 1845. *Facts connected with the social and sanitary condition of the working classes in the city of Dublin, with tables of sickness, medical attendance, deaths, expectation of life, &c.;, &c.; together with some gleanings from the census returns of 1841*. Dublin: O'Gorman.