

Edwin Chadwick and the Poverty of Statistics

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In his 1842 *Report on the sanitary condition of the labouring population of Great Britain*, Edwin Chadwick demonstrated the existence of a mass of preventable illness and premature death in the community caused, he argued, by insanitary physical circumstances.¹ Although much of the evidence for the existence of this preventable mortality was anecdotal, Chadwick included a chapter of differential class-based death data which dramatically illustrated the extent to which insanitary physical circumstances shortened life. Chadwick's chosen statistical measure—the average age at which a given class of people died—showed that what he called the “average period of life” or “chance of life” was as low as 17 for labourers in Manchester but as high as 52 for gentry in Rutlandshire.² Although his statistics were widely quoted at the time,³ professional statisticians dismissed the data and historians ever since have paid little serious attention to it.⁴ In this paper I will argue that Chadwick's class-based average-age-at-death data were a central feature of the *Sanitary report* and that we cannot fully appreciate the argument or even the organization of the report without them.

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¹ Edwin Chadwick, *Report on the sanitary condition of the labouring population of Great Britain*, ed. M W Flinn, Edinburgh University Press, 1965. Unless otherwise noted, all *Sanitary report* page references are to Flinn's edition. On Chadwick, see S Finer, *The life and times of Sir Edwin Chadwick*, London, Methuen, 1952; R A Lewis, *Edwin Chadwick and the public health movement, 1832–1854*, London, Longmans, Green, 1952; A Brundage, *England's "Prussian Minister": Edwin Chadwick and the politics of government growth, 1832–1854*, Pennsylvania State University Press, 1988; Christopher Hamlin, *Public health and social justice in the age of Chadwick: Britain, 1800–1854*, Cambridge University Press, 1998.

² Chadwick, *op. cit.*, note 1 above, pp. 219–54. For the Manchester–Rutlandshire comparison see

p. 223. Chadwick calculated his measure, which does not correspond to the modern notion of “life expectancy”, by adding up the ages of all who died and dividing the total by the number who died. Life expectancy, a very different measure from Chadwick's, is calculated from life tables constructed according to well-defined principles. These tables did not come into common use in England until the mid-1840s. See the discussion in D V Glass, *Numbering the people: the eighteenth-century population controversy and the development of census and vital statistics in Britain*, Farnborough, D C Heath, 1973, pp. 118–45.

³ ‘Report on the sanitary condition of the labouring classes’, *Q. Rev.*, 1842, 71: 417–53, p. 439; ‘Mr. Chadwick's report on the sanitary condition of the labouring population of Great Britain’, *Br. for med. Rev.*, 1843, 15: 328–46, p. 336; ‘Influence of employments on public health’, *Lancet*, 1842–3, ii: 657–61, on p. 661.

⁴ Neither Finer nor Brundage mention these data, though they comprised an entire chapter of the report. But see Lewis, *op. cit.*, note 1 above, pp. 44–5; W F Bynum, *Science and the practice of medicine in the nineteenth century*, Cambridge University Press, 1994, pp. 71–2.

The relative neglect of Chadwick's data on the average age at death among different classes of the community by historians stems partly from their technical shortcomings. Statisticians such as William Farr pointed out almost immediately after Chadwick published his data that the average-age-at-death measure was flawed as an index of life expectancy since it was based on death data alone.⁵ Nor could the measure be used to make comparisons between the sanitary condition of one district and another, Chadwick's other favourite use for it, as it took no account of the different age structures of different populations, a significant determinant of the average age at death of a given population.⁶ As the data were so quickly shown to be defective, historians have often assumed that they can have played little role in the argument of the *Sanitary report*. Thus Michael Cullen argues that Chadwick used inconclusive statistics designed principally to dramatize rather than demonstrate his point. In his important and far more sophisticated reappraisal of Chadwick and the political context of the *Sanitary report*, Christopher Hamlin too argues that Chadwick in general used statistics strategically and selectively, and he devotes little space to the evidentiary role that these statistics may have played in Chadwick's argument.⁷ Though most historians agree that the statistics in the *Sanitary report* were rhetorically powerful, they have not fully grappled with Chadwick's decision to collect these data.

In this paper I will reconstruct the history of the collection and use of these data as a means of assessing their function in the *Sanitary report*. In the first section I will show that Chadwick initially collected average-age-at-death data in the context of a battle he was fighting over the significance of destitution in the production of fever and that this information provided new and compelling evidence for his view that physical circumstances were the most important determinant of preventable death. Yet this polemical context is only part of the story. In the second section I will show that Chadwick, stimulated by the work of French hygienists, also collected these data in a deliberate attempt to test his hypothesis about the significance of insanitary physical circumstances as a cause of surplus mortality. In the third section I will argue that while contemporary criticism of Chadwick's measure was, of course, absolutely valid, historians' reliance on the legitimacy of this criticism has prevented us from seeing the reasons why Chadwick used it in the first place. The measure

⁵ Properly constructed life tables require an enumeration of the number and ages of the living as well as the dying. Actuaries had been aware of this for some time, though in practice it proved difficult to construct life tables given the rudimentary state of vital statistics. See Glass, *op. cit.*, note 2 above, pp. 120–3; John M Eyler, *Victorian social medicine: the ideas and methods of William Farr*, Baltimore, Johns Hopkins University Press, 1979, pp. 68–74. Farr was Compiler of Abstracts in the General Register Office (GRO), the office that compiled statistics on births, deaths, and marriages in England and Wales, and was effectively chief national vital statistician.

⁶ F G P Neison, 'On a method recently proposed for conducting inquiries into the comparative sanitary condition of various districts, with illustrations, derived from numerous places in Great Britain at the period of the last census', *Q. J. statist. Soc.*, 1844, 7: 40–68; Michael Cullen, *The statistical movement in early Victorian Britain: the foundation of empirical social research*, New York, Barnes & Noble, 1975, p. 60.

⁷ Cullen, *op. cit.*, note 6 above, pp. 56, 58; Hamlin, *op. cit.*, note 1 above, pp. 99–100, 174–75.

functioned solely as a means through which he could express the comparative chances of life amongst different classes in the community, and I will show that the state of contemporary class-based vital statistics made the average-age-at-death measure one of the few ways to express these differentials. In the final section I will argue that the mortality differentials the statistics were designed to reflect also functioned to undermine a principal objection to sanitary reform: the notion that cities were invariably unhealthy. Indeed, Chadwick's determination to develop a new argument for the possibility of preventable urban mortality based on these data informed the very structure of the *Sanitary report*.

I

Chadwick first used class-based death data in the 1842 *Sanitary report*. They consisted of comparisons of the class-specific "chances of life" in different parts of England and were expressed in terms of the average age at death for three social groups: labourers, tradesmen and farmers, and gentry and professional men. Although Chadwick had made the basic argument which the data were intended to support before 1842, he had not made any attempt to collect or to use data like these before the *Sanitary report*. These data are completely absent from the 1838 and 1839 reports to the Poor Law Commission, his principal prior involvement with sanitary matters and the ostensible inspiration for the national sanitary inquiry.⁸ Indeed, when Chadwick initiated the national sanitary inquiry in 1839 in England and Wales the requests for information he sent to medical practitioners made no mention of differential class mortality.⁹

The extension of the national sanitary inquiry to Scotland in 1840 quickly triggered Chadwick's interest in comparative mortality. As he had done with the English inquiry, Chadwick actively solicited information from a range of potential contributors including physicians, municipal officers, and local clergy. In contrast to the English and Welsh respondents, several Scottish correspondents, including William Pulteney Alison, professor of medicine at the University of Edinburgh, explicitly objected to the basic premise under which the sanitary inquiry was conducted.¹⁰ Alison claimed that few practitioners in Scotland adhered to the sanitarian view that filth was the main cause of fever and backed up his claim with citations from an impressive array of medical authorities. The most significant determinant of the

⁸ *Fourth annual report of the Poor Law Commissioners*, Parliamentary Papers [PP], 1837–38, XXVIII, appendix A, pp. 67–96; *Fifth annual report of the Poor Law Commissioners*, PP, 1839, XX, appendix C, pp. 100–6. These reports were also reprinted separately under the title *Reports on the sanitary state of the labouring classes, as affected chiefly by the situation and construction of their dwellings, in and about the metropolis*, London, W Clowes, 1839. Though Chadwick did not write the reports themselves, he in all probability wrote the preface and could have included in it whatever he wished.

⁹ These circulars are reprinted at the front of a new edition of Chadwick's report. See Edwin Chadwick, *Report on the sanitary condition of the labouring population of Great Britain*, with a new introduction by David Gladstone, London, Routledge/Thoemmes Press, 1997, pp. xi–xv.

¹⁰ This episode is fully described in Christopher Hamlin, 'Edwin Chadwick, "mutton medicine", and the fever question', *Bull. Hist. Med.*, 1996, 70: 233–65, pp. 251–4; *idem*, op. cit., note 1 above, pp. 121–42, to both of which I am indebted.

diffusion of epidemic fever in his view was the poverty or destitution under which the population lived.¹¹

Christopher Hamlin has powerfully argued that Chadwick's ideologically driven determination to undermine the Alisonian position was the inspiration behind the sanitary inquiry.¹² While, as Hamlin notes, Chadwick's denial that destitution increased susceptibility to disease was only "implicit" in the 1838 and 1839 reports, by mid-1840 he had decided that he needed explicitly to counter the position advocated by Alison and Alison's allies.¹³ Chadwick directed Dr Neil Arnott, one of his collaborators, to prepare a rebuttal of Alison, which Arnott completed in August 1840.¹⁴ The September 1840 annual meeting of the British Association for the Advancement of Science (BAAS) at Glasgow turned into a forum for a range of conflicting analyses of Scottish indigence, disease, and mortality. Several Scottish speakers attacked the sanitary understanding of working-class morbidity and mortality.¹⁵ After the meeting, the faithful Arnott was again called on to write a summary statement of the sanitary position after his and Chadwick's post-BAAS inspection of Glasgow in the company of Chadwick's adversaries.¹⁶

This developing controversy with Alison in all likelihood triggered Chadwick's interest in comparative death data. The first indication of this came in August 1840, scarcely a week before he received Arnott's rebuttal of Alison. Chadwick requested from the General Register Office (GRO)—the national statistical office—mortality data on several classes of labourer in particular locations as well as on "the average duration of life amongst the other chief classes of persons residing within the same locality".¹⁷ The GRO did not, however, collect vital statistics according to class membership and was apparently initially unable to accommodate Chadwick's request.¹⁸ Chadwick required that each death be assigned to one of his three classes,

¹¹ W P Alison, 'Observations on the generation of fever', in *Reports on the sanitary condition of the labouring population of Scotland*, London, W Clowes, 1842, pp. 13–33 [hereafter the local reports shall be referred to as *Local Reports (Scotland)*]. On Alison, see *Dictionary of National Biography*, London, Smith, Elder, 1908–9 (DNB), vol. 1, pp. 290–2.

¹² "[T]he *Sanitary Report* came about not as an opportunity to take on the new and useful project of urban improvement, but to meet the immediate political need of discrediting powerful enemies." Hamlin, op. cit., note 10 above, p. 264; "The *Sanitary Report* is then an ideological manifesto, not an empirical survey of conditions affecting health." *Idem*, op. cit., note 1 above, p. 187.

¹³ Hamlin, op. cit., note 1 above, p. 103.

¹⁴ Neil Arnott, 'Remarks on Dr. W. P. Alison's "Observations on the generation of fever"', in *Local reports (Scotland)*, op. cit., note 11 above, pp. 34–9. This report is dated 24 August 1840.

¹⁵ W P Alison and Robert Cowan both delivered papers opposed to the sanitary perspective. These papers were printed as W P

Alison, 'Illustrations of the practical operation of the Scottish system of management of the poor', *J. statist. Soc. Lond.*, 1840, 3: 211–57; R Cowan, 'Vital statistics of Glasgow, illustrating the sanatory condition of the population', *ibid.*, pp. 257–92.

¹⁶ Neil Arnott, 'On the fevers which have prevailed in Edinburgh and Glasgow', in *Local reports (Scotland)*, op. cit., note 11 above, pp. 1–12. The inspection is referred to on p. 8.

¹⁷ Poor Law Commission to General Register Office, 18 August 1840, Public Record Office (PRO), MH/19/191/3853.

¹⁸ The *Sanitary report* contains comparative data for over 25,000 deaths, but most of these data came from local informants. Chadwick's paper on metropolitan mortality which he appended to the supplementary sanitary inquiry into interment in towns in 1843 was, however, apparently based on GRO data. See 'A return of the average ages at which deaths and funerals occurred during the year 1839 to the several classes of society in the superintending registrar's districts of the metropolis', in *A supplementary report on the results of a special inquiry into the*

and as that knowledge was available only at the local level, and with considerable local labour, he turned to some of the correspondents who had already submitted reports for the sanitary inquiry from English localities.¹⁹ William Baker filed the 'Local Report' for Derby, for instance, in March 1840. Yet in response to a request by Chadwick sent in November 1840, Baker filed a supplementary report in which he "filled up the Table sent to me . . . according to the rank or occupation of the deceased", that is, in the form of gentry, tradesmen, and labourers which Chadwick now favoured. Charles Barham of Truro also sent in his 'Local Report' in mid-1840 but he too resubmitted it with "additions made . . . at the desire of the Poor Law Commissioners". Barham did not specify the additions, but his final report contained a table with average age at death for gentry, tradesmen, and labourers up to December 1840 that obviously was not included in the original report dated May 1840. As was the case with Baker's Derby report, Barham in all likelihood submitted the class-based death data in response to Chadwick's request.²⁰

Although the national sanitary inquiry supposedly went into abeyance from February to November 1841, Chadwick actively collected differential death data during this period.²¹ From March to May he wrote to Boards of Guardians in the Liverpool, Bethnal Green, Whitechapel, and Strand unions.²² When, in November, he was ordered to prepare the inquiry for publication, he bombarded both key local collaborators with requests for more data and contemporary experts for their opinion of his data.²³ The Clerk to the Bethnal Green Guardians was requested to provide

practice of interment in towns, London, W Clowes, 1843, pp. 239–66. This appendix served as the basis for Chadwick's paper delivered to the Statistical Society of London in late 1843 in which he gave his justification for the average-age-at-death measure. See E Chadwick, 'On the best modes of representing accurately, by statistical returns, the duration of life, and the pressure and progress of the causes of mortality amongst different classes of the community, and amongst populations of different districts and countries', *Q. J. statist. Soc.*, 1844, 7: 1–40.

¹⁹ For an indication of the labour involved, see Edwin Chadwick to [Clerk of the Guardians], 26 March 1841, PRO, MH/12/6843.

²⁰ William Baker, 'On the sanitary condition of the town of Derby', in *Local reports on the sanitary condition of the labouring population of England*, London, W Clowes, 1842, pp. 162–82, p. 181; Charles Barham, 'On the sanitary state of Truro', in *ibid.*, pp. 16–35, p. 27; Charles Barham to Poor Law Commission, 5 December 1840, PRO, MH/12/1528/12176a.

²¹ There is some confusion about this point. Flinn and Lewis noted that Lord Normanby ordered Chadwick to stop work on the inquiry, but Peter Mandler claims that there is no evidence of it. Whether the order was given or not, Chadwick ignored it. Flinn, 'Introduction', in Chadwick, *op. cit.*, note 1 above, p. 46; Lewis,

op. cit., note 1 above, p. 39; Peter Mandler, *Aristocratic government in the age of reform: Whigs and Liberals, 1830–1852*, Oxford, Clarendon Press, 1990, p. 177.

²² Edwin Chadwick to [Clerk of the Guardians], 26 March 1841, PRO, MH/12/6843. This letter was intended for Liverpool but Chadwick noted that it was to be sent to Bethnal Green and Whitechapel as well. See Chadwick to [Clerk of the Guardians], 18 May 1841, PRO, MH/12/6843 for additional letters to Bethnal Green and Strand.

²³ The Clerk to the Kendal Guardians was pressed into service for additional data on the average ages at death of all classes within his district. Dr Robert Baker of Leeds was instructed to obtain data on working-class mortality in different districts of the same town, and the Reverend Whitwell Elwin of Bath, already engaged in an inquiry into the causes of pauperism, was co-opted at a very late date in the collection of data on intra-urban middle-class mortality. Edwin Chadwick to [Clerk of the Kendal Guardians], 5 November 1841, 20 November 1841, PRO, MH/12/13582/10852a; Baker to Chadwick, 10 November 1841, PRO, MH/12/15225; Chadwick to Baker, 11 December 1841, file 228, The Papers of Sir Edwin Chadwick, Manuscripts and Rare Books Room, University College London (hereafter Chadwick

the information “as soon as possible”. When his Leeds correspondent Robert Baker begged for more time in December 1841 Chadwick admonished him that “tabular view of the proportion of mortality in the different wards is of extreme importance”. In a highly unusual move, Chadwick offered to pay “any reasonable expenses” that the Clerk to Kendal’s Guardians incurred in obtaining the data, an offer he also made to the Clerks of the Liverpool, Bethnal Green, and Whitechapel unions.²⁴

The time and expense involved in the collection of these data shows that they were of some importance to Chadwick, and his use of them suggests, as R A Lewis noted long ago, that Chadwick believed that they made a decisive contribution to the debate over poverty versus physical circumstances. In the sixteen-page draft outline of the sanitary report found among his papers, Chadwick titled the chapter in which he placed these data ‘Effects of unfavourable sanatory circumstances as shewn in the different average duration of life amongst classes differently situated’, explicitly connecting these data and his conclusion about physical circumstances. He placed this chapter in the outline (and the published report), furthermore, immediately after his discussion of the “evidence that poverty is not the chief cause of disease”. If we regard the outline as Chadwick’s perception of the links in the chain of his argument, it is as though he felt that he had countered the poverty thesis and that it was time to bring forward the evidence in support of his own position. He very revealingly double underscored this chapter heading, the first time in the outline that anything was underlined, perhaps reflecting his sense that he had reached a critical point in his argument.²⁵

It is clear from the published report that Chadwick thought that the class-based death data seriously undermined Alison’s fever/destitution contention. His comparative data from Manchester, the classic industrial city, and Rutlandshire, an overwhelmingly rural county, were of most importance here.²⁶ How, he asked in the published *Sanitary report*, can disease and mortality be primarily related to poverty when agricultural labourers in Rutlandshire—among the most poorly paid workers in the nation—had an average period of life twice as long as that of Manchester factory operatives even though

Papers); Chadwick to Elwin, 9 January 1842, 26 January 1842, file 694, Chadwick Papers. For Baker’s evidence see Chadwick, op. cit., note 1 above, p. 264; for Elwin’s, *ibid.*, pp. 234–6. For experts, see Griffith Davies, Guardian Assurance Office to Edwin Chadwick, 5 January 1842, file 589, Chadwick Papers; Chadwick to Charles Babbage, 3 June 1842, cited in Flinn, ‘Introduction’, in Chadwick, op. cit., note 1 above, p. 54. An undated letter from the actuary James Mitchell to Chadwick almost certainly falls in the same period, see untitled memorandum, n. d., Box 67, folder “memoranda”, Chadwick Papers.

²⁴ Chadwick to [Clerk of the Guardians], 18 May 1841, PRO, MH/12/6843; Chadwick to Baker, 11 December 1841, file 228, Chadwick Papers; Chadwick to [Clerk of the Kendal

Guardians], 5 November 1841, PRO, MH/12/13582/10852a; Chadwick to [Clerks of the Guardians of Bethnal Green and Whitechapel unions], 26 March 1841, PRO, MH/12/6843.

²⁵ Lewis, op. cit., note 1 above, pp. 44–5; untitled memorandum, n.d., box 45, Chadwick Papers. The outline consists of chapter headings under which Chadwick listed the examples with which he intended to illustrate his particular points.

²⁶ It is not clear where Chadwick obtained the Manchester and Rutland data. I could not find a record of Chadwick’s correspondence with Poor Law Guardians for these locales. As these data include deaths during 1840, they were probably not part of the Manchester Statistical Society’s 1839 comparison of these two localities.

Manchester operatives made easily double the wages?²⁷ If poverty was more important than physical circumstances as a determinant of mortality, Chadwick implied, Rutlandshire labourers should have had lower life chances than their class cohort in Manchester. Even more astonishing was the demonstration that the average age at death for Manchester gentry was the same as the poorest class of Rutlandshire labourer. These data suggested to Chadwick that locality was significantly more important as a determinant of mortality than poverty: Manchester gentry had vastly more resources at their disposal than Rutlandshire agricultural labourers, yet they died at the same age. The class-based death data offered little support for the claim that poverty, conceived as wages or resources, was the most significant determinant of mortality.

The comparative data Chadwick collected not only undermined the fever/des-titution link, they also strikingly illustrated the influence of locality or physical circumstances on life chances. The different mortality experiences of textile workers in two contiguous parishes near Bradford that he obtained from Robert Baker were of “extreme importance” here. They did the same work, at the same wage, for the same amount of time, in the same kind of factory. The only thing that differentiated them was place of abode.²⁸ Chadwick applied a similar analysis to both gentry and tradesmen in Bath. The data again showed that members of the same social class in the same city died at different ages. The conclusion seemed inescapable: locality was the most important determinant of life chances. As Chadwick somewhat confusingly put it: “On comparing the proportion of deaths amongst all classes between one district and another, as well as between class and class, the general influence of the locality becomes strikingly apparent”. Whitwell Elwin, in submitting the Bath data, concurred: “Whatever influence occupation and other circumstances may have upon mortality, no one can inspect the registers without being struck by the deteriorated value of life in inferior localities, even where the inhabitants were the same in condition with those who lived longer in better situations.”²⁹

The debate with Alison over the significance of destitution versus sanitary condition for the incidence of fever thus clearly occasioned Chadwick’s interest in class-based death data. But I would argue that there was more going on than simply a determination to refute Alison. The comparative form in which Chadwick presented these data reflects as well his increasing awareness that his claims required a better argument than he had developed up to 1840. Prior to his debate with Alison, Chadwick had barely considered the kind of evidence or the kind of argument he required. In 1840 he concluded that he needed not just better data but a better method and the test he then developed sharply distinguished his later from his earlier sanitary work.

²⁷ Chadwick, *op. cit.*, note 1 above, pp. 223, 243. Chadwick recognized that rents were higher in Manchester, but there was no available index by which costs of living in different regions could have been meaningfully compared.

²⁸ *Ibid.*, pp. 263–4.

²⁹ *Ibid.*, pp. 227, 235.

II

Chadwick's reputation as a social scientist leaves much to be desired. Michael Flinn noted that Chadwick's contributions to both the 1833 Royal Commission on the Employment of Children in Factories and the 1832–34 Royal Commission on the Poor Laws were "fairly extreme examples of partiality and predetermination".³⁰ The 1838 and 1839 Poor Law Commission inquiries into the sanitary condition of the labouring classes similarly merely confirmed what Chadwick already suspected or hoped to be true.³¹ As historians have repeatedly noted, in the early stages of his sanitary work he made little serious attempt to test his own and especially rival hypotheses about the generation of fever.³²

In his favour, it might be said that Chadwick may have imagined that his position was uncontroversial. Although Alison liked to present his own position as the consensus, Chadwick could easily have concluded from a cursory reading of the relevant medical-statistical literature that the poverty-causes-fever hypothesis was controversial among British commentators, even among Alison's 1840 allies.³³ Dr Robert Cowan, for example, was a professor of medical jurisprudence and police at Glasgow and a regular contributor to the Glasgow Statistical Society who spoke with Alison and against the sanitarians at the Glasgow BAAS meeting in 1840. Yet Cowan initially argued against Alison's position. In his first published statistical work in 1837, Cowan traced the very large increase of smallpox and especially fever in Glasgow from 1795 to 1836. He observed that fever had increased steadily since 1816 and rapidly since 1830. Although this was exactly the kind of link between the trade cycle and disease that Alison latched onto, in this paper Cowan did not argue that the data revealed any consistent relation between disease and destitution. He almost argued precisely the opposite; the increase of fever, he claimed, had occurred "during a period of unexampled prosperity". Wages were "ample", the price of provisions "low", and "every individual, able and willing to work, secure of steady

³⁰ Flinn, 'Introduction', in Chadwick, op. cit., note 1 above, p. 37; Lewis, op. cit., note 1 above, pp. 14–15. Even his contemporaries were suspicious of his objectivity. See, for example, the quotation from Dr Alfred Aspland cited in T S Ashton, *Economic and social investigations in Manchester, 1833–1933: a centenary history of the Manchester Statistical Society*, 1934, reprint ed., Fairfield, CT, Augustus M Kelley, 1977, p. 52; Hamlin, op. cit., note 10 above, pp. 259–60.

³¹ Chadwick had noted in 1833 that disease often precipitated the labouring population into destitution, a position he maintained when he drafted the manuscript guidelines for his aborted inquiry into the "causes of pauperism" around 1839–40. In these guidelines, he again identified illness as one of the most important causes of involuntary pauperism. See Poor Law

Commissioners, *Extracts from the information received by His Majesty's Commissioners, as to the administration and operation of the poor-laws*, London, B Fellowes, 1833, pp. 315–16; 'Memoranda of instructions for entering the causes of pauperism', Box 23, folder 1, Chadwick Papers.

³² Finer, op. cit., note 1 above, p. 161; Hamlin, op. cit., note 10 above, pp. 248–50; *idem*, op. cit., note 1 above, p. 108.

³³ For Chadwick's study of Continental data, see Ann La Berge, 'Edwin Chadwick and the French connection', *Bull. Hist. Med.*, 1988, 62: 23–41; *idem*, *Mission and method: the early nineteenth-century French public health movement*, Cambridge University Press, 1992, pp. 291–9. I shall discuss the French data again below.

and remunerating employment".³⁴ Cowan's claims in this pamphlet (which Chadwick owned) may be supplemented by those of William Farr in 1837. After reviewing the available data on sickness and mortality amongst the working classes, Farr argued that the data "annihilate the supposition that the increased mortality in cities is due to want of food, and greater misery". The *Lancet* likewise claimed in an 1838 leader on the causes of increased mortality in cities that the view that it was caused by starvation and vice was "in direct contradiction" with numerous observations.³⁵

As these comments suggest, Chadwick had adopted a position more widely held than Alison liked to admit. Indeed, as a result of the dispute over destitution and disease at the 1840 Glasgow meeting, the BAAS appointed a committee to investigate Scottish vital statistics. The committee reported at the 1842 Manchester meeting that they were not "able to trace the effects of destitution in its different stages on the increase of disease and death". The committee, including Alison, Chadwick and several statistical society heavyweights, based their report on an exhaustive review of existing Scottish vital data compiled by Alexander Watt, the leading authority on Glaswegian vital statistics.³⁶ They claimed that "all writers" recognized that great levels of destitution favoured the spread of disease, but that they could not "form such a correct judgment of the effects of destitution . . . on the mortality of large towns in Scotland as is generally imagined".³⁷ A more explicit slap at Alison is difficult to conceive. As it is highly unlikely that Chadwick bullied the men who composed the committee into adopting his position, their conclusion must be seen as at least a partial vindication of his view. Alison complained in response to the BAAS committee's conclusions that the effects of destitution could be assessed only

³⁴ Robert Cowan, *Statistics of fever and small-pox in Glasgow*, Glasgow, John Clark, 1837, pp. 12–13. Cowan seemed to argue that the increase of fever was caused primarily by meteorological conditions and secondarily by the "habits of our population". For a discussion of Cowan's later work, see Hamlin, op. cit., note 10 above, pp. 257–8.

³⁵ William Farr, 'Vital statistics; or, the statistics of health, sickness, diseases, and death' (1837), in *Mortality in mid-nineteenth century Britain*, ed. Richard Wall, London, Gregg International, 1974, p. 577. As Chadwick lobbied for Farr's appointment to the national statistical office it is unlikely that he was unfamiliar with his work. Farr suggested a similar conclusion in his first letter to the Registrar-General, published in mid-1839. See *First annual report of the Registrar-General*, PP, 1839, XVI, appendix, p. 78. For the comment in the *Lancet* see 'Causes of increased mortality in large cities', *Lancet*, 1837–8, ii: 630–3, on p. 631. Contemporary ambivalence on the relation between fever and destitution was also reflected in a substantial review of medical topography published in the *British and Foreign Medical Review* at the same time. See 'Medical topography and statistics', *Br. for. med. Rev.*, 1838, 6: 1–28, pp. 9–13.

³⁶ Official registration of births, deaths, and marriages was not introduced in Scotland until 1855. Prior to that time, however, Glasgow already had an impressive body of vital statistical data available on which the committee relied. Olive Checkland, 'Local government and the health environment', in *Health care as social history: the Glasgow case*, ed. Olive Checkland and Margaret Lamb, Aberdeen, The University Press, 1982, pp. 1–15, p. 1.

³⁷ W H Sykes, Lord Sandon, G R Porter, J Heywood, W P Alison, and E Chadwick, 'Report of a committee of the British Association for the Advancement of Science . . . on the vital statistics of large towns in Scotland', *Report of the twelfth meeting of the British Association for the Advancement of Science held at Manchester in June 1842*, London, John Murray, 1843, pp. 121–204, on pp. 203–4. For statements of the sanitary position with respect to fever and destitution, see Thomas Southwood Smith, 'Report on some of the physical causes of sickness and mortality to which the poor are particularly exposed', in *Fourth annual report of the Poor Law Commissioners*, op. cit., note 8 above, p. 85; Chadwick, op. cit., note 1 above, pp. 210, 213.

“in years of epidemics”, implying that the committee’s conclusion, based on a continuous and extensive time series, was somehow invalid.³⁸ It was an odd objection as Chadwick and his collaborators did not deny that epidemics were exacerbated by destitution, but the sanitarians were in any event determined not to ground the case for sanitary reform on the momentary panic of epidemics.³⁹

Regardless, however, of the degree of support which Chadwick’s position enjoyed, the historiographic consensus on the methodological weaknesses of Chadwick’s early inquiries remains valid. Chadwick’s theory drew its plausibility from the commonplace correlation between filth and disease and initially relied for its proof on little more than highly selected and anecdotal medical evidence. In the *Sanitary report*, however, the argument was different. Chadwick realized that if he was to argue that locality or physical circumstance was more important than destitution or poverty as a cause of surplus mortality, he needed to find some way of independently comparing these two variables. This realization was, I would suggest, the second major stimulus that prompted Chadwick to collect comparative death data.

It was, however, no easy task to set up an experiment by which these two effects could be tested. The methodology of social scientific investigation was relatively undeveloped, and even the data which might have facilitated the experiment were in short supply.⁴⁰ Chadwick and Alison disagreed about the relative significance of physical circumstances and destitution in the production and/or spread of fever, yet neither possessed reliable statistics on the incidence of fever in the population as a whole or in any class of people. Chadwick’s actuarial advisor James Mitchell emphatically asserted that no “man on earth is in possession of data by which the relative amount of sickness can be ascertained in the several ranks of society”.⁴¹ Apart from data on the highly selected and therefore unrepresentative lives of friendly societies, morbidity statistics were unavailable until much later in the century.⁴² This might seem like an insurmountable obstacle for both men, yet both managed to slip around it. Alison circumvented the difficulty by using hospital and dispensary fever statistics as measures of the extent of fever in the population. While this decision

³⁸ See W P Alison, ‘On the destitution and mortality in some of the large towns in Scotland’, *Q. J. statist. Soc.*, 1842, 5: 289–92, p. 290. Alison read this paper at the same BAAS meeting where the committee on Scottish vital statistics reported so it may be seen as his reply to the committee’s conclusions.

³⁹ In his August 1840 rebuttal of Alison, Neil Arnott agreed that “No one can doubt that the epidemic fevers . . . in Ireland, particularly in the years of scarcity or famine, and in a less degree in Scotland . . . spring from or are connected with the existing destitution”. Arnott, ‘Remarks’, in *Local Reports (Scotland)*, op. cit., note 11 above, p. 36. The determination not to ground sanitary reform on epidemics was in the later 1840s to have serious consequences on sanitarianism’s credibility among physicians. See Margaret Pelling, *Cholera, fever and English medicine:*

1825–1865, Oxford, Clarendon Press, 1978, pp. 46–80.

⁴⁰ On the developing methodology of social scientific research among French hygienists, see La Berge, *Mission and method*, op. cit., note 33 above, pp. 49–81.

⁴¹ Mitchell to Chadwick, n.d., box 67, folder “Memoranda”, Chadwick Papers. Mitchell was an advisor to several royal commissions in the 1830s and 1840s. See *DNB*, vol. 13, p. 516.

⁴² There is a discussion of the state of morbidity data in [E Chadwick], ‘Life assurances’, *Westminster Rev.*, 1828, 9: 384–421, pp. 414–16. For analyses based on the available data, see Farr, ‘Vital statistics’, op. cit., note 35 above, pp. 573–80; F G P Neison, *Contributions to vital statistics*, 2nd ed., London, Simpkin, Marshall, 1846.

was probably the only way he could move his argument forward, the measurement and sampling errors he thereby introduced into it were formidable.⁴³

Chadwick, on the other hand, elected to collect “chance of life” statistics for all classes in the population. At first glance this seems strange: why, if one is interested in fever amongst the working class, does one collect data referring to deaths from all causes and for three different classes? Given the parameters of the national sanitary inquiry—the incidence of removable causes of illness among the labouring population in parts of the kingdom outside London—Chadwick’s decision to expand it to all classes is even more surprising. The answer may be in part that he wanted to shift the argument onto terrain favourable to his cause, as Alison had in effect done by using hospital statistics. In part it may also be that Chadwick knew that good data for morbidity were unavailable and mortality-based data were his only option. Yet his decision to collect class-based data also reflects his realization that these could be used as a test of his hypothesis.

The evolution of Chadwick’s thinking may be gleaned from his correspondence with James Mitchell. Chadwick was certain, as was everyone else, that the poor were not as healthy as the rich. He was also aware that, in addition to this class differential, mortality was much increased for all classes in cities. The problem, for Chadwick, was to reconcile these two differentials. In an undated commentary which almost certainly belongs to this period, Mitchell addressed Chadwick’s attempted reconciliation. Mitchell noted in response to Chadwick’s (lost) query that it was abundantly clear that the mortality differed between districts, “but there is no evidence that this excess of mortality is equally distributed amongst the different ranks of society”. In the next sentence Mitchell noted that “[w]here the mortality is caused by the general unwholesomeness of the air the families of the rich will be in part affected as well as of the poor”.⁴⁴ It seems as though Chadwick had asked Mitchell two questions: first, is the surplus mortality in towns evenly distributed through the population? and, second, if surplus mortality is caused by unwholesome air, could it account for higher urban mortality rates among the non-labouring population? It seems that Chadwick had hypothesized that insanitary physical circumstances, through the production of miasmatic effluvia, were responsible for both differential district and class mortality.

Chadwick’s decision to sample simultaneously locality and class (as surrogates for physical circumstances and destitution) clearly differentiates the *Sanitary report* from his earlier work. The inspiration for this move is not clear, but, as Ann La Berge noted, the French hygienist Adolphe Trébuchet may have been the key influence. In

⁴³ Alison claimed that two-thirds of fever patients were destitute but that less than one-fifth of the population was destitute, thereby illustrating the extent to which destitution facilitated the diffusion of fever. Leaving aside any potential bias caused by the problem of fever cases not treated at institutions and hence undetected, this claim required a relatively unambiguous identification of “destitution” among fever patients and a relatively accurate

estimate of destitution among the population as a whole, both of which were very difficult to ascertain with a reasonable degree of precision. See W P Alison, *Observations on the epidemic fever of MDCCCXLIII in Scotland, and its connection with the destitute condition of the poor*, Edinburgh and London, William Blackwood, 1844, pp. 6–9, 62–4.

⁴⁴ Mitchell to Chadwick, n.d., box 67, folder “Memoranda”, Chadwick Papers.

1840 Trébuchet published a review of the reports of the Paris Conseil du Salubrité from 1829 to 1839 in which was discussed the large differentials in mortality rates between the city's various arrondissements. Trébuchet quoted from the Conseil's report that the usual explanation for these differentials was "misery". The report countered that misery was "without doubt . . . a powerful cause; but it is so especially when it is driven back into the most insalubrious quarters, streets, and houses; when it lives habitually in the midst of filth and dirt, that is to say, in the midst of an infected atmosphere". This view of the genesis of disease among the labouring population thus accorded with the one Chadwick had independently reached, but it was the Conseil's suggested proof of this argument that may have been decisive. How, Trébuchet quoted them, can we explain mortality differentials where there is no misery? Similarly, how can we explain differentials where the extent of misery is the same? Trébuchet neither provided evidence of these intra-class, inter-district differentials himself nor quoted any in the report, but his comments in the paper were very tantalizing.⁴⁵

While there is no direct evidence that Trébuchet's work stimulated Chadwick to collect his own class-based data, the circumstantial evidence is suggestive. Chadwick, for example, appended a lengthy translation of Trébuchet's work to the *Sanitary report*. He also inserted the key passage from Trébuchet in the main body of the report immediately after the discussion on poverty and immediately before his chapter on differential death data as if to highlight the role Trébuchet played in resolving the tension between these rival conceptions. The timing of Chadwick's interest in comparative data is also revealing. Trébuchet's report was published in 1840, and in late 1840 Chadwick initially began to collect class-based data.

Trébuchet's hypothesis as to the role of physical circumstances also helps explain Chadwick's well-known inversion of the French hygienist Louis René Villermé's view that poverty was the most important determinant of life chances.⁴⁶ Villermé's method involved two basic procedures: a comparison between districts in order to show that poorer districts had higher mortality, and then a comparison within one district in order to show that mortality varied between classes. Chadwick's novelty, at least with respect to Villermé, lay in comparing mortality both between and within districts and classes. In his introductory summary of the *Sanitary report* Chadwick noted that he would show "in what proportion these causes of death fall upon the poorer classes as compared with the other classes of society inhabiting the same towns or districts, and in what proportions the deaths fall amongst persons of the same class

⁴⁵ M Trébuchet, 'Report on the labours of the "Conseil de Salubrité" of Paris, from 1829 to 1839', in Chadwick, *op. cit.*, note 9 above, pp. 409–23, p. 415. The passage is cited in Chadwick, *op. cit.*, note 1 above, p. 218. Chadwick's novelty lay in converting the Conseil's suggestion that insanitary dwellings were the source of the differential mortality into his own that insanitary physical circumstances generally were the problem, though the Conseil intended "dwellings" to be interpreted "in its widest acceptation" and

they may thus have meant districts as well. See La Berge, 'Edwin Chadwick', *op. cit.*, note 33 above, p. 34.

⁴⁶ On Villermé's work see William Coleman, *Death is a social disease: public health and political economy in early industrial France*, Madison, University of Wisconsin Press, 1982, pp. 149–171; La Berge, *Mission and method*, *op. cit.*, note 33 above, pp. 59–75. La Berge discusses Chadwick's inversion in 'Edwin Chadwick', *op. cit.*, note 33 above, pp. 35–41.

inhabiting districts differently situated". In the draft *Sanitary report* he claimed that he could attain a "closer approximation to correct conclusions . . . by returns from different classes than by returns from different districts". There was more going on than simply differences between districts, and a comparison of "different districts and of similar [and] of different classes of the same town" was a superior analytical method.⁴⁷ By simultaneously comparing chance of life according to both class and location, Chadwick highlighted the role of physical circumstances without minimizing in any way the important and real class differentials that actually formed an essential part of his argument.⁴⁸ Why Villermé never took the additional step that Chadwick took is not clear. Villermé may have felt that the differential ages at death of a given class between districts was not a matter for concern, that it could easily be explained by traditional devices such as occupation, situation, habits, and so on. He may also have thought that the nearly comparable ages at death of wealthy urban dwellers and poor rural dwellers was likewise unsurprising and unremarkable. But for Chadwick these additional differentials formidably challenged the poverty theory of disease.

While Chadwick's test was problematic, it represented a reasonable attempt at understanding a complicated phenomenon. Certainly many of the technical shortcomings for which he has been criticized are equally apparent in Villermé's much more widely praised work.⁴⁹ Chadwick's attempt may perhaps best be evaluated by comparing it with one of Alison's efforts to disentangle these two effects. In his initial reply to the sanitary inquiry in 1840, Alison reported a test of destitution versus locality which came from some observations he had made on multistorey, multiclass dwellings in Edinburgh. The upper two storeys contained some of the "most destitute" people in the district, while the lower three storeys housed people in "more comfortable circumstances . . .". If, Alison maintained, Chadwick's miasmatic theory was true, then the people in the lower storeys, exposed to more concentrated poison, should have got fever more often. Yet the opposite was true: upper storey inhabitants were sick more frequently than lower storey residents. This, apparently, was something of a crucial experiment for Alison and, buttressed with additional statistical support, he recycled it again in 1844.⁵⁰ The design of this "experiment" is

⁴⁷ Chadwick, op. cit., note 1 above, p. 79; for manuscript quotes see untitled memorandum, n.d., box 45, Chadwick Papers.

⁴⁸ Over the course of his dispute with Alison, Chadwick did not deny that the poor experienced much more sickness and premature death. In his view, however, this was jointly the product of structural imperfections in the housing market and legislative defects in the nuisance laws. He declined, that is, to interpret higher working-class mortality in terms of greater predisposition to disease caused by debilitated workers. On the "monopolistic" character of the housing market, see Chadwick, op. cit., note 1 above, pp. 295–7. In the context of the early 1840s, Chadwick could hardly have chosen a more politically charged term than "monopolist". On Chadwick and

market imperfections, see G Kearns, 'Private property and public health reform in England, 1830–1870', *Soc. Sci. Med.*, 1988, 26: 187–99. For different interpretations of Chadwick's analysis of excess working-class mortality, see La Berge, 'Edwin Chadwick', op. cit., note 33 above, pp. 38–9; Hamlin, op. cit., note 1 above, pp. 164–78, 201–7; Frank Mort, *Dangerous sexualities: Medico-moral politics in England since 1830*, London, Routledge and Kegan Paul, 1987, pp. 13–61.

⁴⁹ For sympathetic discussions of the limitations of Villermé's analysis, see La Berge, *Mission and method*, op. cit., note 33 above, p. 72; Coleman, op. cit., note 46 above, p. 166.

⁵⁰ Alison, op. cit., note 11 above, pp. 24–5; *idem*, op. cit., note 43 above, pp. 65–6.

clear: Alison compared the combination of bad air and well-to-do circumstances with the combination of good air and bad circumstances, but neither the methodology nor the results were superior to Chadwick's.

In fairness to both, it must be admitted that neither Chadwick nor Alison unravelled the very complicated causal relationships between deprivation, insanitary circumstances, and disease.⁵¹ When we consider, furthermore, the different perspectives from which they approached the problem it is not surprising that they could not reach agreement. Alison was principally concerned with the individual sick patient, and both his medical practice and his predispositionist theoretical framework naturally led him to identify their poverty as a significant determinant of their illness.⁵² Chadwick can scarcely be said to have possessed a consistent medical-theoretical perspective at all. His statistical orientation, furthermore, did not lend itself to reflection on individual susceptibilities. If it seems that Chadwick wilfully ignored the role of poverty or destitution in the spread of fever, it may reflect less his ideological concerns than the poverty of contemporary social statistics.

III

Chadwick's decision to collect class-based death data was, then, jointly the product of his dispute with Alison and his awareness that he needed a better argument than he had hitherto used. Once he had decided to collect these data, however, Chadwick hit a wall. This information did not exist, and when Chadwick requested from the GRO in August 1840 data on the average duration of life amongst the different classes of the community, he asked them for something they could not provide. Vital statistics were not collected in such a sociologically useful form.⁵³ Chadwick was fully aware that well-constructed insurance tables contained the best data on the probability of life, but actuarial data for the vast majority of the English population were unavailable.⁵⁴ His options at this point were severely limited. He could either say nothing at all about what was clearly a relevant determinant of mortality—class—or he could make do with some less-than-perfect measure.

Chadwick's position at this time was somewhat analogous to that of William Farr. In 1843, after several years work, Farr published his first life tables in the fifth

⁵¹ On this relationship, see the comments by Anne Hardy, *The epidemic streets: Infectious disease and the rise of preventive medicine, 1856–1900*, Oxford, Clarendon Press, 1993, pp. 280–9.

⁵² For a stimulating discussion of Alison's predispositionist medicine, see C Hamlin, 'Predisposing causes and public health in early nineteenth-century medical thought', *Soc. Hist. Med.*, 1992, 5: 43–70; *idem*, op. cit., note 1 above, pp. 52–66. See also John Pickstone, 'Dearth, dirt and fever epidemics: rewriting the history of British "public health", 1780–1850', in Terence Ranger and Paul Slack (eds), *Epidemics and ideas: essays on the historical perception of pestilence*, Cambridge University Press, 1992,

pp. 125–48; *idem*, 'Ferriar's fever to Kay's cholera: Disease and social structure in Cottonopolis', *Hist. Sci.*, 1984, 22: 401–19.

⁵³ Even fifty years after the Chadwick–Alison controversy William Farr's assistant Noel Humphreys could still admit that "There is practically no really trustworthy information of the various rates of mortality in the actual populations of different social classes". See N Humphreys, 'Class mortality statistics', *J. r. statist. Soc.*, 1887, 50: 255–92, p. 256. See the discussion of this issue in Simon Szreter, *Fertility, class and gender in Britain, 1860–1940*, Cambridge University Press, 1996, pp. 76–128.

⁵⁴ Chadwick, op. cit., note 1 above, pp. 232–3.

annual report of the Registrar-General.⁵⁵ Life tables provided the most reliable means of measuring life expectancy, and their preparation became one of the GRO's most important tasks. Yet before publishing his first life table in 1843, Farr relied on other, less reliable, methods for estimating duration of life. In his second and third reports to the Registrar-General, published in 1840 and 1841 respectively, Farr used proportional mortality as an index of duration of life. Duration of life, according to this not uncommon mode of calculating it, was expressed as the inverse of the proportional mortality. If the mortality of rural areas was 1 death out of every 50 living in the population, then life expectancy was 50 years; if in urban areas it was 1 in 37, then urban life expectancy was 37 years.⁵⁶

The inference that life expectancy may be represented as the inverse of proportional mortality only holds, however, if the population is stationary, as the actuary Joshua Milne had pointed out in 1815.⁵⁷ In the demographic conditions of 1840s England, this assumption was clearly unwarranted. In 1840 and 1841, then, Farr and Chadwick were in the same position. Farr wanted to make an argument, in his case, about mean urban and rural duration of life. Chadwick wanted to make an argument about class, location, and duration of life. The two most readily accessible statistical measures available to estimate duration of life were proportional mortality and average age at death, both of which were widely used and similarly flawed. In 1840 and 1841, Farr chose proportional mortality. Chadwick felt that proportional mortality did not suit his purposes and thus used average age at death. Given the state of contemporary vital statistics, it is not clear what else he could have done.⁵⁸

Chadwick may have preferred the average age at death to Farr's proportional mortality as an index of life expectancy for precisely the reason that most statisticians rejected it. Although contemporary statisticians distrusted Chadwick's measure for several reasons, they were especially concerned with the distorting effects that a population's age structure exerted on it.⁵⁹ But the fact that Chadwick's method highlighted infant mortality while Farr's masked it was, for Chadwick, a positive recommendation in favour of the average-age-at-death measure. Chadwick argued

⁵⁵ *Fifth annual report of the Registrar-General*, PP, 1843, XXI, 161–178; Eyles, op. cit., note 5 above, pp. 66–96.

⁵⁶ *Second annual report of the Registrar-General*, PP, 1840, XVII, appendix, 9–10. Though Farr did not explicitly describe his technique in this report, the only way he could have come up with an urban-rural life expectancy split of 13 years was through the proportional mortality data he cited. This method was again silently employed in the *Third annual report of the Registrar-General*, PP, 1841 (Session 2), VI, appendix, 20, where the difference in "mean duration of life" had increased to 17.

⁵⁷ A stationary population is one in which the size and age structure are not changing.

⁵⁸ For a discussion of the measures commonly used at the time, see Harald Westergaard, *Contributions to the history of statistics* (1932), reprint ed., New York, Agathon Press, 1968, pp.

153–61. There were, of course, published data sets available that were constructed according to sound principles but they were restricted to particular geographic locations or selected lives and hence, in Chadwick's view, of limited applicability. There is a survey of this work in the actuary Joshua Milne's article on 'Mortality, Human', in *Encyclopedia Britannica*, 7th ed., Edinburgh, Adam and Charles Black, 1842, vol. 15, pp. 513–61, on pp. 544–7.

⁵⁹ It should be pointed out that the issue of age standardization that Chadwick disregarded was not a well-known problem; according one authority, Neison's description of it in 1844 is the first on record. See David Lilienfeld, "The greening of epidemiology": sanitary physicians and the London Epidemiological Society (1830–1870), *Bull. Hist. Med.*, 1978, 52: 503–28, p. 509.

that infants were more susceptible to the effects of insanitary circumstances and if his measure was distorted by high infant mortality, so much the better.⁶⁰

Historians have not responded well to Chadwick's defence of his measure in the face of criticisms levelled by Farr and Neison in the mid-1840s. Cullen, for instance, argued that in defending his method Chadwick confused the issue of whether or not infants had to die with whether or not they did. But it would be equally true to say that Chadwick's contemporaries who accepted the inevitability of high infant mortality begged the question. Although we now accept that infants have higher mortality rates than, say, young adults, in 1840 the evidence in favour of inevitably high infant mortality was no more compelling than that in favour of inevitably high urban mortality and Chadwick rejected one as strongly as the other.⁶¹ He was in any event absolutely correct that infant mortality rates, which averaged 15 per cent nationally, were far too high.⁶²

I must, therefore, disagree with Cullen's conclusion that Chadwick's measure was typically methodologically weak and misinformed. It was no worse than those of other statisticians at the time.⁶³ Further, although the average age at death was flawed as an index of comparative salubrity, it had a considerable contemporary impact. Its power is attested by the fact that both medical and lay people used it long after it was refuted by experts.⁶⁴ The analysis of differential mortality, in addition, became one of the pivots on which sanitary reform turned. Yet before comparative data could become the engine of reform, it was necessary to overcome one of the principal obstacles in the way of sanitary reform: the assumption that cities were invariably unhealthy. Chadwick's determination to refute this assumption is the third context which structured the collection and use of these data.

⁶⁰ Chadwick, *op. cit.*, note 1 above, pp. 232–3; *idem*, 'On the best modes', *op. cit.*, note 18 above, pp. 8–10.

⁶¹ Cullen, *op. cit.*, note 6 above, pp. 59–60; Chadwick, *op. cit.*, note 18 above, pp. 8–10. Chadwick adopted this position in spite of advice from his actuarial correspondents. See James Mitchell to Chadwick, n.d., Box 67, folder "Memoranda", Chadwick Papers.

⁶² Chadwick knew he was fighting an uphill battle in seeking to arouse concern about working-class infant mortality rates. In part the persistent high rates themselves induced contemporaries to believe that they were inevitable, but the fact that these were working-class infants meant that there was no influential constituency concerned about the problem. In an undated private memorandum Chadwick observed that when thirty children at the prestigious Westminster School came down with fever and six died there was a public outcry and a parliamentary inquiry. Yet, he wrote, "the children of the poor are scourged [?] without mercy or notice". See untitled memorandum, n.d., box 67, folder 3, Chadwick Papers. The episode to which Chadwick refers occurred in 1848 and was the subject of the *Third report of*

the Metropolitan Sanitary Commission of that year. See PP, 1847–48, XXXII. Infant mortality rates did not become an object of serious theoretical or practical concern until later in the century. See the discussion in Szreter, *op. cit.*, note 53 above, pp. 81, 91, 238–46; Vincent Knapp, 'Major medical explanations for high infant mortality in nineteenth-century Europe', *Canadian Bull. med. Hist.*, 1998, 15: 317–36.

⁶³ In the paper in which he demolished Chadwick's average-age-at-death measure, Neison noted that the same objections applied to the use of crude death rates, such as Villermé and Farr had used, as indices of comparative salubrity. See Neison, *op. cit.*, note 6 above, p. 51.

⁶⁴ For some examples of professional use, see G C Holland, *The vital statistics of Sheffield*, Sheffield, J H Greaves, 1843, p. 128; H Gavin, *Sanitary ramblings, being sketches and illustrations of Bethnal Green* (1848), reprint ed., London, Cass, 1971, pp. 106–7; Stevenson Macadam, 'Introductory lecture at the Medical School, Surgeons' Hall', *Edinb. med. J.*, 1864, 10: 514–26, p. 520. For lay use, see James Hole, *The homes of the working classes, with suggestions for their improvement* (1866), reprint ed., New York, Garland, 1985, p.17.

IV

By the early 1840s the comparative insalubrity of cities was widely recognized. John Graunt had demonstrated it for London in the seventeenth century, and by the start of the nineteenth century the conviction that not just London but cities in general were unhealthy may be found scattered throughout the works of such authors as the political economist Thomas Malthus, the Belgian statistician Adolphe Quetelet, the medical statistician Francis Bisset Hawkins, and a host of other lesser-known statisticians.⁶⁵ From the middle of the eighteenth century, actuaries began to quantify and highlight this urban penalty by preparing separate life tables for urban and rural dwellers, thus contributing even further to the conviction that cities were naturally unhealthy.⁶⁶

The assumption of urban insalubrity was so pervasive by the start of the nineteenth century that cities became something of a smoking gun for statisticians who were otherwise puzzled by mortality differentials; if the differentials could not be explained in any other way, there must be an urban population somewhere to blame. Thus Bisset Hawkins explained the differential mortality of English counties on the basis of their differential urbanization, though he presented absolutely no data in support of this. In a related move, other commentators, including Quetelet and the factory apologist William Greg, used urban mortality data in order to argue that manufacturing was not especially unhealthy. Since manufacturing usually required a concentration of population at one spot, it was difficult to decide, this argument ran, if the higher mortality in manufacturing districts was caused by manufacturing itself or by the concentration of population.⁶⁷

In the early 1840s, Farr and Chadwick emerged as two leading critics of the assumption of inevitably high urban mortality. Farr observed in his earliest sustained discussion of this problem in 1840 that many writers “took a gloomy and perhaps fanatical view” of its inevitability. Chadwick too noted in the *Sanitary report* that “[a]n impression is often prevalent that a heavy mortality is an unavoidable condition of all large towns, and of a town population in general”. Yet he claimed that “a high degree of mortality does not invariably belong to the population of all towns,

⁶⁵ John Graunt, *Natural and political observations mentioned in a following index and made upon the bills of mortality* (1662), reprint ed., New York, Arno Press, 1975, pp. 73–6; Thomas Malthus, *An essay on the principle of population* (1798), reprint ed., New York, Norton, 1976, pp. 46, 52, 67–8, 113; Adolphe Quetelet, *A treatise on man and the development of his faculties* (1842), reprint ed., Farnborough, Gregg International, 1973, pp. 27, 31, 37–8; Francis Bisset Hawkins, *Elements of medical statistics* (1829), reprint ed., Canton, MA, Science History Publications, 1989, pp. 10, 35.

⁶⁶ Milne, ‘Mortality, Human’, op. cit., note 58 above, pp. 544–7. According to Milne, Richard Price composed one of the earliest tables on the probability of life in town and country in his *Observations on reversonary payments* (1771). In

the mid-1830s the actuary Thomas Rowe Edmonds published a series of mortality studies in the *Lancet*, one of which included theoretical life tables for cities and villages: ‘On the mortality at Glasgow, and on the increasing mortality in England’, *Lancet*, 1835–6, ii: 353–9, p. 358. On Edmonds and his influence on Farr, see Eyler, op. cit., note 5 above, pp. 74–7, 108–9, 196–7.

⁶⁷ Hawkins, op. cit., note 65 above, p. 10; Quetelet, op. cit., note 65 above, pp. 37–8; [William Rathbone Greg], *An enquiry into the state of the manufacturing population: and the causes and cure of the evils therein existing*, London, J Ridgway, 1831, p. 6; Chadwick had used the same strategy in the 1833 Royal Commission on the employment of children in factories. For a discussion, see Hamlin, op. cit., note 1 above, pp. 99–100.

and probably not necessarily to any".⁶⁸ The difficulty, for analysts such as Chadwick and Farr, was to demonstrate this proposition.

One strategy that contemporaries used to imply that urban mortality could be reduced was simply to compare it with rural mortality. The assumption behind this comparison seemed to be that since rural areas had lower death rates than urban areas, then the urban rates were artificially high and could be lowered; rural areas functioned in this case as a sort of standard of mortality under ideal conditions. Farr himself highlighted the comparative salubrity of rural districts as compared to urban in his first report to the Registrar-General.⁶⁹ But this comparison did not convince contemporaries that there was unnecessary death in cities; it simply re-inforced the view that cities were unhealthy. A medical reviewer of Farr's first report drew precisely that conclusion and argued that "we must therefore conclude, that among many elements of longevity civilization [or city living] fosters one mighty element of destruction [premature death]".⁷⁰

Farr realized that he needed a better method to demonstrate the possibility of preventable mortality than a simple comparison between urban and rural death rates. In the mid-1850s he would deploy the notion of the healthy district in order to argue the case for preventable mortality,⁷¹ but in the early 1840s he argued that the existence of differential mortality *within* London demonstrated the possibility of prevention. Farr's earliest studies at the GRO suggested that mortality was directly correlated with population density. Yet the correlation was not perfect. The Strand district, for example, was very densely populated but had a relatively low death rate. Farr ingeniously turned this and other potential refutations of his general law to preventive purposes. The fact that dense districts could have relatively low mortality rates implied that the "unhealthful tendency [of dense populations] can be counteracted by artificial agencies".⁷²

Chadwick's proof that cities could be made healthy arose, in contrast, from his knowledge that the "chances of life in favourably circumstanced town districts [were] as high or higher than in rural districts". Once again, differential intra-class death data were absolutely central to his argument and the relevant proofs of the possibility of urban salubrity were found in the chapter on the comparative chances of life, particularly using the data from Bath provided by Whitwell Elwin.⁷³ These showed

⁶⁸ *Second annual report*, op. cit., note 56 above, appendix, p. 10; Chadwick, op. cit., note 1 above, pp. 233–4. The assumption of invariably high urban mortality was widely though not, I would stress, universally held among statisticians and medical writers. Farr and Chadwick are noteworthy as they attempted a statistical refutation of this assumption using the data of urban insalubrity.

⁶⁹ *First annual report*, op. cit., note 35 above, appendix, pp. 76–81.

⁷⁰ 'The registrar-general's report on births, deaths, and marriages in England', *Br. for. med. Rev.*, 1840, 9: 344–59, p. 359.

⁷¹ On the healthy districts, see Eyler, op. cit., note 5 above, pp. 71–2; Simon Szreter, 'The GRO

and the public health movement', *Soc. Hist. Med.*, 1991, 4: 435–63, pp. 438–40. For an earlier use of the same concept, see William Lee, *Summary of experience on disease, and comparative rates of mortality*, London, Eyre and Spottiswoode, 1851, pp. 57–63.

⁷² *First annual report*, op. cit., note 35 above, appendix, p. 80. This strategy is explicit in the *Second annual report*, op. cit., note 56 above, appendix, p. 11.

⁷³ Untitled memorandum, n.d., box 45, Chadwick Papers; Chadwick, op. cit., note 1 above, pp. 234–6.

Chadwick that the “average chances of life amongst the middle classes [in Bath] . . . is nearly the same as that of the farmers . . . of the agricultural districts [of Wiltshire]”. In a salubrious environment such as that inhabited by Bath’s middle classes, urban living was not invariably unhealthy, and the average age at death among members of Bath’s middle class as compared to their class cohort in the countryside illustrated the extent to which life chances in urban areas could be extended.

Chadwick’s commitment to comparative class data and his determination to ground the possibility of preventable mortality on these differentials partly structured, I would suggest, the very organization of the *Sanitary report*. This is most apparent in his determination to demonstrate that rural areas did not present any standard against which the health of urban areas could be judged. Indeed, the belief that rural areas and small towns were routinely healthy was exactly the assumption that Chadwick proposed to refute in the opening sentence of the *Sanitary report*. The report would show, he claimed, the existence of disease attendant on removable circumstances “amidst the population of rural villages, and of the smaller towns”. He reiterated the point as the main conclusion. Excess mortality did not just exist in large towns and amongst manufacturing populations, even though many contemporaries assumed that it did.⁷⁴

The draft outline of the *Sanitary report* makes this determination more apparent. For several of the report’s chapter headings Chadwick very deliberately laid out parallel sets of examples for urban and rural districts. Thus the two first headings of the chapter on ‘Official public arrangements external to the residences by which the sanatory [?] condition of the population appears to be affected’ were “town drainage” and “drainage in rural districts”. The third heading was organized in two parts: “street cleansing, surface cleansing, or scavenging in towns” and “instances of the neglect of road cleansing in rural districts”. The fifth heading, “supplies of water”, was organized into sections on “necessity of improved supplies of water for house and street cleansing” in London and Manchester and “in the rural districts in England”. He intended other sections to show “evidence of increased overcrowding in rural districts as well as in towns”. He proposed to discuss moral improvements produced by employers “in manufacturing districts” and “in rural districts”. He planned to bring forward “examples of buildings voluntarily erected in manufacturing districts” and “in rural districts”.⁷⁵

Chadwick’s determination to highlight the unhealthiness of rural areas is puzzling unless we see it as part of a larger argumentative strategy. Why would he place so much emphasis on rural conditions? To appeal to a rural constituency? Hardly. Chadwick had no real interest in rural sanitary measures; there were much bigger fish to fry. To create a more compelling argument for state intervention? No more likely; the government was not going to legislate on the basis of villages needing sewers. Because rural authorities had sent in replies? Possibly, but this still would not explain why he would have intentionally organized the report in order to highlight

⁷⁴ Chadwick, op. cit., note 1 above, pp. 80, 422.

⁷⁵ In the final version of the *Sanitary report*, Chadwick reorganized some of this material and

thus partially obscured what had been a very deliberate attempt to highlight the insalubrity of rural districts. For manuscript quotes, see untitled memorandum, n.d., box 45, Chadwick Papers.

rural insalubrity. He could simply have included representative examples where it suited his purpose. Revisionist interpretations of Chadwick have surely taught us that he rarely used data simply because someone had sent it to him. This organizational peculiarity of the *Sanitary report* makes sense only if we see it as a deliberate attempt to undermine the “rural comparison argument” for preventable mortality and reground it on the firmer foundation of class-based comparative death data.

At this point we see the centrality of the average age at death measure and its associated data for the *Sanitary report*. Having demolished the rural argument for preventable mortality, Chadwick was forced to come up with an alternative, and that alternative depended on his analysis of the comparative chance of life of different classes. Without these data, a very different *Sanitary report* would have come down to us, not least because it would have been very difficult for Chadwick to argue that mortality really was preventable. It is easy to forget how extremely reluctant his contemporaries were to admit that there was surplus mortality in their district. Comparing their district with another rarely sufficed to convince them as they rarely agreed that the mortality experience of any other locality had any relevance to their own. A comparison of one urban district with another urban district was thus no more compelling than a comparison with a rural district. Local mortality rates were the product of a variety of factors, including but not limited to the location, class composition, and the occupational pursuits of the people in question. As the controversy in the 1860s and 1870s over mortality measures as indices of comparative salubrity amply illustrates, unless the comparison controlled as many of these variables as possible, it could very easily be contested.⁷⁶ Chadwick’s decision to base his case for preventable mortality on comparative class-based statistics thus represents a significant, if flawed, methodological contribution to the intellectual credibility of preventive medicine.

I have argued in this paper that the class-based death data were one of the central features of Chadwick’s *Sanitary report*. The significance of the data on average age at death in the report has long been recognized, but contemporary statisticians’ disaffection with these statistics has led historians to conclude that this significance was mainly polemical or rhetorical. I would instead suggest that the class-based, average-age-at-death data Chadwick gathered over the course of the national sanitary inquiry provided new and compelling evidence in favour of his position, and we need to consider the role that these statistics played in his argument in order to appreciate fully the content and even the form of the *Sanitary report*.

⁷⁶ Henry Rumsey, ‘On certain fallacies in local rates of mortality’, *Trans. Man. statist. Soc.*, 1871–2: 17–39. In this paper, ironically, Rumsey praised Chadwick’s efforts to isolate the class determinants of disease and death. For the controversy over crude mortality rates as indices of comparative mortality, see John M Eyler,

‘Mortality statistics and Victorian health policy: program and criticism’, *Bull. Hist. Med.*, 1976, 50: 335–55; Graham Mooney, ‘Professionalization in public health and the measurement of sanitary progress in nineteenth-century England and Wales’, *Soc. Hist. Med.*, 1997, 10: 53–78.