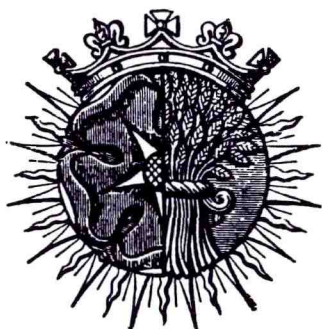


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DUNCAN AND THE CHOLERA TEST: PUBLIC
HEALTH IN MID NINETEENTH-CENTURY
LIVERPOOL

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Local studies have much to contribute to the study of the history of public health reform in nineteenth-century Britain. They may help elucidate the shifting margins between competition and complementarity in the efforts of local and national government. They can offer a corrective to hasty generalization from narrow, usually London-based, sources. They throw light upon the implementation of legislation and upon the local negotiation of the ideas and strategies of medical and political élites. It is equally important, however, that local studies remain aware of the national context of the issues being examined. Otherwise, the specific significance of the local study will be lost.

In the case of Dr William Henry Duncan, Liverpool's Medical Officer of Health from 1847 until his death in 1863, his national significance is obvious. He was the first full-time Medical Officer of Health in England and made important contributions to the public health campaigns associated with Edwin Chadwick in the 1840s. In some ways, he almost slips from national view shortly after his appointment and, preoccupied with local issues perhaps, he left it to others, and most dramatically John Simon, to define the image and the framework of the position of Medical Officer of Health. The curtain seems to fall upon his national role even before his apparent mentor, Chadwick, has been hauled off-stage with the reconstruction of the General Board of Health in 1855. Yet

*See acknowledgements on p. 115.

Duncan remained the Medical Officer of Health in England's second largest city for fifteen years and stayed remarkably faithful to his early vision of environmental public health. Furthermore, there were a number of other strategies and commitments handed on from the 1840s across the baton-change from Chadwick to Simon in 1855, not only in the ideas and practice of Simon himself, but also in those of a cohort of environmental health activists who had been socialized into the earlier public health movement. William Farr, John Sutherland, and Florence Nightingale were among the most prominent but there were many more working for local governments up and down the country. Duncan was one of these.

It is important, then, to explore the relations between the ideas and practice of these foot soldiers and those of their generals in the public health movement. Duncan's approach to and reflections on cholera open an interesting window on these questions. Liverpool was unquestionably one of the worst hit cities in England's cholera epidemics and cholera was without doubt one of the most dramatic of the perils which shaped contemporaries' vision of the shock cities of their age. To a certain extent, cholera has been taken by historians, as it was by some contemporaries, as the paradigmatic epidemic threat to the nineteenth-century industrial city. Certainly, Chadwick and other public health activists sought to use fear and concern over cholera as a lever for wedging free sanitary reform from local and national authorities. It is equally clear that the middle-class press, at least, was complicit in this effort to show cholera as the great teacher of the evils of sanitary abuses. Yet an examination of Duncan's reactions to cholera reveals a number of divergences from the picture of the environmental public health movement which might be reconstructed from the work of Chadwick and colleagues at the General Board of Health. In some respects, his experience of fighting cholera undermined Duncan's confidence in certain aspects of Chadwick's version of the 'sanitary idea' without in any way preparing him to accept Simon's.

I

There were four cholera epidemics in England and Wales during the nineteenth century: in 1831-2, 1848-9, 1853-4, and 1866.

On each occasion, the rate of mortality among the people of Liverpool was high. Table 1, in spite of any qualifications one might urge against the accuracy of the diagnoses of cause of death on which it is based,¹ clearly shows the degree to which Liverpool was one of the distinctive cholera localities.² Although these rates of mortality pale alongside the worst figures for cities on the Continent which sometimes reached levels ten times higher than the worst English cities,³ the national significance of Liverpool is clear in both relative and absolute terms and it certainly earned its reputation as 'the black spot on the Mersey'.⁴ In the first epidemic, Liverpool accounted for one in fourteen of all English cholera deaths, one in ten in the second, one in seventeen in the third and one in seven of the last and mildest epidemic. The rate of cholera mortality in Liverpool during the second epidemic, when about one in seventy of the population of Liverpool died,

- 1 For a discussion of the reliability of cholera registration see G. Kearns, *Urban epidemics and historical geography: cholera in London 1848-9* (Norwich, 1985).
- 2 The materials for England and Wales, excluding London, during the first (1831-2) epidemic come from the records of the first Central Board of Health (P.R.O., PC 1/108, 'Cholera returns in Great Britain'), and the data for London (1832-3) come from the General Board of Health's report on the second epidemic (P.P. 1850 [1275] xxi, p. 365, 'Report of the General Board of Health on the Epidemic Cholera of 1848 and 1849. Appendix B', p. 30). The latter three epidemics are detailed in W. Farr, *Report on the cholera epidemic of 1866 in England. Supplement to the 29th Annual Report of the Registrar-General of Births, Deaths and Marriages in England* (London, 1868); also published as P.P. 1867-8 (4072) xxxviii, p. 1. The population returns come from the published volumes of the decennial censuses and they have been interpolated to give an estimate of the population in each place during the cholera years. For further details of this analysis see G. Kearns, 'Aspects of cholera, society and space in nineteenth-century England and Wales' (unpub. Ph.D. thesis, Cambridge Univ., 1985).
- 3 See G. Kearns, 'Death in the time of cholera', *Journal of Historical Geography*, XV (1989), pp. 425-432.
- 4 An epithet coined by Abraham Hume, a nineteenth-century Liverpool clergyman. It is important to place the Liverpool cholera epidemics in some sort of comparative context if only to avoid the flights of exaggeration to which even such excellent local historians as Eric Midwinter are occasionally given: (writing of the 1849 cholera epidemic in Liverpool) 'No more dreadful sickness has ever so affected a town as hundreds died weekly through a long summer and into the early autumn' (E. Midwinter, *Old Liverpool* (Newton Abbot, 1971), p. 85).

TABLE 1 *Mortality from cholera and other causes (death rates per 1,000 persons living)*

	1832	1849	1854	1866
<i>Liverpool</i>				
Population	196,212	388,159	433,814	360,563
Cholera deaths	1,523	5,308	1,290	1,989
Cholera death rate	7.76	13.68	2.97	3.74
Other deaths		12,532	13,507	20,261
Other death rate		32.29	31.14	38.09
<i>Manchester</i>				
Population	188,609	417,121	461,604	553,790
Cholera deaths	1,144	1,395	63	114
Cholera death rate	6.07	3.34	0.14	0.21
Other deaths		12,604	13,890	17,101
Other death rate		30.22	30.09	30.88
<i>Remainder of the North-West</i>				
Population	1,325,407	1,590,785	1,716,076	2,229,354
Cholera deaths	281	2,133	563	888
Cholera death rate	0.21	1.34	0.32	0.40
Other deaths		36,720	38,706	52,915
Other death rate		23.08	22.55	23.74
<i>London</i>				
Population	1,687,752	2,268,885	2,479,163	2,995,833
Cholera deaths	6,356	14,137	10,738	5,686
Cholera death rate	3.77	6.23	4.33	1.90
Other deaths		54,315	63,487	74,767
Other death rate		23.94	26.51	24.96
<i>Remainder of England and Wales</i>				
Population	10,652,916	12,818,096	13,403,418	15,133,024
Cholera deaths	12,202	30,516	9,306	5,803
Cholera death rate	1.15	2.38	0.69	0.38
Other deaths		271,500	288,893	320,861
Other death rate		21.18	21.55	21.20

Note. The areas are as follows. In 1832 Liverpool is the Borough and Parish of Liverpool plus Toxteth Park, Manchester is the townships of Manchester and Salford, the North-west comprises the administrative counties of Lancashire and Cheshire excluding Liverpool and Manchester as just defined, and London is the registration division as defined in the 1851 census.

For 1849, 1854, and 1866 all data are for registration areas: Liverpool and West Derby districts; Manchester, Salford, and Chorlton districts; the registration counties of Lancashire and Cheshire excluding Liverpool and Manchester as just defined; and the London registration division.

Source. The population figures have been interpolated from the decennial census data, 1831-1871.

was among the highest suffered by any large English city in any of the cholera epidemics. From Table 2, we can see that it was only exceeded by Newcastle in 1832 (and nearly again in 1854), by Hull in 1849, and by Plymouth in 1832.⁵

TABLE 2 *Cholera in the great cities (deaths per 1,000 living)*

	1832	1849	1854	1866
London	3.77	6.23	4.33	1.90
Liverpool	7.76	13.68	2.97	3.74
Manchester	6.07	3.34	0.14	0.21
Birmingham	0.14	0.16	0.12	0.05
Leeds	5.47	8.05	0.29	0.13
Bristol	6.60	8.20	1.13	0.16
Sheffield	6.81	1.03	0.91	0.11
Newcastle	18.37	4.20	13.45	0.32
Bradford	1.29	2.50	0.18	0.15
Hull	5.93	20.05	0.27	0.17
Stoke on Trent	1.24	1.85	0.11	0.09
Portsmouth	1.69	8.37	0.26	1.38
Brighton	0	3.17	0.55	0.17
Preston	0.18	0.36	0.08	0.17
Norwich	2.07	0.57	2.76	0.04
Sunderland	12.60	5.38	0.55	0.91
Merthyr Tydfil	—	2.83	0.26	0.24
Bolton	0.42	1.11	0.13	0.45
Leicester	0	0.03	0.05	0.04
Nottingham	5.71	0.31	0.25	0.03
Bath	1.22	1.29	0	0.02
Stockport	0.44	0.81	0.16	0.16
Oldham	0	0.49	0.31	0.16
Plymouth	13.78	17.07	1.07	0.20

Note: The areas for the latter three epidemics are made up from the following registration districts: Liverpool comprises Liverpool and West Derby; Manchester: Salford, Manchester and Chorlton; Birmingham: Norton, Birmingham and Ashton; Leeds: Hunslet and Leeds; Bristol: Clifton and Bristol; Sheffield: Ecclesall and Sheffield; Newcastle: Newcastle and Gateshead; Hull: Sculcoates and Hull. Merthyr Tydfil is not separately distinguished in the 1832 returns. The towns are listed in their rank order of the population in 1851.

5 The 'great cities' defined here are those which had at least 50,000 inhabitants by 1851. The sample selection is described in greater detail in G. Kearns, 'Le handicap urbain et le déclin de la mortalité en Angleterre et au Pays de Galles, 1851-1900', *Annales de Démographie Historique* 1993, pp. 75-105. The figure for London 1832 actually refers to 1832-3, for Newcastle 1832 to 1831-2, and for Newcastle 1854 to 1853.

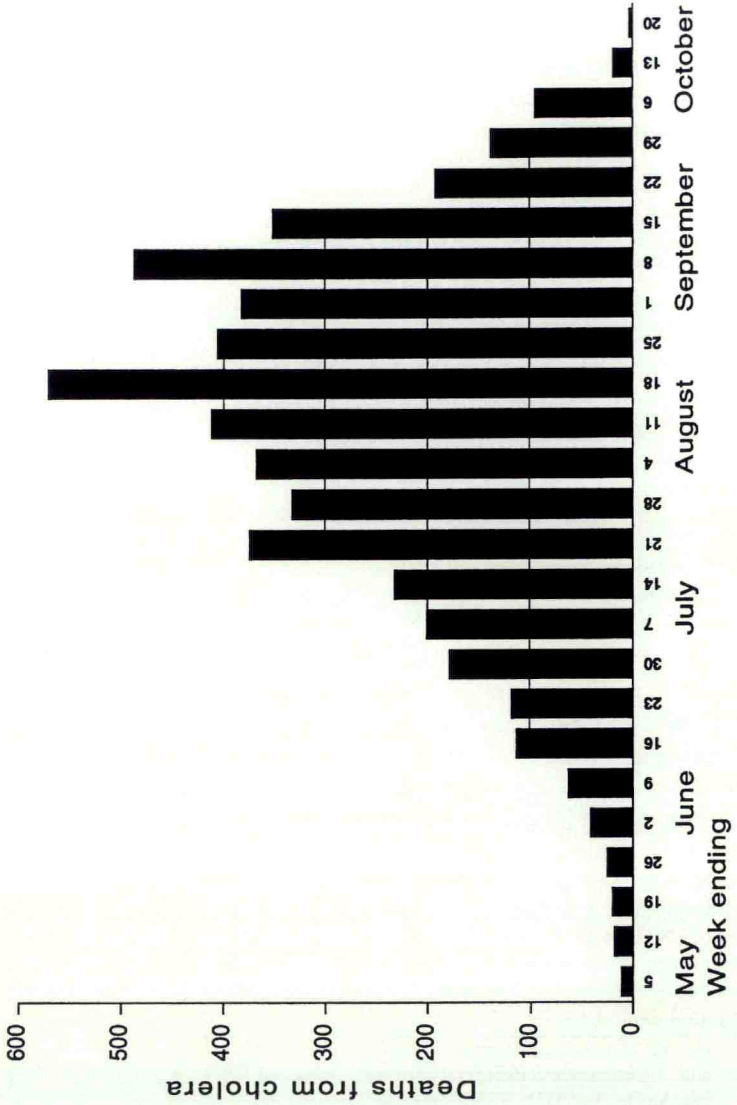


Figure 1 Weekly Cholera Deaths in Liverpool, 29th April-20th October 1849

The Liverpool epidemic of 1849 was of national as well as local importance. At its peak, from mid-August to mid-September, each day about sixty people died from cholera (see Figure 1).⁶ The General Board of Health anxiously demanded daily reports of cholera and diarrhoea deaths and cases from Duncan from late May to early October. It sent two of its Superintending Inspectors to the city on several occasions. One of these was Sutherland, a native of the city, and the other was Richard Grainger, of St Thomas's Hospital, London. National as well as local newspapers followed events in Liverpool, which at the time headed most of the mortality league tables with which Farr was embarrassing cities throughout the country. Duncan, at the time, was still reeling from the horror of inaugurating his tenure in the midst of perhaps the worst typhus epidemic of the century, was cajoling the Corporation to spend the money needed to make its legislative commitment to environmental reform a physical reality, was attempting to define the 'professional' status of his office, and was now required to manage this fledgling public health system with only the services of a temporary clerk for the duration of the epidemic (appointed 21 June 1849, and given one month's notice on 27 December 1849).⁷

Duncan was guided by his experience during the typhus epidemic of 1847 and by the expectation that, as the General Board of Health asserted in its first *Notification* of cholera, dated 5 October 1848: 'whatever is preventive of cholera is equally preventive of typhus and of every other epidemic and constantly recurring disease'.⁸ The Board 'warned the local authorities that the seats of the approaching pestilence in their respective districts, would be the usual haunts of other epidemics'.⁹ Cholera, then, was to be yet another exemplar of the general public health problem. It would behave in the same way as typhus and could be tackled with the same measures.

6 The data come from W. H. Duncan, *Report to the Health Committee of the Borough of Liverpool, on the health of the town during the years 1847-48-49-50, and on other matters within his department* (Liverpool, 1851), p. 30.

7 Liv. R.O., 352.MIN.HEA, 'Health Committee Minutes', vol. 2, 21 June 1849, p. 293; vol. 2, 27 Dec. 1849, p. 456.

8 *Lancet* (1848), vol. 2, p. 462.

9 P.P. 1850 [1273] xxi, p. 3, 'Report from the General Board of Health on the epidemic cholera of 1848 & 1849', p. 19.

II

Duncan's understanding of the general public health problem evolved over the seventeen years between his first experience of cholera, as physician to Liverpool's North Dispensary, in 1832 and his second, as the borough's Medical Officer of Health. To some extent he moved ever closer to Chadwick's version of the sanitary idea but he more or less eschewed moralistic emphases and he retained a stronger interest in housing than in Chadwick's promotion of sanitary engineering. Throughout, he relied heavily upon statistical evidence which he deployed with great care and not a little panache.¹⁰ This, alone, would mark him off from Chadwick, who used statistical material more for illustration than exploration.¹¹ The development of Duncan's thought on the environmental causes of disease provides an intriguing example of the competing claims of scientific and practical demands upon medical ideas. As Cooter showed in a study of the political ideology of anticontagionism, the nuances of the scientific debate in medical journals took on a different and even less important hue when set against the insistent, pragmatic demands of public health policy.¹² It was not only that the explanation of the aetiological and pathological mechanisms of disease were secondary and even irrelevant to the need to decide practical questions about restrictions on trade and movement, it was also that the policy questions about controlling people and the economy raised a set of quandaries in political philosophy on which scientific medicine had no purchase.

From the very beginning, Duncan was convinced of the value of medical statistics. In an early publication presenting a record for 1833 of the cases of sickness which he had treated at the North Dispensary during his twice-weekly attendance there, he remarked that:

- 10 See P. Laxton and G. Kearns, 'Statistics and the management of the public health: the methods of W. H. Duncan' (paper given by P. Laxton at the annual conference of the Social Science History Association, Baltimore, 1993).
- 11 See M. J. Cullen, *The statistical movement in early Victorian Britain: the foundations of empirical social science* (Hassocks, 1975).
- 12 R. Cooter, 'Anticontagionism and history's medical record', in *The problems of medical knowledge: examining the social construction of medicine*, ed. P. Wright and A. Treacher (Edinburgh, 1982), pp. 87-108.

The particulars with regard to age, sex, &c. are pretty well fully given, for I cannot agree with those who look upon such statistical details as of little value. If they have not hitherto been productive of much practical good, it is, I conceive, because Medical Statistics are a branch of the science which has been most unaccountably neglected; and were every individual who has opportunities of observation, to furnish his quota of facts, we might soon be enabled to make deductions having the most important bearing on the etiology and treatment of disease.¹³

In his commentary on this table of sickness, Duncan paid attention to the distribution of sickness by age, sex, season and weather. He merely presented without comment some figures on the nationality and habitations of his patients which showed that 45% were Irish, 47% English and that 39% lived in courts, 24% in cellars and 36% in front houses. Indeed, he commented directly on the relative unimportance of country of birth: 'I have not been able to generalise my observations on this head, nor perhaps, if reduced into form, would they point to any striking result'.¹⁴ This is a world removed from the concerns of his writings in the 1840s. Here, in 1833, he was merely recording the natural rhythms of sickness.

Duncan never lost this interest in medicine as a branch of natural philosophy, although in the 1840s he laid greater stress upon the extent to which the causes of disease were physical and removable. Duncan became one of Chadwick's star witnesses. He gave evidence before Robert Slaney's 1840 Select Committee on the Health of Towns. Duncan described the population of Liverpool which lived in cellars and courts, and estimated that there were 38,000 people living in cellars and a further 86,000 in courts. None of the latter were sewered. Slaney pressed him: 'Are the Committee to understand that there are neither sewers nor underground drains in those courts?—None whatever.'¹⁵ His conception of the public health task in Liverpool related primarily to the regulation of these houses: 'I think that it would be the means of reducing the mortality of Liverpool very much if an efficient plan of

13 W. H. Duncan, 'Table of medical cases entered on Dr. Duncan's Register at Liverpool North Dispensary, during the year 1833', *Liverpool Medical Journal* (1834), p. 18.

14 Duncan, *Liverpool Medical Journal* (1834), p. 18.

15 W. H. Duncan, 'Minutes of evidence', in P.P. 1840 (384) xi, p. 277, 'Report from the Select Committee on the Health of Towns', p. 142.

inspection were carried into effect; if power were vested in some officer or Board to regulate the dwellings of the poor.¹⁶ Duncan thought that little could be expected from the poor. In particular, he suggested that the Irish were generally apathetic and satisfied with their lot whatever that might be. He did not think that without extensive education, the poor would take any advantage of public baths were any to be provided. After he was led by William Cowper through a cost-benefit analysis of putting the courts in proper sanitary order, Duncan assured Slaney that: 'In the first instance, at all events, there would be great expense in putting those places in a habitable state; but I think in the end it would certainly diminish the poor-rates, and the necessity of relief to the people themselves, and to the widows and orphans of those that have died.'¹⁷ He contributed a paper 'On the Sanitary State of Liverpool' to Chadwick's 1842 'Report on the Sanitary Condition of the Labouring Population of Great Britain'. In this paper, Duncan followed the example of Neil Arnott, James Phillips Kay and Thomas Southwood Smith who had reported in 1838 on the removable causes of fever for Chadwick at the Poor Law Commission. He distinguished between physical and moral factors but concentrated almost exclusively on the environment of working-class dwellings among the former and on the habits of the urban Irish as an instance of the latter. In his emphasis on housing Duncan was faithful to the model of public health reform pushed by Chadwick at the start of the decade in which building regulations were to be the vehicle for urban improvement. The report of 1842 marked Chadwick's move towards sanitary engineering as a more fundamental set of reforms, leaving many of his earlier supporters confused.¹⁸ The crucial point of attack was now the urban atmosphere and the proposed strategy was a *system* of cleansing and ventilation.¹⁹

16 P.P. 1840 (384) xi, pp. 145-146.

17 P.P. 1840 (384) xi, p. 147.

18 Lord Normanby, who had introduced a Building Bill into Parliament, was especially embarrassed by Chadwick's change of emphasis. See S. E. Finer, *The life and times of Sir Edwin Chadwick* (London, 1952), pp. 210-211.

19 On the ideological significance of the 'sanitary idea' as a coherent *system*, see P. Corrigan and D. Sayer, *The great arch: English state formation as cultural revolution* (Cambridge, 1985); G. Kearns, 'Private property and public health reform in England, 1830-70', *Social Science and Medicine*, XXVI (1988), pp. 187-199.

Pickstone points to an important element of reductionism in the way Chadwick and Southwood Smith conceptualized urban fevers as the archetypal public health problem. Although an eclectic set of causes of fevers was noted, only a few of them were considered appropriate targets of intervention. In particular, the 'sanitary idea' separated private from public matters, restricting public health measures to the latter. Writing of the fever reports produced for the 1838 Report of the Poor Law Commission, he notes:

Many of the reported causes [of fever] were seen as aspects of 'private' behaviour, and thus inappropriate objects for political action. For example, the overcrowding and intemperance of the poor were seen as 'originating to a considerable extent in their habits'. But drains, cess pools, refuse, burial grounds and slaughter houses arose independently of these habits; these were public matters, hence they could be targeted for political action.²⁰

Whilst he followed this distinction between private and public, Duncan saw the latter primarily as a matter of 'dwellings'. He summarized the causes of fever as follows:

With regard to their *dwellings*, I would point out as the principal circumstances affecting the health of the poor:

1. Imperfect ventilation.
2. Want of places of deposit for vegetable and animal refuse.
3. Imperfect drainage and sewerage.
4. Imperfect system of scavenging and cleansing.

The circumstances derived from their *habits* most prejudicial to their health, I conceive to be:

1. Their tendency to congregate in too large numbers under the same roof, &c.
2. Want of cleanliness.
3. Indisposition to be removed to the hospital when ill of fever.²¹

The conflation of questions of ventilation with those relating to the removal of decomposing waste suggests a sympathy with

20 J. V. Pickstone, 'Dearth, dirt and fever epidemics: rewriting the history of British "public health", 1780–1850', in *Epidemics and ideas: essays on the historical perception of pestilence*, ed. T. Ranger and P. Slack (Oxford, 1992), p. 137.

21 W. H. Duncan, 'On the sanitary state of Liverpool', in PP. 1842 (HL) xxvii, p. 1, 'Local reports on the sanitary condition of the labouring population of England', pp. 283–284.

Southwood Smith's emphasis on animal poisons proceeding directly from the living person and even for the attempt 'to abolish the distinction between the human body and external agents, and so present a fevered patient as merely a form of decomposition'.²² Duncan is perhaps closer to Pickstone's reference to R. B. Howard's conception of 'human miasma' in that same set of Local Reports.²³ In other words, Duncan seems to imply that it is human beings themselves, and not just those with fever, who can pose a threat to public health when they are concentrated in the absence of adequate ventilation:

The influence of this cause is shown, I think, in the case of the cellars whose ventilation is more imperfect than that of the courts and houses, at the same time that they afford a much larger proportion of fever cases. Of the 5,000 cases annually treated by the dispensaries, nearly 1,500 occur in cellars, being 35 per cent. more than the cellar population ought to yield, as compared with the working population.²⁴

Duncan would always retain this emphasis on overcrowding and housing conditions in his understanding of the public health problem.

Duncan developed his ideas on the moral basis of ill-health through comments on the Irish in Liverpool, among whom one third of all sickness reported was from fever, compared only to one quarter in the case of their English neighbours:

Among the causes of fever in Liverpool, I might have enumerated the large proportion of poor Irish among the working population. It is they who inhabit the filthiest and worst-ventilated courts and cellars, who congregate the most numerous in dirty lodging-houses, who are the least cleanly in their habits, and the most apathetic about everything that befalls them. It is among the Irish that fever especially commits its ravages; and it is they who object the most strongly to be removed to the hospital from their miserable abodes. Nor does the evil stop with themselves. By their example and intercourse with others they are

22 Pickstone, 'Fever epidemics', p. 146.

23 Pickstone, 'Fever epidemics', p. 134, referring to R. B. Howard, 'Report on the prevalence of diseases arising from contagion and certain other physical causes among the labouring classes in Manchester', in P.P. 1842 (HL) xxvii, p. 1, 'Local reports on the sanitary condition of the labouring population of England', pp. 282-294.

24 Duncan, 'On the sanitary state of Liverpool', p. 285.

rapidly lowering the standard of comfort among their English neighbours, communicating their own vicious and apathetic habits, and fast extinguishing all sense of moral dignity, independence and self-respect. No one interested in the welfare of his poor brethren can contemplate the prospect with a feeling of melancholy foreboding; and I am persuaded that so long as the native inhabitants are exposed to the inroads of numerous hordes of uneducated Irish, spreading physical and moral contamination around them, it will be in vain to expect that any sanitary code can cause fever to disappear from Liverpool.²⁵

This moralistic attack on the Irish poor, so dominant in the writings of Kay and Girdlestone in the 1830s,²⁶ rarely surfaced to this extent in Duncan's later writings. In this piece for Chadwick's 1842 inquiry he was trying to urge that in its housing and in its population of Irish immigrants, Liverpool suffered in a particularly acute way from both the physical and the moral causes of sickness. In the case of both the physical and the moral factors, Duncan was trying to avoid the conclusion that disease was a direct consequence of poverty. A further radical transformation of poor-law provisions was not on the agenda for the public health reformers and they focused their efforts instead on the physical removable causes of mortality. Duncan's concern with the Irish was, however, a characteristic feature of debate over health in Liverpool. The local authorities repeatedly called for restrictions on immigration and just as frequently pointed to the health costs of the repeated denials of their demands. Augustus Campbell, speaking from the chair at a meeting of the Select Vestry in May 1849 bemoaned the fact that Liverpool 'has been made the hospital and cemetery for Ireland'.²⁷ Beyond the specific reference to the amorality of the poor Irish, there was little made of poverty in Duncan's explanation of disease.

Duncan was not inclined to accept the ultra-sanitarian line that organic decomposition *generates* fever. These miasmas could only extend themselves in epidemic form given certain atmospheric conditions, chiefly relating to electricity. The

25 Duncan, 'On the sanitary state of Liverpool', pp. 293-294.

26 See F. Mort, *Dangerous sexualities: medico-moral politics in England since 1830* (London, 1987).

27 *Liverpool Mercury*, 18 May 1849, p. 20.

atmospheric condition is the factor which unites the effects of poor ventilation and overcrowding with those of poor drainage and inadequate rubbish removal.

III

A year after giving evidence to Chadwick's inquiry, Duncan wrote a paper evaluating Liverpool's new Local Improvement Act.²⁸ This was read before Liverpool's Literary and Philosophical Society on two evenings in February and March of 1843. It was subsequently published by the Society and an abridged version was printed in the First Report of the Health of Towns Commission in 1844.²⁹ In this pamphlet, he barely mentioned moral issues at all. Instead, he treated overcrowding as a physical cause of disease and although he referred to the deplorable habits of the Irish, he conceded that part of the difference between the English and the Irish 'is merely the result of their greater poverty'.³⁰ Observations about the Irish offer no basis for generalizations about the English poor law, it might appear. Duncan went on to suggest that since mortality was generally higher in town than in country and that wages showed the same pattern, poverty could provide no general explanation of urban mortality. The focus of the paper is the atmosphere of towns. Duncan quotes from William Farr's first Annual Report to the Registrar General: 'The source of the higher mortality in cities is ... in the insalubrity of the atmosphere.'³¹ Far from wanting to examine the direct impact of moral causes on mortality, Duncan advised the reader that: 'Wishing to adhere pretty closely to the object of the paper, *i.e.* to point out the physical causes of the high rate of mortality, &c.,—I have said nothing as to the very low rate of morality

28 5 and 6 Vict. c. xlv.

29 W. H. Duncan, *On the physical causes of the high rate of mortality in Liverpool. Read before the Literary and Philosophical Society in February and March, 1843* (Liverpool, 1843); abridged in P.P. 1844 [572] xvii, p. 1, 'First Report of the Commissioners appointed for Inquiring into the State of Large Towns and Populous Districts. Appendix', pp. 12–32. Page references are to the pamphlet [hereafter *Physical Causes*].

30 Duncan, *Physical Causes*, p. 56.

31 Duncan, *Physical Causes*, p. 6.

which many of these [physical] causes [such as overcrowding] tend to induce',³² thereby treating morality itself as one more of the consequences of the physical causes of disease. One important reason why Duncan wanted to concentrate on the mephitic urban atmosphere and its physical causes was that it directed the attention of his middle-class audience to their own interest in sanitary reform. The pamphlet was certainly recognized locally as having materially promoted the sanitary cause. Even a decade later, the *Liverpool Chronicle's* sarcasm has something of the ring of truth about it: 'Dr. Duncan rose one morning and found himself famous by the publication of his pamphlet, showing that Liverpool was then the lowest as regarded longevity of any town in the kingdom. We took alarm and employed him to look after our health'.³³

Duncan insisted that the rich as well as the poor had higher mortality in town than in country: 'the influence of these seats of pestilence is not confined to those who reside within their immediate limits, but extends itself to the whole town, poisoning the atmosphere which all classes are compelled to breathe'.³⁴ He tried to awaken the sympathy of his audience with his graphic descriptions of the misery of the overcrowded courts, 'As some of the members present may not be acquainted with the character and construction of the courts in which so many of their townsmen reside'.³⁵ After an account of the extent to which the housing conditions of the poor supply physical causes of fever beyond the effects of poverty, he asked:

Does any one suppose that if the inhabitants of Rodney Street and Abercromby Square were to exchange places with those of Vauxhall or Exchange Wards, leaving their spacious mansions to be occupied by the inhabitants of the latter district, while they took up residence in the filthy and miserable courts and cellars, of Vauxhall or Exchange,—their relative command of the necessaries of life remaining undisturbed—does any one suppose that the relative mortality of the two classes would likewise remain unaltered?³⁶

32 Duncan, *Physical Causes*, p. 19.

33 *Liverpool Chronicle*, 27 May 1854, p. 7.

34 Duncan, *Physical Causes*, p. 62.

35 Duncan, *Physical Causes*, pp. 9–10.

36 Duncan, *Physical Causes*, p. 62.

He even tried to shame his audience with the revelation that the Corporation was raising money from a general Sewers Rate to provide sewers only in the rich areas, leaving the poor without sewers, while even undeveloped plots in the suburbs had them. From a recent map produced by the Commission of Sewers in Liverpool, he calculated that only one fifth of the streets occupied chiefly by the working classes were sewered compared to fully three fifths of the rest of the city's built-up streets by length.³⁷ Duncan appeared to believe that his best hope lay in appealing to his audience's sense of self-preservation. Having described one appalling set of cellars with mud floors awash with the disgorged contents of privies and ashpits from an adjoining court, he paused to remark: 'I mention this instance in particular, because it may come more home to the members than others which might be adduced; for although they may never be called upon themselves to inhabit the cellars in question, it is possible they may be called upon to drink the milk or cream which has been stationed there'.³⁸

In this report, Duncan also tried to demonstrate the correlations between the physical causes he was speaking of and the sickness and mortality which they produced:

What has been already stated with regard to the high rate of mortality amongst us, and its physical causes, applied to Liverpool as a whole: but I have now to show that the mortality is distributed over the parish in very different proportions, and to point out in how far any connexion may be traced between the ratio of mortality in each district and the particular intensity with which those physical causes may there be found to operate. The subsequent Tables have been constructed with the view of facilitating the illustration of this important point. The materials from which they have been framed were derived from the enumerators' lists of the late census, with which I was favoured by Mr. Eckersley; the returns of the Corporation Surveyors with regard to the court and cellar residences; the map published by the Commissioners of Sewers; the records of the Dispensaries; and a list of the deaths in the different Registrar's districts of the parish, for two years, (1838 and 1842), with which I have been obligingly furnished by the Superintendent Registrar [Eckersley].³⁹

37 Duncan, *Physical Causes*, p. 15.

38 Duncan, *Physical Causes*, p. 14.

39 Duncan, *Physical Causes*, pp. 42-43. The mortality data relate to the registration subdistricts of Liverpool and involve some amalgamation of the wards. 1838 and 1842 were years of relatively light mortality.

Table 3 presents a summary of some of the materials he assembled. The data are all shown as index values of the average of the parish as a whole, which is given at the foot of each column. The rank ordering of the registration subdistricts is not consistent across all these environmental indicators although the middle-class area of Rodney Street and Abercromby wards was consistently salubrious. The working classes were most likely to live in courts and cellars in Vauxhall ward, were least well sewered in Saint Anne's and Lime Street, and were most likely to be found in damp cellars in Saint Paul's, Exchange and Castle Street wards, where they also lived at the greatest population and housing densities and where the higher proportion of courts were closed at both ends. Duncan, himself, worried about some of the data. He questioned the accuracy of the count of the population in courts and cellars: 'From pretty extensive data which I have in my possession, I should be inclined to think these numbers, both on the court and cellar population, to be under the mark; but as they profess to be from actual enumeration, I am of course bound to take them as I find them', and in a footnote he opined, 'Possibly, casual lodgers have been omitted in the enumeration'.⁴⁰ If this were true it would be a serious lacuna in the official census.

The multiplicity of interacting factors made it difficult to isolate the operation of any one but it also made it possible to explain almost any pattern of sickness and disease in terms of perfectly plausible hierarchies of physical causes. Duncan used the ratio between fever cases and population and the crude rate of mortality in the relatively mild years of 1838 and 1842 as indicators of the consequences for health of the physical causes he had described. These are shown in Table 4, together with some later evidence from the early years of Duncan's tenure as Medical Officer of Health.⁴¹ There are three striking features of this table which bear upon Duncan's account of the physical causes of disease. First, the differentiation between the component parts of Liverpool was relatively weak during years of moderate mortality. Second, the level of fever sickness 1835-9 is actually a rather good predictor of the rank-ordering of fever mortality during the later (1847) epidemic.

40 Duncan, *Physical Causes*, p. 11.

41 Duncan, *Report, 1847-48-49-50*, pp. 13, 32, 86.

Third, the disparity between high and low mortality was rather less in the case of cholera than in the case of fever, in this being rather similar to diarrhoeal mortality more generally. In fact, the ranking of the subdistricts is remarkably consistent across all disease categories. We may note in passing that the only one of Duncan's physical causes which picks out Vauxhall as the pre-eminent disease nest is the percentage of the population living in courts and cellars, a housing variable.⁴²

TABLE 3 *The distribution of the physical causes of disease by ward (Liverpool parish = 100)*

<i>Ward(s)</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Vauxhall	170	105	105	99	93	75	102	64	109
St Pauls, Exchange, Castle Street	105	201	109	134	97	100	104	56	114
St Peters, Pitt St, Great George	79	91	106	120	118	120	114	83	112
St Annes, Lime St	99	114	98	78	91	30	88	81	88
Scotland	118	48	96	80	99	115	84	150	94
Rodney St, Abercromby	65	12	83	43	103	125	104	188	88
Parish	34.3	31.8	5.2	44.4	3.3	20	57	30.7	6.8

Note: Each variable is expressed as a ratio to the value for Liverpool parish. The variables are: (1) the percentage of the population living in courts or cellars; (2) the percentage of courts which were closed at both ends; (3) the inhabitants per house in court housing; (4) the percentage of cellars found to be damp; (5) the inhabitants per cellar; (6) the percentage of the length of working class streets which were sewered; (7) the percentage of the length of other streets which were sewered; (8) the surface area per inhabitant, in square yards; (9) the inhabitants per house.

⁴² In line with his focus on physical causes, Duncan did not explore nativity or poverty as explanations of the consistently observed ranking of subdistricts for the different diseases.

TABLE 4 *The distribution of disease by ward (Liverpool parish = 100)*

<i>Ward(s)</i>	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>
Vauxhall	203	132	258	193	191
St Pauls, Exchange, Castle St	148	101	117	108	125
St Peters, Pitt St, Great George	99	99	97	103	80
St Annes, Lime St	51	98	52	55	68
Scotland	72	98	97	125	131
Rodney St, Abercromby	24	74	28	37	24
Total	17.91	32.31	14.00	7.74	17.04

Note: Each variable is expressed as a ratio to the value for Liverpool parish. The variables are: (1) the annual average number of fever cases per thousand population 1835-9; (2) average crude rate of mortality (deaths per thousand living) of 1838 and 1842; (3) fever mortality, 1847; (4) diarrhoea and dysentery, 1847; (5) cholera, 1849.

IV

If the removable causes of disease were those which encouraged the urban fevers, then, since it produced the greatest disparity between high mortality and low mortality subdistricts, the typhus epidemic of 1847 might have offered Duncan a more precise object lesson than the cholera epidemic of two years later. This was, indeed, the conclusion which Duncan reached: 'The cholera was more widely diffused than the Irish fever, and was less affected by sanatory measures, being oftener found in healthy situations than the fever was; though, on the whole, it

was chiefly congregated in the crowded parts.⁴³ To William Farr, Duncan expressed his consternation:

Cholera has altogether left us, after having existed as an epidemic nearly five months and caused a greater mortality than I had anticipated, considering the improved sanitary conditions of the town within the last few years. I am inclined to think that cholera is more dependent on influences beyond our control than typhus fever is; that the 'atmospheric constitution' is an element of more power in the former epidemic, and that it has been lost sight of by the [General] Board of Health when they talk of extinguishing the epidemic. I am persuaded that no house-to-house visitation could shorten the duration of the epidemic by a single day, however much it might circumscribe its ravages. About 10,000 of the worst houses in Liverpool were daily visited but cholera carried off 5,000 of our people.⁴⁴

Duncan was a recognized authority on urban epidemics and Farr was only one among several reformers who sought his reflections on cholera. Farr directed Duncan's attention to what Farr took to be an iron law of cholera, that there was an inverse correlation between elevation and mortality. Farr was anxious to derive practical conclusions from empirical correlations independently of vexatious disputes about disease aetiology.⁴⁵ Duncan offered Farr none of the certainty of statistical inference that he sought. Only at the most aggregated of levels (combining sixteen Liverpool districts into three altitudinal bands) did 'the results distinctly point to the

43 W. H. Duncan, 'Report of the Officer of Health on the Cholera in Liverpool' [Read before the Liverpool Medical and Pathological Society, 1 Nov. 1849], *London Medical Gazette*, New Series vol. 9 (1849), pp. 1102-1105, p. 1103.

44 Liv. R.O. 252 HEA 1/1, f. 262, Duncan to Farr, 13 Nov. 1849. This letter is contained in the first of Duncan's three letter books (Liv. R.O. 252 HEA 1/1-3) which are currently being edited by Kearns and Laxton for publication. They amount to over 1,000 documents on 1,417 leaves of tissue copies whose legibility is in places extremely poor. The collection is far from complete but some further letters have been found in other archives and local newspapers. For a nice sketch of the correspondence see W. M. Frazer, *Duncan of Liverpool: being an account of the work of Dr. W. H. Duncan, Medical Officer of Health of Liverpool, 1847-1863* (London, 1947).

45 See M. Pelling, *Cholera, fever and English medicine, 1825-1865* (Oxford, 1978), p. 109.

relation between the elevation of the soil and the mortality from cholera', whereas 'Taking the districts singly, where the difference of elevation is only 2 or 3 feet, I find the Law is not carried out,—being apparently overpowered by disturbing elements.'⁴⁶

Cholera did not seem to be the exemplar of the public health problem that the General Board of Health assured everyone it was. In some ways, the conceptual space for this divergence of views may have been opened up for Duncan by his adherence to a more eclectic, in Pickstone's terms, theory of urban fevers in general. The introduction of atmospheric effects enabled Duncan to postulate that different urban diseases had distinct aetiologies. Duncan diverged from the thinking of the General Board of Health in four ways. First, and least significantly, in the General Board's *First Notification* of 5 October 1848, the public had been enjoined to avoid green vegetables and any food likely to promote looseness of the bowels. This scant bill of advice had been dallied over by Southwood Smith and then rushed to completion by Chadwick.⁴⁷ In the handbill which Duncan drew up for distribution in Liverpool (20,000 were passed out to the working classes of the city in mid 1849),⁴⁸ he gave 'simple directions and advice as to cleanliness, ventilation, avoidance of damp about their buildings, removal of nuisances, dirt, temperance, etc.'⁴⁹ No mention was made of diet. Indeed at a meeting of the Health Committee on 14 June, Duncan was specifically asked to issue a note of dietary advice to the poor but he refused, saying that he 'was of the opinion that food had little or nothing to do with cholera'.⁵⁰ The advice about diet was largely irrelevant to Chadwick's preventive preoccupations and may have represented little more than a misjudged attempt to placate the medical profession with the inclusion of what he imagined was one of their central concerns.⁵¹

46 Liv. R.O. 252 HEA 1/1, ff. 514–515, Duncan to Farr, 15 May 1852.

47 Finer, *Chadwick*, p. 340.

48 *Liverpool Courier*, 16 June 1849, p. 3.

49 Liv. R.O. 252 HEA 1/1, f. 72, Duncan to Thomas Shapter of Exeter, 13 July 1849.

50 *Liverpool Chronicle*, 16 June 1849, p. 3.

51 On the opposition of some of the medical profession to this advice, see Finer, *Chadwick*, p. 340.

More importantly, Duncan took up the three areas where, according to Pelling, the London medical journals found fault with the General Board: 'the specificity of disease, the nature of epidemic influence, and the question of contagion'.⁵² Taking the last first, it is clear that Duncan became early convinced that cholera was occasionally contagion. In February 1849, while admitting that it was 'not a very scientific idea', he said that recent cases had persuaded him that there was a risk of contagion after death and that 'from what he had seen of the few cases here, he considered it quite right to adopt precautions, and to act as if the disease was contagious. His opinion was still that as a general rule, and under ordinary circumstances, the disease was not contagious'.⁵³ By November, he was convinced of the facts if not the explanation:

Cholera is contagious in certain cases, if favoured by certain concurring circumstances; but its spread by contagion is the exception, not the rule. Many washerwomen, residing in healthy parts, to whom the linen of cholera patients had been sent, died.⁵⁴

This suggestion, repeated on many sides, was dismissed with characteristic special pleading in the General Board of Health's report on the epidemic, where it was argued that in no case could all possible environmental causes of cholera be excluded. After examining the circumstances of ten cases of cholera among washerwomen, Dr Waller Lewis concluded for the General Board of Health that:

The attack can be at least as well assigned to other causes as to the alleged one [contagion]. . . In nearly every instance the condition of the house and the street or court inhabited by the patient was of the most dangerous description.⁵⁵

This was the quality of reasoning which led Farr, when he detected it in the work of Florence Nightingale, to admonish

52 Pelling, *Cholera*, p. 75.

53 *Liverpool Mercury*, 2 Feb. 1849, p. 80, reporting the proceedings of the Health Committee meeting of 1 Feb.

54 Duncan, 'Cholera in Liverpool', p. 1103.

55 P.P. 1859 [1275] xxi, p. 367, 'Appendix B to the Report of the General Board of Health on the epidemic cholera of 1848 and 1849. Report by Mr. Grainger', pp. 186-187.

her to think scientifically and not merely to 'Chadwickize'.⁵⁶ Duncan had even anticipated the objection in referring specifically to washerwomen 'residing in healthy parts'. He presented his conclusions more fully in a later report:

The experience of the late epidemic has modified in some measure the opinion generally entertained by the medical profession as to the non-contagious character of the disease. For myself, after much experience of the epidemic during its former as well as its later visit to Liverpool, I am of opinion that while an individual may inhabit with impunity even the same room with a cholera patient, provided he abstain from absolute contact with the secretions, it is dangerous to handle the body after death or to wash the linen or bedclothes of the deceased.⁵⁷

There were two reasons why Duncan was reluctant to concede the possibility of contagion. First, interpersonal transmission of disease left little space for Duncan's physical causes or their atmospheric effects. Without this, the basis of his advocacy of environmental improvements seemed weaker and he might be back with a public health policy based on quarantine rather than sanitation. Second, as a local official, Duncan was keen to avoid stirring up fears of contagion, a point made by Harbord to a meeting of the Council's Health Committee right at the start of the epidemic.⁵⁸ The two were related, for the broader fear of contagion in foreign ports meant that at the first mention of cholera being in town, epidemic or not, the foreign consuls sent back to their countries the newspaper reports of the Health Committee's weekly counts of deaths and Liverpool ships were subjected to quarantine and all manner of people avoided coming to town to do business.⁵⁹

This sensitivity to the commercial implications of health policy was thought to be particularly strong among the group dubbed by Farr 'the Liverpool squadron'.⁶⁰ Sutherland, for one, was proud of the resolute anticontagionism of his Liverpool

56 J. Eyler, *Victorian social medicine: the ideas and methods of William Farr* (London, 1979), p. 188.

57 Duncan, *Report, 1847-48-49-50*, p. 39.

58 *Liverpool Chronicle*, 3 Feb. 1849, p. 3, reporting the meeting of 1 Feb.

59 *Liverpool Journal*, 9 June 1849, p. 2, reporting the Health Committee meeting of 7 June.

60 B.L. Add. MS. 45751 (Nightingale Papers), f. 140d, Farr to Sutherland, 30 Oct. 1859.

colleagues. He complained at one point (in 1859) to Nightingale that the National Association for Social Science's Committee on Quarantine (created by Gavin Milroy at a meeting in Liverpool) contained 'all the most devoted contagionists in Europe', plus Milroy, 'who is in a transition state': 'All doctors you will observe, & all London doctors & the people are to report on a purely commercial matter, namely Quarantine. There is not a Liverpool man on it & not a single merchant'.⁶¹ After reading Milroy's pamphlet of 1853, written from his experience as an Inspector with the General Board of Health, Duncan had written: 'In your views on this subject I think I entirely concur'.⁶² What probably disappointed Sutherland by 1859 was Milroy's movement towards a position of contingent contagionism on, at least, typhus and plague (among the more important diseases for international quarantine regulations), whereas Sutherland thought only the most extreme anticontagionism would bring the whole quarantine system crashing down. Milroy had written that 'There is ... [a] group of zymotic diseases in which the infectious property ... is only *conditional* and contingent, i.e., depending upon, and requiring for its manifestation, the coexistence of an artificially polluted atmosphere'.⁶³ The point is that Duncan's worries about the limits of anticontagionism were framed by precisely the same concerns about the commercial perils of quarantine on which Sutherland laid such stress. But Duncan was not willing to explain away the apparent occasions of contagion in order. He adopted a very limited version of contingent contagionism which specified quite narrowly the contingent circumstances necessary for the infectious transmission of the disease from the sick or dead to the well.

The second of the three issues that Pelling draws attention to is the 'nature of the epidemic influence'. Once again, for the General Board of Health, this seemed to be a way of avoiding having quarantine follow as an implication of admitting

61 B.L. Add. MS. 45751, f. 126, Sutherland to Nightingale, Sept. [?] 1859.

62 Liv. R.O. 252 HEA 1/2, f. 45, Duncan to Milroy, 22 Oct. 1853.

63 G. Milroy, 'Quarantine as it is, and as it ought to be' *Transactions of the National Association for the Promotion of Social Science, 1858* (London, 1859), p. 525. This position of contingent contagionism has been described in Pelling, *Cholera*, p. 18.

contagion. Instead, certain atmospheric conditions were seen as enabling miasmas to extend themselves very rapidly in ways which looked like contagious spread. Since the epidemic atmosphere was local it could not be excluded by quarantine. The physical disturbances of the atmosphere which promoted this extension might be meteorological, considered broadly to include electricity and magnetism. Sutherland wrote of 'the poison which propagates cholera in an epidemic atmosphere as being truly zymotic'.⁶⁴ For Duncan, the crucial question was the relationship between the local removable causes of disease, the miasma, and the atmospheric influence. He believed the first two to be linked and thus the miasmas to be to a great extent preventable, but the last he considered to be both beyond control and extremely important in the case of cholera. This explained his failure to contain the disease and revealed the hollow nature of the General Board of Health's boasts to have an infallible means of extinguishing it.

Writing to a Dr Head at Hanley who had requested his views on the contagiousness of cholera, Duncan forwarded his report on the years 1847-50 and summarized his personal views in a letter:

You will observe that I believe the disease to be propagated, as a rule, by some atmospheric influence whose nature is as yet undetermined, and which requires some predisposing cause as filth, moisture, or overcrowding, to call it into action,—more particularly in certain stages of the epidemic. The history of cholera outbreaks is conclusive, in my opinion, against the idea of contagion being, as a rule, the mode of propagation. But there are exceptional cases which it is difficult to explain on any other supposition than that the disease does, in certain circumstances, become contagious, these instances, however, being so rare and so limited in application (to the nurse or washerwoman where death takes place) as to justify us in considering it practically as non-contagious.⁶⁵

In September 1852, when the General Board of Health was concerned that the prevalence of cholera in Poland might herald a new cholera season, Duncan drew the same conclusion from the rapid increase in infant diarrhoea, 'owing, I think, to

64 Quoted in Pelling, *Cholera*, p. 66.

65 Liv. R.O. 252 HEA 1/2, ff. 71-72, Duncan to Head, 23 Nov. 1853.

the warmth and peculiar electrical condition of the atmosphere'.⁶⁶ He also explained the supposed presence of cholera on board a ship in much the same way: 'I think it probable that the ship had passed through a stratum of atmosphere charged with cholera poison'.⁶⁷ In another case, he issued a warning to the Government Emigration Agent at Liverpool, a Lieutenant Hodd, that ships which went around the north coast of Ireland would very likely pass through such a 'cholera cloud' and he advised their taking a different route.⁶⁸

This concern with the physical basis of the atmospheric preconditions for cholera epidemics reaches back to his early interest in the effect of seasons on disease and his frequent remarks on the importance of changes in the weather in explaining the rise and fall of sickness. In 1849, he had written to Hartnup at the Liverpool Observatory:

I am sorry to find you have no electrical apparatus.

I had hoped that the results would have thrown some light on the alleged connection of epidemic cholera with particular states of atmospheric electricity.⁶⁹

These atmospheric features were beyond the reach of sanitation and compromised any claim that might be made that public health authorities could eliminate cholera. Yet this was precisely the claim made by the General Board of Health. They argued that a proper system of house-to-house visitation would find the cases of premonitory diarrhoea, all of which could be prevented from passing into cholera, thus snuffing out the epidemic. But Duncan believed that house-to-house visitation: 'did not prevent the continuance of the disease, but did no doubt check its ravages, by preventing cases from becoming confirmed cholera. There is no evidence in this town in favour of the important, the all-important influence, attached to it by the [General] Board of Health'.⁷⁰ In reply to a direct question from the General Board,

66 Liv. R.O. 252 HEA 1/1, ff. 538-539, Duncan to Edward Parker, 8 Sept. 1852.

67 Liv. R.O. 252 HEA 1/1, f. 532, Duncan to the Secretary of the General Board of Health, 26 Aug. 1852.

68 *Liverpool Mercury*, 9 Feb. 1849, p. 142.

69 Liv. R.O. 252 HEA 1/1, f. 97, Duncan to Hartnup, 25 July 1849.

70 Duncan, 'Cholera in Liverpool', p. 1103.

'Will you state your opinion of the efficacy of house [-to-house] visitation as a preventative against cholera?', Duncan replied, 'Very efficacious in distinguishing the number of cases, but no power to extinguish the epidemic'.⁷¹ He was equally blunt in his published report: 'the system has no power to *extinguish* the epidemic, as it has been thought to have, a result which no human means can bring about so long as the cholera poison continues to float in the atmosphere'.⁷²

Sutherland's 'epidemic effect', intended to close the policy door against quarantine, in fact opened wider the door on the very eclecticism which posed such a serious challenge to the certainties of the General Board. Pelling writes of the main challenge to Chadwick's position coming from an insistence on 'the principle of specificity in epidemic disease'.⁷³ The systematic nature of Chadwick's attack on the public health problem depended upon the urban mortality penalty being the product of a particular set of interlinked removable causes which could be targeted through a single strategy of sanitary engineering. If there were instead a variety of specific diseases with an array of diverse causes, then the attack on the problem ran the risk of dissipating into a guerrilla war of piecemeal measures easily frustrated by the patient and persistent opposition of vested interests. Yet this is precisely what seemed to be happening to Duncan's conception of the sanitary idea. Cholera did not bear out the unmediated operation of the physical causes of disease. Typhus did so more directly:

The two epidemics of fever and cholera afford some striking points of contrast. First, in their mode of propagation; fever spreading by contagion from district to district, until it covered the whole town; cholera apparently dependent upon atmospheric influences, appearing almost simultaneously in different localities;—the one reveling amidst filth and overcrowding; the other, while evincing a decided predilection for such conditions, affording at the same time numerous exceptions to the rule, and attacking individuals and places not generally supposed obnoxious to the attacks of fever: the latter being thus more decidedly than cholera under the control of sanatory measures.⁷⁴

71 Liv. R.O. 252 HEA 1/1, f. 312, Duncan to the Secretary of the General Board of Health, 10 Jan. 1850.

72 Duncan, *Report, 1847-48-49-50*, p. 46.

73 Pelling, *Cholera*, p. 79.

74 Duncan, *Report, 1847-48-49-50*, p. 38.

Duncan refused to cling to the Chadwickian certainties, then, partly in order to protect himself against the Health Committee's manifest failure to control cholera but also because he recognized too many anomalies in the reduction of all urban epidemics to the same fundamental set of principles.

Duncan, who was as committed as anyone to the explanation of disease in terms of physical causes, ended up accepting that epidemic diseases were quite specific in their aetiology and that, under certain circumstances, cholera was clearly contagious. He resisted readings of the disease which might appear to allow quarantine as a policy response and shared with Sutherland a belief in a set of poorly-specified atmospheric effects which brought the new account of the ecology of working-class life back within a framework which emphasized the seasonal rhythms and temporal swings in disease. This was in Pickstone's terms an integration of temporal and spatial frames of reference.⁷⁵ It was also a framework which was eclectic not only in its explanation of fever, but also in its conception of the public health problem, for what characterizes Duncan from beginning to end is a resolute focus on the quality of Liverpool's housing, whatever shifts there may have been in Chadwick's own understanding of the fundamental ecological systems of urban life. In fact, like John Simon in London, Duncan found that the practical requirements of improving the public health brought him back to the housing issue time and again. As Lambert judiciously remarks, it was 'Not that Chadwick and his followers were unaware of the housing problem; but, in concentrating on the arterial system, water supply and burials, they had tended to let the more insoluble question of housing, so much to the fore in 1838-40, slip into secondary importance [by 1849]'.⁷⁶

Duncan's experience of fighting cholera led him to discover some of the rigidities of the Chadwickian system from within. His appointment and his general outlook were heavily influenced by the emphasis on removable physical causes of disease promoted by Chadwick. Yet that system could not explain or accommodate the persistence of sanitary problems in Liverpool or the

75 Pickstone, 'Fever', p. 126.

76 R. Lambert, *Sir John Simon, 1816-1904, and English social administration* (London, 1963), p. 148.

stubbornly high mortality it experienced from cholera. That mismatch was to dog Duncan throughout his tenure and he eventually washed his hands of London's 'sanitary censors' and their efforts to hold him to an unrealistic set of expectations based on a superficial reading of the resilience of the public health problem in Liverpool.⁷⁷ This went as much for Chadwick as for Farr, Simon and Greenhow. Liverpool's local circumstances received scant consideration from any of them. Local studies might at least make some amends for that.

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77 Liv. R.O. 252 HEA 1/3, ff. 304, Duncan to P. H. Holland, 7 May 1862.