

SO7: The Politics of demographic statistics

Federal autonomy and the politics of reform: the standardization of mortality statistics in Germany, c.1850-1914

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Introduction

It is generally accepted that historical demographers always need to pay particular attention to the specific conditions under which official mortality data were generated before seeking to analyse or interpret the patterns they seem to reveal (Emery, 1993). Data quality is invariably a critical factor in mortality studies, given the social construction of vital statistics, important transitions in medical theories of disease, and the political configuration of administrative systems. Within a contemporary context, reliable cause-of-death statistics are important not only for identifying and monitoring health problems, but also for developing appropriate programmes for disease prevention and health promotion. Although it is widely recognized that the accuracy and reliability of death certificate information has a significant impact on public and corporate policy, there are continuing concerns over the ability of the International Classification of Diseases (ICD) to reflect real trends in pathological processes, as well as the persistence of errors and inaccuracies in national systems of cause-of-death registration (Rosenberg, 1991; Meslé, 1999). The ICD system, even after ten revisions, is still arranged on the basis of several classification axes (reflecting both anatomical and aetiological criteria as well as specific life events), despite evidence that a more consistent classification procedure using only aetiological factors generates a different picture of mortality trends (Vallin, 1990; Meslé and Vallin, 1996). Various problems have also been highlighted in recent studies of administrative procedures in individual states, including deficiencies in the registration system itself, the impossibility of distinguishing between direct causes of death and underlying or contributory conditions involving complex diseases or uncertain pathogenesis, as well as bureaucratic impediments to the production of high-quality data (Hoel et al., 1993; Ashley and Devis, 1992; Bouvier-Colle et al., 1991; Anderson et al., 1994).

Many of these issues relating to the accuracy of cause-of-death registration systems and the reliability of individual classification schemes had their origins in the nineteenth century, if not earlier. The development of more sophisticated approaches to the

analysis of mortality data in the second half of the nineteenth century was dependent on a range of factors, including the implementation of obligatory post-mortem examinations and improvements in cause-of-death classification systems. However, the persistence of a federal state framework in Germany, even after the achievement of political unification in 1871, facilitated the continuation of existing local practices which inevitably delayed the implementation of a uniform approach to the collation, analysis and publication of mortality data. This paper will examine the historical development of cause-of-death reporting in nineteenth-century Germany within the context of a federal system of health administration and assess the extent to which institutional rigidities in individual states continued to affect both the quality and comparability of demographic data. The persistent difficulties in implementing a standardized cause-of-death classification scheme affected, in turn, not only the analysis and interpretation of mortality trends, but also the focus and direction of public health policy.

The case for convergence and reform

During the nineteenth century wider debates on the political desirability of German unification reinforced concern over the continued diversity in cause-of-death classification schemes and underlying deficiencies in the registration procedures of individual states. The case for convergence in managing cause-of-death registration was reinforced by a number of factors. Firstly, developments in medical theory, reinforced by the publication of research-based journals and a growing emphasis on specific disease entities, contributed to professional dissatisfaction with a symptom-based classification and culminated in the defeat of ancient humoralism (Broman, 1996; Alter and Carmichael, 1997; Risse, 1997). Instead of attributing diseases to a wide range of sufficient causes, medical practitioners increasingly sought to establish a universal necessary cause for each disease (Carter, 1997). From the mid-nineteenth century onwards, physicians and their professional associations in Germany advocated the introduction of standardized cause-of-death statistics as a prerequisite for the scientific understanding of illness and disease. Although the medical reform movement initially lost some of its momentum after 1848-49, Friedrich Beneke, personal physician to the Grand Duke of Oldenburg and founder of the Association for Joint Activities for the Promotion of Scientific Therapeutics, submitted a paper to the German states in 1857 which emphasized the need to introduce standardized mortality and morbidity statistics, including a uniform cause-of-death classification scheme (Ploss, 1882, p.20). The proposal met with a mixed response. Whereas, it served as the starting point for the preparation of a new cause-of-death classification scheme in Prussia (introduced in 1858), the Bremen authorities, while accepting that the existing cause-of-death data were 'completely illusory', felt unable to introduce a system of compulsory post-mortem examination which was accepted as a precondition for any meaningful improvement in mortality statistics (Staatsarchiv Bremen, 4, 21-3).

Secondly, public health protagonists, whether individually or collectively, reinforced the case for the compilation and publication of uniform cause-of-death statistics in the belief that they would confirm the efficacy of sanitary reform. A better understanding of disease was associated directly with notions of prevention and therapy and a belief that predisposing causes were normally controllable (Hamlin, 1992, p.55). Various hygiene associations and societies for medical statistics played an active role in petitioning the North German Confederation and, after 1871, the *Reichstag* with proposals for creating central state institutions which could standardize mortality statistics and improve public health policy. From 1869 onwards, one of the leading public health journals (the *Vierteljahrsschrift für deutsche Gesundheitspflege*) regularly published articles which highlighted the need for a uniform cause-of-death classification scheme. Contributors to the journal condemned the 'many deficiencies' of existing practices, the lack of statistical training among medical officers, and the unreliable mortality data of 'national' statistical offices (Wasserfuhr, 1872; 1875; Körösi, 1872). Public health experts, like many physicians, also explicitly preferred a classification scheme based on 'real aetiology' as the most effective means of establishing coherent pathological processes and confirming the efficacy of sanitary reform measures (Meslé, 1999).

Thirdly, the pressure to standardize mortality data and create a uniform cause-of-death classification scheme in Germany was reinforced by collaboration amongst statisticians at an international level. Statisticians were increasingly aware of the deficiencies in national classification systems and had an explicit professional interest in encouraging a concerted move towards greater standardization. The International Statistical Congress in Brussels in 1853 had initiated a wider discussion of this issue, and the first draft of an international register of causes of death was produced at subsequent congresses in Paris (1855) and Vienna (1857). However, these proposals were inevitably subject to criticism and amendment, and it was not until 1893 that the International Statistics Institute (at Bertillon's suggestion) convened a commission to review the cause-of-death classification scheme. This led to the publication in 1900 of an abbreviated scheme with 36 major headings and a more detailed list of 179 individual causes of death. A further scheme for use in hospitals was also drawn up with 198 specific headings (Leidinger et al., 1997, p.233). The fact that the new ICD scheme was adopted by a number of German cities further reinforced the case for standardization, at a time when urban statisticians (organised in the *Verband deutscher Städtestatistiker*) were increasingly active as a pressure group which demanded further improvements in the classification of causes of death (Staatsarchiv Bremen, 3-M.1.d.8).

Finally, the unification of Germany in 1871 provided the necessary political context for the eventual standardization of mortality statistics and the introduction of a uniform cause-of-death classification scheme, particularly as the new constitution envisaged the creation of a central health service. Despite continued adherence to a federal framework which allowed constituent states a significant degree of autonomy in configuring public health policy, the establishment of the IHO in 1876 was an important step towards the eventual introduction of standardized medical and mortality statistics. Following the Budapest Conference, the IHO requested in October 1876 the submission of mortality data from all towns and cities with a population of 15,000

inhabitants or more, despite the fact that this involved a number of additional calculations by state statistical offices (Staatsarchiv Bremen, 4,57/4-6). A commission was convened in 1890, consisting of representatives of the federal states, as well as statisticians and representatives of the legal and medical professions, with the explicit aim of constructing a uniform cause-of-death classification scheme which came into operation in 1892. However, the scheme (known as the '*ältere System*') retained several classification axes with causes of death determined both on the basis of aetiological criteria and the localized site of specific diseases. Specific causes of death were restricted to particular age groups (so that 'weakness' was restricted to infants dying within their first year of life), while neoplasms were restricted to the age group 15-60 (Leidinger et al., 1997, p.231). Only primary causes of death were to be recorded, despite the relevance of contributory conditions for establishing actual causation, and potential biases were introduced because contemporary political and public health concerns led to a special emphasis on infant deaths and infectious diseases. More importantly, no attempt was made to impose a uniform registration procedure.

Indeed, it was not until 1905 that Germany finally implemented a scheme that incorporated a standardized system of classifying individual causes of death (the so-called '*jüngere System*'). The new scheme included a detailed register of 335 causes of death, which were incorporated into 23 disease groups with nine sub-headings. As in 1892, emphasis was placed on infectious diseases (particularly tuberculosis) and the various causes of both infant and violent deaths. Important changes were introduced in relation to specified age-groups: the adult age-group 15-60 was now sub-divided into two separate categories (15-30 and 30-60), while a clearer distinction was drawn in recording deaths amongst the elderly between those aged between 60 and 70 and those of 70 years or more. The 1905 scheme reflected an overriding concern to improve the quality of cause-of-death registration and included a wide range of detailed instructions. If other causes of death were registered, general, symptom-based descriptions (such as 'weakness of the heart' or 'paralysis of the lungs') were simply to be omitted. Priority was to be given to acute rather than chronic illnesses and in cases of multiple causality, the probable original disease was to be registered (Prinzing, 1906, p.332). Apart from the inclusion of appendicitis as an additional cause of death in 1907, this classification scheme was retained until 1932, when Germany finally adopted the ICD system (Würzburger, 1909, p.46). Prior to the outbreak of the First World War, however, no further progress was made towards the introduction of a compulsory system of post-mortem examination. Indeed, by the late-1920s the German system of cause-of-death registration was increasingly regarded as defective: it was unsystematic, too detailed in its treatment of infectious diseases and too summary in listing diseases of specific organs (Generallandesarchiv Karlsruhe, Justizministerium 234/6401).

Despite the achievement of political unification in 1871 and a growing awareness in many quarters of the importance of standardized cause-of-death data for the analysis of mortality trends and for the formulation of appropriate public health measures, Germany did not adopt a uniform classification scheme until 1905 and deficiencies were still evident in the management of the registration process even in the 1920s.

The remaining sections of this paper will examine the factors which undermined the attempt to generate uniform cause-of-death statistics and restricted both the comparability of cause-of-death data and the quality of contemporary mortality analysis. The significance of institutional rigidities at the federal state level will be analysed with particular reference to the city-state of Bremen.

Federalism and state health administration

Despite the territorial re-configuration of Germany as a result of the Napoleonic Wars there were still 39 separate states in 1815. Many states sought to reinforce their 'national' legitimacy and pursued different policies in relation to a wide range of developmental issues. Federalism reinforced the 'monarchical principle' and, with few exceptions, there was no support for the centralization of political power, either in the Constitution of 1848/49 or at the creation of the North German Confederation in 1867 (Boldt, 1990). Moreover, political power in Germany remained fragmented even after unification in 1871. The new constitution was superimposed on a collection of previously independent states: it recognized their continued status as territorial entities; granted them their own constitutions and state parliaments; and confirmed their extensive legislative and executive powers. Only Alsace-Lorraine was to be administered directly from Berlin (Roesler, 1996).

The retention of a federal constitutional framework throughout the nineteenth century had important implications for the structure of state administration, the direction of health policy, as well as the range and quality of demographic statistics. Following the creation of both the North German Confederation and the *Reich*, various arguments were advanced in favour of a central coordination of health administration and the collation of uniform medical and demographic data. Imperial agencies would be able to develop more effective solutions to contemporary health issues than individual states acting in isolation, and a central authority would be better placed to implement medical policing measures in a more successful manner. Given the continuing deficiencies of parish register data, there was a clear need for an effective reorganization by the state of mortality statistics, based on a common classification and registration system (Wasserfuhr, 1872). However, it was quickly apparent that the *Reich* was unable to assume responsibility for health administration, as it was simply 'not feasible to proceed against state legislation or local administration or the rights of individuals by federal decree' (Virchow, 1985, pp.77,85). Even the proposal in the autumn of 1871 to create a Central Institute for Medical Statistics proved to be contentious, as it reflected persistent differences between the various advocates of public health reform (Varrentrapp, 1872, p.145). Although the Imperial Health Office (IHO) was established in 1876, it only exercised a 'passive monitoring role', and responsibility for the enactment and implementation of health administration remained the responsibility of the individual states (Weindling, 1991, p.205; Rapmund, 1901, p.64). The Imperial government in Berlin was certainly responsible for a number of important initiatives, including the Vaccination Law of 1874 and the introduction of compulsory health insurance in 1883, but the IHO was denied executive powers and other legislation (such as the Foodstuffs Law of 1879 and the Law on Contagious

Diseases of 1900) simply sought to standardize existing state regulations (Witzler, 1995, p.96). Indeed, even the limited objective of achieving greater uniformity in medical statistics remained problematic, as both Mecklenburg-Strelitz and Mecklenburg-Schwerin continued to refuse to cooperate with the relevant *Reich* authorities (the Imperial Statistical Office and the IHO) until 1924 (Kohler, 1991, p.280). In general, there was no consolidated health legislation in Germany prior to 1914 and health administration in the individual states continued to reflect an operational structure which frequently had its origins in the late-eighteenth and early-nineteenth centuries (Sachs, 1879).

There was some similarity in the framework of medical administration at the federal state level (Table 1) which reflected a shared ideological tradition moulded by the concept of medical police, with its primary emphasis on coercive, individual-based measures. In reality, however, the management of medical affairs varied substantially among the individual states and the overall system of medical administration was condemned by a contemporary observer as a 'chaos without form or life' (Stoll, 1842). Whereas Prussia had four levels of administration (central; provincial; administrative district; and local), other states were far less bureaucratic. In Baden and Hesse local medical officers were directly responsible to the central government ministry, but in smaller states, such as Schaumburg-Lippe and Schwarzburg-Rudolstadt, there was simply no legislative framework for regulating medical affairs or securing the collation of reliable cause-of-death data (Guttstadt, 1890). Even after 1871, therefore, there was a significant degree of variation in the administrative structure of state medical services.

Federal autonomy and cause-of-death registration

Individual causes of death were initially reported in parish registers from the late-sixteenth century onwards and this practice was made compulsory throughout Prussia following the severe plague epidemic of 1708-10 (Kisskalt, 1925, p.165). Indeed, Prussia played an important role in the development of cause-of-death data throughout Germany: the urban authorities in Berlin and Breslau began publishing bills of mortality in the 1720s and 1730s and individual provinces reported causes of death at a comparatively early date (Boeck, 1863, p.5). By the second half of the eighteenth century cause-of-death registration had become an official concern. Under the influence of Süssmilch and as a result of an increasing interest in medical topography, important steps were taken to improve registration procedures in the Circular of 1766 and the *Allgemeines Landrecht* of 1794, a process which was reinforced by the creation of the Royal Statistical Bureau in 1805 (Guttstadt, 1879, p.153). Other German states were more dilatory in their approach to the compilation of cause-of-death data. Coburg adopted a basic classification system in 1781, but it only contained fairly general, symptom-based diseases. It was not until 1803 that the Bavarian authorities required a yearly overview of 'dominating diseases' based on parish register material which remained the main source of information on population statistics until 1875, despite the fact that local medical officers were instructed to record all deaths by age, sex and cause from 1809 onwards (Nicolai, 1783;

Kerschensteiner, 1886; Krinner, 1928). By the second half of the nineteenth century many German states were in a position to publish cause-of-death data on a regular basis, but this never became a uniform practice. Hesse, for example, consistently failed to issue a separate series of medical statistics and the approach of individual states to cause-of-death registration continued to vary significantly (Kohler, 1991, p.295).

The persistence of state autonomy in many areas of health policy and administration had important ramifications in terms of the development of a reliable system of cause-of-death classification. Firstly, there was a continuing lack of uniformity in the classification of causes of death, as well as significant deficiencies in the schemes adopted by individual German states. In Prussia, the decree of 1799 laid down 53 separate cause-of-death headings, a number that was reduced progressively in the course of the nineteenth century to 33 (1810), 11 (1815), and finally to 10 (1861). Following the introduction of civil registration, however, an important reclassification exercise was carried out which resulted in 30 individual causes of death (without sub-headings). A similar process was evident in Bavaria, where there was an initial reduction in the number of disease categories from 18 (1815-39) to 11 (1855) (Kohler, 1991; Oettinger, 1855). By contrast, the classification scheme utilized by the medical authorities in Baden in 1894 consisted of eight major disease categories, covering a total of 136 individual diseases (Die Statistik der Bewegung der Bevölkerung, 1894). Even at the beginning of the twentieth century, the number of individual disease categories in 'national' classification systems varied between 17 in Saxe-Meiningen to 66 in Bavaria. To a large extent, the continuing absence of a uniform cause-of-death scheme simply reflected the adoption in individual states of different classification systems, whether developed by medical experts (such as Bertillon, Flinzer, Lackner or Virchow), or advocated by institutions and government agencies, including the IHO, the Prussian Ministry of Culture, the Hamburg Conference of 1888, or the international community (with the publication of the ICD in 1893) (Würzburger, 1909). The extent to which this lack of uniformity undermined the quality of statistical data was evident in Bremen. Until 1892 the city-state had utilized the Virchow system, which had then been replaced by the IHO's new classification scheme. However, the Bertillon system had been employed for processing local statistics, primarily for comparative purposes. As a result, specific diseases were allocated to different categories and it was increasingly difficult to maintain comparability with earlier data (Staatsarchiv Bremen, 4,21-566).

The inherent problems of comparability were compounded by deficiencies in national cause-of-death classification schemes. Most schemes in the early nineteenth century were symptom-based, structured on the basis of contemporary nosologies, and continued to reflect the traditional distinction between internal and external causes of death, despite the increasing condemnation of this 'superficial' division of human diseases (Lesky, 1976, p.353). The names of individual causes of death were also derived directly from contemporary vernacular language, or even regional dialects, as the reference to 'chicken cough' (*Hühnerhusten*) in the death registers of Bremen indicates (Leidinger et al., 1997, pp.223-4). Classification schemes often betrayed official concern over specific causes-of-death (including accidents and suicide) or

infectious diseases, such as cholera, which posed particular problems in terms of public health and medical policing (Zur Statistik des Königreichs Hannover, 1855). They were also frequently characterized by terminological problems which undermined their reliability, even within the framework of existing medical knowledge. The original classification scheme in Bavaria suffered from overlapping disease categories, with tuberculosis deaths also listed under consumption, dropsy, or suppuration, and an extensive reliance on observed symptoms (such as 'inflammation' and 'sclerosis') which may have been the result of a number of potential diseases (Oettinger, 1855). The Hamburg authorities relied extensively on a latin terminology for individual diseases, while the classification scheme in Saxony contained some disease categories which were seldom replicated in other states (Oesterlen, 1865, p.771). Even in the case of Prussia, the appearance of a uniform classification system was misleading and persistent weaknesses were evident both in relation to medical diagnosis and categorization (Guttstadt, 1879). The cause-of-death statistics for the period 1820-34 essentially distinguished between acute and chronic causes of death, as well as internal and external diseases, and included a separate category for cases of sudden death (Oesterlen, 1865, p.772). Indeed, it was officially accepted that the medical statistics for cities such as Berlin, based on the classification scheme of 1858, were more reliable than cause-of-death data from larger administrative areas (Eulenberg, 1874, p.240).

The continued adherence to a federal state framework meant that Germany still maintained a variety of cause-of-death classification schemes even in the late-nineteenth century. Any meaningful analysis of the available data, particularly from a comparative perspective, was complicated by differences in classification procedures and the diagnosis of individual diseases. Although some disease categories (such as dysentery, scarlet fever and whooping cough) were common to all the states, there were substantial differences in terminology, in the classification of individual diseases and in the overall coverage of national classification systems. Whereas 'convulsions' (as a cause of death in early childhood) was linked with debility in Alsace-Lorraine, Prussia was the only state to distinguish between pulmonary tuberculosis and other forms of tuberculosis (Table 2). In the early decades of the nineteenth century there had sometimes been a tendency to register a number of separate diseases under a common heading so that 'internal acute disease' in Prussia included deaths from measles, scarlet fever, dysentery and asiatic cholera (Hoffmann, 1839, pp.45-6). The final designation of a particular cause of death was also the result of a complicated process of distinguishing between primary and underlying causes, as the classification of deaths from pneumonia and paralysis of the lung in Bremen in 1872 reveals (Table 3). In many cases, the diagnostic skills of medical practitioners remained limited even at the end of the nineteenth century. Errors were inevitably made in registering diseases such as tuberculosis before the advent of reliable diagnostic tests, a tendency which was reinforced by widespread belief that the disease was both hereditary and socially damaging (Bryder, 1996, p. 254; Hardy, 1993, p.263). Secondly, individual classification problems were compounded by the difficulty of controlling the accuracy of cause-of-death registration. The quality of mortality data in Germany remained very uneven because of federal differences in registering causes of death. During the first half of the nineteenth century, there was a general reliance

on lay reporting with attendant problems in relation to biases arising from classification inconsistency and confusion between locally defined illness and medically defined disease (Stephens, 1990; Zimicki, 1990). In Bremen, for example, the civil death registers contained information relating to the presumed cause of death (*'mutmassliche Todesursache'*) from 1834 onwards, but this was to some extent a matter of individual opinion. Although an oral notification of death by two witnesses (preferably connected with the deceased) was necessary in order to register a death, there was no general requirement to report the actual cause of death or to produce a death certificate (Leidinger et al, 1997, p.222). Medical practitioners throughout this period were concentrated in urban areas, where demand for their services was primarily located. Cities and towns, such as Stettin, were therefore able to adopt medical certification of cause of death, while the shortage of doctors in rural areas necessitated a continued reliance on lay reporting which exacerbated quality differences in cause-of-death data (Wasserfuhr, 1872). In many rural areas of Prussia the clergy registered a high proportion of all deaths. Although existing procedures were improved by the appointment of local registrars, they remained dependent for cause-of-death information on lay officials or acquaintances of the deceased (Guttstadt, 1879). Prior to 1914, only 14 states required medical certification of cause of death. The Prussian registration system, in particular, suffered from serious deficiencies, including questionable diagnosis and mistaken categorization, and exclusive certification by medically-trained personnel was only undertaken in Bremen, Hamburg and Lübeck.

A pre-condition for a systematic registration of death causation was the introduction of an obligatory post-mortem examination. Initiatives in this area had already been undertaken in the late-eighteenth century, specifically in parts of Austria-Hungary, as a means of encouraging the population to seek medical advice. From 1822 onwards death certificates were filled out by local medical officers in Baden, while Bavaria attempted to introduce compulsory post-mortem examinations by medical practitioners in 1839 (Döllinger, 1847; Kohler, 1991). Ultimately, legislation enacted by the Elector of Hesse in 1824 served as a basic model for policy development in Germany as a whole: post-mortem examinations were to be carried out by physicians and surgeons in urban areas, but by laymen in rural districts, provided they had been trained by physicians (Leidinger et al, 1997, p.227). In reality, however, the situation was far from satisfactory. Particularly during epidemics there were insufficient doctors even in urban areas to carry out post-mortems and they frequently registered causes of death, such as 'convulsions' which were inadequate for statistical purposes. Smaller states deliberately failed to encourage post-mortem examinations and the extent of this practice in rural areas of Prussia remained dependent on the attitude of local clergymen (Wasserfuhr, 1872). In Bremen, the state authorities only granted permission for burial if death had been certified by a physician, the next-of-kin, or by two other individuals who were fully aware of the exact circumstances. Following the introduction of an obligatory post-mortem examination from 1 January 1872, they preferred to use 'sensible' laymen, such as school teachers, to carry out post-mortem examinations if no physician was available, but were forced eventually to rely on rural constables who had been trained to recognize causes of death following practical instruction in the mortuary of the General Hospital by two police doctors, Dr Pauli and

Dr Kottmeier (Staatsarchiv Bremen, 2-D.20.c.1; 4, 21-5). Similarly, laymen were permitted to register a cause of death in Prussia only if they had received effective training, although it was widely recognized that new legislation was necessary to improve the reliability of post-mortem examinations and the quality of mortality statistics (Rapmund, 1901, p.827; Tracinski, 1895). The Imperial Ministry of the Interior had intended to introduce compulsory post-mortem examinations in 1877, but no such legislation had been passed prior to 1914, apart from the formal requirement that every death had to be registered. Regulations relating to post-mortem examinations remained a matter for individual states and were never applied in a uniform manner throughout the *Reich*. Although there was an increasing tendency in many states to require a compulsory post-mortem examination, no such provision was made in Lippe, Mecklenburg-Strelitz, Oldenburg, Schwarzburg-Sonderhausen and Waldeck, and it remained limited in Prussia to the larger cities and a number of administrative districts (such as Niederbarnim). Post-mortem regulations remained unchanged in Bremen until 1927, when the state authorities finally required post-mortem examinations to be carried out by physicians, even in rural areas (Wasserfuhr, 1872, p.190; Rapmund, 1914, pp.830-31; Staatsarchiv Bremen, 4, 21-11).

The situation was aggravated by the absence of any clear policy in relation to notifiable diseases. Despite a general emphasis on the need to remove dangerous agents, in particular infectious diseases, from contemporary society, the approach of individual states to compulsory notification varied considerably. Although the Prussian regulation of 1835 specified a wide range of notifiable diseases, including cholera, dysentery, measles, scarlet fever, smallpox, and typhus, the extent of compulsory notification in many smaller states, including Saxe-Meiningen, Saxe-Weimar and Schwarzburg-Rudolstadt, remained limited, and the official reaction of individual states to specific diseases continued to be uneven (Kirchner, 1907; Rapmund, 1914, p.465). Mandatory notification of a number of contagious diseases deemed to be a danger to the public (including leprosy, asiatic cholera, petechial typhus, yellow fever, bubonic plague and smallpox) was introduced throughout Germany by the Imperial Law of 30.6.1900, but the reporting of all other infectious diseases remained the responsibility of individual *Länder*. As a result, the extent of diversity was 'not inconsiderable' (Rapmund, 1914, p.329). Although there was a tendency for some states to model 'national' legislation on the Prussian *Landesseuchengesetz* of August 1901, measles and whooping cough were only notifiable in Hamburg and the principality of Lübeck, whereas Hamburg was the sole state to insist on the notification of mumps. Differences in 'national' registration systems persisted: in Saxony notifiable diseases were initially registered with the *Bezirksarzt* who was then responsible for forwarding the information to the *Landes-Medizinal-Kollegium*, whereas in Prussia they were registered directly with the local authorities. There was no consensus even within individual states on what constituted the most effective notification system for both rural and urban areas and there was considerable concern over the cost implications to the Post Office of allowing all epidemic diseases to be notified on unfranked forms following the recommendation of the Imperial Ministry of the Interior in 1902 (Sächsisches Hauptstaatsarchiv Dresden, Ministerium des Innern, 15155). In most cases the costs of complying with official notification requirements were met by the local authorities, but some states (including Baden, Bavaria, Braunschweig, Thuringia

and Württemberg) provided financial support from central government to poor rural parishes to improve efficiency.

The significance of institutional rigidities

The first statistical office in Germany was established in Prussia in 1805, although a director was not appointed until 1810. Other German states followed Prussia's example, sometimes with a considerable time lag. Whereas Bavaria and Württemberg created a central statistical bureau in 1815 and 1820 respectively, an appropriate institution for the collation and analysis of statistical data was only set up in Baden in 1852. Indeed, it was not until the early-1860s that Hesse and Bremen instigated a centralized compilation of mortality data (Kleindinst and Zahn, 1914; Boeckh, 1856, pp.13, 853; Kohler, 1991, p.280). Each statistical bureau developed its own operational structure, both in relation to accountability, administrative procedures, and specific areas of responsibility. In certain cases, responsibility for collating and processing health statistics was shared between the respective Ministry of the Interior and the Statistical Bureau in a manner that seldom encouraged cooperation. The fact that mortality data were seen as an integral component of both demographic and medical statistics inevitably created disputes between different state agencies, whether at the imperial or federal level, and there was considerable opposition after 1871 to the creation of a Central Institute for Medical Statistics (Leidinger et al., 1997, p.234; Varrentrapp, 1872, 145).

The historical legacy of institutional arrangements created at an earlier period in the nineteenth century retarded the process of statistical standardization. In Bremen, the Statistical Bureau was responsible for producing demographic statistics, as well as mortality data with the assistance of the medical authorities. Such an arrangement inevitably led to conflict between the different agencies, in particular between the Senate Commission for Bremen Statistics, and the Health Board (*Gesundheitsrat*) and Medical Commission. In 1876 the Statistical Bureau refused to provide weekly mortality data (disaggregated by age and cause of death) which had been requested by the IHO, unless its own weekly series (initiated in 1871) could be discontinued. The local sanitary authorities were therefore initially compelled to produce the necessary data, despite the fact that the Medical Commission lacked relevant experience in this area (Staatsarchiv Bremen, 4,57/4-6). The inter-agency dispute continued until 1878, when it was finally agreed that the weekly mortality series would be compiled by the Statistical Bureau (Staatsarchiv Bremen, 3-M.1.d.1). Such difficulties, however, were symptomatic of a need to retain bureaucratic autonomy at a time when both the scale and resourcing of state administration remained relatively limited (Leist, 1955). In 1864 expenditure on the Bremen Statistical Bureau accounted for under five per cent of internal administrative costs and 0.27 per cent of the state's ordinary expenditure: the comparative figures for 1905 were 9.1 per cent and 0.24 per cent respectively (Zur Statistik des Bremischen Staats, 1865, pp.97-104; Jahrbuch für Bremische Statistik, 1910, pp.339-43). Under such circumstances, it is not surprising that the Statistical Bureau was unwilling to accept new tasks, particularly in response to IHO requests, unless additional resources could be found to employ the necessary personnel

(Staatsarchiv Bremen, 4,57/4-6).

Institutional rigidities, which reflected the legacy of well-established administrative procedures at the federal state level, were also evident in two further areas. On the one hand, any attempt to introduce standardized mortality data which could be collated in a uniform fashion throughout Germany inevitably entailed a significant re-classification of specific causes of death in a manner that failed to reflect established procedures in individual states. Although Bremen ultimately adopted a classification scheme that reflected Virchow's concern with anatomical localization and pathological information, the civil death registers for 1872 still contained a number of causes of death that were defined on the basis of visible symptoms, including 'chest disease' 'dropsy', 'paralysis of the lung', and 'weakness'. The acceptance of alternative classification schemes, as advocated by the IHO and specific professional pressure groups, by definition involved short-term adjustment costs. Indeed, there were constant attempts to modify proposals for alternative classification schemes in order to reflect Bremen's specific epidemiological profile and to retain a degree of comparability with earlier cause-of-death data. The Bremen authorities insisted on a number of modifications to the new classification scheme of 1892, replacing 'rare infectious diseases' by a separate category for 'influenza, smallpox and Asiatic cholera', and inserting an additional heading for 'croup-like pneumonia'. These were diseases which had a particular significance for Bremen, given its function as a port-city, as a centre for long-distance in-migration and for emigration, and its geographical location on the river Weser. Dissatisfaction with other aspects of the IHO's attempt to generate standardized mortality statistics was evident throughout the period before 1914. Although it was generally accepted that the planned introduction of a new cause-of-death classification scheme did not present 'any difficulties' for the Bremen authorities, the Health Board (*Gesundheitsrat*) expressed amazement that non-infectious diseases of the nervous system (including convulsions, meningitis and tetanus) had been omitted and registered its concern that the inclusion of complicated latin definitions would create considerable problems in completing death certificates (Staatsarchiv Bremen, 3-M.1.d.8). In 1901, Böhmert (as Director of the Statistical Bureau) publicly criticized the IHO proposals: whereas some disease categories were not particularly useful for statistical purposes, others (such as paralysis or oedema of the lung) were completely unusable. The introduction of a more extensive classification scheme in 1905 was met with equal scepticism by the Director who viewed it simply as another system which would further undermine effective comparisons with earlier cause-of-death data in Bremen, despite the fact that the Statistical Office remained committed to this objective (Staatsarchiv Bremen, 3-m.1.d.8; 4, 21-566).

On the other hand, the attempt to standardize both the collation and analysis of mortality data raised a number of methodological problems which continued to delay progress in the constituent states. Because of its port-city status and the presence of a considerable 'floating population' (including many emigrants), the Bremen Statistical Bureau throughout most of the nineteenth century had utilized the permanently resident population (*Wohnbevölkerung*) to calculate demographic rates, rather than the population actually resident in the city at any given point in time (*ortsanwesende*

Bevölkerung). Given seasonal variations in the balance between temporary residents and temporary migrants, it was argued that a base line population derived from those entitled to be resident in Bremen was the only way to avoid any distortion created by the emigrant trade (Berufs-und Betriebszählung, 1907). Bremen was the only federal state that insisted on this method of estimating mortality trends and its approach attracted stringent criticism. According to Wolffhügel (1876), by excluding the deaths of 'foreigners' Bremen was able to present itself as one of the healthiest cities in the cheapest possible way, without installing a central water supply and without incurring any debts. The situation was compounded by the fact that the IHO required all mortality data to be returned to Berlin on the basis of the 'actual' population, and a formal request to this effect was forwarded to the Deputation for Bremen Statistics in June 1878 (Staatsarchiv Bremen, 4,57/4-6). Although the city-state authorities were forced to comply with imperial practice in compiling demographic statistics, cause-of-death data were still calculated on the basis of the permanently resident population, primarily to retain comparability with earlier years. As a result, cause-of-death statistics had to be provided in two forms: firstly, for the state of Bremen based on the permanently resident population; and, secondly, for the port-city based on the population actually resident. It is interesting to note in this context that the editor of one of the local newspapers, the *Bremer Nachrichten*, was only prepared to publish quarterly or monthly mortality data if they were presented on the basis of the 'actual' population (Staatsarchiv Bremen, 4, 57/4-6).

A final problem that limited the ability of the Bremen authorities to effect necessary improvements in the collation and analysis of mortality data was their continued dependency on the cooperation of local physicians. In 1872, as a reaction to the severe smallpox epidemic, a decision was made to introduce a weekly morbidity series (with a particular emphasis on diseases such as scarlet fever, measles, smallpox, abdominal typhus, meningitis and puerperal fever). The Medical Commission was hopeful that all local doctors would cooperate in returning the required disease-specific information, as the availability of improved statistical data would benefit the port-city's health and wellbeing. Eight physicians refused to respond to the official request: some 'foreign' practitioners were unwilling to participate and Dr Boekelmann simply indicated that 'statistics were not to his liking'. Although there was a gradual acceptance by the medical profession of the need to cooperate with the medical authorities in the provision of morbidity and mortality data, a number of doctors still failed to fulfil their designated duties in the mid-1880s (Staatsarchiv Bremen, 4,7-III.1.b). Given the limited scale of Bremen's administrative apparatus, the support of professional groups such as the local physicians was critical if further improvements in medical statistics were to be achieved. Opposition from the Medical Association, or non-compliance by individual practitioners, could act as an important constraint on institutional reform.

The various directors of Bremen's Statistical Bureau during this period were generally in favour of reform. Heinrich Frese openly advocated the compilation of a weekly mortality series by cause of death in 1871 using the model developed by English urban authorities, in order 'to stimulate the interest of the population in medical statistics and public health' (Staatsarchiv Bremen, 3-M.1.d.1). Böhmert at the beginning of the twentieth century was equally aware of the need for further

convergence in reporting cause-of-death data, even though he remained highly critical of the IHO's proposals and the failure to adequately consult the federal states (Staatsarchiv Bremen, 4,21-566). But because of institutional rigidities and the need to retain existing practices, if only for long-run comparative purposes, the rate of progress was slow. Although the Bremen authorities responded rapidly to specific IHO requests and immediately distributed the official questionnaire relating to cancer patients in 1900, the implementation of a uniform cause-of-death classification scheme remained a contentious issue. Indeed, even after the outbreak of the First World War there was continuing uncertainty over how to register specific causes of death, when the Statistical Office in Baden sought advice as to whether soldiers who died of their wounds should be returned in the classification scheme under 21b (first-, or second-degree murder), or 21c (accidental or violent death) (Staatsarchiv Bremen, 3-M.1.d.8 and 21).

Conclusion

The quality of mortality analysis remains dependent on the accuracy and reliability of vital registration, particularly in relation to cause of death. It is widely recognized that there is considerable misclassification of individual causes of death (for example, in respect to maternal mortality), problems in measuring registration coverage, and perceptible biases in national reporting systems (Magnin et al., 1988; Ruzicka and Lopez, 1990). Even using the current ICD system, there are continuing difficulties in identifying coherent pathological processes (Meslé, 1999). The example of Germany in the second half of the nineteenth century is instructive in this context, as it illustrates some of the underlying factors which hindered the long-run improvement of cause-of-death data at an international level. Despite the achievement of political unification in 1871 and the creation of central state agencies (such as the Imperial Statistical Office and the IHO), mortality data for demographic analysis remained of doubtful quality prior to the outbreak of the First World War. The retention of a federal state constitution reinforced existing institutional rigidities which prevented any rapid implementation of a uniform procedure for the collation, analysis and publication of mortality data. There had been growing pressure for the introduction of standardized mortality and morbidity statistics in Germany from the mid-nineteenth century onwards, but the federal structure of state power continued to influence, if not to determine, the precise configuration of government policy in this area. The IHO's efforts to move towards

a uniform cause-of-death classification system were constantly frustrated by the historical embeddedness of bureaucratic practice and administrative policy in the individual federal states. Even at the end of the nineteenth century, there were still considerable differences in death registration procedures, in the range of notifiable diseases and, most importantly, in the extent of compulsory post-mortem examinations. It was not until 1905 that Germany finally adopted a standardized scheme for classifying causes of death and it did not introduce the ICD system until 1932.

Official recognition of the need to secure greater uniformity in cause-of-death

registration, reinforced by the activities of various pressure groups, both within Germany and internationally, helped to lay the basis for some improvement in the quality and range of mortality analysis. By the early-twentieth century the Bremen Statistical Office was publishing time-series data on cause of death by age group on a regular basis, and had been able to carry forward detailed assessments of infant and child mortality by social class, including the impact of housing conditions on mortality trends, as well as the death rate from specific diseases, such as cancer and tuberculosis (Berendt, 1906; Funk, 1911; Böhmert, 1931). The proportion of deaths of indeterminate cause had also fallen to under two per cent (Bremisches Statistisches Amt, 1910, p.39). However, contemporary developments in mortality analysis were not solely dependent on the achievement of a uniform classification system, as individual states were still able to generate consistent mortality data on the basis of their specific approach to cause-of-death registration. Moreover, the Bremen authorities had introduced a weekly report on morbidity trends focusing on important acute infectious diseases (including scarlet fever, measles, smallpox and whooping cough) well before the IHO's request for similar data. The evidence from Bremen indicates that opposition from the constituent states to the standardization of mortality and morbidity data was not simply a function of 'national' sovereignty or a narrow-minded commitment to retain long-established administrative practices. The adoption of an alternative cause-of-death classification system, as advocated by the IHO, involved significant adjustment and transaction costs, and would have caused reporting discontinuities with earlier mortality data. The continued failure of other states to adopt a rigorous post-mortem examination system also undermined the case for greater convergence in cause-of-death registration. Not only did the proposed IHO scheme fail to reflect fully the specific epidemiological profile of Bremen, but the adoption of an alternative classification scheme had significant cost implications at a time when the Statistical Office was not a priority for increased government expenditure. To this extent, the social construction of mortality data in Germany prior to 1914 reflected two countervailing forces. On the one hand, pressure from the imperial government in Berlin to achieve greater uniformity and comparability in cause-of-death data and, on the other hand, the continuing role of local officials at the level of the federal state in defining categories of disease and determining modes of registration. Under these circumstances, it is not surprising that the implementation of a uniform cause-of-death classification scheme in Germany was a protracted and contested process with important implications for the development of mortality analysis and the configuration of health policy.

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Table 1: The Structure of State Medical Administration in individual German States, c. 1900

State	Central Ministry	Provincial	District
Prussia*	Interior + <i>Wissenschaftliche Deputation</i>	Ober-Präsident <i>Provinzial-Medizinalcollegium</i>	Kreisphysicus
Bavaria	Interior Ober-Medizinalrat, <i>Ober-Medizinal-Ausschuss</i>	Kreis Medizinalrat <i>Kreis-Medizinal-Ausschuss</i>	Bezirksarzt
Saxony	Interior Ober-Medizinalrat, <i>Landes-Medizinal-Kollegium</i>	Medizinalrat	Bezirksarzt
Württemberg	Interior <i>Medizinal-kollegium</i>		Oberamtsarzt
Baden	Interior <i>Landes-Gesundheitsrat</i>		Bezirksarzt
Hesse	Interior <i>Medizinischer Zentralausschuss</i>		Kreisarzt
Mecklenburg-Schwerin	Justice <i>Medizinalkommission</i>		Kreisphysicus
Oldenburg	State <i>Medicinalkollegium</i>		Amtsarzt
Braunschweig	State <i>Ober-Sanitäts-Kollegium</i>		Physikus
Saxe-Weimar	State <i>Medizin-Kommission</i>		Bezirksarzt
Saxe-Meiningen	State <i>Medizinal-deputation</i>		Physikus
Alsace-Lorraine	Interior		Kreisarzt
Bremen	Medicinalkommission des Senats <i>Gesundheitsrath</i>		
Hamburg	Medicinalkollegium		

* In Prussia, an additional level of administration existed in each Regierungsbezirk.

+ Previously the responsibility of the Ministry of Culture and Education from 22.6.1849.

Note: The designated central advisory bodies on which medical doctors were represented are in italics. In the case of Hamburg the Medicinalkollegium also included 4 'Physici' and 3 practising doctors (Law of 26.10.1870).

Source: A.Guttstadt, *Deutschlands Gesundheitswesen. Organisation und Gesetzgebung des Deutschen Reichs und seiner Einzelstaaten*. Leipzig, 1890; W.Prausnitz, *Grundzüge der Hygiene*. Munich, 1916 (10th edition).

Table 2: The classification of individual causes of death in different German states, 1890

	Disease	Classification
1.	Smallpox	Pocken (P,S,W,Bad,SCG,HB,EL) Blattern (Bav, H, HH)
2.	Scarlet fever	Scharlach (all states)
3.	Whooping cough	Keuchhusten (all states)
4.	Diphtheria and croup	Diphtherie u.Kroup (P, Bav, S, W, HH, EL) Rachenbräune u.Kroup (Bad) Rachendiphtheritis u.Kroup (SCG) Diphtheritis, Bräune, Kroup (HB)
5.	Typhus	Typhus (P, H) Typhus u.Flecktyphus (Bav, HH) Abdominaltyphus (S, W, Bad) Unterleibtyphus (SCG, HB)
6.	Measles	Masern (S, W, Bad, H, HB, HH) Masern u.Rötheln (Bav, SCG, EL)
7.	Dysentry	Ruhr (all states)
8.	Cholera nostras	Cholera nostras (Bav) Einheimische Brechdurchfall (P) Brechdurchfall (Bad) Darmkatarrh u.Brechdurchfall (H) Darmkatarrh, Enteritis, u.Brechdurchfall (SCG) Durchfall u.Brechdurchfall (HB) Durchfall, Brechdurchfall der Kinder (HH) no entry (S, W)
9.	Childhood diarrhoea	Diarrhö e der Kinder (P) Kinderdurchfall (Bad) no entry (S, W)
10.	Tuberculosis	Lungentuberkulose (P) Lungenschwindsucht (S, Bad, H, SCG, HB, HH, EL) Allgemeine Tuberkulose (P)

11. Convulsions
Krämpfe (P)
Krämpfe der Kinder (HH)
Krämpfe überhaupt (HB)
Fraisen, Eklampsie der Kinder (Bav)
Eklampsie der Kinder (Bad)
Lebensschwäche, Konvulsionen und Eklampsie (EL)
no entry (S, W, H, SCG)

12. Stroke
Apoplexie (P, H, SCG)
Hirnschlagfluss (Bav)
Hirnschlag (EL)
Gehirnschlag (Bad)
Schlaganfall (HB)
Schlagfluss (HH)
no entry (S, W)

Note: P - Prussia; Bav - Bavaria; S - Saxony; W - Württemberg;
Bad - Baden; H - Hesse; SCG - Sachsen-Coburg und Gotha;
HB Bremen; HH - Hamburg; EL - Elsass-Lothringen.

Source: Staatsarchiv Bremen, 3-M,1,d.8.

Table 3: Pneumonia and paralysis of the lung as causes of death in Bremen, 1872

Disease	classification
<i>Lungenentzündung</i> <i>Pneumonia</i>	as a complication of measles, and 'morbilli' as a result of whooping cough and organic heart disease and 'black' smallpox and chronic dropsy as a complication of typhus and pleurisy chronic pneumonia and herpes
<i>Lungenlähmung</i>	paralysis of the lungs and consumption and encephalitis and phthisis and Bright's renal disease and 'Marasmus Senilis' and measles and bronchitis

Source: Zivilstandsregister der Stadt Bremen, 1872.