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The importance of long-term records in public health surveillance: the US weekly sanitary reports, 1888–1912, revisited

Andrew D. Cliff, Peter Haggett, Matthew Smallman-Raynor, Donna F. Stroup and G. David Williamson

Abstract

Background This paper outlines the ways in which a little-used archive of early public health records may throw light on longer-term trends in international epidemic behaviour and serve as a major source of epidemiological information for historians of urbanization and public health. The *Weekly Abstract of Sanitary Reports* was the official disease surveillance report of the US Public Health Service and its predecessors, and began to publish urban mortality statistics on a regular basis in 1888. Here, the authors describe the first 25 years of continuous reporting (1888–1912), when the *Reports* contained not only disease data for US cities, but also records sent back by US consuls based in some 250 cities in many parts of the world.

Methods The content of the weekly editions of the *Reports* was systematically sampled and analysed using graphical techniques and the simple statistical method of running means.

Results Relatively complete weekly series of mortality from all causes, and six infectious diseases (diphtheria, enteric or typhoid fever, measles, scarlet fever, tuberculosis and whooping cough) were identified for a total of 100 cities world-wide.

Conclusion Reporting coverage for these cities is sufficiently complete that multivariate analysis should be possible to obtain a comparative picture of mortality for many parts of the world. Despite limitations of the data, sources of the type described in this paper form an important comparative database for studying international patterns of mortality.

Keywords: public health surveillance, history, infectious diseases, United States

Introduction

Data from public health surveillance systems should be assessed regularly if they are to retain their utility for public health workers.[1] Thus, in the United States for example, work is constantly under way to make the records supplied by state health departments and published in the Centers for Disease Control and Prevention's (CDC) weekly disease surveillance report, *Morbidity and Mortality Weekly Report*, more effective for public health workers. In particular, new ways of rapidly detecting unusual patterns in routine disease surveillance data have recently been explored.[2]

Comparisons with other fields suggest that, in addition to this emphasis on making current records timely and useful, a concern with the value of the historical maintenance of past public health data is important. For example, by way of analogy with meteorology, the dominant and immediate concern is with improving short-term forecasts of weather conditions within the next few hours and days. However, the realization that climates are unstable and that global warming (with its important economic and public health consequences) is likely, has given a new value to long-term records. Archival meteorological records, such as those contained in the Smithsonian Institution's *Smithsonian meteorological tables*, provide a benchmark against which the extent of present climatic change can be accurately assessed.[3] Likewise, in civil engineering, past records of river flow provide important parameters in designing dams and reservoirs to cope with future extremes. The July 1993 floods of the Mississippi and Missouri Rivers provide a contemporary example of the issues involved.[4]

Despite the recognition that past public health records may be of utility to current public health practitioners, historical

Department of Geography, University of Cambridge, Cambridge CB2 3EN, UK.

Andrew D. Cliff, Reader in Theoretical Geography

Department of Geography, University of Bristol, Clifton, Bristol BS8 1SS, UK.

Peter Haggett, Professor of Urban and Regional Geography

Department of Geography, University of Nottingham, University Park, Nottingham NG7 2RD, UK.

Matthew Smallman-Raynor, Research Fellow in the Department of Geography and the Department of Public Health Medicine and Epidemiology

Division of Surveillance and Epidemiology, Epidemiology Program Office, Centers for Disease Control and Prevention, Atlanta, GA 30333, USA.

Donna F. Stroup

G. David Williamson

Address correspondence to Matthew Smallman-Raynor.

disease data naturally remain of primary interest to historians of urbanization and public health. Even then, explanations for why diseases were widespread at a particular point in time, and how they were controlled, may have contemporary relevance. This is particularly so in areas of the world where those same diseases continue to thrive or are re-emerging.

One problem that confronts students of long-term change in international disease activity is the apparent dearth of records before the first world war. International data at the global level only became generally available with the establishment of the Health Section of the League of Nations in 1923. Before this date, integrated records of international disease activity, such as the foreign and colonial reports contained in the *Registrar General's Weekly Return for England and Wales* (London: HMSO) from the 1870s onwards, are limited in their geographical coverage.

Against this background, we outline the potential of one little-used archive of early domestic and international public health statistics – the US *Weekly Abstract of Sanitary Reports* – to augment studies of infectious disease activity in urban areas for a time 'window' several decades before the establishment of the League of Nations. The paper begins with a brief review of the history of public health surveillance conducted by the US Public Health Service and its predecessors. In particular, the rationale behind the unilateral decision of the United States to establish an international disease surveillance system in the last quarter of the nineteenth century is examined. The nature of the resultant public health statistics contained in the *Weekly Abstract of Sanitary Reports* is then described. Finally, the value and drawbacks of studying past public health records of the type contained in the *Weekly Abstract of Sanitary Reports* are considered.

Background: past US public health records

Domestic disease surveillance

Public health surveillance in the United States has a history spanning more than 250 years. Notification of some diseases began in the colonial period on a local basis, particularly in the port cities. In 1741, the colony of Rhode Island passed an act requiring tavern keepers to report contagious diseases among their patrons. Two years later, the colony passed a law requiring the reporting of smallpox, yellow fever, and cholera.[5] Despite these early examples of reporting requirements, for most states and cities recording was limited to periods when epidemics either threatened or were in progress. State-wide notifications were not required until 1883, when Michigan became the first of the states to enact a law requiring physicians and householders to report certain diseases to health officers or boards of health.[6] By 1901, most state and municipal laws required notification of selected communicable diseases such as smallpox, tuberculosis and cholera to local health authorities.[7] In 1914, federal–state links were strengthened when Public Health Service officers were appointed as collaborating epidemiologists to serve in state health departments.

At the national level, a law was passed by the US Congress as early as 27 May 1796, authorizing the President 'to direct the revenue officers and the officers commanding forts and revenue cutters to aid in the execution of quarantine and also in the execution of the health laws of the States, respectively, in such manner as may to him appear necessary'.[8] National disease monitoring began in 1850, when the federal government began publishing US mortality statistics based on the decennial census of that year. However, it was not until 1925 that all states were participating in national morbidity reporting.[9] After the Public Health Service review of reporting systems in 1948, the National Office of Vital Statistics assumed the responsibility for morbidity reporting and, in 1949, for publishing the weekly morbidity statistics that had appeared for several years in the *Public Health Reports*. Finally, in 1952, mortality data were added to form what is now known as the *Morbidity and Mortality Weekly Report*. Since 1961 this publication has been the responsibility of Centers for Disease Control and Prevention (CDC).

International disease intelligence

The United States' concern with overseas disease intelligence was a product of the nineteenth century. As the century progressed, so the number of vessels headed for the United States from foreign destinations, and the consequent danger of introduced epidemics, grew. Six statutes were passed between 1850 and 1880 that authorized both the quarantine of vessels and the measures to be taken for the prevention of epidemics. The need for accurate information about diseases outside as well as within the United States was clearly becoming ever more acute.

In the wake of the 1873 cholera epidemic, the idea of an international disease surveillance system was advanced by John M. Woodworth, then Supervising Surgeon of the Marine Hospital Service.[10] Woodworth contended that the most effective way of halting the spread of an epidemic disease, such as cholera, was to prevent it from entering the country. To this end, he advanced a programme of international disease surveillance under which US consuls, scattered in hundreds of towns and cities around the world, were to submit weekly summaries of mortality in their jurisdictions.[11] Disease intelligence gathered in this manner could then be used to bolster the operation of quarantine regulations against ships headed for the United States from the same foreign locations. The subsequent evolution of Woodworth's scheme, as well as its antecedents, is traced in Fig. 1.

The 1878 Quarantine Act ('An Act to Prevent the Introduction of Contagious or Infectious Diseases into the United States') required the publication of a weekly abstract of the overseas consular sanitary reports, and this was begun as the *Bulletin of the Public Health* on 13 July of that

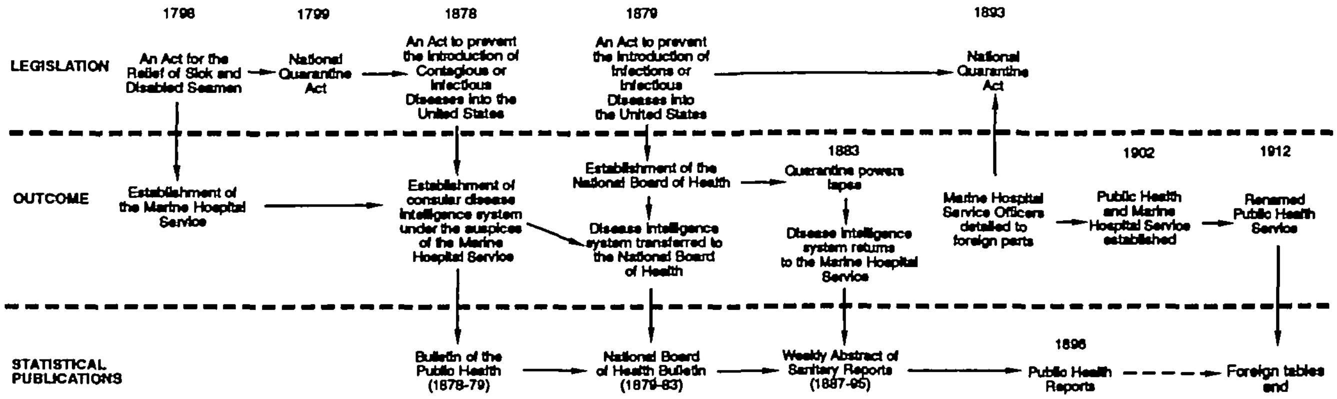

Figure 1 Critical dates in the development of disease surveillance in US public health records, 1798–1912.

year.[11,12] In 1879, Congress authorized $5000 for the collection of data and the publication of health reports; further measures to prevent 'the introduction of infectious and contagious' diseases were also enacted.[13] The original bulletins were discontinued in May 1879, and several years passed before the new Surgeon General of the Marine Hospital Service, John B. Hamilton, recaptured the initiative and relaunched the weekly bulletins as the *Weekly Abstract of Sanitary Reports*, which first appeared in January 1887.[14] With new legislation in 1893, the reports were extended, and Volume XI, published in January 1896, appeared under the new title of *Public Health Reports.*[15]

Implications for historical studies

Federal reporting of some diseases on a weekly basis can therefore be traced back in the United States for just over 100 years. For individual cities, notably those older cities on the Atlantic seaboard, the records extend back still further. Thus, Baltimore has incomplete records from 1797 and regular monthly mortality records back to 1856; New York's regular series begin in 1804.[16] Although these reporting periods are not long by European standards (for example, London's series run from 1629), they do provide an archive for longer-term studies of disease in the United States.

Of equal interest are the international sanitary reports collated through the US consular system. As noted in the Introduction, global disease surveillance data only became generally available with the establishment of the Health Section of the League of Nations in 1923. The *Weekly Abstract of Sanitary Reports* and its successor publications provide an opportunity to extend the international perspective for certain infectious diseases and cities back to the last quarter of the nineteenth century. It is to the nature and potential value of these international reports that the paper now turns.

Weekly reports for foreign cities, 1888–1912

We take as our example here the 25-year 'window' of international data reporting in the US *Weekly Abstract of Sanitary Reports* and its successor, the weekly *Public Health Reports*, between January 1888 and December 1912. For convenience, we refer to these publications as the *Reports* in the remainder of the text. Our 25-year observation period encompasses the first complete calendar year of the surveillance system to its final demise. Detailed work on these sources and their analysis is the subject of a continuing study.[17]

The structure of reporting in a typical weekly issue of the *Reports* from the turn of the century appears in Fig. 2. Each edition was divided into two main sections: 'United States' (upper path, Fig. 2) and 'Foreign and Insular Cities' (lower path, Fig. 2). The 'Foreign and Insular' section was largely based on the sanitary reports received from the consuls. It consisted of foreign city mortality tables (right, lower path) which contained demographic and mortality data relating to all causes, and up to 11 infectious diseases, in the various consular jurisdictions around the world. This mortality table was supplemented by reports of great 'plague' diseases (cholera, plague, smallpox and yellow fever) and reprints of qualitative reports from the consuls. The foreign city mortality tables, published on a weekly basis, provide the information on which to reconstruct international epidemic history from the late nineteenth century; a parallel weekly mortality table for US cities commenced publication in the summer of 1888 (right, upper path).

The development of the foreign city mortality tables

Weekly tabular information on deaths from all causes for some overseas cities was first published in Volume II, Number 47, 20 January 1887. By March of that year, the tables had been expanded to include deaths from major selected diseases. The table consisted of a matrix with 24 cities by seven diseases, together with the population of each city and the total number of deaths from all causes. As noted above, the data came mainly from US consular representatives in overseas cities, to whom responsibility for disease reporting had been legislated under the National Quarantine Act of 1878.[18] Under this Act, consular officers were required to advise the Supervising

Surgeon-General of the Marine Hospital Service in Washington, DC, as to the sanitary conditions in their jurisdiction.

Consular officials were appointed to promote trade, to protect the interests of US citizens, and to oversee the activities of merchant shipping; representatives did not necessarily have medical expertise, and disease reporting usually relied on the returns of local health authorities.[19,20] However, the National Quarantine Act of 1893 authorized the detail of medical officers to US consulates overseas. They were based mainly in port cities to assist with ship and passenger inspection to prevent contagious or infectious diseases from entering the United States. Because of outbreaks of cholera in Europe a number of medical officers were immediately assigned to consulates there.

The weekly foreign mortality tables continued to be published until Rupert Blue's appointment as Surgeon General in 1911. He reviewed all publications of the US Public Health Service and decided to continue the reporting for only the United States and its territories. The last foreign tables to be published appeared in the 20 December 1912 issue, although the separate entries for cholera, yellow fever, plague and smallpox continued.

We have been unable yet to reconstruct a full rationale for the Surgeon-General's decision to discontinue the consular tables. His annual report for the year in question contains a warm endorsement of the work of the US consuls in foreign countries: 'Too much credit can not be given to the importance of the information thus obtained nor to the excellent service being rendered in this way by the State Department through its diplomatic and consular officers'.[21] The decision to cease publishing the overseas tables for non-plague diseases probably reflected three factors: (1) the falling mortality from many of the common infectious diseases, (2) the growth of independent national public health reporting in many foreign countries, and (3) the enhanced role of international organizations (such as the Pan American Sanitary Bureau founded in 1902) in the international exchange of epidemic data.

Number of cities reporting

Usually two to three pages of each report were devoted to the table of deaths from infectious diseases by city. Figure 3 graphs the number of overseas cities (upper) included in these tables

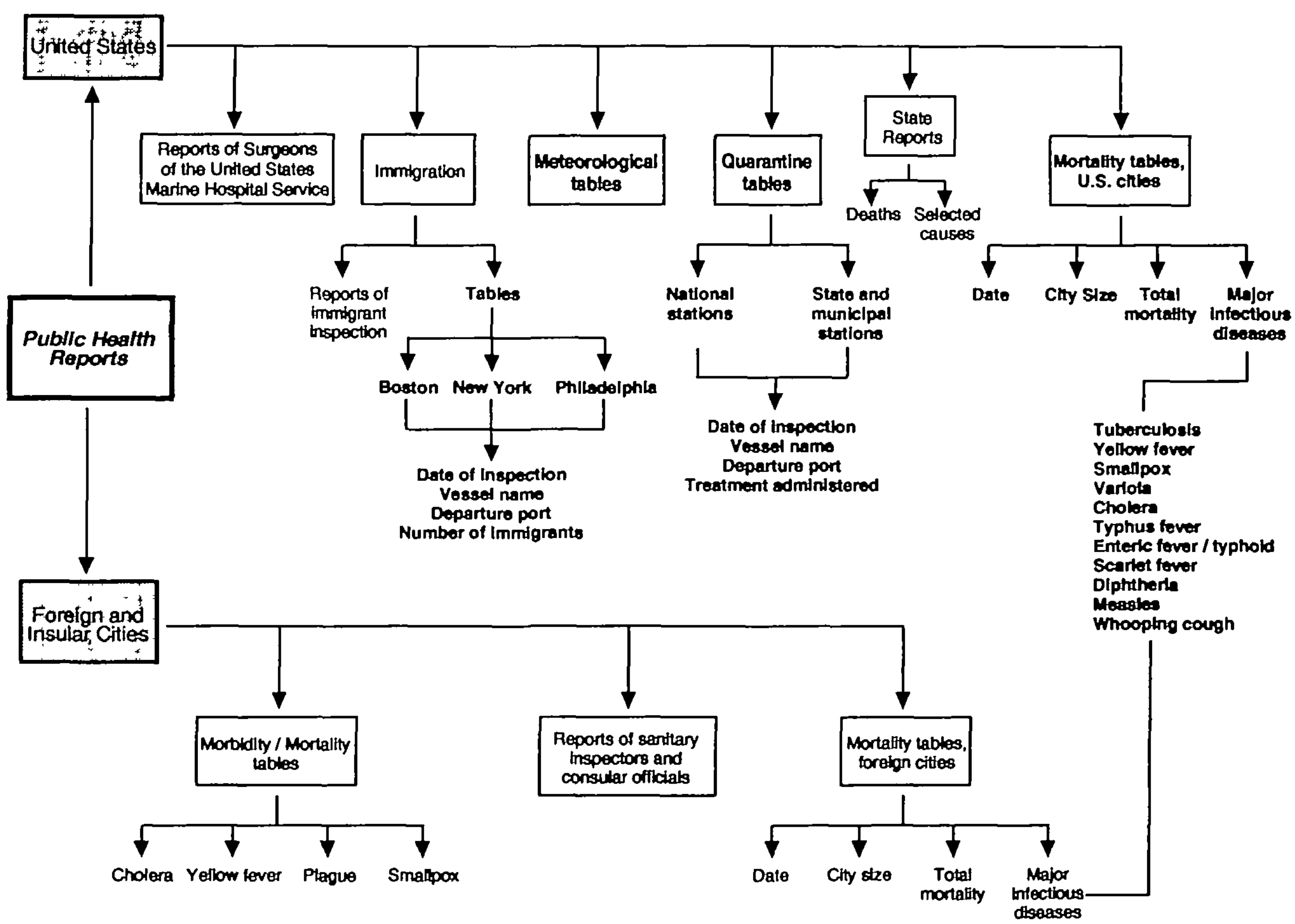

Figure 2 Structure of reporting in a typical issue of the *Weekly Abstract of Sanitary Reports*. [Note the differences between records for the United States (above) and for 'foreign and insular' cities based on consular records (below).]

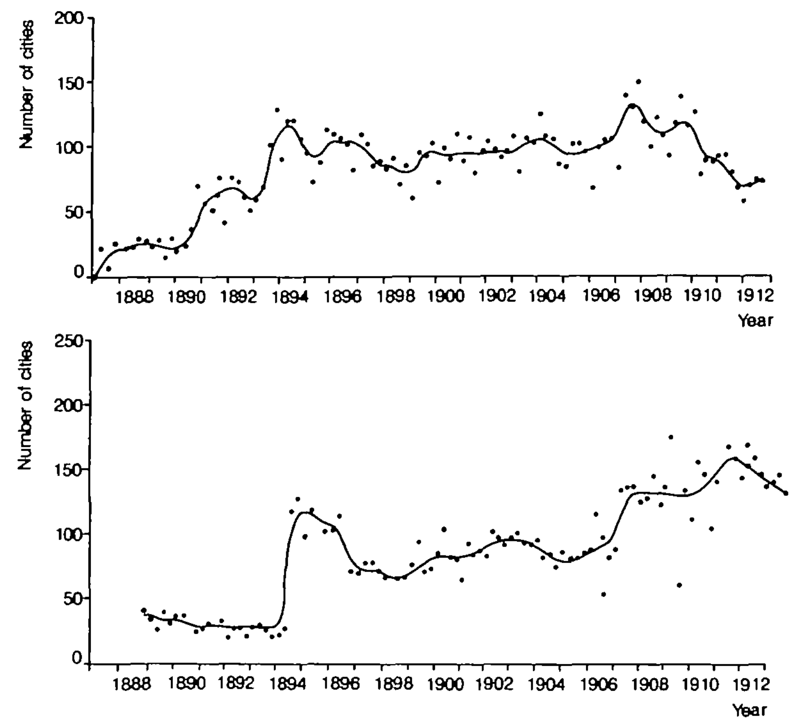

Figure 3 Number of cities for which disease statistics were published in the US weekly sanitary *Reports*. Upper, foreign cities. Lower, US cities. Points are based on a sample count of cities at the start of each quarter, with running means shown by the continuous line.

for sample editions of the reports, 1888–1912. The number of US cities covered by domestic surveillance is plotted in the lower graph.

For foreign cities, the number reporting began at fewer than 30 but by 1894 had risen to more than 100. This represented approximately one-third of consular jurisdictions world-wide.[22] Coverage remained at that level until 1908, when it began to contract, until the series was discontinued in 1912. For US cities (lower), the pattern is more complex, with an isolated reporting peak in 1894, followed by a trough, and then a steady rise up to 1912.

Location of foreign reporting cities

The geographical coverage provided by the reporting cities was far from evenly balanced; not all foreign cities reported continuously. Although the number of cities making returns in any one week rarely exceeded 140, those were drawn from an overall sample of more than 250 cities that, at some time or another over the 25 years, 1888–1912, found their way into the series. Figure 4 shows the location of foreign cities that reported in one sample year: 1893. Not surprisingly, the reporting pattern is dominated by cities with which the United States had close trading links (and thus consular officials), in Europe, the Caribbean Basin and along the St. Lawrence Seaway in Canada. Other cities, especially in Central and Southern Europe, were important transhipment points for emigrants to the United States. The pattern is also marked by cities in countries such as the United Kingdom, which had advanced public health systems and could thus readily supply weekly figures.

Diseases reported

Figure 2 indicates that deaths from 11 diseases were reported in the foreign mortality tables at some time or another during the 25-year period: cholera, diphtheria, enteric fever or typhoid, measles, plague, scarlet fever, smallpox, tuberculosis, typhus fever, whooping cough, and yellow fever. However, non-zero records for some of these diseases are very rare, and only six diseases (diphtheria, enteric or typhoid fever, measles, scarlet fever, tuberculosis and whooping cough) provide a continuous record in a sufficiently large number of cities to make statistical analysis worth while.[17]

Disease time series

The foreign city mortality tables contain weekly mortality information for up to 11 diseases, and all causes, for some 250 consular cities. It is therefore possible to construct 2750 (i.e. 11 × 250) weekly time series of place- and cause-specific mortality for the period 1888–1912. As we describe in the Discussion, however, many of these series are fractured and reporting is incomplete. Nevertheless, by sampling and cross-checking with independent national disease records, we have

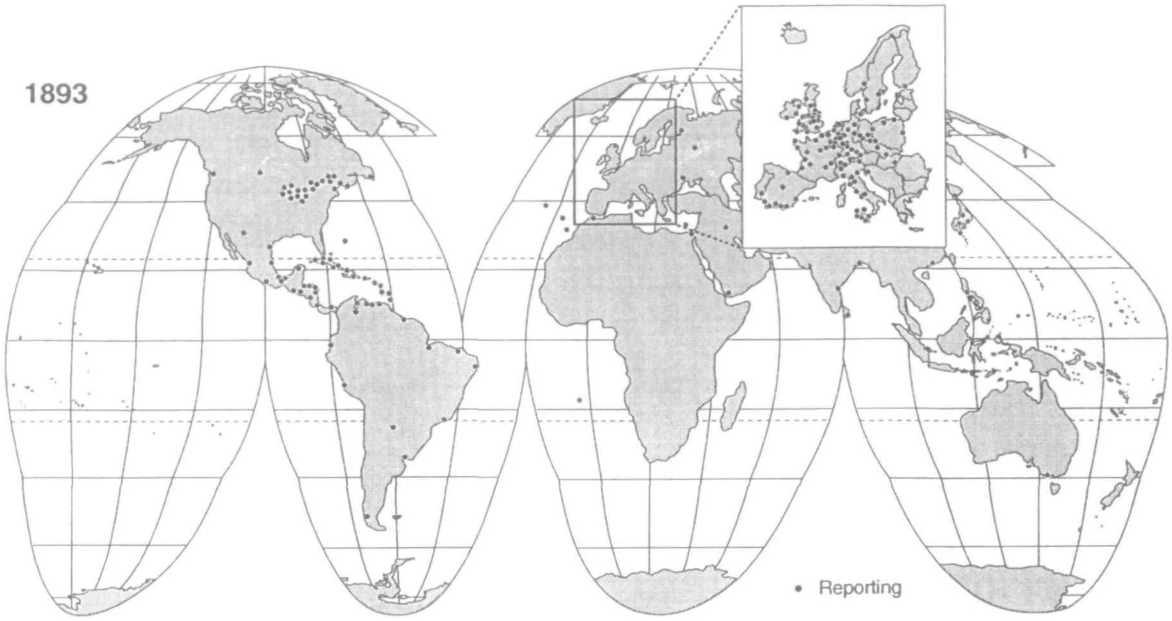

Figure 4 Location of foreign cities for which mortality data are available in the *Reports* in a sample year, 1893. Reporting cities are identified by the black dots.

identified and abstracted data relating to 100 cities which possess relatively complete series for mortality from all causes and six diseases (diphtheria, measles, scarlet fever, tuberculosis, typhoid and whooping cough).[17] To place these data in context, the 100 sample cities recorded a total of about 18 million deaths from all causes during the 25-year observation period, of which two million deaths (11 per cent of total reported deaths) were attributed to the six infectious diseases. A sample series of measles mortality in Paris is shown in Fig. 5; the classic pattern of recurring epidemic peaks interspersed by periods of relative epidemiologic calm is readily apparent. Similar series for other cities and diseases are currently being analysed for evidence regarding global diffusion mechanisms, epidemiologic transitions and shifts.[17]

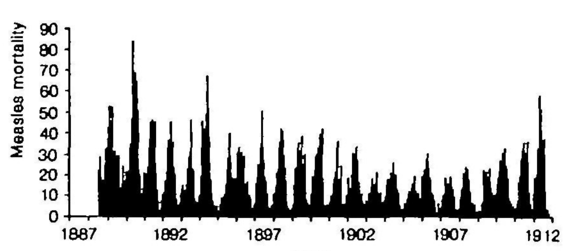

Figure 5 Example of a city time series constructed from the *Reports*, 1888–1912. Measles deaths in Paris. (Note that, although the year 1887 is plotted on the horizontal axis, no data are available for the period before 1888.)

City and national populations

The data available from the foreign city mortality tables give a picture of diseases in selected cities and not for countries as a whole. At a time when the rural fraction of the population was much larger than today, it is important to note that such rural populations are excluded and that reporting cities constitute only a fraction of the total population of a given country. To illustrate this point, Table 1 shows for three dates (1890, 1900 and 1910) the total populations of the overseas reporting cities in relation to the countries involved. Parallel information for US cities covered by the domestic surveillance system is also given.

Table 1 Estimates of population coverage by international and domestic disease surveillance in the *Reports* for three sample years

	1890	1900	1910
Foreign countries			
Disease-reporting cities*	9.18	25.27	45.70
Proportion (percentage)†	0.59	1.66	3.03
United States			
Disease-reporting cities*	9.14	9.35	15.50
Proportion (percentage)†	14.52	12.30	16.86

*Population in millions. Population totals are based on cities reporting in the first week of the year.
†Population of reporting cities expressed as a percentage proportion of the entire population.

For the US cities, the proportion of the total population covered by the disease statistics appears to be around 14–17 per cent. For foreign countries the calculation is less easy. Relying on an estimated population of 1.6 billion in 1900,[23] however, population coverage rises from 0.59 per cent in 1890 to just over 3 per cent in 1910.

Because the published statistics also include the populations of the reporting cities, they also allow investigation of the way the distribution of diseases may relate to city size through the threshold mechanism. Foreign cities tend to be larger, on average, than their US counterparts. Thus in 1900 a quarter of all foreign cities had populations of more than 320 000, whereas in the United States the corresponding figure was 60 000. A quarter of all foreign cities were below 25 000, whereas for the United States the corresponding figure was 14 500.

Discussion

Use of a past data source, such as the *Reports*, has both drawbacks and advantages. We briefly review both.

Limitations to the utility of the *Reports*

Inevitably, any data source from a historical period poses problems. Although specific issues are considered in detail below, we preface our discussion by noting that the *Reports* can provide only a partial insight into the international behaviour of infectious diseases. The quality of the available data limits the analysis to deaths from just six diseases (diphtheria, measles, scarlet fever, tuberculosis, typhoid and whooping cough) in cities located primarily in the Americas and Europe. These cities represent only a small proportion of the national population of their respective countries, some of which had already established death registration systems for both urban and rural populations. For these reasons, the *Reports* provide an insight into disease mortality at selected international sites rather than a global view of disease occurrence. Notwithstanding this, although more extensive data may be available from the domestic surveillance records of some countries, the *Reports* represent a single and integrated record of mortality at hundreds of sites world-wide.

Against this background, we note several specific problems in the use of the *Reports*. First is the difficulty of obtaining a complete and unbroken set of weekly editions. The weekly print run was about 3000 in 1899, but substantially lower in earlier years. Most copies were forwarded to individual public health officers, consuls and sanitarians and, doubtless, over time many copies have been lost. However, a few hundred copies were retained for binding and distributed as an annual edition to Marine Hospital libraries and other Service institutions.[24] A century of wear and tear has taken its inevitable toll on some editions, and the reader is often confronted with torn and missing text.

Second is the sheer scale of the archive and the transcription effort needed to convert data to a machine-readable form. To make the data available for analysis, they have to be converted from entries on the printed page to a time–space–disease matrix in a computer. This conversion would not be so difficult were each weekly report to refer to a specific and standard week of record. However, the Surgeon General's office printed what had come to hand that week, rather than by, for example, week of occurrence on a regular basis. Reports might refer to records from some previous week, depending upon the lag in reporting; delays in reporting of up to six weeks are not uncommon. Sometimes, late reports from a distant city or a tardy respondent were simply aggregated for periods longer than a week, and these reports would be included in notes outside the main table. Even the term 'week' is not without ambiguity: most respondents related their figures to a week ending on a Friday or Saturday but other closing days were not unknown.

Optical character reading of sample pages was tried but proved unhelpful. The variety and wear of printer fonts, the variable table formats, and the presence of specks and errors on the printed pages made recognition too slow. In the end, hand transfer and checking of the records proved the faster and more reliable (if more expensive) way of data transfer.

Once the data were assembled onto computer disks, a third problem remained. Given the overall data dimensions – up to 11 diseases, up to 250 cities, and 1300 weeks – we generate a data matrix with some three million cells. However, in reality, the matrix is very sparse. Only about one-third of all cells are occupied, and the data pattern resembles a moth-eaten lace curtain rather than a closely woven fabric. So we chose to abstract those cities and diseases for which reasonable runs of figures within the 1300 consecutive weeks were reported. Missing observations within the time series place a premium on statistical models that could cope with incomplete series.

The fourth problem is fundamental and refers to the interpretation of the figures. Eleven diseases are recorded in the tables and several more are referred to less regularly in the text. The value of the figures, then as now, depends in part on the validity of the diagnosis. As described by MacKellar,[25] the proportion of deaths that were certified, the proportion for which an autopsy was performed, the degree to which international definitions of a disease were either available or followed, and the changing terminology of disease all affect the accuracy of cause-of-death statistics for nineteenth and early twentieth century populations. Moreover, primary records were not always completed by a qualified physician, and we note that the *Reports* make occasional references to data supplied by coffin manufacturers, grave diggers and other unofficial sources.[17] Confidence in the published data is further limited by the potential misallocation of deaths by time, place and cause, and by issues concerning the population coverage of urban registration systems.[25]

These data-associated uncertainties are likely to vary spatially and temporally in an unknown manner and this complicates analysis. In particular, disease time series, such as the measles series plotted in Fig. 5, can only provide useful insights if data biases are assumed to be more or less constant in time. It is noteworthy, however, that data uncertainties in the *Reports* do not necessarily represent a magnification of the problems encountered in the domestic surveillance reports of foreign locations. Indeed, where it has proved possible to cross-check the *Reports* with domestic surveillance reports (for example, the *Registrar General's Weekly Return for England and Wales*), an extremely close accordance between the two records has been observed.[17]

A further uncertainty surrounds the fifth problem: defining the city to which the disease data relate. Many of the places in the tables were growing rapidly in the late nineteenth century, and the limits of the 'real' city as a built-up epidemiological unit tended to run well ahead of the boundaries of the 'legal' city as a unit of administration. The problem is not insubstantial. Statistical entries for London, for example, varied on a weekly basis from the greater metropolitan area (population approximately 7 000 000 in 1900) to the city proper (population approximately 4 000 000). Although the city definitions used in the weekly reports are not spelled out, we have used the population totals given there.

Potential value of past sources

To set against the problems, we see considerable value in the consular records as an international archival source. First, the *Reports* represent a major single source of epidemiological information which, as argued in the Introduction, can be used to provide a long-term perspective on the present-day occurrence of certain infectious diseases.[26]

Second, the *Reports* represent a potentially valuable source of statistical information for historians of urbanization and public health. Specifically, the consular records allow us to construct a picture of disease change at a time of very rapid urbanization both at the international level and within the United States itself. Here, the work of the Superintendent of Public Health of Providence, Charles V. Chapin, provides an important early precedent.[27] In the case of the United States, the ten largest reporting cities in 1888 had an estimated population of 5.5 million. At the end of the window period, their total population was 12.4 million, an increase of 128 per cent. The ten largest reporting cities outside the United States showed an even faster rate of increase, 210 per cent. In this context, the potential contribution of the consular records to historical studies of urban development, population growth and disease control is considerable.

Many third world countries are today going through urbanization phases not unlike those experienced at the turn of the last century in Europe and North America. About one-third of the population of cities in developing countries lives in slums and shanty towns and, by the year 2000, it is estimated that the number living under such conditions will have reached 2.2 billion.[28] Public health events in one period may have lessons for public health events in another.[29] In that context, the population-size data for cities given in the weekly reports will allow both the cross-sectional and longitudinal implications of changing city size to be detected.[30]

Third, these data permit an early international cross-section to be drawn to supplement the many national studies of disease incidence. As noted in the Introduction, international data at the world level only became generally available with the setting up of the League of Nations Health Section in 1923; the weekly consular reports allow the international perspective, albeit in partial form, to be extended back by several decades.

Fourth, the resilience and re-emergence of some infectious diseases from the past into the present decade has made studies of their earlier incidence more timely. The revival of interest in tuberculosis is a case in point.[31]

Fifth, past records provide a basis for studies of return periods and other extreme-event models. We mentioned in the Introduction the use of past hydrological records to provide estimates of the intensity of floods likely to be encountered over a design period for dams of, say, 100 or 200 years. The nonstationary nature of epidemiological events makes the analogy a controversial one, but it may be possible to define models that allow some bounded estimates to be made of the maximum disease incidences likely to be encountered in a given period. In the case of influenza, for example, the death rates experienced in the 1918–1919 pandemic represent an extreme intensity that provides a picture that may need to be considered in health-service emergency planning. Used with due caution, historical data may allow estimates of other extreme-event conditions to be made.

Conclusion

When little of public health interest seems to be occurring, the accurate recording and prompt reporting of disease data must often be seen from the local level as a routine and soulless task, in which the records submitted appear to have only a limited and transient value. In this paper, we have argued a contrary view: it is that very regularity of reporting that, over the longer run, has the power to give us particular insights into the ways disease patterns are shifting over time and space. In that record, the periods with zero cases may be just as meaningful as the sharp peaks. The archive of past surveillance records, for all their frustrations and limitations, provides a unique epidemiological resource for the United States. Preserving and studying such records not only keep faith with those past generations of public health officers on whose efforts our present understanding is built, but also provide a standard against which present changes can be better judged.

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